

APPENDIX 2

HOUSTON-GALVESTON-BRAZORIA RFP DEMONSTRATION SPREADSHEET

Dallas-Fort Worth and Houston-Galveston-Brazoria Moderate
Areas Reasonable Further Progress State Implementation
Plan Revision for the 2015 Eight-Hour Ozone National
Ambient Air Quality Standard

Project Number 2022-023-SIP-NR

Appendix 2 - Sheet 1

Houston-Galveston-Brazoria (HGB) 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Reasonable Further Progress Demonstration with MOVES3 Calculation Spreadsheet

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Appendix 2 - Sheet 2**2023 RFP Demonstration Analysis with MOVES3****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

2023 RFP Demonstration Analysis with MOVES3: To determine if the 2023 RFP requirements are met, the 2023 target level of emissions is compared to the 2023 controlled forecast inventory. The 2023 forecast inventory includes growth between the 2017 base year and the 2023 attainment year. The controlled forecast inventory has been reduced by subtracting the RFP control reductions from 2017 to 2023. If the 2023 controlled forecasted RFP EI is less than the 2023 RFP target level of emissions the 2023 RFP requirement is satisfied.

Line #	Description	NO _x (tpd)	VOC (tpd)
Line 1	Uncontrolled or existing controlled six-county HGB 2023 emissions forecast with growth	1545.37	1213.80
Line 2	Creditable six-county HGB RFP control reductions between 2017 and 2023	1234.69	772.26
Line 3	Controlled six-county HGB 2023 RFP emissions forecast (Line 1 minus Line 2)	310.68	441.54
Line 4	Amount of NOX reduction substitution (see Sheet 3)	0.00	0.00
Line 5	Controlled six-county HGB 2023 RFP forecast without reductions reserved for contingency and accounting for NOX substitution (Line 3 plus Line 4)	310.68	441.54
Line 6	Six-county HGB 2023 RFP target level of emissions	312.99	441.72
Line 7	Excess (+) / Shortfall (-) (Line 6 minus Line 5)	2.31	0.18
Line 8	Is controlled RFP EI less than target level of emissions?	Yes	Yes

Notes:

1) To calculate the RFP controlled forecast for each milestone/attainment year, the total RFP creditable control strategy reductions to date (total RFP reductions from 2017 to the current RFP milestone year) are subtracted from the total uncontrolled RFP EI.

2) To calculate the final excess or shortfall for each milestone/attainment year, the controlled RFP emissions forecast is subtracted from the RFP target level of emissions. The RFP target level of emissions for all milestone years is calculated on the "Calc Targets" page.

3) Excess emissions reductions (Line 7) may be used to provide a transportation conformity safety margin. The safety margin must be less than or equal to the excess emissions reductions.

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Appendix 2 - Sheet 3**2023 RFP NO_x Substitution Analysis with MOVES3****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

The NO_x substitution calculation includes six steps. First, calculate the percent target reduction for both VOC and NO_x by comparing the base year and target inventories. Second, calculate the percent actual reduction by comparing the base year and the actual inventory. Third, compare the percent required reduction to the percent actual reduction. If the percent actual reduction is greater than the percent required, then there are surplus reductions. If the percent actual reduction is less than the percent target, then there is a shortfall of reductions. The difference between the percent actual and the percent target reduction (when there are surplus reductions) is the amount that is available for substitution. For the fourth step, determine the percent NO_x needed for substitution. The minimum base year VOC percentage needed is equal to the percent base year shortfall in VOC plus the smallest increment possible, or 0.01. The respective NO_x percent is calculated using the NO_x base year inventory. The percent base year NO_x transfer should not exceed the percent base year NO_x surplus. The percent NO_x available to transfer is based upon the base year because the base year is the basis for the required reduction calculations. Fifth, convert the percent base year NO_x to a percent target NO_x using the percent base year NO_x from step 5 and the relative values of the base year and target NO_x inventory. The percent NO_x transfer is derived from milestone year target values because those are the values modified by NO_x transfer. The percent NO_x transfer is a percentage of the milestone year target NO_x value that is added back into the NO_x inventory and a percentage of the milestone year target VOC that is subtracted from the VOC inventory. For the sixth step, calculate the resulting tons per day (tpd) associated with the percent NO_x transfer. For NO_x, multiply the NO_x percent transfer and the NO_x milestone year target value. For VOC, multiply the percent NO_x transfer (which is the same as the percentage of the milestone year target VOC that is subtracted from the VOC inventory) and the VOC milestone year target value. The NO_x transfer amount (in tpd) is added to the NO_x actual (in tpd) inventory in the RFP demonstration calculation, and the VOC transfer amount (in tpd) is subtracted from the VOC actual (in tpd) inventory.

Line #	Description	NO _x	VOC
Line 1	2017 base year emissions (tpd)	352.47	459.17
Line 2	2023 controlled RFP EI (tpd)	310.68	441.54
Line 3	Total actual reductions for 2017 to 2023 (Line 1 minus Line 2) (tpd)	41.79	17.63
Line 4	Percent actual reductions for 2017 to 2023 (percent Line 3 is of Line 1) (%)	11.86	3.84
Line 5	2023 target RFP EI (tpd)	312.99	441.72
Line 6	2023 total target reductions for 2017 to 2023 (Line 1 minus Line 5) (tpd)	39.48	17.45
Line 7	Percent target reductions for 2017 to 2023 (percent Line 6 is of Line 1) (%)	11.20	3.80
Line 8	Percent surplus or shortfall (percent actual minus percent target, Line 4 minus Line 7) (%)	0.66	0.04
Line 9	Percent surplus to transfer (NO _x percentage should be less than Line 8) (%)	0.00	0.00
Line 10	Convert the percent surplus to transfer to tons per day (tpd)	0.00	Only NO _x Value Needed
Line 11	Calculate what percentage Line 10 is of target (this is the percentage to transfer) (%)	0.00	0.00
Line 12	Tons equivalent to percent for transfer [Line 5 times (Line 10 divided by 100)] (tpd)	0.00	0.00
Line 13	NO _x substitution amount okay? (Check to assure NO _x substitution does not exceed maximum available: Sheet 02, Line 9 must be greater than zero)	Okay to Substitute	Okay to Substitute

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Appendix 2 - Sheet 4

2024 Contingency Demonstration with MOVES3 for RFP

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Summary 2024 Contingency for 2023 RFP

Contingency Element Description	NO _x	VOC
Six-county HGB 2017 base year (BY) emissions inventory	352.47	459.17
Percent for 2024 attainment year contingency calculation (total of 3%)	1.50	1.50
Required contingency reductions between 2023 and 2024 (BY emissions inventory multiplied by contingency percent: Line 1 multiplied by Line 2)	5.29	6.89
Control reductions to meet contingency requirements		
Excess reductions from 2023 RFP demonstration	2.31	0.18
Subtract 2023 RFP demonstration motor vehicle emissions budget (MVEB) safety margin from excess reductions from 2023 RFP demonstration	0.00	0.00
2023 to 2024 emissions reductions due to Federal Motor Vehicle Control Program (FMVCP), inspection and maintenance (I/M), reformulated gasoline (RFG), 2017 Low Sulfur Gasoline Standard, on-road TxLED, and ULSD	22.00	12.96
2023 to 2024 emissions reductions due to Federal non-road mobile new vehicle certification standards, non-road RFG, and non-road TxLED	2.89	3.22
Total RFP demonstration contingency reductions	27.20	16.36
Contingency Excess (+) or Shortfall (-)	21.91	9.47

If changes are made to the enter reductions page, please assure the control reduction summary values above are consistent with the table below. The enter reductions page allows for the control reduction for a row to change. The table above adds particular rows from below.

Contingency Element Description	NO _x	VOC
HGB 2017 Base Year EI	352.47	459.17
Percent for contingency calculation (total of 3%)	1.50	1.50
2023 to 2024 RFP required contingency reductions (BY EI x (contingency percent))	5.29	6.89
Calculate available reductions to meet contingency requirements: add excess 2023 control reductions; subtract MVEB safety margin adjustment; and add each 2023 to 2024 control reduction		
Excess reductions from 2023 RFP demonstration	2.31	0.18
Subtract 2023 RFP MVEB safety margin from excess reductions from 2023 RFP demonstration	0.00	0.00
Chapter 117 NOX controls	0.00	0.00
Chapter 115 Storage Tank Rule	0.00	0.00
Coating / printing rules	0.00	0.00
Portable fuel containers	0.00	0.00
Federal Motor Vehicle Control Program (FMVCP)	23.85	13.26
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	-1.56	-0.26
Inspection and Maintenance (I/M)	-0.20	-0.04
On-road TxLED	-0.09	0.00
Tier I and II locomotive NOX standards	0.00	0.00
Small non-road spark ignition (SI) engines (Phase I)	-0.13	1.03
Heavy duty non-road engines	-0.07	0.03
Tiers 2 and 3 non-road diesel engines	-0.16	-0.04
Small non-road SI engines (Phase II)	0.10	0.90
Large non-road SI & recreational marine	2.21	0.69
Non-road TxLED	-0.04	0.00
Non-road RFG	0.00	0.00
Tier 4 non-road diesel engines	0.85	0.16
Diesel recreational marine	0.01	0.00
Small SI (Phase III)	0.12	0.45
Chapter 117 NOX area source engine controls	0.00	0.00
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	0.00	0.00
Commercial marine vessel engine certification standards and fuel programs	0.00	0.00
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Total 2024 RFP contingency reductions	27.20	16.36
Contingency Excess (+) or Shortfall (-)	21.91	9.47
Are contingency reductions equal to or greater than required contingency reduction?	Yes	Yes

Note 1: Inspection and Maintenance Program is only modeled for the five counties covered by the program: The five I/M counties include: Brazoria, Fort Bend, Galveston, Harris, and Montgomery.

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2024 Contingency Demonstration with MOVES3 for 2023 Attainment

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Summary 2024 Contingency for 2023 Attainment Demonstration		
Contingency Element Description	NO _x	VOC
Six-county HGB 2017 base year (BY) emissions inventory (EI)	352.47	459.17
Percent for contingency calculation (total of 3%)	1.50	1.50
2023 to 2024 AD required contingency reductions (BY EI x (contingency percent))	5.29	6.89
Control reductions to meet contingency requirements		
Excess reductions from 2023 attainment demonstration	0.00	0.00
Subtract reductions reserved for 2023 attainment demonstration MVEB safety margin	0.00	0.00
2023 to 2024 emissions reductions due to federal Motor Vehicle Control Program (FMVCP), HGB inspection and maintenance (I/M), reformulated gasoline (RFG), 2017 Low Sulfur Gasoline Standard and on-road TxLED	22.00	12.96
2023 to 2024 emissions reductions due to federal non-road mobile new vehicle certification standards, non-road RFG, and non-road TxLED	2.89	3.22
Total attainment demonstration contingency reductions	24.89	16.18
Contingency Excess (+) or Shortfall (-)	19.60	9.29

If changes are made to the enter reductions page please assure the control reduction summary values above are consistent with the table below. The enter reductions page allows for the control reduction for a row to change. The table above adds particular rows from below.

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Contingency Element Description	NO _x	VOC
2017 BY EI	352.47	459.17
Percent for AD contingency calculation (total of 3%)	1.50	1.50
2023 to 2024 required AD contingency reductions (BY EI x (contingency percent))	5.29	6.89
Control reductions to meet contingency requirements		
Add excess reductions from 2023 attainment demonstration	0.00	0.00
Subtract 2023 attainment demonstration MVEB safety margin	0.00	0.00
Chapter 117 NOX controls	0.00	0.00
Chapter 115 Storage Tank Rule	0.00	0.00
Coating / printing rules	0.00	0.00
Portable fuel containers	0.00	0.00
Federal Motor Vehicle Control Program (FMVCP)	23.85	13.26
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	-1.56	-0.26
Inspection and Maintenance (I/M)	-0.20	-0.04
On-road TxLED	-0.09	0.00
Tier I and II locomotive NOX standards	0.00	0.00
Small non-road spark ignition (SI) engines (Phase I)	-0.13	1.03
Heavy duty non-road engines	-0.07	0.03
Tiers 2 and 3 non-road diesel engines	-0.16	-0.04
Small non-road SI engines (Phase II)	0.10	0.90
Large non-road SI & recreational marine	2.21	0.69
Non-road TxLED	-0.04	0.00
Non-road RFG	0.00	0.00
Tier 4 non-road diesel engines	0.85	0.16
Diesel recreational marine	0.01	0.00
Small SI (Phase III)	0.12	0.45
Chapter 117 NOX area source engine controls	0.00	0.00
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	0.00	0.00
Commercial marine vessel engine certification standards and fuel programs	0.00	0.00
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This row not used for current RFP	0.00	0.00
This row not used for current RFP	0.00	0.00
Total attainment demonstration contingency reductions	24.89	16.18
Contingency Excess (+) or Shortfall (-)	19.60	9.29

Note: Row 60 is for Q/A

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Appendix 2 - Sheet 6

Calculations: 2023 RFP MVEBs with MOVES3

HGB 2015 Nonattainment Area Eight-Hour Ozone Season VOC and NO_x (tons per day)

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Summary 2023 MVEB

Description	NO _x	VOC
2023 on-road emissions projection without post-1990 FCAA controls	1110.38	644.96
2023 on-road mobile source RFP control reductions	1055.24	613.56
2023 On-road mobile controlled inventory	55.14	31.40
Transportation conformity safety margin	0.00	0.00
Excess emissions reduction for 2023	2.31	0.18
Is excess emissions enough for safety margin?	yes	yes
2023 Six-County HGB MVEB with safety margin	55.14	31.40

Note: If safety margin is > than excess emission reducti

Notes:

1) If there are excess RFP control reductions, a transportation conformity safety margin is allowed. The transportation conformity safety margin for this SIP revision is calculated based upon a percentage of excess emissions. Control of the safety margin options and calculation of the NO_x and VOC values is done on the "Enter % RFP Cont & Conf SM" sheet of this spreadsheet. If changes are needed for the Safety Margin, go to the "Enter % RFP Cont & Conf SM" sheet.

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Appendix 2 - Sheet 7

Quantify the Reductions to Meet the Initial 15%, the 3% per Year and Contingency Requirements with MOVES3

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

The Initial 15%, the 3% per Year and Contingency Requirements: The FCAA mandates that an initial 15%, plus a 3% per year starting in year seven, VOC reduction, net of growth, occur from the baseline year 2017 through the attainment year. The reductions must be demonstrated for the six-year period from baseline 2017 through 2023. NO_x may be substituted for VOC for the counties designated nonattainment under the one-hour, 1997 eight-hour standard, and 2008 eight-hour standards from the baseline 2017 through 2023. An additional 3% reduction must be demonstrated as a contingency measure for the one-year period following the attainment year, 2023. The division of the percent reductions between VOC and NO_x are entered in the data entry sheet with tab name "Enter % for RFP Cont & Conf SM."

Calculation of Required 15% VOC Reductions and 3% per Year NO_x and VOC Reductions

RFP Analysis Year	Total Percent Reduction Requirement	Percent NO _x	Percent VOC	RFP BY EI NO _x (tpd)	RFP BY EI VOC (tpd)	Required Reductions NO _x (tpd)	Required Reductions VOC (tpd)
2017	N/A	N/A	N/A	352.47	459.17	N/A	N/A
2023	15.0	11.2	3.8	352.47	459.17	39.48	17.45
2024 Contingency	3.0	1.5	1.5	352.47	459.17	5.29	6.89

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Appendix 2 - Sheet 8

Target Calculations with MOVES3: 2023 RFP Target Level of NOX and VOC Emissions

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Post-2017 target level of NO_x emissions: The NO_x target level is calculated by subtracting the reductions necessary to meet: the initial 15% from the baseline 2017 through 2023.

RFP Post-2017 Target Level of NOX Emissions			
RFP Milestone Year	Previous Target	Post-2017 Percent Reduction Requirement NO _x (tpd)	NO _x Target (tpd)
2017 Base Year	N/A	N/A	352.47
2023	352.47	39.48	312.99

Post-2017 target level of VOC emissions: The VOC target level is calculated by subtracting the reductions necessary to meet: the initial 15% from the baseline 2017 through 2023.

"RFP Post-2017 Target Level of VOC Emissions			
RFP Milestone Year	Previous Target	Post-2017 Percent Reduction Requirement VOC (tpd)	VOC Target (tpd)
2017 Base Year	N/A	N/A	459.17
2023	459.17	17.45	441.72

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Appendix 2 - Sheet 09**Enter RFP NO_x and VOC Percentage Reductions, Contingency Percents and Safety Margin****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

A 15% reduction is required for HGB for the period from the baseline 2017 through 2023. Input percentage of NO_x and VOC reductions to be used to demonstrate RFP for 2023. Only a NO_x value needs to input. The VOC percent will be calculated automatically based upon the total required and the percent NO_x to be used.

RFP NO _x and VOC Percent Reductions for Milestone and Attainment Years			
RFP Milestone Year	NO _x %	VOC %	Total Percent
2023	11.2	3.8	15

A 3% contingency is required for the RFP attainment contingency for 2023 to 2024. A 3% contingency is also required for the attainment demonstration for 2023 to 2024. The contingency reductions can be from NO_x or VOC. Input only the percent of the contingency reductions that will be from NO_x. The VOC value will be calculated automatically as 3 minus the NO_x percent.

RFP and Attainment Demonstration NO _x and VOC Percent Reductions for 2023 to 2024 Contingency			
Contingency Year	NO _x %	VOC %	Total Percent
RFP 2023 Milestone Contingency	1.5	1.5	3
AD 2023 to 2024	1.5	1.5	3

If there are excess RFP control reductions, a transportation conformity safety margin is allowed. The safety margin for this SIP revision is calculated based upon a percentage of excess emissions. If a safety margin will be used, enter the percentage of excess VOC and NO_x emissions to be used below. The safety margin amount must be less than or equal to the excess reductions after demonstrating RFP. The percentage entered must be between 0 and 100. An error message will appear if a value over 100 is entered. Adjusting the safety margin below will automatically update the MVEB calculation to include the percent of excess emissions entered. For reference, the corresponding percent of the MVEB and tons per day are provided.

RFP Milestone Year	Pollutant	Conformity Safety Margin % of Excess RFP Reductions	Percent of On-road EI (For Reference)	Tons Per Day Change to On-road EI (For Reference)
2023	NO _x	0	0.00	0.00
	VOC	0	0.00	0.00

Enter the percent of the NO_x milestone year target that will be transferred to VOC. Only the NO_x percent is entered. The VOC percent is automatically equal to the NO_x percent transfer. These values are used on Sheet 03 in the NO_x transfer calculations.

NO _x Substitution	Percent of NO _x Reductions to Transfer to Percent VOC Reductions	Percent of VOC Reductions Transferred from Percent NO _x Reductions
2023	0.00	0.00

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Appendix 2 - Sheet 10

Enter Airport Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	8.83	8.77	0.06	0.67	2.64	2.64	0.00	0.15
2023	7.81	7.75	0.06	0.71	2.62	2.61	0.00	0.14

Notes:

- 1) The airport emissions inventory includes emissions from: aircraft; aircraft auxiliary power units (APU); and, airport ground support equipment (GSE).

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Appendix 2 - Sheet 11

Enter Area Source Emissions Inventory
HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Existing Controlled Emissions (as of 2017) NOX (tpd)	Post-2017 Controlled NOX (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Existing Controlled Emissions (as of 2017) VOC (tpd)	Post-2017 Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	31.86	31.86	0.00	0.00	298.93	298.93	0.00	0.00
2023	37.31	37.31	0.00	0.00	289.85	289.85	0.00	0.00

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Appendix 2 - Sheet 12

Enter Biogenic Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	See Note 1	N/A	N/A	N/A	See Note 1	N/A	N/A	N/A

Notes:

1) Beginning with the Air Emissions Reporting Requirements (December 2008), the emissions required to be reported no longer include emissions from biogenic sources. Therefore, as of the 2017 reporting year, the comprehensive triennial emissions inventory no longer includes emissions from biogenic sources. The RFP demonstrations are based upon the emissions from anthropogenic sources. The guidance for RFP calculations shows the first step is to subtract the emissions from biogenic sources from the total base year emissions to obtain the total anthropogenic emission inventory. As of 2017, under the AERR, the base year emissions do not include biogenic sources and already represent the total anthropogenic emissions. In this case, step one of the RFP process is not needed, and the emissions from biogenic sources is unnecessary. This RFP SIP revision: uses a base year of 2017; does not require subtraction of the biogenic emissions in Step One of the RFP calculation process; and does not include quantification of emissions from biogenic sources.

2) 6 HGB means the six nonattainment counties and indicates values are for the six counties that had an existing designation under the 1997 one-hour ozone standard, and the 2008 & 2015 eight-hour ozone standards. Includes: Brazoria, Chambers, Fort Bend, Galveston, Harris, and Montgomery counties.

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Appendix 2 - Sheet 13

Enter Commercial Marine Emissions Inventory
HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	105.06	75.88	29.17	27.77	2.49	2.37	0.12	4.93
2023	120.68	66.36	54.33	45.02	2.92	2.59	0.33	11.30

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Appendix 2 - Sheet 14

Enter Oil and Gas Production, Drilling Rigs, Diesel Engines Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	0.55	0.23	0.32	58.35	0.09	0.02	0.07	76.33
2023	0.89	0.25	0.64	72.13	0.15	0.02	0.13	87.53

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Appendix 2 - Sheet 15

Enter Locomotive Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	11.83	10.89	0.94	7.96	0.57	0.57	0.00	0.00
2023	8.67	7.93	0.75	8.60	0.39	0.39	0.00	0.00

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Appendix 2 - Sheet 16

Enter NONROAD Categories Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	124.08	35.66	88.42	71.26	170.42	36.16	134.26	78.78
2023	154.40	30.66	123.74	80.14	194.82	36.57	158.25	81.23

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Appendix 2 - Sheet 17

Enter On-road Mobile Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled or Existing Control NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled or Existing Control VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	91.82	91.82	0.00	0.00	45.11	45.11	0.00	0.00
2023	1,110.38	55.14	1,055.24	95.03	644.96	31.41	613.55	95.13

Notes:

Note 1: The HGB 2015 ozone nonattainment area uncontrolled on-road EI values for 2017 reflect controls in place up to 2017, no post-2017 controls included (existing 2017 controls).

Note 2: The HGB 2015 ozone nonattainment area uncontrolled on-road EI values for 2023 reflect pre-1990 controls, no post-1990 controls included (uncontrolled).

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Appendix 2 - Sheet 18

Enter Point Source Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Existing Controlled Emissions (as of 2017) NOX (tpd)	Post-2017 Controlled NOX (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Existing Controlled Emissions (as of 2017) VOC (tpd)	Post-2017 Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	97.36	97.36	0.00	0.00	73.37	73.37	0.00	0.00
2023	105.23	105.23	0.00	0.00	78.09	78.09	0.00	0.00

Notes:

- 1) The difference between existing post-2017 Controlled emissions (as of 2017) and Post-2017 Controlled VOC emissions represents noncreditable as well as creditable reductions.

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Appendix 2 - Sheet 19

Enter 2023 Control Measure Reductions

HGB 2015 Nonattainment Area Eight-hour Ozone Season VOC and NO_x

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

RFP Control Strategy Description	Source Category	Total 2017 to 2023 NO _x Emissions Reductions (tpd)	Total 2017 to 2023 VOC Emissions Reductions (tpd)	Use this control for RFP demonstration? (Yes or No)	Is this an on-road mobile control that will change the MVEB? (Yes or No)
Chapter 117 NO _x controls	Point	0.00	0.00	Yes	No
Chapter 115 Storage Tank Rule	Point	0.00	0.00	Yes	No
Coating / printing rules	Point	0.00	0.00	Yes	No
Portable fuel containers	Area	0.00	0.00	Yes	No
Federal Motor Vehicle Control Program (FMVCP)	OR	1033.45	602.37	Yes	Yes
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	OR	18.06	7.25	Yes	Yes
Inspection and Maintenance (I/M)	OR	1.78	3.94	Yes	Yes
On-road TxLED	OR	1.95	0.00	Yes	Yes
Tier I and II locomotive NO _x standards	NR	0.75	0.00	Yes	No
Small non-road spark ignition (SI) engines (Phase I)	NR	-6.74	52.33	Yes	No
Heavy duty non-road engines	NR	0.34	5.14	Yes	No
Tiers 2 and 3 non-road diesel engines	NR	2.67	0.56	Yes	No
Small non-road SI engines (Phase II)	NR	4.82	49.11	Yes	No
Large non-road SI & recreational marine	NR	50.94	16.89	Yes	No
Non-road TxLED	NR	0.97	0.00	Yes	No
Non-road RFG	NR	0.00	0.13	Yes	No
Tier 4 non-road diesel engines	NR	65.88	14.28	Yes	No
Diesel recreational marine	NR	0.02	0.00	Yes	No
Small SI (Phase III)	NR	4.83	19.80	Yes	No
Chapter 117 NO _x area source engine controls	Area	0.00	0.00	Yes	No
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	NR	0.64	0.13	Yes	No
Commercial marine vessel engine certification standards and fuel programs	NR	54.33	0.33	Yes	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
Total		1234.70	772.27		

Notes

- 1) Point source Chapter 117 NO_x controls in the HGB area had compliance deadlines before 2017. The 2017 EI includes the effects of the control. No additional control beyond 2017 are claimed.
- 2) Area source Chapter 117 NO_x controls in the HGB area had compliance deadlines before 2017. The 2017 EI includes the effects of the control. No additional control beyond 2017 are claimed.
- 3) Area source Portable fuel containers controls in the HGB area had compliance deadlines before 2017. The 2017 EI includes the effects of the control. No additional control beyond 2017 are claimed.
- 4) All six counties in the HGB area are covered by the federal RFG requirement.
- 5) Inspection and Maintenance Program is only modeled for the five counties covered by the program: The five I/M counties include: Brazoria, Fort Bend, Galveston, Harris, and Montgomery.
- 6) "This row not used for current RFP" control rows were created only to allow for planners to easily add controls for alternative scenario analyses.

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Appendix 2 - Sheet 20

Enter 2024 Contingency Measure Control Measure Reductions

HGB 2015 Nonattainment Area Eight-Hour Ozone Season VOC and NO_x

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

RFP Control Strategy Description	Source Category	Total 2017 to 2024 NO _x Emissions Reductions (tpd)	Total 2017 to 2024 VOC Emissions Reductions (tpd)	Use this control for 2024 RFP contingency? (Yes or No)
Chapter 117 NOX controls	Point	0.00	0.00	No
Chapter 115 Storage Tank Rule	Point	0.00	0.00	No
Coating / printing rules	Point	0.00	0.00	No
Portable fuel containers	Area	0.00	0.00	No
Federal Motor Vehicle Control Program (FMVCP)	OR	1057.30	615.63	Yes
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	OR	16.50	6.99	Yes
Inspection and Maintenance (I/M)	OR	1.58	3.90	Yes
On-road TxLED	OR	1.86	0.00	Yes
Tier I and II locomotive NOX standards	NR	0.00	0.00	No
Small non-road spark ignition (SI) engines (Phase I)	NR	-6.87	53.36	Yes
Heavy duty non-road engines	NR	0.27	5.17	Yes
Tiers 2 and 3 non-road diesel engines	NR	2.51	0.52	Yes
Small non-road SI engines (Phase II)	NR	4.92	50.01	Yes
Large non-road SI & recreational marine	NR	53.15	17.58	Yes
Non-road TxLED	NR	0.93	0.00	Yes
Non-road RFG	NR	0.00	0.13	Yes
Tier 4 non-road diesel engines	NR	66.73	14.44	Yes
Diesel recreational marine	NR	0.03	0.00	Yes
Small SI (Phase III)	NR	4.95	20.25	Yes
Chapter 117 NOX area source engine controls	Area	0.00	0.00	No
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	NR	0.00	0.00	No
Commercial marine vessel engine certification standards and fuel programs	NR	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
Total		1203.85	787.99	

Note: Unspecified control rows were created only to allow for planners to easily add controls for alternative scenario analyses.

Notes

Please see notes for the control reductions on:

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Appendix 2 - Sheet 21**Calculate 2017 RFP Base Year Emissions Inventory****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

Data Entry Sheet 1 of 6: Enter Base

Data Entry Sheet 1 of 6: Enter Base

The 2017 Base Year Inventory	NO_x (tons/day)	VOC (tons/day)
Point Source 2017 EI	97.36	73.37
Area Source 2017 EI	31.86	298.93
On-road mobile 2017 EI	91.82	45.11
Non-road mobile 2017 EI	131.43	41.76
Biogenic 2017 EI (see Note 1)	See Note 1	See Note 1
Total 2017 Base Year Inventory	352.47	459.17

Notes:

1) Beginning with the Air Emissions Reporting Requirements (December 2008), the emissions required to be reported no longer include emissions from biogenic sources. Therefore, as of the 2017 reporting year, the comprehensive triennial emissions inventory no longer includes emissions from biogenic sources. The RFP demonstrations are based upon the emissions from anthropogenic sources. The guidance for RFP calculations shows the first step is to subtract the emissions from biogenic sources from the total base year emissions to obtain the total anthropogenic emission inventory. As of 2017, under the AERR, the base year emissions do not include biogenic sources and already represent the total anthropogenic emissions. In this case, step one of the RFP process is not needed, and the emissions from biogenic sources is unnecessary. This RFP SIP revision: uses a base year of 2017; does not require subtraction of the biogenic emissions in Step One of the RFP calculation process; and does not include quantification of emissions from biogenic sources.

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Appendix 2 - Sheet 22

2023 Forecasted Uncontrolled or Existing Control Emissions Inventory with pre-2017 Controls HGB 2015 Nonattainment Area Eight-Hour Ozone Season VOC and NO_x Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Uncontrolled or Existing Control EI with pre-2017 controls: These calculations add up to the total Uncontrolled or Existing Control NO_x and VOC emissions (tpd) for the 2023 RFP milestone year. The totals for each source category used in these calculations were entered on enter EI sheets.

Forecasted 2023 Uncontrolled or Existing Control Emissions Inventory with pre-2017 Controls		
Emissions Description	NO _x (tpd)	VOC (tpd)
Point Source	105.23	78.09
Area Source	37.31	289.85
On-Road Mobile Source	1110.38	644.96
Non-Road Mobile Source	292.45	200.90
Total	1545.37	1213.80

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Appendix 2 - Sheet 23

Calculations: 2017 to 2023 Control Measures Reductions

HGB 2015 Nonattainment Area Eight-Hour Ozone Season VOC and NO_x

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Explanation: The control strategy name, control reduction amount, status of inclusion of the control in the RFP calculations, and whether or not the control is for on-road mobile sources were all input into the Enter Reductions 2023 sheet. The reduction is the reduction that is creditable from each control between 2017 and 2023. If the control has been turned off by inputting a "No" in the "Use this control for 2023 RFP demonstration?" column, the spreadsheet will put a zero in for the reduction for that control on this sheet, even if a positive value for the control was input into the Enter Reductions 2023 sheet. If it was intended to have a positive reduction for the control but there is a zero, go back to the Enter Reductions 2020 Sheet and change the No to a Yes indicating that the control will be used for RFP demonstration.

Creditable Reductions Control Strategy	Source Category	Total 2017 to 2023 NOX Emissions Reductions (tpd)	Total 2017 to 2023 VOC Emissions Reductions (tpd)	Use this control for RFP demonstration? (Yes or No)	Is this an on-road mobile control that will change the MVEB? (Yes or No)
Chapter 117 NOX controls	Point	0.00	0.00	Yes	No
Chapter 115 Storage Tank Rule	Point	0.00	0.00	Yes	No
Coating / printing rules	Point	0.00	0.00	Yes	No
Portable fuel containers	Area	0.00	0.00	Yes	No
Federal Motor Vehicle Control Program (FMVCP)	OR	1033.45	602.37	Yes	Yes
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	OR	18.06	7.25	Yes	Yes
Inspection and Maintenance (I/M)	OR	1.78	3.94	Yes	Yes
On-road TxLED	OR	1.95	0.00	Yes	Yes
Tier I and II locomotive NOX standards	NR	0.75	0.00	Yes	No
Small non-road spark ignition (SI) engines (Phase I)	NR	-6.74	52.33	Yes	No
Heavy duty non-road engines	NR	0.34	5.14	Yes	No
Tiers 2 and 3 non-road diesel engines	NR	2.67	0.56	Yes	No
Small non-road SI engines (Phase II)	NR	4.82	49.11	Yes	No
Large non-road SI & recreational marine	NR	50.94	16.89	Yes	No
Non-road TxLED	NR	0.97	0.00	Yes	No
Non-road RFG	NR	0.00	0.13	Yes	No
Tier 4 non-road diesel engines	NR	65.88	14.28	Yes	No
Diesel recreational marine	NR	0.02	0.00	Yes	No
Small SI (Phase III)	NR	4.83	19.80	Yes	No
Chapter 117 NOX area source engine controls	Area	0.00	0.00	Yes	No
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	NR	0.64	0.13	Yes	No
Commercial marine vessel engine certification standards and fuel programs	NR	54.33	0.33	Yes	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
This row not used for current RFP	N/A	0.00	0.00	No	No
Total 2020 RFP Control Reductions		1234.69	772.26		

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Appendix 2 - Sheet 24

Calculations: 2023-2024 Contingency Control Measures Reductions

HGB 2015 Nonattainment Area Eight-Hour Ozone Season VOC and NO_x

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Explanation: The control strategy name, control reduction amount, status of inclusion of the control in the RFP calculations, and whether or not the control is for on-road mobile sources were all input into the Enter Cont Reductions 2024 sheet. The reduction is the reduction that is creditable from each control between 2023 and 2024. If the control has been turned off by inputting a "No" in the "Use this control for 2024 RFP contingency demonstration?" column, the spreadsheet will put a zero in for the reduction for that control on this sheet, even if a positive value for the control was input into the Enter Cont Reductions 2024 sheet. If it was intended to have a positive reduction for the control but there is a zero, go back to the Enter Cont Reductions 2024 Sheet and change the No to a Yes indicating that the control will be used for RFP contingency demonstration.

RFP Control Strategy Description	Source Category	Total 2023 to 2024 NO _x Emissions Reductions (tpd)	Total 2023 to 2024 VOC Emissions Reductions (tpd)	Use this control for 2024 RFP contingency demonstration? (Yes or No)
Chapter 117 NOX controls	Point	0.00	0.00	No
Chapter 115 Storage Tank Rule	Point	0.00	0.00	No
Coating / printing rules	Point	0.00	0.00	No
Portable fuel containers	Area	0.00	0.00	No
Federal Motor Vehicle Control Program (FMVCP)	OR	23.85	13.26	Yes
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	OR	-1.56	-0.26	Yes
Inspection and Maintenance (I/M)	OR	-0.20	-0.04	Yes
On-road TxLED	OR	-0.09	0.00	Yes
Tier I and II locomotive NOX standards	NR	0.00	0.00	No
Small non-road spark ignition (SI) engines (Phase I)	NR	-0.13	1.03	Yes
Heavy duty non-road engines	NR	-0.07	0.03	Yes
Tiers 2 and 3 non-road diesel engines	NR	-0.16	-0.04	Yes
Small non-road SI engines (Phase II)	NR	0.10	0.90	Yes
Large non-road SI & recreational marine	NR	2.21	0.69	Yes
Non-road TxLED	NR	-0.04	0.00	Yes
Non-road RFG	NR	0.00	0.00	Yes
Tier 4 non-road diesel engines	NR	0.85	0.16	Yes
Diesel recreational marine	NR	0.01	0.00	Yes
Small SI (Phase III)	NR	0.12	0.45	Yes
Chapter 117 NOX area source engine controls	Area	0.00	0.00	No
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	NR	0.00	0.00	No
Commercial marine vessel engine certification standards and fuel programs	NR	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
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This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
This row not used for current RFP	N/A	0.00	0.00	No
Total 2021 RFP Control Reductions		24.89	16.18	

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Calculations: 2017 to 2023 On-road Control Measures Reductions

HGB 2015 Nonattainment Area Eight-Hour Ozone Season VOC and NOX

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Creditable Reductions Control Strategy	Control Used for RFP Demonstration?	On-road Mobile Source Control?	Total 2017 - 2023 'On-road Mobile NO _x Emissions Reductions (tpd)	Total 2017 - 2023 'On-road Mobile VOC Emissions Reductions (tpd)
Chapter 117 NOX controls	Yes	No	0.00	0.00
Chapter 115 Storage Tank Rule	Yes	No	0.00	0.00
Coating / printing rules	Yes	No	0.00	0.00
Portable fuel containers	Yes	No	0.00	0.00
Federal Motor Vehicle Control Program (FMVCP)	Yes	Yes	1033.45	602.37
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	Yes	Yes	18.06	7.25
Inspection and Maintenance (I/M)	Yes	Yes	1.78	3.94
On-road TxLED	Yes	Yes	1.95	0.00
Tier I and II locomotive NOX standards	Yes	No	0.00	0.00
Small non-road spark ignition (SI) engines (Phase I)	Yes	No	0.00	0.00
Heavy duty non-road engines	Yes	No	0.00	0.00
Tiers 2 and 3 non-road diesel engines	Yes	No	0.00	0.00
Small non-road SI engines (Phase II)	Yes	No	0.00	0.00
Large non-road SI & recreational marine	Yes	No	0.00	0.00
Non-road TxLED	Yes	No	0.00	0.00
Non-road RFG	Yes	No	0.00	0.00
Tier 4 non-road diesel engines	Yes	No	0.00	0.00
Diesel recreational marine	Yes	No	0.00	0.00
Small SI (Phase III)	Yes	No	0.00	0.00
Chapter 117 NOX area source engine controls	Yes	No	0.00	0.00
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	Yes	No	0.00	0.00
Commercial marine vessel engine certification standards and fuel programs	Yes	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
This row not used for current RFP	No	No	0.00	0.00
Total On-road Mobile Source RFP Control Reductions			1055.24	613.56

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Summary Sheet: Uncontrolled or Existing Control NOX Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

2017 Uncontrolled or Existing Control NOX (tons per day)

RFP Analysis Year	HGB
Area Sources	31.86
Non-Road Mobile Sources	250.35
On-Road Mobile Sources	91.82
Point Sources	97.36
Total	471.39

2023 Uncontrolled or Existing Control NOX (tons per day)

RFP Analysis Year	HGB
Area Sources	37.31
Non-Road Mobile Sources	292.45
On-Road Mobile Sources	1,110.38
Point Sources	105.23
Total	1,545.37

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Summary Sheet: Controlled or Post-2017 Controlled NOX Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Controlled or Post-2017 Controlled NOX for 2017 (tons per day)

RFP Analysis Year	HGB
Area Sources	31.86
Non-Road Mobile Sources	131.43
On-Road Mobile Sources	91.82
Point Sources	97.36
Total	352.47

Controlled or Post-2017 Controlled NOX for 2023 (tons per day)

RFP Analysis Year	HGB
Area Sources	37.31
Non-Road Mobile Sources	112.95
On-Road Mobile Sources	55.14
Point Sources	105.23
Total	310.63

Note: The controlled inventory shown here includes all controls. The controlled RFP inventory may not include all controls and may therefore be a higher value than shown here.

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Summary Sheet: Uncontrolled or Existing Control VOC Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

2017 Uncontrolled or Existing Control VOC (tons per day)

RFP Analysis Year	HGB
Area Sources	298.93
Non-Road Mobile Sources	176.21
On-Road Mobile Sources	45.11
Point Sources	73.37
Total	593.62

2023 Uncontrolled or Existing Control VOC (tons per day)

RFP Analysis Year	HGB
Area Sources	289.85
Non-Road Mobile Sources	200.90
On-Road Mobile Sources	644.96
Point Sources	78.09
Total	1,213.80

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Summary Sheet: Controlled or Post-2017 Controlled VOC Emissions Inventory

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Controlled or Post-2017 Controlled VOC for 2017 (tons per day)

RFP Analysis Year	HGB
Area Sources	298.93
Non-Road Mobile Sources	41.76
On-Road Mobile Sources	45.11
Point Sources	73.37
Total	459.17

Controlled or Post-2017 Controlled VOC for 2023 (tons per day)

RFP Analysis Year	HGB
Area Sources	289.85
Non-Road Mobile Sources	42.18
On-Road Mobile Sources	31.41
Point Sources	78.09
Total	441.53

Note: The controlled inventory shown here includes all controls. The controlled RFP inventory may not include all controls and may therefore be a higher value than shown here.

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Appendix 2 - Sheet 30

Summary Sheet: 2017 Emissions Inventory By Category

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

2017 (tons per day)

Emissions Inventory Source	Uncontrolled or Existing Control NO _x	Controlled or Post 2017 Controlled NO _x	Uncontrolled or Existing Control VOC	Controlled or Post-2017 Controlled VOC
Area Sources	31.86	31.86	298.93	298.93
Non-Road Mobile Sources	250.35	131.43	176.21	41.76
On-Road Mobile Sources	91.82	91.82	45.11	45.11
Point Sources	97.36	97.36	73.37	73.37
Total	471.39	352.47	593.62	459.17

Note: The controlled inventory shown here includes all controls. The controlled RFP inventory may not include all controls.

HGB RFP Summary of the 2017 Base Year Average Summer Weekday NO_x and VOC Emissions

Emissions Inventory Source	Uncontrolled NO _x	Controlled NO _x	Uncontrolled VOC	Controlled VOC
Non-Road Mobile Sources	250.35	131.43	176.21	41.76
On-Road Mobile Sources	91.82	91.82	45.11	45.11
Emissions Inventory Source	Existing Controlled NO _x	Post-2017 Controlled NO _x	Uncontrolled VOC	Post-2017 Controlled VOC
Area Sources	31.86	31.86	298.93	298.93
Point Sources	97.36	97.36	73.37	73.37
Total of All Sources	471.39	352.47	593.62	459.17
QA	471.39	352.47	593.62	459.17

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Summary Sheet: 2023 Emissions Inventory By Category

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

2023 (tons per day)

Emissions Inventory Source	Uncontrolled or Existing Control NO _x	Controlled or Post-2017 Controlled NO _x	Uncontrolled or Existing Control VOC	Controlled or Post-2017 Controlled VOC
Area Sources	37.31	37.31	289.85	289.85
Non-Road Mobile Sources	292.45	112.95	200.90	42.18
On-Road Mobile Sources	1110.38	55.14	644.96	31.41
Point Sources	105.23	105.23	78.09	78.09
Total	1545.37	310.63	1213.80	441.53

Note: The controlled inventory shown here includes all controls. The controlled RFP inventory may not include all controls and may therefore be a higher value than shown here.

HGB RFP Summary of the 2023 Attainment Year Average Summer Weekday NO_x and VOC Emission

Emissions Inventory Source	Uncontrolled NO _x	Controlled NO _x	Uncontrolled VOC	Controlled VOC
Non-Road Mobile Sources	292.45	112.95	200.90	42.18
On-Road Mobile Sources	1110.38	55.14	644.96	31.41
Emissions Inventory Source	Existing Controlled NO _x	Post-2017 Controlled NO _x	Uncontrolled VOC	Post-2017 Controlled VOC
Area Sources	37.31	37.31	289.85	289.85
Point Sources	105.23	105.23	78.09	78.09
Total of All Sources	1545.37	310.63	1213.80	441.53
QA	1545.37	310.63	1213.80	441.53

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Summary Total Non-Road Emissions Inventory
HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

'RFP Analysis Year	Uncontrolled NO _x (tpd)	Controlled NO _x (tpd)	Total Reduction NO _x (tpd)	Percent Reduction	Uncontrolled VOC (tpd)	Controlled VOC (tpd)	Total Reduction VOC (tpd)	Percent Reduction
2017	250.35	131.43	118.92	47.50	176.21	41.76	134.45	76.30
2023	292.45	112.95	179.50	61.38	200.90	42.18	158.72	79.00

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Summary Sheet: 2017 Non-Road Summary by Category

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

2017 (tons per day)

Emissions Inventory Source	Uncontrolled NOx	Controlled NOx	Uncontrolled VOC	Controlled VOC
Airport	8.83	8.77	2.64	2.64
Locomotive	11.83	10.89	0.57	0.57
Marine	105.06	75.88	2.49	2.37
NONROAD Model	124.08	35.66	170.42	36.16
Drilling Rigs	0.55	0.23	0.09	0.02
Total ALM	125.72	95.54	5.70	5.58
ALM Plus Drilling Rigs (Off-road)	126.27	95.77	5.79	5.60
Total All	250.35	131.43	176.21	41.76

Note: The controlled inventory shown here includes all controls. The controlled RFP inventory may not include all controls and may therefore be a higher value than shown here.

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Summary Sheet: 2023 Non-Road Summary by Category

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

2023 (tons per day)

Emissions Inventory Source	Uncontrolled NOx	Controlled NOx	Uncontrolled VOC	Controlled VOC
Airport	7.81	7.75	2.62	2.61
Locomotive	8.67	7.93	0.39	0.39
Marine	120.68	66.36	2.92	2.59
NONROAD Model	154.40	30.66	194.82	36.57
Drilling Rigs	0.89	0.25	0.15	0.02
Total ALM	137.16	82.04	5.93	5.59
ALM Plus Drilling Rigs (Off-road)	138.05	82.29	6.08	5.61
Total All	292.45	112.95	200.90	42.18

Note: The controlled inventory shown here includes all controls. The controlled RFP inventory may not include all controls and may therefore be a higher value than shown here.

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Appendix 2 - Sheet 35

Summary Sheet: 2017 and 2023 On-Road Summaries

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

HGB Eight County RFP Ozone Season Weekday On-Road Mobile Source NOX Emissions

RFP Analysis Year Inventory	Uncontrolled or Existing Control NOx (tons per day)	Controlled NOx (tons per day)
2017 Base Year	91.82	91.82
2023 Attainment Year	1,110.38	55.14

HGB EightCounty RFP Ozone Season Weekday On-Road Mobile Source VOC Emissions

RFP Analysis Year Inventory	Uncontrolled or Existing Control VOC (tons per day)	Controlled VOC (tons per day)
2017 Base Year	45.11	45.11
2023 Attainment Year	644.96	31.41

2023 HGB Eight County RFP Ozone Season Weekday On-Road Mobile Source NOX and VOC Emissions and Control Strategy Reductions

RFP Analysis Year and Inventory of On-Road Mobile Emissions Inventory Strategies	NOX (tons per day)	VOC (tons per day)
2023 Uncontrolled Inventory	1,110.38	644.96
Federal Motor Vehicle Control Program (FMVCP)	1033.45	602.37
Reformulated Gasoline (RFG)/East Texas Regional Low RVP/Low Sulfur	18.06	7.25
Inspection and Maintenance (I/M)	1.78	3.94
On-road TxLED	1.95	0.00
2023 Controlled Inventory	55.14	31.41
QA Check	55.1400000000001	31.4000000000000

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Appendix 2 - Sheet 36

Summary Sheet: Calculation Process for 2023 Target Levels of Emissions

HGB 2015 Eight-Hour Ozone Nonattainment Area

Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery

Summary of the Calculation Process for 2023 HGB RFP Target Levels

Line	Description	NO _x	VOC
Line 1	Step 1: 2017 base year emissions inventory (see Table 2-13)	352.47	459.17
Line 2	Percent of NO _x (PN) and VOC (PV) to meet 15% reduction requirement (PN plus PV = 15)	11.20%	3.80%
Line 3	Step 2: Calculate the total NO _x and VOC reduction requirement between 2017 and 2023 (Line 1 Multiplied by Line 2)	39.48	17.45
Line 4	Step 3: Calculate the 2023 target level of emissions (Line 1 minus Line 3)	312.99	441.72

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Appendix 2 - Sheet 37**Summary Sheet: Total RFP Emissions Reductions****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

Control Strategy Description	NO _x Reductions	VOC Reductions
Chapter 117 NOX controls	0.00	0.00
Chapter 115 Storage Tank Rule	0.00	0.00
Coating / printing rules	0.00	0.00
Portable fuel containers	0.00	0.00
Federal Motor Vehicle Control Program (FMVCP)	1033.45	602.37
Reformulated Gasoline (RFG)/Tier 3 Sulfur Gasoline/Ultra Low Sulfur Diesel	18.06	7.25
Inspection and Maintenance (I/M)	1.78	3.94
On-road TxLED	1.95	0.00
Tier I and II locomotive NOX standards	0.75	0.00
Small non-road spark ignition (SI) engines (Phase I)	-6.74	52.33
Heavy duty non-road engines	0.34	5.14
Tiers 2 and 3 non-road diesel engines	2.67	0.56
Small non-road SI engines (Phase II)	4.82	49.11
Large non-road SI & recreational marine	50.94	16.89
Non-road TxLED	0.97	0.00
Non-road RFG	0.00	0.13
Tier 4 non-road diesel engines	65.88	14.28
Diesel recreational marine	0.02	0.00
Small SI (Phase III)	4.83	19.80
Chapter 117 NOX area source engine controls	0.00	0.00
Drilling Rigs: Federal Engine Standards and Texas Low Emission Diesel	0.64	0.13
Commercial marine vessel engine certification standards and fuel programs	54.33	0.33
Total:	1234.69	772.26

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Appendix 2 - Sheet 38**Summary Sheet: Point Source RFP Emissions Reductions****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

Emissions	NO _x	VOC
Existing Controlled Emissions (as of 2017)	105.23	78.09
RFP Point Source Reductions	0.00	0.00
RFP Post-2017 Controlled Emissions	105.23	78.09

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Appendix 2 - Sheet 39**Summary Sheet: Area Source RFP Emissions Reductions****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

Emissions	NO _x	VOC
Existing Controlled Emissions (as of 2017)	37.31	289.85
RFP Area Source Reductions	0.00	0.00
RFP Post-2017 Controlled Emissions	37.31	289.85

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Appendix 2 - Sheet 40**Summary Sheet: Non-Road Source RFP Emissions Reductions****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

Emissions	NO _x	VOC
Uncontrolled	292.45	200.90
RFP Non-Road Source Reductions	179.45	158.70
RFP Post-2017 Controlled Emissions	113.00	42.20

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Appendix 2 - Sheet 41**Summary Sheet: On-Road Source RFP Emissions Reductions****HGB 2015 Eight-Hour Ozone Nonattainment Area****Six Nonattainment Counties: Brazoria, Chambers, Fort Bend, Galveston, Harris, Montgomery**

Emissions	NO _x	VOC
Uncontrolled	1110.38	644.96
RFP On-Road Source Reductions	1055.24	613.56
RFP Post-2017 Controlled Emissions	55.14	31.40

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