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Tesoro Refining & Marketing Company LLC
474 West 900 North
Salt Lake City, UT 84103

May 5, 2017

Mr. Marty D. Gray
Manager, New Source Review Section UDAQ
195 N 1950 W
Salt Lake City, UT 84114Regional Administrator
U.S. Environmental Protection Agency

HAND DELIVERED

RE: Best Available Control Technology (BACT) Assessment for Tesoro Refining & Marketing Company LLC and Tesoro Logistics Operations LLC Salt Lake City Utah

Tesoro Refining & Marketing Company LLC (Tesoro) – Salt Lake City Refinery is submitting the attached Best Available Control Technology (BACT) assessment per the Utah Department of Environmental Quality Division of Air Quality (UDAQ) request received February 2, 2017. For purposes of this submittal Tesoro has included emission units within the Tesoro Refinery and Tesoro Logistics Operations LLC (TLO) organizations. The facilities within the Tesoro Refinery and the TLO Truck Loading Rack and Remote Tank Farm are a single major source.

If you have any questions regarding this submittal, please contact Michelle Bujdoso of my staff at 801.366.2036.

Sincerely,

Karma M. Thomson

Karma M. Thomson
Vice President, Tesoro Salt Lake City Refinery

$PM_{2.5}$ Serious Nonattainment SIP
Best Available Control Technology Analysis

Tesoro Marketing and Refining Company LLC
Tesoro Logistics Operations LLC

TESORO

Prepared for
Tesoro Marketing and Refining Company LLC

April 2017

BARR

Best Available Control Technology Analysis

Tesoro Salt Lake City Refinery

Prepared for
Tesoro Refining & Marketing Company LLC

April 2017

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Best Available Control Technology Analysis

April 2017

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1.0 Executive Summary

The Utah Department of Environmental Quality Division of Air Quality (UDAQ) requested in a letter dated January 23, 2017 Tesoro Refining & Marketing Company LLC (Tesoro) complete a Best Available Control Technology (BACT) assessment for their existing emission units at the Salt Lake City refinery in Salt Lake County, Utah. For purposes of this submittal Tesoro has included emission units within the Tesoro Refining & Marketing Company LLC and Tesoro Logistics Operations LLC (TLO) organizations. The facilities within Tesoro (Refinery) and the TLO (Truck Loading Rack and Remote Tank Farm) are a single major source.

The BACT Assessment will assist UDAQ in determining acceptable pollution controls as necessary by a Serious Designation for $PM_{2.5}$ by performing an evaluation of existing emission units emitting direct $PM_{2.5}$ and $PM_{2.5}$ precursors including the following:

- Particulate matter with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$)
- Sulfur dioxide (SO_2)
- Oxides of nitrogen (NO_X)
- Volatile organic compounds (VOC)
- Ammonia

Table 1-1 lists the project-related emission units and pollutants that have been included in the BACT review.

Table 1-1 Summary of Emission Units and Pollutants subject to BACT

Emissions Unit	$PM_{2.5}$ SIP Pollutants Emitted
FCCU/CO Boiler	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
H-101 Crude Unit Furnace	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
F-1 Ultraformer Unit Furnace	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
F-15 Ultraformer Regeneration Furnace	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
F-680 DDU Furnace	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
F-681 DDU Furnace	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
F-701 GHT Furnace	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
Cogeneration Units (2)	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
Sulfur Recovery Unit (SRU)	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
Fugitive Equipment	VOC
Refinery Wastewater System	VOC
Refinery Drains	VOC
North and South Flares	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
SRU Flare	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
Reformer Regeneration Vent	VOC
Cooling Tower UU2	$PM_{2.5}$, VOC
Cooling Tower UU3	$PM_{2.5}$, VOC
Transport Loading Racks (2)	VOC
LPG Loading Rack	VOC
K1 Compressors (2)	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia
Fixed Roof Tanks	VOC
Internal Floating Roof Tanks	VOC
External Floating Roof Tanks	VOC
Emergency Engines	$PM_{2.5}$, SO_2, NO_X, VOC
Temporary Boilers	$PM_{2.5}$, SO_2, NO_X, VOC, Ammonia

This BACT analysis follows EPA's five-step top-down approach, as specified in the U.S. EPA's draft New Source Review Workshop Manual, (October 1990).[1]

- Step 1 – Identify All Available Control Technologies
- Step 2 – Eliminate Technically Infeasible Options

[1] The workshop manual can be found at U.S. EPA's website http://www.epa.gov/NSR/ttnnsr01/gen/wkshpman.pdf.

- Step 3 – Rank Remaining Control Technologies by Control Effectiveness
- Step 4 – Evaluate Most Effective Control Technologies and Document Results
- Step 5 – Select BACT

A key consideration for the technical feasibility of control technologies is the schedule for installation. Per UDAQ's stated timeline the control technology must be in place for one year in advance of the attainment date of December 31, 2019. If due to the time for engineering design, the refinery operating schedule, or the equipment lead time, it is not feasibly possible to install and operate prior to December 31, 2018, that technology is determined to be technically infeasible and eliminated from further consideration. For these control technologies that cannot be installed by December 31, 2018, Tesoro did not complete further evaluation of technical and economic feasibility. Upon a more detailed review, Tesoro may determine that these control technologies are not technically or economically feasible. Due to the limited timeframe of this requested evaluation, Tesoro has not completed these evaluations for control technologies that cannot be installed by December 31, 2018.

Table 1-2 to Table 1-6 below summarize BACT for each project-related emission unit and pollutant and control technologies which cannot be installed by December 31, 2018.

Table 1-2 $PM_{2.5}$ BACT

Source Description	BACT	Basis
FCCU/CO Boiler	Electrostatic Precipitator (ESP) + Wet Gas Scrubber (WGS)	The new WGS will be operational by 12/31/18. The performance of the system will meet BACT.
H-101 Crude Unit Furnace F-1 Ultraformer Unit Furnace F-15 Ultraformer Regen Furnace F-680 DDU Furnace F-681 DDU Furnace F-701 GHT Furnace	Good Design Methods and Good Operating Practices	Add-on controls are technically infeasible. Firing only natural gas instead of treated refinery fuel gas is technically infeasible.
Cogeneration Units (2)		
Sulfur Recovery Unit (SRU)		
Temporary Boiler		
North and South Flares	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency meet BACT.
SRU Flare	Flare Minimization Plan	Minimizing flow meets BACT.
Cooling Tower UU2	Current Drift Eliminator and Good Operating Practices	Upgrades to the drift eliminator are not technically feasible by 12/31/18.
Cooling Tower UU3		
K1 Compressors (2)	Natural Gas and Good Operating Practices	Replacing one natural gas engine with an electric motor isn't technically feasible by 12/31/18.
Emergency Engines	Ultra-Low Sulfur Diesel, Good Operating Practices, and Compliance with MACT ZZZZ	Limited hours of operation and good combustion practices meets BACT

Table 1-3 SO_2 BACT

Source Description	BACT	Basis
FCCU/CO Boiler	Wet Gas Scrubber (WGS)	The new WGS will be operational by 12/31/18. The performance of the system will meet BACT.
H-101 Crude Unit Furnace F-1 Ultraformer Unit Furnace F-15 Ultraformer Regen Furnace F-680 DDU Furnace F-681 DDU Furnace F-701 GHT Furnace Temporary Boilers	Low H_2S Content Fuel Gas (60 ppm annual average, 162 ppm 3-hour average)	Upgrades to the amine treatment system are not technically feasible by 12/31/18.
Cogeneration Units (2)	Turbines: Low H_2S Content Combined Gas HRSGs: Low H_2S Content Refinery Fuel Gas (60 ppm H_2S annual average, 162 ppm H_2S 3-hour average)	Current turbine combined gas meets low H_2S content. Upgrades to the amine treatment system are not technically feasible by 12/31/18.
Sulfur Recovery Unit (SRU)	Tail Gas Treatment Unit and Sulfur Shedding Plan	Upgrades to the TGTU or installing a wet gas scrubber are not technically feasible by 12/31/18.
North and South Flares	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency meet BACT.
SRU Flare	Flare Minimization Plan	Minimizing flow meets BACT. Exclusive use of natural gas for the pilot isn't technically feasible by 12/31/18.
K1 Compressors (2)	Natural Gas and Good Operating Practices	Replacing one natural gas engine with an electric motor isn't technically feasible by 12/31/18.
Emergency Engines	Ultra-Low Sulfur Diesel and Good Combustion Practices	Using Ultra-Low Sulfur Diesel meets BACT.

Table 1-4 NOx BACT

Source Description	BACT	Basis
FCCU/CO Boiler	Wet Gas Scrubber (WGS) and LoTOx unit	The new WGS and LoTOx will be operational by 12/31/18. The performance of the system will meet BACT.
H-101 Crude Unit Furnace	Ultra Low NOx Burners (ULNB)	ULNB meets BACT. There are no technically feasible options because there is no plot space available for an SCR or SNCR.
F-1 Ultraformer Unit Furnace	ULNB	ULNB meets BACT. There are no technically feasible options because there is no plot space available for an SCR or SNCR.
F-15 Ultraformer Regen Furnace	Low NOx Burners (LNB)	LNB meets BACT. Installation of ULNB is technically infeasible due to burner impingment. , SCR, or SNCR is not technically feasible by 12/31/18.
F-680 DDU Furnace	ULNB	Installation of SCR or SNCR is not technically feasible by 12/31/18.
F-681 DDU Furnace	ULNB	Installation of SCR or SNCR is not technically feasible by 12/31/18.
F-701 GHT Furnace	LNB	LNB meets BACT. Installation of ULNB is technically infeasible due to burner impingement. SCR, or SNCR is not technically feasible by 12/31/18.
Cogeneration Units (2)	SoLoNOx Technology	Installation of advanced combustion controls, SCR, or SNCR is not technically feasible by 12/31/18.
Sulfur Recovery Unit (SRU)	Good Design Methods and Operating Practices	Good design methods and operating practices meet BACT.
North and South Flares	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency meet BACT.
SRU Flare	Flare Minimization Plan	Minimizing flow meets BACT.
K1 Compressors (2)	Catalytic Converter, Natural Gas and Good Operating Practices	Replacing one natural gas engine with an electric motor isn't technically feasible by 12/31/18.
Emergency Engines	Good Combustion Practices and Emergency Engine requirements from MACT ZZZZ	Upgrading to Tier 4 engine is not technically feasible.
Temporary Boilers	Use of Gaseous Fuels and Operate boiler on temporary basis per 40 CFR 60.41b	NOx performance is limited by rental boiler availability

Table 1-5 VOC BACT

Source Description	BACT	Basis
FCCU/CO Boiler	Operation of a CO Boiler, Good Combustion Practices	Operation of a CO Boiler and following good combustion practices meets BACT.
H-101 Crude Unit Furnace F-1 Ultraformer Unit Furnace F-15 Ultraformer Regen Furnace F-680 DDU Furnace F-681 DDU Furnace F-701 GHT Furnace Cogeneration Units (2) Sulfur Recovery Unit (SRU) Temporary Boiler	Good Design Methods and Operating Practices	Good design methods and operating practices meets BACT.
Fugitive Equipment	LDAR Program (40 CFR 60 Subpart GGGa)	An LDAR program compliant with Subpart GGGa meets BACT.
Refinery Wastewater System	API Separator Covers (Non QQQ)	Installation QQQ API Separator Covers, vapor recovery to a vapor combustor or carbon adsorption unit is not feasible by 12/31/18.
Uncontrolled Refinery Drains	Good Operating Practices	Replacement or retrofit controls are not feasible by 12/31/18.
North and South Flares	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency meet BACT.
SRU Flare	Flare Minimization Plan	Minimizing flow meets BACT.
Cooling Tower UU2 Cooling Tower UU3	Compliance with 40 CFR 63 Subpart CC	A leak detection program compliant with Subpart CC meets BACT.
Transport Loading Rack (2)	Vapor Recovery Unit with Carbon adsorption	Operation of a vapor recovery unit with carbon adsorption meets BACT.
LPG Loading Rack	Flare	Operation of a flare meets BACT.
K1 Compressors (2)	Catalytic Converter	Operation of a catalytic converter meets BACT.
Fixed Roof Tanks	Good Design Methods and Operating Practices	Good design methods and operating practices meets BACT.
Internal Floating Roof Tanks	Upgrade to MACT CC controls or operate using NSPS Kb required controls	Some tanks are anticipated to be upgraded by 12/31/18. Upgrading all tanks is technically not feasible by 12/31/18.
External Floating Roof Tanks	Upgrade to MACT CC controls or operate using NSPS Kb required controls	Some tanks are anticipated to be upgraded by 12/31/18. Upgrading all tanks is technically not feasible by 12/31/18.
Emergency Engines	Good Combustion Practices and Emergency Engine requirements from MACT ZZZZ	Upgrading to Tier 4 engine is not technically feasible

Table 1-6 Ammonia BACT

Source Description	BACT	Basis
FCCU/CO Boiler	Operation of a CO Boiler, Good Combustion Practices	Operation of a CO Boiler and following good combustion practices meets BACT.
H-101 Crude Unit Furnace F-1 Ultraformer Unit Furnace F-15 Ultraformer Regen Furnace F-680 DDU Furnace F-681 DDU Furnace F-701 GHT Furnace Cogeneration Units (2) K1 Compressors (2) Temporary Boiler	Good Design Methods and Operating Procedures	Good design methods and operating procedures meets BACT.
North and South Flares	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency	Flare Gas Recovery System (FGRS), Flare Minimization Plan, Flare Caps, and Flare Combustion Efficiency meet BACT.
SRU Flare	Flare Minimization Plan	Minimizing flow meets BACT. FGRS technically infeasible

Based upon the BACT determinations indicated above, Tesoro has committed to significant emissions reductions since the 2014 baseline period by December 31, 2018. These emissions reductions are achieved by significant investments in emissions control technologies. A summary of the emission reductions compared to 2014 is provided below in Table 1-7.

Table 1-7 Summary of Emissions Reductions

Source Description	BACT	Pollutant	Actual Emissions Reductions by 12/31/18 (tpy)
FCCU/CO Boiler	Wet Gas Scrubber and LoTOx	SO_2	458.43
		NO_x	103.24
F-1 Ultraformer Unit Furnace	Ultra Low NOx Burners	NO_x	15.12
Sulfur Recovery Unit (SRU)	Tail Gas Treatment Unit	SO_2	135.33
North and South Flares	Flare Gas Recovery	All	(Variable)

Tesoro has also completed additional projects to reduce emissions from storage tanks by installing guidepole controls, retrofitting storage tanks with internal floating roofs, replacing tanks and by controlling degassing emissions with a portable thermal oxidizer.

2.0 BACT Methodology

BACT is defined as an emission limitation based on the maximum emission reduction achievable after a case-by-case review of potential emission controls which takes into account energy, environmental and economic impacts. This emissions limit may be achieved by a variety of means, such as control technologies, clean fuels, inherently lower polluting processes or alternative operating practices.[2]

2.1 Top-Down BACT Approach

This BACT analysis has been conducted in accordance with Section 165(a) (4) of the Clean Air Act (at 40 CFR Part 52.21(j)), and 40 CFR 51.1010(a). BACT technologies have been selected using the "top-down" approach specified in U.S. EPA's draft New Source Review Workshop Manual, (October 1990),[3] using the five-step process.

Step 1 - Identify all Available Control Technologies

All available control technologies are identified for each emission unit. A control technology is considered available for a specific pollutant if it could practically be applied to the specific emission unit. To identify all available control technologies, the following sources were consulted:

- U.S. EPA's RACT/BACT/LAER Clearinghouse (RBLC)
- U.S. EPA's New Source Review (NSR) website
- U.S. EPA draft permit review comments on recent PSD permits
- State/local agency air quality permits and the associated agency review documents
- Permit applications and BACT reports for recent projects

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[2] "Best available control technology means an emissions limitation (including a visible emission standard) based on the maximum degree of reduction for each pollutant subject to regulation under Act which would be emitted from any proposed major stationary source or major modification which the Administrator, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such source or modification through application of production processes or available methods, systems, and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of such pollutant. In no event shall application of best available control technology result in emissions of any pollutant which would exceed the emissions allowed by any applicable standard under 40 CFR parts 60 and 61. If the Administrator determines that technological or economic limitations on the application of measurement methodology to a particular emissions unit would make the imposition of an emissions standard infeasible, a design, equipment, work practice, operational standard, or combination thereof, may be prescribed instead to satisfy the requirement for the application of best available control technology. Such standard shall, to the degree possible, set forth the emissions reduction achievable by implementation of such design, equipment, work practice or operation, and shall provide for compliance by means which achieve equivalent results."

[3] The workshop manual can be found at U.S. EPA's website http://www.epa.gov/NSR/ttnnsr01/gen/wkshpman.pdf.

- Air pollution control technology vendors and consultants
- Manufacturer's recommendations
- Technical journals, reports, webinars, conferences and seminars

Recent court and regulatory agency determinations[4] have held that "clean fuels" must be considered as one of the emission control technologies in a BACT analysis. The fuels analysis is based on pollutant emissions directly associated with use of a particular fuel. EPA has recognized that the initial list of control technologies for a BACT analysis does not need to include "clean fuel" technologies that would fundamentally redefine the source. Such technologies that do not need to be included in the analysis include those that would require a facility to switch to a primary fuel type (i.e., coal, natural gas, or biomass) other than the type of fuel used for its primary combustion process.

Step 2 - Eliminate Technically Infeasible Control Technologies

Each control technology identified in Step 1 is evaluated, using source-specific factors, to determine if it is technically feasible. If physical, chemical and engineering principles demonstrate that a technology could not be successfully used on the emission unit, then that technology is determined to be technically infeasible. Economics are not considered in the determination of technical feasibility. Technologies which are determined to be infeasible are eliminated from further consideration.

In this step, the control technology is also evaluated for feasibility of installation and operation before December 31, 2018. The control technology must be in place for one year in advance of the attainment date of December 31, 2019. If, due to the time for engineering design, the refinery operating schedule, or the equipment lead time it is not feasibly possible to install and operate prior to December 31, 2018, that technology is determined to be technically infeasible, and will be eliminated from further consideration.

Factors considered in estimating installation schedules for emission control technologies include:

- Does the emission source need to be out of service to complete the installation?
- If a shutdown is required, when is the next maintenance shutdown (turnaround) planned for that emission unit? Turnarounds (TARs) occur once every 5 to 7 years. 2016 was the most recent refinery TAR.
- Can the engineering design, equipment procurement, construction contracts and construction planning be accomplished prior to the next scheduled maintenance shutdown?
- Can funding for the project be approved before the next TAR?
- Can air quality permits be obtained prior to the start of construction? This would include and construction activities which are needed to occur prior to the TAR.

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[4] Northern Michigan University Ripley Heating Plant – PSD Appeal No. 08-02 before the US EPA Environmental Appeals Board and Petition Numbers IV-2008-1 and IV-2008-2 to the US EPA for re-consideration of Title V/PSD Air Quality Permit #V-07-017 for Cash Creek Generation, LLC facility located in Henderson, Kentucky.

Step 3 - Rank Technically Feasible Technologies by Control Effectiveness

All technically feasible technologies are ranked in order of overall control effectiveness. Rankings are based on the level of emission control expressed as emissions per unit of production, emissions per unit of energy used, the concentration of a pollutant emitted from the source, control efficiency, or a similar measure. The control effectiveness listed will be representative of the level of emission control which can be achieved by the control technology at the operating conditions of the emission unit being reviewed. If the most effective control technology is selected as BACT, then Step 4 need not be completed.

Step 4 - Evaluate Technically Feasible Control Technologies

The economic, environmental, and energy impacts of each technically feasible control technology are evaluated. Step 4 is only required if the most effective control technology is not proposed as BACT. As the top control technology was chosen in all cases, the economic, environmental, and energy impact analyses were not required for this evaluation.

The environmental impact analysis assesses collateral environmental impacts associated with control of the regulated pollutant in question. Impacts considered may include solid or hazardous waste generation, wastewater discharges from a control device, visibility impacts, collateral increases in emissions of other criteria or non-criteria pollutants, increased water consumption, and land use. The environmental impact analysis is conducted based on consideration of site-specific circumstances.

The energy impact analysis considers whether use of an emission control technology results in any significant or unusual energy penalties or benefits. Energy use may be evaluated on an energy used per unit of production basis; energy used per ton of pollutant controlled or total annual energy use. Energy impacts may consider whether or not use of an emission control technology will have an adverse impact on local energy supplies due to increased fuel consumption or the loss of fuel production or power generation.

Step 5 - Select BACT

Based on technical considerations and economic, environmental and energy impacts the proposed BACT for each emissions unit will include:

- A pollutant-specific emission control technology as BACT, or a combination of controls when appropriate

- Document approach is consistent with NSPS requirements (BACT floor) i.e. equal to, or more stringent than the applicable NSPS.

Relevant RBLC determinations are discussed for comparison purposes.

3.0 Overview of Available Control Technologies

Available emission control technologies for the $PM_{2.5}$ SIP pollutants evaluated in this report are listed in Table 3-1. This table summarizes the results of Step 1 of the BACT analysis to identify all available control technologies. Further evaluation of these control technologies for each emissions unit is completed in the remainder of this report.

Table 3-1 Available Emission Control Technologies

Pollutant	Control Technology
$PM_{2.5}$	**Add On $PM_{2.5}$ Control Technologies**
	Wet Gas Scrubber
	Electrostatic Precipitator (ESP)
	Drift Eliminator Upgrades
	Other $PM_{2.5}$ Control Options
	Use of Natural Gas
	Good Design Methods and Operating Practices
	Flare Gas Recovery
	Flare Management Plan
	Flare Cap
	Flare Combustion Efficiency
	Current Drift Eliminators and Good Operating Practices
	Electric Motor
	Ultra-Low Sulfur Diesel
	Comply with emergency engine requirements of MACT ZZZZ
	Replace engine with Tier 4 Engine
SO_2	**Add On SO_2 Control Technologies**
	Wet Gas Scrubber
	Off Gas Scrubber
	Add on Caustic Spray tower scrubbers on heater exhaust
	Tail Gas Treatment Unit
	Standby Secondary Tail Gas Treatment Unit
	Other SO_2 Control Technologies
	Feed Hydrotreating
	DeSOx Catalyst
	Use of Low Sulfur Natural Gas
	Low H_2S content fuel gas
	Polishing amine or caustic scrubber after existing amine scrubbing system
	Good Design Methods and Operating Practices
	Sulfur Recovery Unit and Tail Gas Treatment Unit Reliability Upgrades
	Sulfur Shedding Plan
	Flare Gas Recovery
	Flare Management Plan
	Flare Cap
	Flare Combustion Efficiency
	Electric Motor

Pollutant	Control Technology
	Ultra-Low Sulfur Diesel
	Comply with emergency engine requirements of MACT ZZZZ
NO_X	**Add On NO_X Control Technologies**
	$LoTO_X$
	Low NO_X Burners (LNB)/Ultra Low NO_X Burners (ULNB)
	Selective Catalytic Reduction (SCR)
	Selective Non-Catalytic Reduction (SNCR)/Enhanced SNCR
	Catalytic Converter
	Catalytic Converter with 3-way catalyst
	Other NO_X Control Technologies
	Feed Hydrotreating
	NO_X Reduction Additives
	Use of Natural Gas
	Good Design Methods and Operating Practices
	Steam/Water Injection
	SoLoNOx (Combustion Control) Technology
	Solar Turbines Advanced Combustion Controls
	Flare Gas Recovery
	Flare Management Plan
	Flare Cap
	Flare Combustion Efficiency
	Electric Motor
	Comply with emergency engine requirements of MACT ZZZZ
	Replace engine with Tier 4 engine
	Use of Gaseous Fuel
	Operate temporary boiler on temporary basis per 40 CFR 60.41b
VOC	**Add on VOC Control Technologies**
	CO Boiler (COB) with Good Combustion Practices
	Catalytic Control
	Catalytic Oxidation
	Thermal Oxidation
	Vapor Recovery System
	Vapor Combustion Unit
	Flare
	Carbon Adsorption
	Other VOC Control Technologies
	CO Promoter Catalyst Additive

Pollutant	**Control Technology**
	VOC Promoter with ESP
	Good Design Methods and Operating Procedures
	Use of Natural Gas
	LDAR Program
	API Separator Floating Covers
	API Separator Floating Roof Covers meeting QQQ Standards
	Replace uncontrolled drains
	Retrofit controls
	Controlled Drains at QQQ Process Units
	Flare Gas Recovery
	Flare Management Plan
	Flare Cap
	Flare Combustion Efficiency
	Comply with emergency engine requirements of MACT ZZZZ
	Replace engine with Tier 4 engine
	Compliance with 40 CFR Part 63, Subpart CC
	Low emitting drift eliminators
	Electric Motor
	NSPS Kb Controls
	RSR Controls
	Degassing controls when storage tanks are taken out of service
	Vent tank to a Control Device
	Retrofit to an IFR
	Dome Retrofit
	Installation of a vapor recovery system VOC control
Ammonia	**Add-on Ammonia Control**
	CO Boiler (COB)
	Water Based Strippers
	Thermal Oxidation
	Other Ammonia Control Technologies
	Good design methods and operating procedures
	Use of Natural Gas
	Flare Gas Recovery
	Flare Management Plan

4.0 BACT for Fluidized Catalytic Cracking Unit (FCCU) and Carbon Monoxide Boiler (COB)

In the FCCU process, coke is formed on the FCCU catalyst and must be removed in the regenerator to maintain catalyst performance. In the regenerator, combustion air is added to burn off the coke in the catalyst. The regenerator is operated in partial burn mode, in which the regenerator is operated to produce Carbon Monoxide (CO), which fuels the downstream CO Boiler (COB). Regenerator off-gas is analyzed by O2, CO, and CO2 continuous emission monitoring systems (CEMS) prior to entry to the COB. Spare CO, O2, and CO2 analyzers are also installed and can be switched to at any time to minimize CEMS downtime.

The COB is used to recover residual heat from the FCCU Regenerator and create steam, while also oxidizing CO from the regenerator. To support the FCCU Reactor, residual coke from the circulated FCCU catalyst is burned off in the FCCU Regenerator so the catalyst can be reused in the reactor. The flue gas from this regeneration process is fed to the COB and is mixed with flue gases from combustion of refinery fuel gas. This mixture heats boiler feed water to create high-pressure steam. Emissions are directed out the top of the COB to the Electrostatic Precipitator (ESP) for particulate removal. The ESP acts as a control device to remove particulate matter from the COB exhaust. The ESP utilizes an electric field to impact negative charge on the catalyst fines which then attach to positively charged grids. These fines are periodically removed from the grids.

Tesoro is installing a wet gas scrubber (WGS) and LoTOx^{TM} systems downstream of the ESP. The systems will be operational by January 1, 2018. The LoTOx^{TM} system injects ozone into the FCCU/CO Boiler exhaust stream within the WGS. NOX compounds are oxidized with ozone to form compounds that are removed from the flue gas in the WGS. SO2 is removed from the FCCU/CO Boiler exhaust gas stream by contacting the exhaust gas with water, buffered with a sodium reagent (either sodium hydroxide, NaOH or soda ash or Na2CO), in the spray tower. These same liquid sprays also remove particulates from the flue gas. Liquid containing these compounds is collected and purged from the scrubber. It is then processed by a Purge Treatment Unit (PTU), which separates and dewaters the particulate. The system is designed to discharge a neutral pH liquid stream. The final effluent is low in total suspended solids (TSS), and contains up to 10% total dissolved solids (TDS) from sodium sulfate and sodium nitrate.

There is a bypass stack located upstream of the COB that enables emissions from the FCCU Regenerator to be discharged directly to the atmosphere, bypassing the COB and ESP, during process upset conditions. Flue gas from the regenerator enters the F-54 seal tank, which contains an exhaust stem that connects to the COB and a separate connection to the F-55 Seal Tank. The F-55 seal tank contains an exhaust stem that routes emissions to the COB/ESP Bypass Stack. Each of the two seal drums can be filled with water to create a water seal that prevents flue gas from escaping up the exhaust stem.

4.1 FCCU and COB $PM_{2.5}$ Emissions

Currently, an ESP is installed downstream of the COB to capture particulate matter from the COB exhaust gas. Tesoro is required by AO DAQE-AN1033350071-16 to install a Wet Gas Scrubber to further capture and control particulate matter from the COB by January 1, 2018.

4.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

4.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 4-1. The following sections provide additional detail.

Table 4-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for FCCU and COB

Technology	Technically Feasible?
ESP	Yes
ESP + Wet Gas Scrubber	Yes

All control technologies are technically feasible.

4.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 4-2, according to their control effectiveness.

Table 4-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for FCCU and COB

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	ESP + Wet Gas Scrubber	To Be Determined	--
2	ESP	1 lb/1,000-lb coke burn filterable PM	Existing Control at Tesoro SLC, Meets NSPS Subpart Ja

4.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

4.1.5 Step 5 – BACT Selection

BACT for $PM_{2.5}$ emissions from the FCCU is an ESP with a Wet Gas Scrubber. Tesoro is installing a Belco 8-6000 model wet gas scrubber, the best model offered. Tesoro is required to have the Wet Gas Scrubber operational by January 1, 2018, and complete an initial emissions performance test after startup. Recent

BACT determinations for FCCUs with a Wet Gas Scrubber show limits of 0.5-1 lb filterable PM emissions per 1000 pounds of coke burn. The NSPS Ja standard for FCCUs is 1 lb filterable PM emissions per 1000 pounds of coke burn which is consistent with Tesoro's current limit.

4.2 FCCU and COB SO_2 Emissions

SO_2 emissions are a result of the catalyst regeneration process. Currently, a low SO_X catalyst, $DeSO_X$, is utilized to reduce SO_2 emissions. By January 1, 2018, a wet gas scrubber is required to be installed on the flue gas outlet downstream of the COB, further reducing SO_2 emissions.

4.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

4.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 4-3. The following sections provide additional detail.

Table 4-3 Technical Feasibility of SO_2 Control Technologies for FCCU and COB

Technology	Technically Feasible?
Feed Hydrotreating	No
Wet Gas Scrubber	Yes
DeSOx Catalyst	Yes

Hydrotreatment of the feed is considered a technically infeasible option at Tesoro. Tesoro does not have a vacuum tower to separate the vacuum gas oil from the residual oil and there is no viable technology to hydrotreat FCCU feed that contains residual oil. Since Tesoro does not have the process equipment to operate a feed hydrotreatment unit, it is not considered to be an applicable control technology.

4.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 4-4, according to their control effectiveness.

Table 4-4 Control Effectiveness Ranking of SO_2 Control Technologies for FCCU and COB

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Wet Gas Scrubber	10 ppmvd @ 0% O_2 on a 365-day rolling average 18 ppmvd @ 0% O_2 on a 7-day rolling average	Consent Decree / AO
2	DeSOx Additive	9.8 lb/1,000-lb	Approval Order

4.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

4.2.5 Step 5 – BACT Selection

BACT for SO_2 emissions from the FCCU and COB is a Wet Gas Scrubber. This control requirement is more stringent than recent BACT determinations, with the most stringent being equivalent to the emission limitations listed for FCCUs in NSPS Ja. Tesoro will be subject to the following limits as of January 1, 2018:

- 10 ppmvd @ 0% O_2 on a 365-day rolling average
- 18 ppmvd @ 0% O_2 on a 7-day rolling average

4.3 FCCU and COB NO_X Emissions

NO_X emissions are the result of catalyst regeneration and combustion in the CO Boiler. Tesoro is required to install a $LoTO_X$ unit along with a Wet Gas Scrubber by January 1, 2018.

4.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information are listed in Table 3-1.

4.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 4-5. The following sections provide additional detail.

Table 4-5 Technical Feasibility of NO_X Control Technologies for FCCU and COB

Technology	Technically Feasible?
Feed Hydrotreating	No
NO_X Reduction Additives	No
$LoTO_X$	Yes
Low NO_X Burners	No
SCR	Yes
SNCR/Enhanced SNCR	Yes

As discussed in 4.2.2, Tesoro does not have the required process equipment to operate a feed hydrotreatment unit, and therefore a hydrotreatment unit is not considered further for analysis.

As indicated by multiple vendors, NO_X reduction additives are not effective reducing agents in partial combustion FCCU's. As Tesoro operates a partial combustion FCCU, NO_X reduction additives are not feasible and are not considered further for analysis.

Most NO_X emissions from the COB are due to the oxidation of reduced nitrogen compounds entering the COB in the catalyst regenerator off gas. Low NO_X Burners (LNB) in the COB have no effect on fuel-based NO_X formation, and therefore are not considered further for analysis.

4.3.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 4-6, according to their control effectiveness.

Table 4-6 Control Effectiveness Ranking of NO_X Control Technologies for FCCU and COB

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	$LoTO_X$	10 ppmvd @ 0% O_2 on a 365-day rolling average 20 ppmvd @ 0% O_2 on a 7-day rolling average	Consent Decree / AO
2	SCR	20 ppm at 0% O_2	Vendor Information
3	SNCR/Enhanced SNCR	60 ppmv @ 0% O_2	Vendor information

4.3.4 Step 4 – Evaluation of Feasible Control Technologies

The installation of SCR, SNCR, or enhanced SNCR results in ammonia slip and incremental condensable PM emissions. The installation of these units may require the installation of a wet gas scrubber for ammonium nitrates and sulfate control.

Tesoro plans to install a $LoTO_X$ unit, which is the top control efficiency, and therefore no cost evaluation is required. The use of $LoTO_X$ eliminates ammonia slip, but will increase the nitrates in the wastewater and increases electricity use due to the ozone generators.

4.3.5 Step 5 – BACT Selection

BACT for NO_X emissions from the FCCU and COB is a $LoTO_X$ unit. This is consistent with recent BACT determinations, with the most stringent being:

- 10 ppmvd @ 0% O_2 on a 365-day rolling average
- 20 ppmvd @ 0% O_2 on a 7-day rolling average

Recent BACT and LAER determinations for NOx emissions from FCCUs are more stringent than the BACT floor emission limits for NO_X from FCCUs listed in NSPS Ja.

4.4 FCCU and COB VOC Emissions

VOC is the result of catalyst regeneration. Currently, Tesoro operates a COB to reduce the VOC emissions.

4.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

4.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 4-7. The following sections provide additional detail.

Table 4-7 Technical Feasibility of VOC Control Technologies for FCCU and COB

Technology	Technically Feasible?
COB with Good Combustion Practices	Yes
VOC Promoter with ESP	No
Add-on Catalytic Control	No
CO Promoter Catalyst Additive	No

A VOC Promoter with an ESP works well with full burn regeneration, however since Tesoro uses partial burn regeneration this technology is infeasible and is not considered for further analysis. Also, a CO promoter catalyst additive can only be used in full burn FCCU catalyst regenerators, a CO promoter is infeasible and not considered further.

Due to the extremely low concentration of VOCs in the exhaust stream following the COB, add on catalytic control is not technically feasible and is not considered for further analysis.

4.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 4-8, according to their control effectiveness.

Table 4-8 Control Effectiveness Ranking of VOC Control Technologies for FCCU and COB

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	COB with Good Combustion Practices	0.005 lb/MMBtu	AP-42 Table 1.4-2

4.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is already installed.

4.4.5 Step 5 – BACT Selection

BACT for VOC emissions from the FCCU and COB is a COB with good combustion practices. This proposal is consistent with recent RBLC determinations for FCCUs. During unit startup or shutdown, good combustion practices will be followed in order to minimize VOC emissions.

4.5 FCCU and COB Ammonia Emissions

The operation of catalyst regeneration on partial burn mode generates ammonia and reduced nitrogen compounds. These reduced nitrogen compounds are oxidized in the COB.

4.5.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for Ammonia emissions from a review of available information are listed in Table 3-1.

4.5.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for Ammonia emissions are summarized in Table 4-9. The following sections provide additional detail.

Table 4-9 Technical Feasibility of Ammonia Control Technologies for FCCU and COB

Technology	Technically Feasible?
COB	Yes
Add-on Ammonia Control	No

Ammonia created due to combustion is present in extremely low concentrations within the outlet stream of the FCCU and COB, lower than add-on control technology is able to achieve. Therefore, add-on ammonia control technology is infeasible and is not considered further.

4.5.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 4-10, according to their control effectiveness.

Table 4-10 Control Effectiveness Ranking of Ammonia Control Technologies for FCCU and COB

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	COB	60 ppmv @ 0% O_2	EEP, Section 5 – Process Vents, Table 5-4

It should be noted that Tesoro's plan to install a wet gas scrubber has the potential to reduce ammonia emissions, as the best in class wet gas scrubber is planned to be installed.

4.5.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

4.5.5 Step 5 – BACT Selection

BACT for ammonia emissions from the FCCU is the operation of a COB. This proposal is consistent with recent RBLC determinations for FCCUs. During unit startup or shutdown, good combustions practices will be followed in order to minimize ammonia emissions.

5.0 BACT for Process Heaters

The refinery has six fired process heaters:

- H-101 Crude Unit Furnace
- F-1 Ultraformer Unit Furnace
- F-15 Ultraformer Regeneration Heater
- F-680 DDU Charge Heater
- F-681 DDU Rerun Boiler
- F-701 GHT Unit Heater

The emissions from these process heaters are discussed in total in the sections which follow.

5.1 Process Heaters $PM_{2.5}$ Emissions

According to the AP-42 emission factors, particulate matter emissions from combustion of gaseous fuels are typically low and consist of filterable and condensable fractions.

5.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

5.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 5-1. The following sections provide additional detail.

Table 5-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for Process Heaters

Technology	Technically Feasible?
Use of Natural Gas	No
Good Design Methods and Operating Practices	Yes
Add On $PM_{2.5}$ Control	No

$PM_{2.5}$ concentration in the flue gas is well below the range achievable by add-on control devices, and thus post-combustion $PM_{2.5}$ control is technically infeasible.

The use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for combustion in the process heaters would result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions.

5.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 5-2, according to their control effectiveness.

Table 5-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for Process Heaters

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Design Methods and Operating Practices	0.0075 lb/MMBtu	AP-42 Table 1.4-2

5.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

5.1.5 Step 5 – BACT Selection

Since add-on control devices for $PM_{2.5}$ is not feasible, BACT for $PM_{2.5}$ emissions from the process heaters is good design methods and operating practices. This proposal is consistent with recent RBLC determinations for fuel gas process heaters. During unit startup or shutdown, good operating practices will be followed in order to minimize PM emissions.

5.2 Process Heaters SO_2 Emissions

SO_2 emissions from combustion of refinery fuel gas arise from trace amounts of sulfur present in the fuel. Currently, Tesoro treats their fuel gas to remove H_2S.

5.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

5.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 5-3. The following sections provide additional detail.

Table 5-3 Technical Feasibility of SO_2 Control Technologies for Process Heaters

Technology	Technically Feasible?
Use of Low Sulfur Natural Gas	No
Low H_2S content fuel gas	Yes
Polishing amine or caustic scrubber after existing amine scrubbing system	No
Off Gas Scrubber	No
Add on Caustic Spray tower scrubbers on heater exhaust	No

The use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for combustion in the process heaters would result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions.

SO_2 concentration in the process heater stacks are below 5 ppm, which is below the levels current off gas scrubbers and add-on caustic spray towers can meet. Therefore, add on scrubbers are technically infeasible.

Low H_2S content fuel gas is used at Tesoro. With the current equipment, Tesoro can reliably achieve H_2S concentrations of less than or equal to 60 ppm on an annual average in their fuel gas. Although a secondary polishing amine or caustic scrubber downstream of the existing amine scrubber may be feasible to further reduce the H_2S concentration in the fuel gas, such technology is not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, a secondary polishing scrubber is technically infeasible.

5.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 5-4, according to their control effectiveness.

Table 5-4 Control Effectiveness Ranking of SO_2 Control Technologies for Process Heaters

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Low H_2S content fuel gas	Existing system (less than 60 ppm H_2S on an annual average, 162 ppm on a 3-hour average)	NSPS Subpart Ja

5.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

5.2.5 Step 5 – BACT Selection

BACT for SO_2 emissions from the process heaters is the use of low H_2S content fuel gas. Recent RBLC determinations range from 25 ppm H_2S on an annual average to 100 ppm H_2S on a 24 hour average in the fuel gas, while the NSPS Ja limit is 60 ppm H_2S on an annual average and 162 ppm H_2S on a 3 hour average. As discussed in Step 2, Tesoro cannot reliably achieve 25 ppm H_2S on an annual average or 100 ppm H_2S on a 24-hr average with existing equipment. Therefore, compliance with the NSPS Ja limits represent BACT.

5.3 Process Heaters VOC Emissions

VOC emissions from the process heaters are a result of incomplete combustion of the refinery fuel gas.

5.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

5.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 5-5. The following sections provide additional detail.

Table 5-5 Technical Feasibility of VOC Control Technologies for Process Heaters

Technology	Technically Feasible?
Good Design Methods and Operating Procedures	Yes
Use of Natural Gas	No
Catalytic Oxidation	No
Thermal Oxidation	No

All VOC control techniques seek to oxidize products of incomplete combustion, with excess oxygen typically present.

The application of thermal oxidation or catalytic oxidation technology within a process heater is concluded to not be technically feasible. Thermal oxidation and catalytic oxidation has been shown to be ineffective below VOC concentrations of 100 ppm. The concentration in process heater exhaust streams are estimated to be below 13 ppm, making thermal or catalytic oxidation technically infeasible.

The use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for combustion in the process heaters would result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions.

5.3.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 5-6, according to their control effectiveness.

Table 5-6 Control Effectiveness Ranking of VOC Control Technologies for Process Heaters

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Design Methods and Operating Procedures	0.0055 lb/MMBtu	AP-42 Table 1.4-2

5.3.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

5.3.5 Step 5 – BACT Selection

BACT for VOC from the process heaters is using good design methods and operating procedures. This proposal is consistent with recent RBLC determinations, with recent limits being 0.005 lb/MMBtu on a 1 hour average. During unit startup or shutdown, good operating practices will be followed in order to minimize VOC emissions.

5.4 Process Heaters Ammonia Emissions

Ammonia emissions are the result of combustion, and according to the EPA WebFIRE emission factors are extremely low (0.0031 lb/MMBtu) for natural gas combustion.

5.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for Ammonia emissions from a review of available information are listed in Table 3-1.

5.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for Ammonia emissions are summarized in Table 5-7. The following sections provide additional detail.

Table 5-7 Technical Feasibility of Ammonia Control Technologies for Process Heaters

Technology	Technically Feasible?
Add-on Ammonia Control	No
Good design methods and operating procedures	Yes

Due to the extremely low concentration of ammonia in the flue gas (0.0031 lb generated per MMBtu of heat input), any add on ammonia control is technically infeasible. For exhaust streams with higher concentrations, control technologies such as water-based strippers and thermal oxidation are typical add-on ammonia control technologies.

5.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 5-8, according to their control effectiveness.

Table 5-8 Control Effectiveness Ranking of Ammonia Control Technologies for Process Heaters

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good design methods and operating procedures	0.0031 lb/MMBtu	EPA WebFIRE Database

5.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

5.4.5 Step 5 – BACT Selection

BACT for ammonia from the process heaters is using good design methods and operating procedures. There are no BACT determinations for ammonia generated from combustion. During unit startup or shutdown, good operating practices will be followed in order to minimize ammonia emissions.

5.5 Process Heaters NO_X Emissions

There are three mechanisms by which NOx production occurs during combustion including thermal, fuel, and prompt NOx formation. In the case of gaseous fuel combustion, the primary mechanism of NOx formation is through thermal NOx formation. The H-101, F-1, F-680, and F-681 process heaters have ULNB currently installed to assist with reducing NOx formed from the fuel. Process heaters F-15 and F-701 have LNB currently installed.

5.5.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information is listed in Table 3-1.

5.5.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 5-9 and Table 5-10. The following sections provide additional detail.

Table 5-9 Technical Feasibility of NOx Control Technologies for Process Heaters with ULNB Installed (H-101, F-1, F-680, and F-681)

Technology	Technically Feasible?
ULNB	Yes
SCR + ULNB	No
SNCR + ULNB	No

Table 5-10 Technical Feasibility of NOx Control Technologies for Process Heaters with LNB Installed (F-15, F-701)

Technology	Technically Feasible?
ULNB	No
LNB + SCR/SNCR	No
SCR + ULNB	No
SNCR + ULNB	No

There is no plot space available for an SCR reactor at H-101 or F-1. Tesoro is limited by rail tracks and the Salt Lake City sewer line easement restrictions in the immediate area where an SCR reactor would be placed. Although the addition of SCR or SNCR to the heater may be feasible for other heaters, such technology is not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, ULNB with SCR or SNCR is considered technically infeasible for all process heaters.

As F-15 and F-701 both use Low NOx burners, it may be theoretically feasible to upgrade the burners to ULNB; a detailed engineering review has not been completed and would be necessary to determine if technically feasible for the noted heaters. Regardless, such technology is not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, an upgrade to ULNB is considered technically infeasible for F-15 and F-701. In addition burner impingement is a significant concern when retrofitting small furnace boxes such as F-15 and F-701 with ULNB tips.

5.5.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 5-11, according to their control effectiveness.

Table 5-11 Control Effectiveness Ranking of NOx Control Technologies for Process Heaters

Heater	Technology	Emission Control Effectiveness	Basis for Listed Performance
F-1	ULNB	0.04 – 0.065 lb/MMBtu	Approval Order
H-101		0.054 lb/MMBtu	Approval Order
F-680		0.049 lb/MMBtu	Approval Order
F-681		0.052 lb/MMBtu	Approval Order
F-15	LNB	0.079 lb/MMBtu	Approval Order
F-701		0.074 lb/MMBtu	Approval Order

5.5.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required. The top technically feasible control for each heater based upon current control technology is selected.

5.5.5 Step 5 – BACT Selection

NO_X from process heaters is the existing burner configuration because upgrades are technically infeasible.

NSPS Ja for heaters greater than 40 MMBtu/hr with a natural draft must be less than 0.04 lb/MMBtu (or 40 ppmvd @ 0% excess air). Forced draft must be less than 0.06 lb/MMBtu (60 ppmvd @ 0% excess air) regardless of size. However, NSPS Ja standards for NO_x do not apply to any of these process heaters, and process heaters F-15 and F-701 have capacities less than 40 MMBtu/hr.

6.0 BACT for Cogeneration Units

The Cogeneration system consists of two turbine trains, designated as the East and West Cogen system trains. Each turbine burns both natural gas and SRU Sweet Gas; natural gas serves as the primary fuel for the combustion turbines while supplemental refinery fuel gas consists of up to 30% of the mixture. The combustion exhaust drives a turbine to produce electricity for the refinery and electrical grid, and is then sent to the heat recovery steam generators (HRSG). The HRSG produces steam for the refinery. The HRSG is fired with refinery fuel gas. There are no add-on or tail gas emission controls. Passive NO_X control on the turbine is accomplished by the $SoLoNO_X$ lean pre-mix combustion technology.

6.1 Cogeneration Units $PM_{2.5}$ Emissions

According to the AP-42 emission factors, particulate matter emissions from combustion of gaseous fuels are typically low and consist of filterable and condensable fractions.

6.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

6.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 6-1. The following sections provide additional detail.

Table 6-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for Cogeneration Units

Technology	Technically Feasible?
Use of Natural Gas	No
Good Design Methods and Operating Procedures	Yes
Add-on $PM_{2.5}$ control	No

$PM_{2.5}$ concentration in the flue gas is well below the range achievable by add-on control devices, and thus post-combustion $PM_{2.5}$ control is technically infeasible.

The use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for exclusive combustion in the turbines and HRSGs would result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions. Also, the operation of the Cogen units to burn fuel gas is listed as a flaring minimization measure in the Consent Decree Flare Management Plan and NSPS Ja.

6.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 6-2, according to their control effectiveness.

Table 6-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for Cogeneration Units

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Design Methods and Operating Procedures	0.0075 lb/MMBtu	AP-42 Table 1.4-2

6.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

6.1.5 Step 5 – BACT Selection

Since add-on control devices for $PM_{2.5}$ is not feasible and a switch to 100% natural gas firing would not result in a facility-wide decrease in emissions, BACT for $PM_{2.5}$ emission from the Cogens is good design methods and operating practices. This proposal is consistent with recent RBLC determinations for cogeneration turbines of 0.0075 lb/MMBtu on a 3 hour average. During unit startup or shutdown, good operating practices will be followed in order to minimize PM emissions.

6.2 Cogeneration Units SO_2 Emissions

SO_2 emissions from combustion of refinery fuel gas arise from trace amounts of sulfur present in the fuel. Each turbine fires a mixture of SRU Sweet Gas and natural gas. The combined gas to the turbines is generally less than 25 ppm H_2S on an annual average. Each HRSG fires refinery fuel gas, which is treated to remove H_2S and meets NSPS Ja standard of 60 ppm H_2S on an annual average.

6.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

6.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 6-3. The following sections provide additional detail.

Table 6-3 Technical Feasibility of SO_2 Control Technologies for Cogeneration Units

Technology	Technically Feasible?
Use of Natural Gas	No
Low H_2S content fuel gas	Yes
Polishing amine or caustic scrubber after existing amine scrubbing system	No
Off Gas Scrubber	No
Add on Caustic Spray tower scrubbers on heater exhaust	No

The exclusive use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for exclusive combustion in the turbines and HRSGs would result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions. Also, the operation of the Cogen units to burn fuel gas is listed as a flaring minimization measure in the Consent Decree Flare Management Plan.

SO_2 concentration in the Cogen stack is below 8 ppm @ 0% O2 on an annual average, which is below the levels current off gas scrubbers and add-on caustic spray towers can meet. Therefore, add on scrubbers are technically infeasible.

Although a secondary polishing amine or caustic scrubber downstream of the existing amine scrubber may be feasible, such technology is not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, a secondary polishing scrubber is technically infeasible.

6.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 6-4, according to their control effectiveness.

Table 6-4 Control Effectiveness Ranking of SO_2 Control Technologies for Cogeneration Units

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Low H_2S content fuel gas	HSRG: Existing system (less than 60 ppm H_2S on an annual average, 162 ppm H_2S on a 3-hour average) Turbines: Existing system (less than 25 ppm H_2S in the combined gas on an annual average)	NSPS Subpart Ja

6.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control options are selected.

6.2.5 Step 5 – BACT Selection

BACT for SO_2 emissions from the Cogens is the use of low H_2S content fuel gas meeting NSPS Ja standards.

Recent RBLC determinations range from 25 ppm H_2S on an annual average to 100 ppm H_2S on a 24 hour average in the fuel gas, while the NSPS Ja limit is 60 ppm H_2S on an annual average and 162 ppm H_2S on a 3 hour average. As discussed in Step 2, Tesoro cannot reliably achieve 25 ppm H_2S on an annual average or 100 ppm H_2S on a 24-hr average for the refinery fuel gas fired at the HRSGs with existing equipment. Therefore, compliance with the NSPS Ja limits represent BACT for the HRSGs

Tesoro can achieve 25 ppm H_2S on an annual average at the turbines with the existing equipment. The combined high pressure natural gas and refinery fuel gas combusted in the turbines meet the NSPS Ja limits of 60 ppm H_2S on an annual average and 162 ppm H_2S on a 3 hour average. Therefore, compliance with the NSPS Ja limits represent BACT for the Turbines.

6.3 Cogeneration Units NO_X Emissions

There are three mechanisms by which NOx production occurs during combustion including thermal, fuel, and prompt NOx formation. In the case of gaseous fuel combustion, the primary mechanism of NOx formation is through thermal NOx formation. The Cogen turbines utilize SoLoNOx™ controls to reduce the NOx emissions by a lean-premix technology to optimize the air/fuel mixture.

6.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information are listed in Table 3-1.

6.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 6-5. The following sections provide additional detail.

Table 6-5 Technical Feasibility of NOx Control Technologies for Cogeneration Units

Technology	Technically Feasible?
SoLoNOx Technology	Yes
Solar Turbines Advanced Combustion Controls	No
SCR	No
SNCR	No
Steam/Water Injection	No

Although SCR, SNCR, and Solar advanced combustion controls may feasible technologies, it is not feasible to design, install, and begin to operate any of these technologies prior to December 31, 2018. Therefore, SCR, SNCR, and Solar advance combustion controls are technically infeasible.

Tesoro contacted the manufacturer of the Cogens to determine if steam/water Injection may be feasible. This control system is not available for Tesoro's Solar Cogens and is therefore considered technically infeasible.

6.3.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 6-6, according to their control effectiveness.

Table 6-6 Control Effectiveness Ranking of NOx Control Technologies for Cogeneration Units

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	SoLoNOx Technology	32 ppm @ 15% O_2	SOLAR performance guarantee
		18 ppm @ 15% O_2	Performance test results

6.3.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control options are selected.

6.3.5 Step 5 – BACT Selection

BACT for NO_x emissions from the Cogens is the continuation of the SoLoNOx Technology. The most recent BACT determination from the RBLC database include limits of 15 ppm @ 15% O_2 for SoLoNOx technology in 2010, with newer technology than was available when the Cogen units were installed. Additional controls are technically infeasible by December 31, 2018.

6.4 Cogeneration Units VOC Emissions

VOC emissions from the Cogens are a result of incomplete combustion of the natural gas and fuel gas.

6.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

6.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 6-7. The following sections provide additional detail.

Table 6-7 Technical Feasibility of VOC Control Technologies for Cogeneration Units

Technology	Technically Feasible?
Good Design Methods and Operating Procedures	Yes
Use of Natural Gas	No
Catalytic Oxidation	No
Thermal Oxidation	No

All VOC control techniques seek to oxidize products of incomplete combustion, with excess oxygen typically present.

The application of thermal oxidation or catalytic oxidation technology following the Cogens is concluded to not be technically feasible. Thermal oxidation and catalytic oxidation has been shown to be ineffective below VOC concentrations of 100 ppm. The concentration in the Cogen exhaust streams are estimated to be below 13 ppm, making thermal or catalytic oxidation technically infeasible.

The use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for exclusive combustion in the turbines and HRSGs would result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions. Also, the operation of the Cogen units to burn fuel gas is listed as a flaring minimization measure in the Consent Decree Flare Management Plan.

6.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 6-8, according to their control effectiveness.

Table 6-8 Control Effectiveness Ranking of VOC Control Technologies for Cogeneration Units

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Design Methods and Operating Procedures	0.0021 lb/MMBtu	AP-42 Table 3.1-2a

6.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

6.4.5 Step 5 – BACT Selection

BACT for VOC from the Cogens is using good design methods and operating procedures. This proposal is consistent with recent RBLC determinations for cogeneration turbines, with limits of 0.005 lb/MMbtu on a 3 hour average. During unit startup or shutdown, good design methods and operating practices will be followed in order to minimize VOC emissions.

6.5 Cogeneration Units Ammonia Emissions

Ammonia emissions from the Cogen units are the result of combustion.

6.5.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for Ammonia emissions from a review of available information are listed in Table 3-1.

6.5.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for Ammonia emissions are summarized in Table 6-9. The following sections provide additional detail.

Table 6-9 Technical Feasibility of Ammonia Control Technologies for Cogeneration Units

Technology	Technically Feasible?
Good Design Methods and Operating Procedures	Yes
Add-on ammonia control	No

Due to the extremely low concentration of ammonia in the Cogen flue gas (0.0031 lb generated per MMBtu of heat input), any add on ammonia control is technically infeasible. For exhaust streams with higher concentrations, control technologies such as water-based strippers and thermal oxidation are typical add-on ammonia control technologies.

6.5.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 6-10, according to their control effectiveness.

Table 6-10 Control Effectiveness Ranking of Ammonia Control Technologies for Cogeneration Units

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Design Methods and Operating Procedures	2 ppmvd @ 15% O_2	EPA WebFIRE Emission Factor (0.0031 lb/MMBtu)

6.5.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

6.5.5 Step 5 – BACT Selection

BACT for ammonia emissions from the Cogen units is good design methods and operating procedures. This proposal is consistent with recent RBLC determinations of 2 ppmvd @ 15% O_2 for cogeneration turbines. During unit startup or shutdown, good design methods and operating practices will be followed in order to minimize ammonia emissions.

7.0 BACT for Sulfur Recovery Unit (SRU)

The Sulfur Recovery Unit (SRU) complex reduces sulfur emissions from refinery processes by removing H_2S from the refinery sour water and sour fuel gas systems and converting it into elemental sulfur. In the SRU process, the sour water stripper acid gas and amine acid gas are sent to a burner to convert some of the H_2S to SO_2 and all of the ammonia to nitrogen. The heated gas mixture is fed to the first of three reactor stages, where the SO_2/H_2S mixture is converted to sulfur vapor over a catalyst bed, generating heat in the process. The elemental sulfur vapor is condensed via cooling and separated, while the remaining mixture is reheated through a heat exchanger. The cycle of gas reheated, passing the mixture over a catalyst reactor stage, and condensing the sulfur is repeated a total of three times; the remaining gas vapor, known as tail gas, is directed to the Tail Gas Treating Unit (TGTU). The liquid sulfur that is isolated from the acid gas is drained through sealed legs to a sulfur pit, where it is stored and sold as elemental sulfur product. In the TGTU, the tail gas is reduced to H_2S for additional capture by an amine absorber and recycling to the front of the SRU. The outlet stream from the TGTU is routed to a thermal oxidizer to control reduced sulfur emissions. The oxidizer uses refinery fuel gas as a fuel source.

7.1 SRU $PM_{2.5}$ Emissions

According to the AP-42 emission factors, particulate matter emissions from combustion of gaseous fuels are typically low and consist of filterable and condensable fractions. There are no process emission factors available for SRUs.

7.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

7.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 7-1. The following sections provide additional detail.

Table 7-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for SRU

Technology	Technically Feasible?
Good Design Methods and Operating Practices	Yes
Use of Natural Gas (Incinerator)	No
Add-on $PM_{2.5}$ Control	No

$PM_{2.5}$ concentration in the flue gas is well below the range achievable by add-on control devices, and thus post-combustion $PM_{2.5}$ control is technically infeasible.

The use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for combustion in the incinerator may result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions.

7.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 7-2, according to their control effectiveness.

Table 7-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for SRU

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Design Methods and Operating Practices	0.0075 lb/MMBtu	AP-42 Table 1.4-2

7.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

7.1.5 Step 5 – BACT Selection

Since add-on control devices for $PM_{2.5}$ are not feasible, BACT for $PM_{2.5}$ emissions from the SRU is use of good design methods and operating practices. There are no BACT determinations for $PM_{2.5}$ from SRUs in the RBLC database. During unit startup or shutdown, good operating practices will be followed in order to minimize $PM_{2.5}$ emissions.

7.2 SRU SO_2 Emissions

Uncaptured SO_2 in the Claus unit is contained in the tail gas and is the major source of SO_2 from the SRU. Tesoro uses a TGTU to recover additional sulfur from the tail gas, which was installed after the 2014 SIP baseline period. During times of startup, shutdown, or malfunction, a sulfur shedding plan is utilized to reduce the amount of sulfur being sent to the SRU, reducing SO_2 emissions.

7.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

7.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 7-3. The following sections provide additional detail.

Table 7-3 Technical Feasibility of SO_2 Control Technologies for SRU

Technology	Technically Feasible?
Wet Gas Scrubber	No
SRU and TGTU Reliability Upgrades	No
Standby Secondary TGTU	No
Sulfur Shedding Plan	Yes
TGTU	Yes

Although a wet gas scrubber, standby secondary TGTU, or reliability upgrades to the TGTU/SRU may be feasible, it is not feasible to design, install, and operate any of this equipment prior to December 31, 2018. Therefore, a wet gas scrubber, standby secondary TGTU, and TGTU/SRU reliability upgrades are considered technically infeasible.

7.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 7-4, according to their control effectiveness.

Table 7-4 Control Effectiveness Ranking of SO_2 Control Technologies for SRU

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	TGTU	95% Sulfur Recovery 60 tons per year	Approval Order
2	Sulfur Shedding Plan	Reduces SO_2 emissions by managing H_2S generation in the refinery	--

7.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

7.2.5 Step 5 – BACT Selection

BACT for SO_2 emissions from the SRU is a TGTU and a sulfur shedding plan.

Recent RBLC determinations include limits of 250 ppmvd @ 0% O_2 on a 12-hour basis, equivalent to the NSPS Ja SO_2 emission limit from SRUs. Tesoro is currently unable to meet this limitation without upgrades, which are technically infeasible by December 31, 2018. During unit startup, shutdown or SRU malfunction, the refinery sulfur shedding plan will be utilized to decrease SO_2 emissions.

7.3 SRU NO_X Emissions

There are three mechanisms by which NOx production occurs during combustion including thermal, fuel, and prompt NOx formation. In the case of Claus sulfur recovery, the SRU reaction furnace is operated in a reducing environment, where ammonia in the acid gas feed is reduced to N_2. A negligible amount of NO_X is formed from thermal or fuel formation mechanisms.

7.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information are listed in Table 3-1.

7.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 7-5. The following sections provide additional detail.

Table 7-5 Technical Feasibility of NO_X Control Technologies for SRU

Technology	Technically Feasible?
Good Design Methods and Operating Procedures	Yes
Add-on NOx control	No

NOx is assumed to be present in low concentrations within the outlet stream of the SRU unit, lower than add-on control technology is able to achieve. Therefore, add-on NOx control technology is infeasible and is not considered further.

7.3.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 7-6, according to their control effectiveness.

Table 7-6 Control Effectiveness Ranking of NO_X Control Technologies for SRU

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Design Methods and Operating Procedures	0.10 lb/MMBtu	EEP, Section 5 – Process Vents, Table 5-7

7.3.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, because Tesoro selects the top control option.

7.3.5 Step 5 – BACT Selection

BACT for NOx from the SRU is using good design methods and operating procedures. This proposal is consistent with recent RBLC determinations for SRUs with Tail Gas Treatment units, ranging from 0.02 lb/MMBtu to 0.2 lb MMBtu. During unit startup or shutdown, good operating practices will be followed in order to minimize NOx emissions.

7.4 SRU VOC Emissions

VOCs are introduced into the SRU from the in the acid gas feed streams. VOC emissions from the SRU are a result of incomplete combustion of the fuel in the incinerator.

7.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

7.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 7-7. The following sections provide additional detail.

Table 7-7 Technical Feasibility of VOC Control Technologies for SRU

Technology	Technically Feasible?
Good Design Methods and Operating Procedures	Yes
Use of Natural Gas	No
Catalytic Oxidation	No
Thermal Oxidation (Tail Gas Incinerator)	Yes

All VOC control techniques seek to oxidize products of incomplete combustion, with excess oxygen typically present.

The application of catalytic oxidation technology is not feasible, as sulfur levels in the TGTU exhaust can poison oxidation catalysts.

The use of a clean fuel, natural gas, instead of refinery fuel gas is not feasible for Tesoro. Importing natural gas for combustion in the incinerator would result in diversion of the excess fuel gas to the flare, which may result in flow rates to the flares in excess of the permitted refinery flare cap and no facility-wide net reduction in emissions.

7.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 7-8, according to their control effectiveness.

Table 7-8 Control Effectiveness Ranking of VOC Control Technologies for SRU

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Thermal Oxidation (Tail Gas Incinerator) Good Design Methods and Operating Procedures	0.0014 lb/MMBtu	EEP, Section 5 – Process Vents, Table 5-7

7.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

7.4.5 Step 5 – BACT Selection

BACT for VOC from the SRU is using the tail gas incinerator with good design methods and operating procedures. This proposal is consistent with recent RBLC determinations for SRUs, with a lowest limit of 0.0004 lb/MMBtu for a thermal oxidizer with an optimized air-fuel ratio. During unit startup or shutdown, good operating practices will be followed in order to minimize VOC emissions.

7.5 SRU Ammonia Emissions

The feed to the SRU contains ammonia, primarily from the sour water system overhead. Ammonia control is accomplished in the SRU by operating in sub-stoichiometric mode, creating a reducing atmosphere in which ammonia is converted to N_2, resulting in minimal ammonia emissions. Therefore, there are negligible ammonia emissions from the SRU and a BACT evaluation is not completed.

8.0 BACT for Fugitive Equipment

8.1 Fugitive Equipment VOC Emissions

Control strategies for volatile organic compound emissions from fugitive components are based on LDAR program work practice requirements, which identify and then reduce emissions from process equipment components.

8.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

8.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 8-1. The following sections provide additional detail.

Table 8-1 Technical Feasibility of VOC Control Technologies for Fugitive Equipment

Technology	Technically Feasible?
LDAR Program	Yes

8.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 8-2, according to their control effectiveness.

Table 8-2 Control Effectiveness Ranking of VOC Control Technologies for Fugitive Equipment

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	LDAR Program	N/A	N/A

8.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

8.1.5 Step 5 – BACT Selection

BACT for VOC emissions from fugitive equipment is an LDAR program, as required by 40 CFR Part 60 Subpart GGGa and Tesoro's Consent Decree. This proposal is consistent with recent RBLC determinations for fugitive emissions.

9.0 BACT for Refinery Wastewater System

9.1 Refinery Wastewater VOC Emissions

All wastewater and storm water streams within the refinery is treated in the Wastewater Treatment Plant (WWTP). Oil is recovered from the WWTP and is stored and/or reprocessed in the refinery. The API separators are fitted with floating roof covers.

9.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

9.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 9-1. The following sections provide additional detail.

Table 9-1 Technical Feasibility of VOC Control Technologies for Refinery Wastewater System

Technology	Technically Feasible?
Good design methods and operating practices	Yes
API Separator Floating Covers	Yes
API Separator Floating Roof Covers meeting NSPS QQQ standards	No
Vapor Combustion Unit	No
Carbon Adsorption	No

Although the addition of API separator meeting NSPS Subpart QQQ standards or vapor recovery to a vapor combustor or carbon adsorption unit may be feasible, it is not feasible to design, install, any of this equipment before December 31, 2018. Therefore, an API separator meeting QQQ standards, vapor combustion and carbon adsorption are considered technically infeasible.

9.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 9-2, according to their control effectiveness.

Table 9-2 Control Effectiveness Ranking of VOC Control Technologies for Refinery Wastewater System

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	API Floating Separator Covers, Good design methods and operating practices	0.20 lb/Mgal wastewater	AP-42 Table 5.1-3

9.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

9.1.5 Step 5 – BACT Selection

BACT for VOC from the waste water treatment plant is API floating separator covers with good design methods and operating practices. Although recent BACT determinations from the RBLC database show vapor combustion or carbon adsorption as BACT, it is technically infeasible to install and operate either type of equipment prior to December 31, 2018.

10.0BACT for Refinery Drains

10.1 Refinery Drains VOC Emissions

All wastewater and storm water streams within the refinery are collected and drained to the plant sewer system. The wastewater is then directed to the Wastewater Treatment Plan (WWTP) for treatment. Drains within the refinery are either controlled or uncontrolled. Controlled drains (water seal or closed system) meeting NSPS QQQ standards were installed when the DDU, GHT, BSU, and FGR were constructed. Other miscellaneous drains in the refinery are also controlled. Uncontrolled drains exist throughout the refinery in process units built prior to the NSPS QQQ standards. Currently, emissions from all drains are monitored on an annual basis per Utah Rule R307-326-9.

10.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

10.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 10-1. The following sections provide additional detail.

Table 10-1 Technical Feasibility of VOC Control Technologies for Refinery Drains

Technology	Technically Feasible?
Good operating practices	Yes
Controlled drains at QQQ process units	Yes
Replace uncontrolled drains	No
Retrofit controls	No

The replacement of individual drains is technically infeasible. The refinery sewer system located in process areas which existed prior to NSPS QQQ standards are not able to be upgraded due to the age and location around process equipment.

Installing retrofit controls, i.e. p-trap inserts, limits the flow capacity of the drains. The effective open area of a drain pipe would be cut in half to create the water seal inside the drain insert, which may backup and cause standing water issues during firefighting conditions. The inserts may also cause drain cup overflows when large amounts of fluids need to be removed quickly from process vessels during upsets or preparations for turnarounds. A complete refinery hydraulic study would need to be completed prior to installing the retrofit controls to ensure process safety issues were not created with the individual retrofit installations. Upon completion of the study it may be determined that some drains can be retrofitted with controls. It is not feasible to complete a refinery wide hydraulic study, design, install, and operate these retrofit controls prior to December 31, 2018. Therefore, installing retrofit controls on drains is technically infeasible.

10.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 10-2, according to their control effectiveness.

Table 10-2 Control Effectiveness Ranking of VOC Control Technologies for Refinery Drains

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Controlled drains at QQQ process units	0.032 lb/hr	Background Information Document to proposed NSPS QQQ, February 1985, pages 4-9
2	Good operating practices	0.064 lb/hr	AP-42 Table 5.1-3

10.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

10.1.5 Step 5 – BACT Selection

BACT for VOC emissions from uncontrolled refinery drains is good operating practices. BACT for VOC emissions from refinery drains at the DDU, GHT, BSU, and FGR is compliance with NSPS Subpart QQQ. Recent RBLC determinations require compliance with 40 CFR Part 61, Subpart FF using controls. Additional controls are technically infeasible by December 31, 2018.

11.0 BACT for North and South Flares

Process gases are routed to the North and South Flare Gas Recovery (FGR) Seal Drums. During normal operations, gases are routed to the FGR compressor and directed to the amine absorber prior to being routed to the refinery fuel gas system. The North and South Flare are subject to the following flare caps:

- 181,003 SCFD (365-day rolling average)
- 271,505 SCFD (30-day rolling average)

Tesoro implements Flare Minimization Practices to avoid flaring by preventing breaking the FGR water seals or venting fuel gas and to minimize flaring when these events occur.

Tesoro is required to ensure one FGR compressor is available for operation to recover flare gas 98% of the time over a rolling 8,760 clock hour (1 year) period. In addition, two compressors must be available for operation (or in operation) to recover flare gas 95% of the time over a rolling 8,760 clock hour (1 year) period. Tesoro maintains a spare flare gas compressor in addition to the two available for operation or in operation.

Tesoro implements the following Good Air Pollution Control Practices including during periods of startup, shutdown, and/or malfunction to minimize flare emissions:

A continuous flare pilot shall be maintained at all times.

The presence of a flare pilot flame shall be continuously monitored. If an alarm indicates that the pilot flame is lost, operations personnel are to promptly attempt to reignite the pilot, document any corrective actions taken.

Flares are operated without visible emissions, while minimizing the flare Steam/Vent Gas (S/VG) ratio to 3 or less.

Flare operating personnel monitor flare operation using the *flare video monitoring* system. If smoke is detected by the operators, or by other technical or operations personnel, adhere to the practice outlined in Section 7 below.

Tesoro is not permitted to allow the flares to smoke nor have visible emissions at any time. If visible emissions are observed either firsthand or through the video monitoring system:

Operators increase steam flow to the flare until the visible emissions are eliminated while minimizing the flare Steam/Vent Gas (S/VG) ratio to 3 or less.

Operators address the cause of visible emissions

Operators initiate Method 22 observations

During non-routine operations, the process gases from the process vessels are discharged to the North and South flare systems. When the flow of gas exceeds the capacity of the FGR compressors, gas breaks through the water seal and is routed to the flare stack for combustion.

The flares are operated in compliance with the applicable standards at 40 CFR 60.18, 40 CFR 63.11 and *Tesoro's Consent Decree.*

11.2 North and South Flares $PM_{2.5}$ Emissions

$PM_{2.5}$ is generated from the combustion of vent gas at the flare tip.

11.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

11.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 11-1. The following sections provide additional detail.

Table 11-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for North and South Flares

Technology	Technically Feasible?
Flare Gas Recovery	Yes
Flare Cap	Yes
Flare Combustion Efficiency	Yes
Flare Management Plan	Yes
Add-on $PM_{2.5}$ Control	No
Use of Natural Gas for Pilot	Yes

Any add on $PM_{2.5}$ control technology is not technically feasible, as it is not feasible to enclose a safety flare tip.

11.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 11-2, according to their control effectiveness.

Table 11-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for North and South Flares

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Gas Recovery Flare Cap Flare Management Plan	181,003 SCFD (365-day rolling average) 271,505 SCFD (30-day rolling average)	Consent decree
1	Use of Natural Gas for Pilot Flare Combustion Efficiency	0.0075 lb/MMBtu	AP-42 Table 1.4-2

11.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options is not required, as the top feasible control option is selected.

11.2.5 Step 5 – BACT Selection

BACT for $PM_{2.5}$ from the North and South flares is a flare gas recovery system, flare cap, flare management plan, use of natural gas for pilot, and flare combustion efficiency. Tesoro will limit waste gas flow rates to 181,003 SCFD (365 day rolling average) and 271,505 SCFD (30 day rolling average) for these flares. The recent RBLC determinations include emission limits based upon AP-42 for natural gas combustion of 0.0075 lb/MMBtu. During periods of startup and shutdown, the flare management plan will be used in conjunction with good operating procedures to minimize flaring.

11.3 North and South Flares SO_2 Emissions

SO_2 is generated from the combustion of H_2S and other sulfur-containing gases in the vent gas stream.

11.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

11.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 11-3. The following sections provide additional detail.

Table 11-3 Technical Feasibility of SO_2 Control Technologies for North and South Flares

Technology	Technically Feasible?
Flare Gas Recovery	Yes
Flare Management Plan	Yes
Flare Cap	Yes
Use of Natural Gas for Pilot	Yes
Add on SO_2 controls	No

Add on SO_2 technology is not technically feasible, as it is not feasible to enclose a safety flare tip.

11.3.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 11-4, according to their control effectiveness.

Table 11-4 Control Effectiveness Ranking of SO_2 Control Technologies for North and South Flares

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Gas Recovery Flare Cap Flare Management Plan	181,003 SCFD (365-day rolling average) 271,505 SCFD (30-day rolling average)	Consent decree
1	Use of Natural Gas for Pilot	0.0006 lb/MMBtu (for natural gas)	AP-42 Table 1.4-2

11.3.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of the technically feasible control options is not required, as the top feasible control option is selected.

11.3:5 Step 5 – BACT Selection

BACT for SO_2 emissions from the North and South flares is a flare gas recovery system, flare cap, flare management plan, use of natural gas for pilot. Tesoro will limit waste gas flow rates to 181,003 SCFD (365 day rolling average) and 271,505 SCFD (30 day rolling average) for these flares. During periods of startup and shutdown, the flare management plan will be used in conjunction with good operating procedures to minimize flaring.

11.4 North and South Flares NO_X Emissions

There are three mechanisms by which NOx production occurs during combustion including thermal, fuel, and prompt NOx formation. In the case of gaseous fuel combustion, the primary mechanism of NOx formation is through thermal NOx formation.

11.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information are listed in Table 3-1.

11.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 11-5. The following sections provide additional detail.

Table 11-5 Technical Feasibility of NOx Control Technologies for North and South Flares

Technology	Technically Feasible?
Flare Gas Recovery	Yes
Flare Cap	Yes
Flare Combustion Efficiency	Yes
Flare Management Plan	Yes
Add-on NOx control	No

Add on NOx control is not technically feasible as it is not possible to enclose a safety flare tip.

11.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 11-6, according to their control effectiveness.

Table 11-6 Control Effectiveness Ranking of NOx Control Technologies for North and South Flares

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Gas Recovery Flare Cap Flare Management Plan	181,003 SCFD (365-day rolling average) 271,505 SCFD (30-day rolling average)	Consent decree
2	Use of Natural Gas for Pilot Flare Combustion Efficiency	0.068 lb/MMBtu	AP-42 Table 1.4-1

11.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of the technically feasible control options is not required, as the top feasible control option is selected.

11.4.5 Step 5 – BACT Selection

BACT for NO_X from the North and South flares is a flare gas recovery system, flare cap, flare management plan, use of natural gas for pilot, and flare combustion efficiency. Tesoro will limit waste gas flow rates to

181,003 SCFD (365 day rolling average) and 271,505 SCFD (30 day rolling average) for these flares. In reviewing the RBLC determinations, there is no clear BACT precedent for NOx from flares. During periods of startup and shutdown, the flare management plan will be used in conjunction with good operating procedures to minimize flaring.

11.5 North and South Flares VOC Emissions

VOCs from the North and South flares are a result of incomplete combustion of the vent gas.

11.5.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

11.5.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 11-7. The following sections provide additional detail.

Table 11-7 Technical Feasibility of VOC Control Technologies for North and South Flares

Technology	Technically Feasible?
Flare Gas Recovery	Yes
Flare Cap	Yes
Flare Combustion Efficiency	Yes
Flare Management Plan	Yes
Add-on VOC Control	No

Add on VOC control is not technically feasible as it is not possible to enclose a safety flare.

11.5.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 11-8, according to their control effectiveness.

Table 11-8 Control Effectiveness Ranking of VOC Control Technologies for North and South Flares

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Gas Recovery Flare Cap Flare Management Plan	181,003 SCFD (365-day rolling average) 271,505 SCFD (30-day rolling average)	Consent decree
1	Flare Combustion Efficiency	96.5% combustion efficiency	MACT Subpart CC

11.5.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of the technically feasible control options is not required, as the top feasible control option is selected.

11.5.5 Step 5 – BACT Selection

BACT for VOC from the North and South flares is a flare gas recovery system, flare caps, flare management plan, use of natural gas for pilot, and flare combustion efficiency. Tesoro will limit waste gas flow rates to 181,003 SCFD (365 day rolling average) and 271,505 SCFD (30 day rolling average) for these flares. The recent RBLC determinations include a 98% destruction efficiency at the flare, which is equivalent to 96.5% combustion efficiency according to MACT Subpart CC. During periods of startup and shutdown, the flare management plant will be used in conjunction with good operating procedures to minimize flaring.

11.6 North and South Flares Ammonia Emissions

Ammonia is generated from the combustion of the vent gas and the oxidation of nitrogen compounds in the vent gas stream.

11.6.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for ammonia emissions from a review of available information are listed in Table 3-1.

11.6.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for ammonia emissions are summarized in Table 11-9. The following sections provide additional detail.

Table 11-9 Technical Feasibility of Ammonia Control Technologies for North and South Flares

Technology	Technically Feasible?
Flare Gas Recovery	Yes
Flare Cap	Yes
Flare Combustion Efficiency	Yes
Flare Management Plan	Yes
Add-on Ammonia Control	No

Add on ammonia control is not technically feasible as it is not feasible to enclose a safety flare.

11.6.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 11-10, according to their control effectiveness.

Table 11-10 Control Effectiveness Ranking of Ammonia Control Technologies for North and South Flares

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Gas Recovery Flare Cap Flare Management Plan	181,003 SCFD (365-day rolling average) 271,505 SCFD (30-day rolling average)	Consent decree
1	Flare Combustion Efficiency	0.0031 lb/MMBtu	EPA WebFIRE Database

11.6.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of the technically feasible control options is not required, as the top feasible control option is selected.

11.6.5 Step 5 – BACT Selection

BACT for ammonia from the North and South flares is a flare gas recovery system, flare caps, flare management plan, use of natural gas for pilot, and flare combustion efficiency. Tesoro will limit waste gas flow rates to 181,003 SCFD (365 day rolling average) and 271,505 SCFD (30 day rolling average) for these flares. There are no BACT determinations in the RBLC for ammonia emissions from flares. During periods of startup and shutdown, the flare management plan will be used in conjunction with good operating procedures to minimize flaring.

12.0 BACT for SRU Flare

During startup, shutdown, and malfunction events, process gases from the sour water stripper and amine treatment units may be sent directly to a flare knockout drum and routed to the SRU flare stack for combustion. Fuel gas is burned at the flare tip as pilot and purge gases, however there is no routine waste gas venting to the SRU flare.

The SRU Flare is not subject to 40 CFR 60.18 or 40 CFR 63.11, and cannot feasibly comply with those standards due to the nature of acid gas combustion. Tesoro implements a Flare Management Plan which include flare minimization per the standards of NSPS Subpart Ja for the SRU Flare. Sulfur Shedding is also implemented throughout the refinery in the event of an acid gas flaring event.

12.1 SRU Flare $PM_{2.5}$ Emissions

$PM_{2.5}$ is generated from the combustion of vent gas at the flare tip.

12.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

12.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 12-1. The following sections provide additional detail.

Table 12-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for SRU Flare

Technology	Technically Feasible?
Flare Management Plan	Yes
Add-on $PM_{2.5}$ Control	No
Flare Gas Recovery	No
Natural Gas for Pilot	No

Add-on $PM_{2.5}$ controls are not feasible, as it is not feasible to enclose a flare tip to capture the $PM_{2.5}$ generated. A flare gas recovery compressor is not feasible because the SRU flare is used only during startup and shutdown of the SRU which normally receives all of the acid gases, and there are no alternate processing methods. The flare management plan includes provisions for shutting down the sour water stripper and storing of the sour water when feasible until the SRU is back online.

Although exclusive use of natural gas for the pilot may be feasible, Tesoro is not able to complete this modification prior to December 31, 2018.

12.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 12-2, according to their control effectiveness.

Table 12-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for SRU Flare

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Management Plan	Varies	N/A

12.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

12.1.5 Step 5 – BACT Selection

BACT for $PM_{2.5}$ from the SRU flare is the implementation of a flare management plan for use during normal, startup, and shutdown operations. This proposal is consistent with recent RBLC determinations.

12.2 SRU Flare SO_2 Emissions

SO_2 is generated from the combustion of H_2S and other gases in the vent gas stream.

12.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

12.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 12-3. The following sections provide additional detail.

Table 12-3 Technical Feasibility of SO_2 Control Technologies for SRU Flare

Technology	Technically Feasible?
Flare Management Plan	Yes
Add on SO_2 Control	No
Flare Gas Recovery	No
Natural Gas for Pilot	No

Add-on SO_2 controls are not feasible, as it is not feasible to enclose a flare tip to capture the SO_2 generated. A flare gas recovery compressor is not feasible because the SRU flare is used only during startup and shutdown of the SRU which normally received all of the acid gases, and there are no alternate processing methods. The flare management plan includes provisions for shutting down the sour water *stripper and storing* of the sour water when feasible until the SRU is back online.

Although exclusive of natural gas for the pilot may be feasible, Tesoro is not able to complete this modification prior to December 31, 2018.

12.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 12-4, according to their control effectiveness.

Table 12-4 Control Effectiveness Ranking of SO_2 Control Technologies for SRU Flare

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Management Plan	Varies	N/A

12.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

12.2.5 Step 5 – BACT Selection

BACT for SO_2 from the SRU flare is the implementation of a flare management plan for normal, startup, and shutdown operation. This proposal is consistent with recent RBLC determinations.

12.3 SRU Flare NO_X Emissions

NOx emissions from the SRU flare are due to the combustion of the vent gas.

12.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information are listed in Table 3-1.

12.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 12-5. The following sections provide additional detail.

Table 12-5 Technical Feasibility of NO_X Control Technologies for SRU Flare

Technology	Technically Feasible?
Flare Management Plan	Yes
Add-on NOx control	No
Flare Gas Recovery	No

Add-on NOx controls are not feasible, as it is not feasible to enclose a flare tip to capture the NOx generated. A flare gas recovery compressor is not feasible because the SRU flare is used only during startup and shutdown of the SRU which normally received all of the acid gases, and there are no alternate processing methods. The flare management plan includes provisions for shutting down the sour water stripper and storing of the sour water when feasible until the SRU is back online.

12.3.3 Step 3 –Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 12-6, according to their control effectiveness.

Table 12-6 Control Effectiveness Ranking of NOx Control Technologies for SRU Flare

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Management Plan	Varies	N/A

12.3.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

12.3.5 Step 5 – BACT Selection

BACT for NOx from the SRU flare is the implementation of a flare management plan for normal, startup, and shutdown operation. This proposal is consistent with recent RBLC determinations.

12.4 SRU Flare VOC Emissions

VOCs from the SRU flare are a result of incomplete combustion of the vent gas.

12.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

12.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 12-7. The following sections provide additional detail.

Table 12-7 Technical Feasibility of VOC Control Technologies for SRU Flare

Technology	Technically Feasible?
Flare Management Plan	Yes
Add-on VOC control	No
Flare Gas Recovery	No
Natural Gas for Pilot	No

Add-on VOC controls are not feasible, as it is not feasible to enclose a flare tip to capture the VOCs generated. A flare gas recovery compressor is not feasible because the SRU flare is used only during startup and shutdown of the SRU which normally received all of the acid gases, and there are no alternate processing methods. The flare management plan includes provisions for shutting down the sour water stripper and storing of the sour water when feasible until the SRU is back online.

Although exclusive use of natural gas for the pilot may be feasible, Tesoro is not able to complete this modification prior to December 31, 2018.

12.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 12-8, according to their control effectiveness.

Table 12-8 Control Effectiveness Ranking of VOC Control Technologies for SRU Flare

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Management Plan	Varies	N/A

12.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

12.4.5 Step 5 – BACT Selection

BACT for VOC from the SRU flare is the implementation of a flare management plan for normal, startup, and shutdown operation. This proposal is consistent with recent RBLC determinations.

12.5 SRU Flare Ammonia Emissions

Ammonia is generated from the combustion of the vent gas and the oxidation of nitrogen compounds in the vent gas stream.

12.5.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for ammonia emissions from a review of available information are listed in Table 3-1.

12.5.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for ammonia emissions are summarized in Table 12-9. The following sections provide additional detail.

Table 12-9 Technical Feasibility of Ammonia Control Technologies for SRU Flare

Technology	Demonstrated In Practice?	Technically Feasible?
Flare Management Plan	Yes	Yes
Add-on Ammonia control	No	No
Flare Gas Recovery	Yes	No

Add-on ammonia controls are not feasible, as it is not feasible to enclose a flare tip to capture the ammonia generated. A flare gas recovery compressor is not feasible because the SRU flare is used only during startup and shutdown of the SRU which normally received all of the acid gases, and there are no alternate processing methods. The flare management plan includes provisions for shutting down the sour water stripper and storing of the sour water when feasible until the SRU is back online.

12.5.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 12-10, according to their control effectiveness.

Table 12-10 Control Effectiveness Ranking of Ammonia Control Technologies for SRU Flare

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Flare Management Plan	Varies	

12.5.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

12.5.5 Step 5 – BACT Selection

BACT for ammonia from the SRU flare is the implementation of a flare management plan for normal, startup, and shutdown operation. This proposal is consistent with recent RBLC determinations.

13.0BACT for Cooling Towers

Utilities Unit #2 (UU2) and Utilities Unit #3 (UU3) are cooling towers which reduce the temperature of cooling water that serve heat exchangers throughout the refinery process units. Water is cooled in the cooling tower when it is trickled past flowing air; cooling occurs as a portion of the water is evaporated to the atmosphere. Potential emissions include particulate matter, due to minerals in the water, and VOCs during unplanned heat exchanger leaks into the cooling water.

13.1 Cooling Tower $PM_{2.5}$ Emissions

Cooling towers have direct contact between the water and the air, and some of the water may become entrained in the air stream and can be carried out of the tower as particulate emissions. Tesoro's cooling towers currently use a drift eliminator to reduce $PM_{2.5}$ emissions.

13.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

13.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 13-1. The following sections provide additional detail.

Table 13-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for Cooling Tower

Technology	Technically Feasible?
Drift Eliminator Upgrades	No
Current Drift Eliminator and Good Operating Practices	Yes

Upgrades to the current drift eliminators may be feasible, but such upgrades are not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, drift eliminator upgrades are considered technically infeasible.

13.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 13-2, according to their control effectiveness.

Table 13-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for Cooling Towers

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Current Drift Eliminator and Good Operating Practices	0.012 lb/MMGal	AP-42, Section 13.4

13.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

13.1.5 Step 5 – BACT Selection

BACT for $PM_{2.5}$ emissions from the cooling towers is the current drift eliminator coupled with good operating practices. This is consistent with recent RBLC determinations, with limits of 0.03 lb/MMgal.

13.2 Cooling Tower VOC Emissions

VOC emissions from cooling towers result from leaks of process fluid into the cooling water stream.

13.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

13.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 13-3. The following sections provide additional detail.

Table 13-3 Technical Feasibility of VOC Control Technologies for Cooling Towers

Technology	Technically Feasible?
Compliance with 40 CFR Part 63, Subpart CC	Yes
Drift Eliminator Upgrades	No

Upgrades to the current drift eliminators may be feasible, but are not able to be designed, installed, and in operation before December 31, 2018. Therefore, drift eliminator upgrades are considered to be technically infeasible.

13.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 13-4, according to their control effectiveness.

Table 13-4 Control Effectiveness Ranking of VOC Control Technologies for Cooling Towers

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Compliance with 40 CFR Part 63, Subpart CC	0.7 lb/MMGal	EPA AP-42 Table 5.1-2

13.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

13.2.5 Step 5 – BACT Selection

BACT for VOC emissions from cooling towers is complying with 40 CFR Part 63, Subpart CC, which requires monitoring for hydrocarbons in the cooling water return. This control technology is consistent with recent RBLC determinations.

14.0 BACT for Loading Racks

14.1 Transportation Rack VOC Emissions

Tesoro and TLO operate two transportation loading racks, the TLR and the BCLR, for loading and unloading refinery products into and out of trucks and railcars. VOC vapors are discharged from the tankers as they are filled, and each loading rack is operated with a vapor recovery unit with carbon adsorption as the control device.

14.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

14.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 14-1. The following sections provide additional detail.

Table 14-1 Technical Feasibility of VOC Control Technologies for Loading Racks

Technology	Technically Feasible?
Carbon adsorption	Yes
Flare/Thermal Oxidizer	Yes

All control options are technically feasible.

14.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 14-2, according to their control effectiveness.

Table 14-2 Control Effectiveness Ranking of VOC Control Technologies for Loading Racks

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Carbon Adsorption	10 mg/L product loaded	MACT CC
1	Flare/Thermal Oxidizer	10 mg/L product loaded	MACT CC

14.1.4 Step 4 – Evaluation of Feasible Control Technologies

The use of a flare/thermal oxidizer results in additional combustion related emissions from the controlled VOC. In comparison, a carbon adsorption unit recovers product which would otherwise be emitted and results in no collateral emissions. Therefore, a carbon adsorption unit is considered the top feasible control option in this case. The economic and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

14.1.5 Step 5 – BACT Selection

BACT for VOC from the transport loading racks is a vapor recovery unit with carbon adsorption. This proposal is consistent with recent RBLC determinations.

14.2 LPG Loading Rack VOC Emissions

The Salt Lake City Refinery operates two liquefied petroleum gases (LPG) racks: a 6-bay rail loading and offloading rack and a single-bay truck loading and offloading rack. The rack utilizes arms for liquid and vapor loading and unloading. Following loading/unloading operations, LPG is recovered from the arms using a compressor and then the remaining vapors in the arms are vented to the FGR system.

14.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

14.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 14-3. The following sections provide additional detail.

Table 14-3 Technical Feasibility of VOC Control Technologies for Loading Racks

Technology	Technically Feasible?
Carbon adsorption	No
FGR	Yes

Carbon adsorption is not technically feasible, as the LPG being loaded contains low molecular weight compounds which are not effectively captured by activated carbon.

14.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 14-4, according to their control effectiveness.

Table 14-4 Control Effectiveness Ranking of VOC Control Technologies for Loading Racks

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	FGR	181;003 SCFD (365-day rolling average) 271,505 SCFD (30-day rolling average)	Consent Decree

14.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

14.2.5 Step 5 – BACT Selection

BACT for VOC from the LPG loading rack is routing the recovered LPG to the FGR system. No RBLC determinations for LPG loading racks were identified.

15.0 BACT for K1 Compressors

The K1 compressors are two compressors operated in parallel to recycle hydrogen into the UFU desulfurization reactor. They are each driven by an internal combustion engine fired by natural gas. The exhaust goes through a catalytic converter that controls NO_X emissions prior to release to the atmosphere.

15.1 K1 Compressors $PM_{2.5}$ Emissions

$PM_{2.5}$ emissions result from the combustion of natural gas in the engine.

15.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

15.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 15-1.

Table 15-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for K1 Compressors

Technology	Technically Feasible?
Use of Natural Gas	Yes
Good Operating Practices	Yes
Electric Motor	No

Although replacing one motor with an electric motor may be feasible for one of the compressors, such upgrades are not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, an upgrade to the motors is considered technically infeasible.

15.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 15-2, according to their control effectiveness.

Table 15-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for K1 Compressors

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Natural Gas and Good Operating Practices	0.019 lb/MMBtu	AP-42, Table 3.2-3

15.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

15.1.5 Step 5 – BACT Selection

BACT for $PM_{2.5}$ emissions from the K1 Compressors is the use of natural gas and good operating practices. This control technology is consistent with recent RBLC determinations. During startup and shutdown, good operating practices will be used to minimize emissions.

15.2 K1 Compressors SO_2 Emissions

SO_2 emissions occur from combustion of natural gas due to trace amounts of sulfur present in the fuel.

15.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

15.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 15-3. The following sections provide additional detail.

Table 15-3 Technical Feasibility of SO_2 Control Technologies for K1 Compressors

Technology	Technically Feasible?
Use of Natural Gas	Yes
Good Operating Practices	Yes
Electric Motor	No

Although replacing the motor with an electric motor may be feasible for one of the compressors, such upgrades are not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, an upgrade to the motors is considered technically infeasible.

15.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 15-4, according to their control effectiveness.

Table 15-4 Control Effectiveness Ranking of SO_2 Control Technologies for K1 Compressors

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Natural Gas and Good Operating Practice	0.00059	AP-42 Table 3.2-3

15.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

15.2.5 Step 5 – BACT Selection

BACT for SO_2 emissions from the K1 Compressors is the use of natural gas and good operating practices. This is consistent with recent RBLC determinations. During startup and shutdown good operating practices will be used to minimize emissions.

15.3 K1 Compressors NO_X Emissions

There are three mechanisms by which NO_x production occurs during combustion including thermal, fuel, and prompt NO_x formation. In the case of gaseous fuel combustion, the primary mechanism of NOx formation is through thermal NO_x formation.

15.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information are listed in Table 3-1.

15.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 15-5. The following sections provide additional detail.

Table 15-5 Technical Feasibility of NO_X Control Technologies for K1 Compressors

Technology	Technically Feasible?
Electric Motor	No
SCR	No
Catalytic Converter	Yes
Combustion control systems	No
Use of Natural Gas	Yes
Good Operating Practices	Yes

Although replacing the motor with an electric motor for one of the compressors, installing an SCR, or upgrading the combustion control systems may be feasible, such upgrades are not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, an upgrade to the motors, SCR, and upgrades to combustion control systems is considered technically infeasible.

15.3.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 15-6, according to their control effectiveness.

Table 15-6 Control Effectiveness Ranking of NOx Control Technologies for K1 Compressors

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Catalytic Converter, Natural Gas and Good Operating Practices	3.2 lb/hr	Approval Order Limit II.B.6.c

15.3.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

15.3.5 Step 5 – BACT Selection

BACT for NOx from the K1 Compressors is the use of a catalytic converter, natural gas and good operating practices, with an emissions limit of 3.2 lb/hr. Additional controls are not technically feasible as BACT.

15.4 K1 Compressors VOC Emissions

VOC emissions from the furnaces are a result of incomplete combustion of the refinery fuel gas. Tesoro utilizes a catalytic converter for VOC control on the compressors.

15.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

15.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 15-7. The following sections provide additional detail.

Table 15-7 Technical Feasibility of VOC Control Technologies for K1 Compressors

Technology	Technically Feasible?
Catalytic Converter	Yes
Catalyst upgrade to 3-way catalyst	No
Electric Motor	No
Use of Natural Gas	Yes
Good Operating Practices	Yes

Although replacing the motor with an electric motor for one of the compressors or upgrading the catalyst in the catalytic converter may be feasible, it is not feasible to design, install, and begin operating either of these control technologies prior to December 31, 2018 as these compressors are not scheduled to go through a maintenance shutdown. Therefore, an upgrade to the motors and upgrades to the catalyst is considered technically infeasible.

15.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 15-8, according to their control effectiveness.

Table 15-8 Control Effectiveness Ranking of VOC Control Technologies for K1 Compressors

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Catalytic Converter, Natural Gas and Good Operating Practices	0.03 lb/MMBtu	AP-42 Table 3.2-3

15.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

15.4.5 Step 5 – BACT Selection

BACT for VOC from the K1 compressors is a catalytic converter, natural gas and good operating practices. This control technology is consistent with recent RBLC determinations.

15.5 K1 Compressors Ammonia Emissions

Ammonia emissions are the result of combustion, and according to the EPA WebFIRE emission factors are extremely low (0.0031 lb/MMBtu) for natural gas combustion.

15.5.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for Ammonia emissions from a review of available information are listed in Table 3-1.

15.5.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for ammonia emissions are summarized in Table 15-9. The following sections provide additional detail.

Table 15-9 Technical Feasibility of Ammonia Control Technologies for K1 Compressors

Technology	Technically Feasible?
Add-on Ammonia Control	No
Use of Natural Gas	Yes
Electric Motor	No
Good Operating Practices	Yes

Due to the extremely low concentration of ammonia in the flue gas (0.0031 lb generated per MMBtu of heat input), any add on ammonia control is technically infeasible. For exhaust streams with higher concentrations, control technologies such as water-based strippers and thermal oxidation are typical add-on ammonia control technologies.

Although replacing the motor with an electric motor may be feasible for one of the compressors, such upgrades are not able to be designed, installed, and in operation prior to December 31, 2018. Therefore, an upgrade to the motor is considered technically infeasible.

15.5.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 15-10, according to their control effectiveness.

Table 15-10 Control Effectiveness Ranking of Ammonia Control Technologies for K1 Compressors

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Natural Gas and Good Operating Practices	0.0031 lb/MMBtu	EPA WebFIRE Database

15.5.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

15.5.5 Step 5 – BACT Selection

BACT for ammonia from the K1 Compressors is using natural gas and good operating practices. There are no BACT determinations for ammonia generated from combustion. During unit startup or shutdown, good operating practices will be followed in order to minimize ammonia emissions.

16.0 BACT for Fixed Roof Tanks

16.1 Fixed Roof Tanks VOC Emissions

Fixed roof tanks are either vented with a gooseneck or have a pressure/vacuum vent. Emissions from fixed roof tanks are in the form of working losses and standing losses. Standing losses occur through tank temperature fluctuations, while working losses occur primarily from liquid level changes.

16.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

16.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 16-1. The following sections provide additional detail.

Table 16-1 Technical Feasibility of VOC Control Technologies for Fixed Roof Tanks

Technology	Technically Feasible?
Vapor Recovery System	Tank 104 – Yes All others - No
Vent to a Control Device	Tank 104 – Yes All other - No
Retrofit to an IFR	No
Good design methods and operating procedures	Yes

Although adding a vapor recovery system or venting to a control device may be feasible, it is not feasible to design, install, and begin operating either of these control technologies prior to December 31, 2018 (with the exception of existing vapor recovery and venting to a control device at Tank 104). Therefore, a vapor recovery system and venting to a control device is considered technically infeasible.

As a part of the 2015 update to MACT Subpart CC, referred to as the Refinery Sector Rule (RSR), it was required to determine whether any fixed roof tanks previously classified as Group 2 tanks must be reclassified as Group 1 tanks due to the change in definition. Any tanks classified as a Group 1 storage tank require that a closed vent system with a control device be installed or the tank be converted to an internal floating roof tank at the next opportunity where the tank is emptied and degassed, but no later than January 30, 2026. Four Group 1 fixed roof tanks are not scheduled to be emptied and degassed prior to December 31, 2018. Table 16-2 lists the four tanks to have their controls upgraded, and the anticipated timeframe the updates will occur.

All other fixed roof tanks are classified as Group 2 tanks and follow good design methods and operating procedures.

Table 16-2 Fixed Roof Tanks to Be Updated to MACT CC Controls with Anticipated Upgrade Date

Tank	Anticipated Upgrade Date
TK612	Between January 1, 2019 and January 30, 2026
TK609A	Between January 1, 2019 and January 30, 2026
TK609B	Between January 1, 2019 and January 30, 2026
Tank 291	Between January 1, 2019 and January 30, 2026

16.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 16-3, according to their control effectiveness.

Table 16-3 Control Effectiveness Ranking of VOC Control Technologies for Fixed Roof Tanks

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Vapor recovery system and venting to control device (Tank 104 only)	95%	NSPS Subpart Kb
2	Good design methods and operating procedures	Varies by tank	N/A

16.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected for each tank.

16.1.5 Step 5 – BACT Selection

With the exception of Tank 104, BACT for VOC emissions from fixed roof tanks is good design methods and operating procedures, as additional control technology is not feasible.

BACT for VOC emissions from Tank 104 is a vapor recovery system and venting to a control device consistent with existing operations.

17.0 BACT for Internal Floating Roof Tanks

17.1 Internal Floating Roof Tanks VOC Emissions

An internal floating roof (IFR) tank has a permanent roof with a floating roof on the inside floating on the surface of the liquid. Emissions from a floating roof tank come from both withdrawal losses and standing losses. Withdrawal losses are generally due to liquid level fluctuations, and standing storage losses originate from the rim seal, deck fittings, and the deck seam. All internal floating roof Group 1 tanks currently meet the double seal standard from 40 CFR Part 60 Subpart Kb and 40 CFR Part 63 Subpart CC (Existing MACT CC).

Some of the IFR tanks have been upgraded to meet controls required by recent revisions to Subpart CC under RSR. Under RSR, a new section within 40 CFR 63 Subpart CC (MACT CC RSR) has been added at 40 CFR 63.660. This new section contains new and additional requirements for floating roof seals, deck fitting controls, inspections, recordkeeping, and reporting. The existing storage tank section under Subpart CC, 40 CFR 63.646, remained effective until the new compliance date of April 29, 2016. After the new compliance date, the requirements of 40 CFR 63.646 no longer apply and the compliance requirements of 40 CFR 63.660 are now effective.

RSR requires that the next time the vessel is emptied and degassed or by February, 1, 2026, whichever comes first, the tank is upgraded to meet the deck fitting controls of 40 CFR Subpart WW, which is the method of compliance under 40 CFR 63.660. The deck fitting control upgrades (or commonly referred to below as Upgrades to RSR Controls) for IFR tanks from 40 CFR 63.646 to 40 CFR 63.660 compliance include:

- IFR well covers must be gasketed (i.e. deck openings other than for vents, drains, or legs) 1/8" max gap criteria.
- IFR vents to be gasketed (vacuum breakers, rim vents) 1/8" max gap criteria.
- Deck openings other than for vents must project into liquid.
- Access hatches and gauge float well covers are required to be bolted and gasketed.
- Emergency roof drains must have seals covering at least 90% of the floating roof deck opening.
- IFR column wells must have gasketed cover or flexible fabric sleeve.
- Unslotted guidepoles required to have a pole wiper at the deck fitting and a gasketed cap at the top of the pole.
- Slotted guidepoles must have an external pole wiper and an internal pole float or equivalent.
- Each opening through a floating roof for a ladder having at least one slotted leg shall be equipped with one of the following configurations:
    - A pole float in the slotted leg and pole wipers for both legs. The wiper or seal of the pole float must be at or above the height of the pole wiper.
    - A ladder sleeve and pole wipers for both legs of the ladder.
    - A flexible enclosure device and either a gasketed or welded cap on the top of the slotted leg.

Additionally, tank degassing emissions are controlled by portable combustion units, as required by the Utah SIP Section IX.H Emission Limits and Operating Practices.

17.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

17.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 17-1. The following sections provide additional detail.

Table 17-1 Technical Feasibility of VOC Control Technologies for Internal Floating Roof Tanks

Technology	Technically Feasible?
NSPS Kb Controls	Varies by tank
Existing MACT CC Controls	Varies by tank
RSR Controls	Varies by tank
Degassing controls when storage tanks are taken out of service	Yes
Installation of a vapor recovery system with vapor combustion	No

Although the installation of a vapor recovery system may be feasible, it would not be able to be designed, installed, and operated prior to December 31, 2018.

The technical feasibility of meeting NSPS Kb controls and/or RSR controls (MACT Subpart CC) varies by storage tank. The following tanks have been upgraded to include the MACT CC required controls and or currently meet NSPS Subpart Kb controls:

- TK331 (Kb)
- TK414
- TK504 (Kb)
- TK503 (Kb)

Table 17-2 shows the list of remaining tanks which are to be upgraded to the RSR MACT CC controls and the anticipated timeframe of the upgrade. Tanks complying with NSPS Kb are already in compliance. Tank 297 will be demolished and taken out of service prior to December 31, 2018.

Table 17-2 Internal Floating Roof Tanks to Be Updated to RSR Controls with Anticipated Upgrade Date

Tank	Anticipated Upgrade Date
TK244	Before December 31, 2018
TK413	Between January 1, 2019 and January 30, 2026
TK321	Between January 1, 2019 and January 30, 2026
TK402	Between January 1, 2019 and January 30, 2026
TK412	Between January 1, 2019 and January 30, 2026

17.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 17-3, according to their control effectiveness.

Table 17-3 Control Effectiveness Ranking of VOC Control Technologies for Internal Floating Roof Tanks

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	RSR Controls	Varies by tank	N/A
1	Degassing controls when storage tanks are taken out of service.	Varies by tank	N/A
1	NSPS Kb Controls	Varies by tank	N/A

17.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

17.1.5 Step 5 – BACT Selection

BACT for VOC emissions from internal floating roof tanks is as follows:

- For tanks currently meeting NSPS Kb and TK244, meeting NSPS Kb is BACT.
- For tanks currently meeting RSR requirements, meeting RSR is BACT.
- For tanks that don't meet either NSPS Kb or RSR requirements, the existing MACT CC controls are BACT because upgrades are not feasible by 12/31/18.

This is consistent with recent RBLC determinations of using dual seals and welded decks. During tank shutdowns and degassing, a portable combustion unit will continue to be used to control emissions.

18.0 BACT for External Floating Roof Tanks

18.1 External Floating Roof Tanks VOC Emissions

An external floating roof (EFR) tank is an open topped tank with a roof floating on the surface of the liquid. Emissions from a floating roof tank come from both withdrawal losses and standing losses. Withdrawal losses are generally due to liquid level fluctuations, and standing storage losses originate from the rim seal and deck fittings. All external floating roofs currently meet the double seal standard from 40 CFR Part 60 Subpart Kb or 40 CFR Part 63 Subpart CC (Existing MACT CC).

Some of the tanks have been upgraded to meet RSR controls. Refer to Section 17.1 for additional background on compliance with RSR.

RSR requires that the next time the vessel is emptied and degasses or by February 1, 2026, whichever comes first, the tank is upgraded to meet the deck fitting controls of 40 CFR Subpart WW, which is the method of compliance under 40 CFR 63.660. The deck fitting control upgrades (or commonly referred to below as Upgrades to RSR Controls) for external floating roof tanks from 40 CFR 63.646 to 40 CFR 63.660 compliance include:

- EFR well covers must be gasketed (i.e. deck openings other than for vents, drains, or legs) 1/8" max gap criteria.
- EFR vents to be gasketed (vacuum breakers, rim vents) 1/8" max gap criteria.
- Deck openings other than for vents must project into liquid.
- Access hatches and gauge float well covers must be bolted and gasketed.
- Emergency roof drains must have seals covering at least 90% of the floating roof deck opening.
- Guidepole wells must have gasketed deck cover and a pole wiper.
- Unslotted guidepoles required to have a cap at the top of the pole.
- Slotted guidepoles must have an internal float or equivalent.

Additionally, tank degassing emissions are being now controlled by portable combustion units, as required by the Utah SIP Section IX.H Emission Limits and Operating Practices.

18.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

18.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 18-1. The following sections provide additional detail.

Table 18-1 Technical Feasibility of VOC Control Technologies for External Floating Roof Tanks

Technology	Technically Feasible?
Dome Retrofit	No
Installation of a vapor recovery system with vapor combustion	No
Existing MACT CC Controls	Varies by tank
NSPS Kb Controls	Varies by tank
RSR Controls	Varies by tank

Due to Tesoro being located in an earthquake zone, due to the snow load, and due to the age of most EFR tanks, the addition of a dome via retrofit to external floating roofs is technically infeasible. As a dome to capture emissions is technically infeasible, the installation of a vapor recovery system with vapor combustion is also technically infeasible.

The technical feasibility of meeting NSPS Kb controls and/or RSR controls (MACT Subpart CC) varies by storage tank. For several tanks, the upgrades are not technically feasible before December 31, 2018. Additional detail is provided below.

18.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 18-2, according to their control effectiveness.

Table 18-2 Control Effectiveness Ranking of VOC Control Technologies for External Floating Roof Tanks

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Meets RSR Controls	Varies by tank	N/A
1	Degassing controls when storage tanks are taken out of service.	Varies by tank	N/A
1	NSPS Kb Controls	Varies by tank	N/A

18.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected. The following tanks have been upgraded to include the MACT CC required controls and or currently meet NSPS Subpart Kb controls:

- TK298
- TK326
- TK327

- TK328
- TK423
- TK424

Table 18-3 shows the list of remaining tanks which are to be upgraded to the MACT CC controls and the anticipated timeframe of the upgrade. Tanks complying with NSPS Kb are required to be in compliance currently.

Table 18-3 External Floating Roof Tanks to Be Updated to MACT CC Controls with Anticipated Upgrade Date

Tank	Anticipated Upgrade Date
TK144	Before December 31, 2018
TK245	Before December 31, 2018
TK432	Before December 31, 2018
TK431	Before December 31, 2018
TK243	Between January 1, 2019 and January 30, 2026
TK252	Between January 1, 2019 and January 30, 2026
TK325	Between January 1, 2019 and January 30, 2026
TK241	Between January 1, 2019 and January 30, 2026
TK405	Between January 1, 2019 and January 30, 2026
TK242	Between January 1, 2019 and January 30, 2026
TK307	Between January 1, 2019 and January 30, 2026
TK308	Between January 1, 2019 and January 30, 2026
TK324	Between January 1, 2019 and January 30, 2026
TK330	Between January 1, 2019 and January 30, 2026
TK421	Between January 1, 2019 and January 30, 2026
TK422	Between January 1, 2019 and January 30, 2026

18.1.5 Step 5 – BACT Selection

BACT for VOC emissions from the external floating roof tanks is as follows:

- For tanks currently meeting NSPS Kb, meeting NSPS Kb is BACT.
- For tanks currently meeting RSR requirements and TK144, TK245, TK432, TK431, meeting RSR is BACT.
- For tanks that don't meet either NSPS Kb or RSR requirements, the existing MACT CC controls are BACT because upgrades are not feasible by 12/31/2018.

This is consistent with recent RBLC determinations of using slotted guidepole controls. During tank shutdowns and degassing, a portable combustion unit will continue to be used to control emissions.

19.0BACT for Emergency Engines

Tesoro operates four compression ignition emergency engines: one at the wastewater treatment plant, two fire water pumps, and one at the firehouse. These engines are designated as emergency engines, with usage limited to 500 hours per year. All engines are subject to the Part 63, Subpart ZZZZ standards. The Firehouse Engine was installed in 2011, and is therefore subject to Part 60, Subpart IIII standards.

19.1 Emergency Engine $PM_{2.5}$ Emissions

$PM_{2.5}$ emissions are the result of diesel combustion in the compression ignition engines.

19.1.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for $PM_{2.5}$ emissions from a review of available information are listed in Table 3-1.

19.1.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for $PM_{2.5}$ emissions are summarized in Table 19-1. The following sections provide additional detail.

Table 19-1 Technical Feasibility of $PM_{2.5}$ Control Technologies for Emergency Engines

Technology	Technically Feasible?
Ultra-Low Sulfur Diesel Use	Yes
Good Combustion Practices	Yes
Comply with Emergency Engine requirements of MACT ZZZZ	Yes
Replace engine with Tier 4 Engine	No

Although it may be feasible to replace the emergency engines with engines meeting EPA Tier 4 requirements, such a change would not be able to be engineered and implemented prior to December 31, 2018. Therefore, the replacements of the emergency engines are considered technically infeasible.

19.1.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 19-2, according to their control effectiveness.

Table 19-2 Control Effectiveness Ranking of $PM_{2.5}$ Control Technologies for Emergency Engines

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Ultra-Low Sulfur Diesel Use	0.0022 lb/hp-hr	AP-42 Table 3.3-1
1	Good Combustion Practices		
1	Comply with Emergency Engine requirements of MACT ZZZZ		

19.1.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected. All control options are considered equal for the purposes of this evaluation.

19.1.5 Step 5 – BACT Selection

BACT for $PM_{2.5}$ emissions from the emergency engines is using ultra-low sulfur diesel, good combustion practices, and compliance with MACT ZZZZ. This is consistent with recent RBLC determinations, listing good combustion practices and ultra-low sulfur diesel as BACT.

19.2 Emergency Engine SO_2 Emissions

SO_2 emissions from the emergency engines are from the combustion of sulfur in the diesel fuel.

19.2.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for SO_2 emissions from a review of available information are listed in Table 3-1.

19.2.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for SO_2 emissions are summarized in Table 19-3. The following sections provide additional detail.

Table 19-3 Technical Feasibility of SO_2 Control Technologies for Emergency Engines

Technology	Technically Feasible?
Ultra-Low Sulfur Diesel	Yes
Good Combustion Practices	Yes

All control technologies are technically feasible.

19.2.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 19-4, according to their control effectiveness.

Table 19-4 Control Effectiveness Ranking of SO_2 Control Technologies for Emergency Engines

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Ultra-Low Sulfur Diesel	1.2E-05 lb/hp-hr	AP-42 Table 3.4-1 (at 0.0015 wt% S)
1	Good Combustion Practices		

19.2.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

19.2.5 Step 5 – BACT Selection

BACT for SO_2 from the emergency engines is the use of ultra-low sulfur diesel and good combustion practices. This is consistent with recent RBLC determinations, listing the top control technology as ultra-low sulfur diesel.

19.3 Emergency Engine NO_X Emissions

NO_X emissions from the emergency engines result from the combustion of the diesel fuel.

19.3.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information are listed in Table 3-1.

19.3.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 19-5. The following sections provide additional detail.

Table 19-5 Technical Feasibility of NO_X Control Technologies for Emergency Engines

Technology	Technically Feasible?
Good Combustion Practices	Yes
Comply with Emergency Engine requirements of MACT ZZZZ	Yes
Replace engine with Tier 4 Engine	No

Although it may be feasible to replace the emergency engines with engines meeting EPA Tier 4 requirements, such a change would not be able to be engineered and implemented prior to December 31, 2018. Therefore, the replacements of the emergency engines are considered technically infeasible.

19.3.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 19-6, according to their control effectiveness.

Table 19-6 Control Effectiveness Ranking of NO_X Control Technologies for Emergency Engines

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Combustion Practices	0.031 lb/hp-hr	AP-42 Table 3.3-1
1	Comply with Emergency Engine requirements of MACT ZZZZ		

19.3.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

19.3.5 Step 5 – BACT Selection

BACT for NO_X emissions from the emergency engines is using good combustion practices, and compliance with MACT ZZZZ. This is consistent with recent RBLC determinations.

19.4 Emergency Engine VOC Emissions

VOC emissions from the emergency engines are the result of diesel combustion.

19.4.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for VOC emissions from a review of available information are listed in Table 3-1.

19.4.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for VOC emissions are summarized in Table 19-7. The following sections provide additional detail.

Table 19-7 Technical Feasibility of VOC Control Technologies for Emergency Engines

Technology	Technically Feasible?
Good Combustion Practices	Yes
Comply with Emergency Engine requirements of MACT ZZZZ	Yes
Replace engine with Tier 4 Engine	No

Although it may be feasible to replace the emergency engines with engines meeting EPA Tier 4 requirements, such a change would not be able to be engineered and implemented prior to December 31, 2018. Therefore, the replacements of the emergency engines are considered technically infeasible.

19.4.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 19-8, according to their control effectiveness.

Table 19-8 Control Effectiveness Ranking of VOC Control Technologies for Emergency Engines

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
1	Good Combustion Practices	2.47E-03 lb/hp-hr	AP-42 Table 3.3-1
1	Comply with Emergency Engine requirements of MACT ZZZZ		

19.4.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required, as the top feasible control option is selected.

19.4.5 Step 5 – BACT Selection

BACT for VOC emissions from the emergency engines is using good combustion practices, and compliance with MACT ZZZZ. This is consistent with recent RBLC determinations.

19.5 Emergency Engine Ammonia Emissions

Ammonia emissions from the combustion of diesel fuel are negligible, and therefore a BACT evaluation is not completed for ammonia emissions from the emergency engines.

20.0BACT for Temporary Boilers

Tesoro generates steam used in the refinery in the heat recovery steam generators (HRSGs) at the Cogen Units and waste heat boilers located in the process units. Tesoro does not have any backup boilers on site, and rents package boilers to produce steam on a temporary basis for the refinery as needed when the HRSG or other waste heat steam producers are out of service and the online steam production capacity is insufficient to meet refinery steam demand. This practice produces less emissions than an unplanned or planned startup and shutdown of all or some process units. Once these units are back in service and operating in a stable manner, operation of the package boilers ceases. Situations requiring the use of temporary package boilers are relatively infrequent; so, it is more economical to use rental equipment than installing backup boilers which would rarely be used.

Temporary boiler emissions are limited by:

- The use of natural gas for fuel.
- The boilers are operated only on an as needed basis.
- Time on site is limited to 180 days or less per 40 CFR 60.41b.

The emissions from these Temporary Boilers are discussed in total in the sections which follow.

20.1 Temporary Boilers $PM_{2.5}$ Emissions

According to the AP-42 emission factors, particulate matter emissions from combustion of gaseous fuels are typically low and consist of filterable and condensable fractions. Since the temporary boilers fire natural gas, $PM_{2.5}$ emissions from temporary boilers will be equivalent to $PM_{2.5}$ from the refinery's process heaters, and $PM_{2.5}$ BACT for temporary boilers is the same as the Process Heater BACT. See Section 5.1 for the Process Heater $PM_{2.5}$ BACT analysis.

20.2 Temporary Boilers SO_2 Emissions

SO_2 emissions from combustion arise from trace amounts of sulfur present in the fuel. Temporary boilers operate on natural gas, therefore SO_2 emissions from the temporary boiler are minimal. The use of natural gas and good combustion practices are BACT for SO_2 from the temporary boilers. See Section 15.2 for the K1 Compressor SO_2 BACT analysis for additional detail for natural gas-fired units.

20.3Temporary Boilers VOC Emissions

VOC emissions from the Temporary Boilers are a result of incomplete combustion. Temporary boilers operate on the same fuels as the refinery process heaters and combustion conditions in a temporary boiler are similar to those in Tesoro's process heaters.

The application of thermal oxidation or catalytic oxidation technology within a temporary package boiler is concluded to not be technically feasible. Thermal oxidation and catalytic oxidation has been shown to be ineffective below VOC concentrations of 100 ppm. The concentration in a temporary boiler exhaust stream are estimated to be below 13 ppm, making thermal oxidation technically infeasible.

BACT for temporary boilers is the same as the Process Heater BACT. See Section 5.3 for the Process Heater VOC BACT analysis.

20.4 Temporary Boilers Ammonia Emissions

Ammonia emissions are the result of combustion, and according to the EPA WebFIRE emission factors are extremely low (0.0031 lb/MMBtu) for natural gas combustion.

Temporary boilers will use the same fuels as refinery process heaters; so, the ammonia BACT for temporary boilers is the same as the process heater ammonia BACT. See Section 5.4 for the Process Heater ammonia BACT analysis.

20.5 Temporary Boilers NO_X Emissions

There are three mechanisms by which NOx production occurs during combustion including thermal, fuel, and prompt NOx formation. In the case of gaseous fuel combustion, the primary mechanism of NOx formation is through thermal NOx formation.

Temporary boilers are operated on gaseous fuels; thus, minimizing NOx emissions associated with fuel bound nitrogen.

20.5.1 Step 1 – Identify All Available Control Technologies

Potential control technologies for NO_X emissions from a review of available information is listed in Table 3-1.

20.5.2 Step 2 – Technical Feasibility of Control Technologies

The technical feasibility of potential control options for NO_X emissions are summarized in Table 20-1. The following sections provide additional detail.

Table 20-1 Technical Feasibility of NO_X Control Technologies for Temporary Boilers)

Technology	Technically Feasible?
ULNB	No
SCR + ULNB	No
SNCR + ULNB	No
Use of Gaseous Fuels	Yes
Operate boiler on temporary basis per 40 CFR 60.41b	Yes

The NOx performance of rental boilers is limited by the availability boilers in the rental fleet at the time when the temporary boilers are needed onsite at the refiners.

NOx performance may also be limited by:

- When the boiler was purchased by the rental company.
- What technologies can be incorporated into a design which would fit on a truck trailer

20.5.3 Step 3 – Effectiveness of Feasible Control Technologies

The technically feasible control options are ranked in Table 20-2, according to their control effectiveness.

Table 20-2 Control Effectiveness Ranking of NOx Control Technologies for Temporary Boilers

Rank	Technology	Emission Control Effectiveness	Basis for Listed Performance
Temporary Boilers	Use of gaseous fuels	Varies by boiler	NOx performance is limited by rental boiler availability
	Operate boiler on temporary basis per 40 CFR 60.41b		

20.5.4 Step 4 – Evaluation of Feasible Control Technologies

The economic, environmental, and energy impacts of technically feasible control options are not required. The top technically feasible control for each heater based upon current control technology is selected.

20.5.5 Step 5 – BACT Selection

BACT for NO_X from Temporary Boilers is:

- Use of natural gas.
- Limited use of temporary boilers while onsite and limit time on site to 180 days or less.

Tesoro will operate temporary boilers on gaseous fuels to minimize NOx from fuel bound nitrogen.

As noted above, the NOx performance of rental boilers is limited by the boilers in the rental company's fleet and the availability of boilers during the time when Tesoro needs them on site. So, the NOx performance of temporary boilers cannot be guaranteed at all times a temporary boiler is needed.

Tesoro will limit temporary boiler use time periods as they are needed to meet refinery steam demand when Cogen HRSGs and other waste heat steam generating capacity is out of service and during transition periods when operation of the boilers for plant reliability is required. Tesoro limits the time onsite for temporary boilers to 180 days or less per the requirements of 40 CFR 60.41b.