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Notice of Construction Worksheet

NOC No. **1222**	Source: Tesoro Refining & Marketing Company LLC 10200 March Point Road Anacortes, WA 98221 NOC Contact: Rebecca Spurling NWCAA No.: 1006-V-S
Permit Engineer: **Lyn Tober**	
NOC Received: **August 10, 2015**	

A. Project Description

Tesoro Refining and Marketing Company LLC (Tesoro) is proposing the Clean Products Upgrade Project (CPUP) to improve the company's capability to deliver cleaner local transportation fuels and global feedstocks primarily for polyester, "making the Anacortes refinery a stronger, more economically viable member of the communities it serves". Included in the proposed project are plans to:

- Build an Aromatics Recovery Unit (ARU) capable of producing 15,000 barrels per day of mixed xylenes product, a feedstock used to make clothing, film for medical x-rays, plastics, cleaners, and many other products.[1]
- Install a new Marine Vapor Emission Control (MVEC) system that will reduce emissions of volatile organic compounds (VOC) and toxic air pollutants (TAPs). The MVEC system will control hydrocarbon emissions from marine vessels during loading operations of gasoline-range materials and crude in addition to the mixed xylenes product.
- Expand the Naphtha Hydrotreater (NHT) to process 46,000 barrels of naphtha per day from 40,000 barrels per day. This will allow Tesoro to further reduce the sulfur content in gasoline as required by the new federal Tier 3 regulations.
- Install a new Isomerization (Isom) Unit to increase the amount of octane available to the refinery. Coupled with the NHT expansion project, this provides more flexibility for production of gasoline.

The project will not increase the refinery's capacity to process crude or change the crude slate processed. The goal for the xylene portion of the project is to extract the xylenes that already exist in gasoline as a separate product for export. Note that the xylene extraction process unit (i.e., ARU) will process the existing heavy reformate currently generated at the Anacortes refinery along with medium reformate imported over the dock from external sources.

The project triggers Prevention of Significant Deterioration (PSD) program review as a major modification for particulate matter less than or equal to 10 microns in diameter

[1] Mixed xylenes product is a mixture of p-xylene (~18% wt), o-xylene (~23% wt), m-xylene (~42% wt), and ethylbenzene (~17% wt).

(PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and greenhouse gas (GHG) emissions.

The project triggers review under the minor New Source Review program in NWCAA Section 300 for nitrogen oxides (NO_X), sulfur dioxide (SO_2), carbon monoxide (CO), particulate matter (PM), sulfuric acid mist (SAM), volatile organic compounds (VOC), and toxic air pollutants (TAPs).

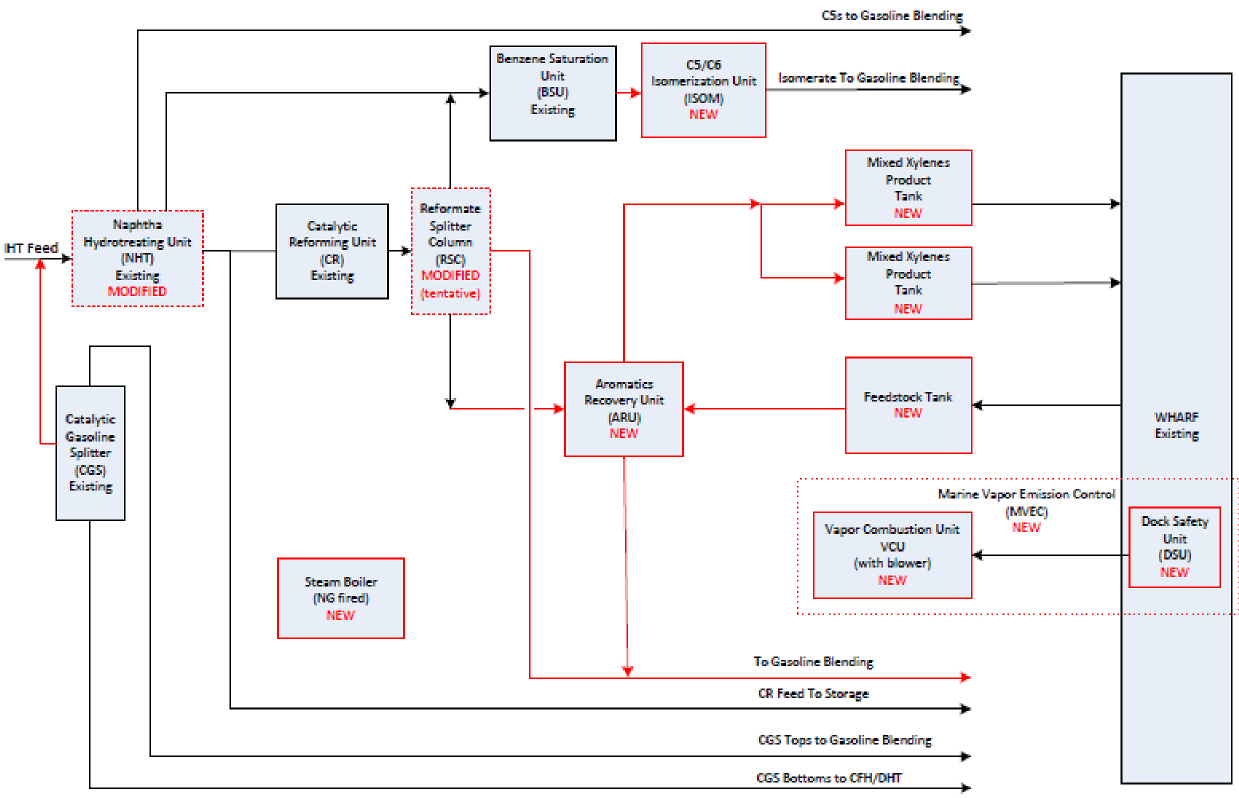

Figure 1 is a high-level process flow diagram of the proposed project. The new processes, equipment, and streams are outlined in red.

Figure 1. High Level Process Flow Diagram of Project

The new ARU includes the following emission units:

- A boiler (F-6870) rated at 584 MMBtu/hr firing natural gas equipped with low NO_X burners (LNB) and selective catalytic reduction (SCR) to reduce NO_X emissions, and catalytic oxidation to control CO emissions. Process vents from the distillation columns in the ARU will be routed to either the firebox of the new boiler, the refinery fuel gas system via the flare gas recovery system, or to the flare system for control;
- Two mixed xylenes product tanks with capacities of 193,000 barrels (Tank 287) and 384,000 barrels (Tank 286), each equipped with internal floating roofs (IFRs) with dual seals;
- One medium reformate tank with a capacity of 384,000 barrels (Tank 285) equipped with an external floating roof with dual seals; and
- Fugitive components in volatile organic compounds (VOC)/hazardous air pollutant (HAP) service.

The new MVEC includes the following emission units:

- Vapor Combustion Unit (VCU) comprising three 40 MMBtu/hr combustion units controlling vapors from the loading of mixed xylenes product, gasoline-range materials, and crude assumed to have a control efficiency of at least 99% and
- Fugitive components in VOC/HAP service.

Note that the Dock Safety Unit (DSU) on the dock (i.e., wharf) as shown on the diagram has no emission points beyond fugitive components.

Emission units at the new Isom Unit include only fugitive components in VOC/HAP service along with a perchloroethylene process tank (2,245 gallons). The new boiler will provide the additional steam required by the new Isom Unit; emissions from that additional steam are accounted for as part of the new boiler emissions.

Emission units at the NHT expansion include only a modification to the fugitive components in VOC/HAP service. The new boiler will provide the additional steam required by the modified NHT Unit; emissions from that additional steam are accounted for as part of the new boiler emissions.

There are several existing process units that will experience a change in utilization as part of this project but are not being physically modified that may or may not result in emissions increases (i.e., non-modified project-related existing units):

- The NHT operation is being expanded so it is being physically modified to accommodate the additional throughput. However, the associated heaters do not need to be and are not being modified to accommodate the increased throughput (NHT Heater and Stabilizer Column Reboiler (F-6600 & F-6601));
- Reformate Splitter Column (RSC) Reboiler (F-6602);
- The Catalytic Reformer (CR) is not being physically modified but will experience in increase in utilization resulting in emission increases from Feed Heater, Inter-Reactor Heaters, Column Heater, and Regeneration Heater (F-6650, F-6651, F-6652, F-6653, F-6654, & F-6655);
- The project will result in a shift of throughput and/or vapor pressure of products in existing refinery storage tanks. The tanks will not be physically modified to accommodate these changes and the applicability of requirements will not change as a result of these shifts, but the emissions from the tanks will potentially increase (Tanks 13, 14, 17, & 231); and
- Tesoro currently sends excess hydrogen to the refinery fuel gas system to be used as fuel for refinery combustion sources. The project plans to use this excess hydrogen for the expanded NHT operation and the new Isom Unit. The hydrogen from the refinery fuel gas system will need to be replaced with purchased natural gas, thereby potentially increasing GHG emissions from combustion sources at the refinery.

Note that, pursuant to NWCAA 300.3, minor new source review permitting only applies to added or physically modified emission units. Therefore, emissions increases from non-modified existing units are not reviewed as part of this permitting exercise. However, these increases are reviewed under the Prevention of Significant Deterioration (PSD) program.

B. New Source Review (NSR) Fees

NWCAA NSR fees have been assessed in accordance with the fee schedule effective January 1, 2015 (fee schedule in effect at original submittal). The NSR fees assessed and amount paid are listed in the NSR Fee Worksheet posted on the OAC Whiteboard for this project.

C. Public Notice

In accordance with NWCAA 305.1, an internet notice that NWCAA received this NOC application was posted on the NWCAA website for a minimum of 15 consecutive days ending on August 25, 2015.

Formal public notification (i.e., 30-day comment period) is required for this project under NWCAA 305.2 and WAC 173-400-171 because the project-estimated emissions increase exceeds the PSD Significant Emission Rate (SER) threshold of 15 tpy PM_{10}. Because of the significant public interest and the tight timeframe of this project, NWCAA is scheduling a hearing and announcing it with the notification of the 30-day public comment period. The hearing will be conducted in conjunction with a hearing for the PSD permit.

No comments were received during the public comment period and hearing. / The comments and responses are included as Appendix A of this worksheet.

D. SEPA Review (NWCAA Section 155)

Skagit County Planning and Development Services is the SEPA lead agency for this project and issued the associated final Environmental Impact Statement (EIS) on ***. A copy of the EIS is *** [included in the OAC file]. This OAC is being issued after the date of the final EIS issuance.

<u>GHG Disclosure and Mitigation</u>

The greenhouse gas (GHG) emissions are estimated for the project and presented in Table 1. The project GHG emissions triggered PSD and, thus, will be subject to Best Available Control Technology (BACT) under PSD. GHG emissions were reviewed and addressed in the EIS.

E. Permit History

NWCAA issued Regulatory Order (RO) 44 for the NHT reactor replacement project on February 2, 2016. Because the reactor was coming to the end of its useful life, Tesoro needed to replace the reactor. Since the reduction in gasoline sulfur standards (i.e., Tier 3) was upcoming, Tesoro proposed to install a larger reactor vessel to prepare for meeting the new standards. However, hydraulic restriction elsewhere in the NHT limits the reactor capacity and prevents utilization of the expanded capacity. RO 44 was issued to address PSD applicability concerns. The NHT expansion portion of this permitting action will include removal of the hydraulic restrictions in the NHT to allow for full utilization of the new larger reactor. With the permitting of the NHT expansion project, upon request, RO 44 will become null and void.

The NHT process unit has a couple of OACs that apply to portions of the unit (i.e., OACs 827b and 896a). Applicability of these OACs does not change with the issuance of this permit.

F. Basis for New Source Review Applicability

Permitting requirements for the emissions increases of the various pollutants are addressed under the Prevention of Significant Deterioration (PSD) program and minor New Source Review (NSR). Generally, although NWCAA has the authority to review and permit any pollutant increase under minor NSR, if a pollutant triggers under PSD, the permitting requirements will be addressed under PSD; minor New Source Review (NSR) addresses those pollutants that do not trigger PSD.

PSD Program Applicability

Table 1 lists the estimated emissions increases for the PSD applicability determination. Note that this table includes emission increases from both new and modified emission units and also non-modified project-related existing units (e.g., increased utilization).

Table 1: Project Emissions for PSD Applicability Determination

	NO_X	CO	SO_2	VOC	SAM	PM	PM_{10}	$PM_{2.5}$	GHG (CO_2e)
Project Emissions Increase (tpy)	36.7	33.0	39.3	101.9	0.01	21.6	21.6	21.6	353,094
PSD Significant Emission Rate (SER) (tpy)	40	100	40	40	7	25	15	10	75,000
Is Project Emissions Increase > SER?	No	No	No	Yes	No	No	Yes	Yes	Yes
Netting Analysis: Sum of Changes (tpy)	--	--	--	-455.1	--	--	N/A	N/A	N/A
Net Emissions Increase (NEI) (tpy)	--	--	--	-353.3	--	--	N/A	N/A	N/A
Is Net Emissions Increase > SER?	--	--	--	No	--	--	Yes	Yes	Yes

Because the Project Emissions Increase or Net Emissions Increase (NEI) is greater than the Significant Emission Rate (SER) for PM_{10}/$PM_{2.5}$ and greenhouse gases (GHG), these pollutants are addressed under PSD permitting. Note that even though PM_{10} and $PM_{2.5}$ trigger PSD, PM (also called total suspended particulate (TSP)) does not so should be addressed under minor NSR. In the application, Tesoro conservatively assumed that all project particulate matter emissions are each PM, PM_{10}, and $PM_{2.5}$ (hence the identical emission rates). All the project particulate matter emissions are from gaseous fuel combustion. According to AP-42[2], particulate from natural gas combustion is less than 1 micron in size (i.e., $PM_{2.5}$). Therefore, all project particulate matter emissions, including PM, are $PM_{2.5}$ and, in effect, are addressed under the PSD program. The BACT conclusions and $PM_{2.5}$/PM_{10} limits in the PSD permit are sufficient to address PM, and this minor NSR permit does not need to include any additional limitations for PM, PM_{10}, or $PM_{2.5}$.

[2] AP-42 Section 1.4.3

Minor NSR Program Applicability

The minor NSR program applicability is on an individual emission unit basis under NWCAA Section 300. For new emission units, the potential to emit (PTE) is based on operating at 100% capacity and uncontrolled (or utilizing whatever controls, if any, would apply regardless of any permitting action) for 8,760 hour per year. For modified emission units the analysis is based on the change in actual emissions. In some cases, minor NSR is triggered regardless of emission rates through the applicability of a federal New Source Performance Standard (NSPS: 40 CFR Part 60) or a National Emission Standard for Hazardous Air Pollutants (NESHAP: 40 CFR Parts 61 & 63).

Table 2 lists the controlled PTE emissions from each new process unit and those process units that are physically modified submitted as part of the application. These emissions include controls that Tesoro assumed would be BACT (e.g., SCR for the boiler) so are not necessarily suitable for determining the applicability of NSR. However, looking at the controlled emissions, the criteria pollutant emissions are over the NSR exemption thresholds or the TAPs are over the de minimis listed in chapter 173-460 WAC; therefore, minor NSR is triggered for each of those process units. In addition, most of the process units trigger a new NSPS or MACT standard and thereby trigger minor NSR as well. The entries in bold are those criteria that trigger minor NSR for that emission unit.

Table 2: Controlled PTE by Emission Unit for NSR Applicability

Emission Unit	NO_X (tpy)	CO (tpy)	SO_2 (tpy)	VOC (tpy)	TAP(s) over de minimis?	Trigger NSPS/ NESHAP?
Boiler F-6870	**27.9**	**18.9**	**6.4**	**14.1**	**Yes**	**Yes**
Marine Vapor Combustion Unit (MVEC VCU)	**3.1**	**14.0**	**32.6**	**15.4**	**Yes**	No
ARU Fugitive Components + ARU Tankage Fugitive Components (new process unit)	--	--	--	1.6 [a]	**Yes** [a]	**Yes**
Isom Fugitive Components (rolled into existing process unit)	--	--	--	**9.2**	**Yes**	-- [b]
MVEC Fugitive Components (new process unit)	--	--	--	1.1 [a]	**Yes** [a]	**Yes**
CR/NHT Fugitive Components (rolled into existing process unit)	--	--	--	**5.5**	**Yes**	**Yes**
Tank 285 (Medium Reformate feedstock)	--	--	--	**14.6**	**Yes**	**Yes**
Tank 286 (Mixed Xylenes Product)	--	--	--	**13.8**	**Yes**	**Yes**
Tank 287 (Mixed Xylenes Product)	--	--	--	**7.2**	**Yes**	**Yes**
Perchloroethylene Process Tank	--	--	--	0	No	**Yes**
ARU Distillation Unit Process Vents	-- [c]	-- [c]	-- [c]	-- [c]	-- [c]	**Yes**
NSR exemption thresholds (NWCAA 300.5d)	***2.0***	***5.0***	***2.0***	***2.0***	***De minimis***	**--**

[a] Emissions based on controlled emission factors (i.e., refinery-specific emission factors based on NSPS GGGa compliance) rather than uncontrolled Refinery Average factors (Protocol Table 2-2).
[b] An analysis to determine if this project qualifies as a modification under NSPS was not provided in the application.
[c] An emission estimation was not provided for the ARU distillation unit process vents in the application.

The perchloroethylene process tank is a pressurized process vessel; the pressure release vents for which are routed to the flare. Therefore, it does not have any emissions for the purposes of NSR applicability. However, it is included in this NSR action because it is subject to the Organic Liquids Distribution (OLD) MACT and thereby triggers minor NSR.

The ARU distillation unit is an affected unit under 40 CFR 60 Subpart NNN. Therefore, the distillation unit and associated process vents trigger minor NSR review.

G. Emissions Estimates & Ambient Impacts

Table 2 lists the new and modified sources of emissions associated with the project.

Boiler F-6870

The proposed boiler (F-6870) is rated at 584 MMBtu/hr firing natural gas equipped with low NO_X burners (LNB) and selective catalytic reduction (SCR) to reduce NO_X emissions, and catalytic oxidation to control CO emissions. Tesoro estimated steady state emissions from the boiler based on vendor information (NO_X, CO, & NH_3), site-specific natural gas sulfur content (SO_2), and AP-42 (VOC & toxics). The boiler was assumed to operate over the entire year (i.e., 8,760 hours per year).

Process vents from the distillation columns in the ARU may be routed to the firebox of the new boiler for control. These process vents will have no significant impact on boiler emissions. They are considered inherently low in sulfur content because they are produced in a process unit that is intolerant to sulfur contamination. In addition, the total combined flow of these process vents will be approximately 1,800 scf/hr, which is nearly negligible (about 0.3%) as compared to the total fuel fired in the boiler. As such, for the purposes of this permitting analysis, the boiler is assumed to fire only natural gas.

The boiler control devices (SCR for NO_X and CO catalyst for CO) need to be brought up to temperature before they are fully effective. As such, the boiler is effectively operating solely on the installed low NO_X burners without additional control during startups; Tesoro estimates that potential emissions during startup for NO_X will be 40.0 lb/hr NO_X and 21.6 lb/hr CO. Tesoro estimated emissions based on vendor information and modeling results. Note that Tesoro conservatively estimates 6 cold startups per year (24 hours each) and 12 hot startups per year (4 hours each).

<u>Marine Vapor Combustion Unit (VCU)</u>

Tesoro designed the VCU to combust the displaced vapors collected from loading marine vessels along with natural gas introduced at the dock safety unit to keep the gas within safe ranges during transport to the VCU (called enrichment gas). Natural gas is also introduced at the VCU burners to assist the combustion (called support gas). Combustion emissions are based on vendor information (NO_X), AP-42 (CO), and an assumed worst-case sulfur content (SO_2). Short-term emissions are based on the rating of the unit (i.e., 120 MMBtu/hr). Annual emissions are based on an annual estimated loading rate.

For the purposes of the unit PTE calculation, the VCU is assumed to have a 99% control efficiency. VOC and toxics emissions were calculated as stemming from two different mechanisms: uncontrolled emissions (i.e., the 1% of the gases that did not get combusted as a result of technical efficiency constraints) and directly from combustion of the gas. Tesoro calculated uncontrolled emissions by determining the worst-case emissions based on three different material profiles (mixed xylenes product, crude oil, and gasoline) being displaced over the two lines on the dock. The 24-hour emissions are calculated based on the hourly emissions from the worst-case combination of profiles multiplied by 24. Annual emissions are calculated using the annual estimated loading rate.

The direct toxics emissions from the combustion of the gas were calculated using AP-42 for natural gas combustion. Note that the hexavalent chromium emission factor was based on the Emissions Estimation Protocol for Petroleum Refineries (Table 4-3) which states that hexavalent chromium is 20% of the total chromium emission factor in AP-42. Short-term emissions are based on the rating of the unit (i.e., 120 MMBtu/hr). Annual emissions are based on an annual estimated loading rate.

<u>Fugitive Components</u>

This project will install new fugitive components in a variety of process units (ARU, ARU Tankage, Isom, MVEC, and CR/NHT). Emissions for valves and pumps were calculated based on 2013-2014 refinery data for units subject to 40 CFR 60 Subpart GGGa. For connectors associated with the ARU and ARU Tankage, the emission factor was assumed equal to the valve emission factor because monitoring will be required under 40 CFR 63 Subpart H. For connectors in the other units (Isom, CR/NHT, and MVEC), the connector emission factor was based on the leak definition under 40 CFR 60 Subpart VVa (500 ppm) and the Screening Value Correlation in Protocol Table 2-10.

<u>Storage Tanks</u>

The project includes installation of three new storage tanks:

- Tank 285: 384,000 barrels EFR storage tank equipped with mechanical shoe primary seal and rim-mounted secondary seal primarily storing medium reformate
- Tank 286: 384,000 barrels IFR storage tank equipped with dual seals primarily storing mixed xylenes product
- Tank 287: 193,000 barrels IFR storage tank equipped with dual seals primarily storing mixed xylenes product

Tesoro requested the flexibility to potentially store gasoline in any of the proposed tanks beyond their normal proposed service. As such, VOC and TAP emissions from the storage tanks were calculated considering storage of mixed xylenes product, medium reformate, and gasoline to determine the worst-case emissions.

Tesoro estimated emissions from the three new storage tanks during normal operations (i.e., working and standing losses) using AP-42 and TankESP. Tank inspection emissions were also calculated, including five days of standing idle, refilling losses, one day of tank degassing for the initial vapor space purge, and two days of forced ventilation after initial vapor space purge. Tank degassing emissions from the storage of gasoline were assumed to be 99% controlled.

<u>Criteria Pollutant Emissions and Ambient Impacts</u>

Table 3 lists the controlled PTE criteria pollutant emission increases for the entire project covered under minor NSR and compares them against the modeling thresholds. Note that NO_X, CO, and SO_2 emissions come exclusively from the combustion sources (Boiler & VRU). VOC emissions come from both the boiler and MVEC along with fugitives and new storage tanks.

Table 3: Project Criteria Air Pollutant Emissions – Controlled as Permitted

Pollutant	Emissions (ton/yr)	Minor NSR Modeling Thresholds (ton/yr)
NOx	31.0	40
CO	32.9	100
SO_2	39.0	40
VOC	82.6	No ambient std

Tesoro provided ambient air quality modeling demonstrations for NO_X, CO, and SO_2; the results of which are listed in Table 4.

Table 4: Criteria Air Pollutant Ambient Impacts

Pollutant	Averaging Period	Modeled Ambient Impact of the Project (μg/m³)	Back-ground [f]	Total Concentration (μg/m³)	Ambient Air Quality Standard (μg/m³) [b]	Percent of Standard (%)
NO_2 [a]	1-hr	47.0	58.2	105.2	188 [c]	56.0
	Annual	0.72	16.9	17.6	100 [e]	17.6
CO	1-hr	100.7	1,113	1,213.7	40,000 [e]	3.0
	8-hr	20.1	805.7	825.8	10,000 [e]	8.3
SO_2	1-hr	132.6	57.5	190.1	196 [e]	97.0
	3-hr	189.9	54.9	244.8	1,300 [e]	18.8
	24-hr	54.4	19.9	74.3	260 [d]	28.6
	Annual	5.31	11.2	16.5	52 [d]	31.1

Notes:
a. Pursuant to EPA's Tier 2 approach, NO_2 concentrations are assumed to be 80 percent of NO_X for the 1-hour standard and 75 percent for the annual standard.
b. The ambient air quality standards shown are the most stringent primary standards under federal, state or NWCAA regulation. Many of these standards have allowances for periodic values to exceed the listed standard. Modeled impacts are considered to be higher than actual ambient impacts. For these reasons, this ambient impact analysis is considered to be a conservative approach.
c=NAAQS, d=State, e=both NAAQS & State.
f. Background design data is from NW-AIRQUEST: http://lar.wsu.edu/nw-airquest/lookup.html

Tesoro conservatively used maximum short-term rates, including startup, in the criteria pollutant modeling to demonstrate compliance with both short-term and annual average standards.

As can be seen in Table 4, the project will not exceed, or cause to exceed, any ambient air quality standard for criteria air pollutants (e.g., NAAQS). Note that the SO_2 impacts come close to the ambient standard (97%). The MVEC VCU is the primary contributor to that impact. As such, to avoid a potential exceedance of the ambient standard, Tesoro is required to monitor the sulfur content and the flow of the gases into the VCU on a continuous basis to accurately track SO_2 emissions to demonstrate that they are not exceeding the emission limitation set to protect the 1-hour NAAQS (i.e., estimated emissions in this application). A mass emission rate (i.e., 51.4 lb/hr) on a 1-hour basis was chosen as the limit for the VCU because it is directly related to ambient impact. **[OAC Conditions (12)(a) & (13)]**

<u>Toxic Pollutant Emissions and Ambient Impacts</u>

For the purposes of determining toxics impacts, WAC 173-460-080(3) allows for the use of toxics offsets. Tesoro is proposing to use the MVEC to control hydrocarbon emissions from marine vessels during existing loading operations of gasoline-range materials and crude in addition to the proposed mixed xylenes product. As such, Tesoro discounted project TAP emissions using past actual emissions from gasoline-range materials and crude uncontrolled loading.

Past actual annual emissions were calculated by selecting the maximum two-year average emissions from loading of gasoline and crude by year over the past 10 years for each pollutant (i.e., VOC and TAPs). This was the offset value for annual average pollutants (i.e., benzene, ethylbenzene, and naphthalene). To determine the 24-hour average offset values, the 24-hour average was calculated by taking the maximum two-year annual average emissions by pollutant and dividing by 365 to determine the attribution for each day. No discount was taken for pollutants with 1-hour averaging periods.

Table 5 lists the controlled PTE TAP emission increases for the entire project, including the toxics offsets, and compares them against the modeling thresholds. The table includes only those TAPs that triggered NSR – that is, their emissions increases, excluding the offsets, were estimated to be over the de minimis of chapter 173-460 WAC. If estimated project emissions of any TAP, including offsets, were over the SQER, modeling was conducted using AERMOD to evaluate ambient impacts which were compared against the acceptable source impact levels (ASILs).

Table 5: Project Toxic Air Pollutant Emissions – Controlled as Permitted

Toxic Air Pollutant	Averaging period	Emissions (lb/avg period)	SQER (lb/avg period)	Ambient Impact if over SQER (µg/m³)	ASIL (µg/m³)	Percent of ASIL (%)
Carbon Monoxide	1 hour	14.2	50.4	--	--	--
Nitrogen Dioxide	1 hour	42.16	1.03	447.6	470	95.2
Sulfur Dioxide	1 hour	52.87	1.45	569.6	660	86.3
Sulfuric Acid	24 hour	0.54	0.131	0.01	1	1.3
Ammonia	24 hour	63.0	9.31	3.1	70.8	4.4
Cobalt	24 hour	0.001	0.013	--	--	--
n-Hexane	24 hour	(27.4)	92	--	--	--
Manganese	24 hour	0.0056	0.00526	1.3e-4	0.04	0.3
Mercury	24 hour	0.0038	0.0118	--	--	--
Vanadium	24 hour	0.034	0.0263	8.1e-4	0.2	0.4
m-xylene	24 hour	41.97	29	4.1	221	1.9
p-xylene	24 hour	19.63	29	--	--	--
o-xylene	24 hour	18.97	29	--	--	--
Arsenic	year	1.07	0.0581	2.2e-6	3.03e-4	0.7
Benzene	year	(5,297)	6.62	--	--	--
Beryllium	year	0.064	0.08	--	--	--
Cadmium	year	5.88	0.00228	1.2e-5	2.38e-4	5.2
Chromium (Hexavalent)	year	1.53	0.00128	3.2e-6	6.67e-6	47.7
Formaldehyde	year	401.1	32	8.4e-4	0.167	0.5
Naphthalene	year	59.12	5.64	0.0006	0.0294	2.2
3-Methylchloranthrene	year	0.0096	0.0305	--	--	--
7,12-Dimethylbenz(a)anthracene	year	0.0856	0.00271	1.7e-7	1.41e-5	1.3
Ethylbenzene	year	2,498	76.8	0.2	0.4	54.7

Tesoro conservatively used maximum post-project short-term rates, including boiler startup for NO_2, in the TAP modeling to demonstrate compliance with both short-term and annual average standards. The boiler and VRU are point sources and modeled as such. However, the fugitive emissions sources (i.e., ARU fugitive components, NHT fugitive components, MVEC fugitive components, Tank 285, Tank 286, and Tank 287) were divided into volume sources to best represent emission behavior.

To reduce the number of model runs, Tesoro chose to split the toxics into groups. Tesoro created individual model runs for those TAPs emitted from all or most sources (nitrogen dioxide, sulfur dioxide, ammonia, sulfuric acid, m-xylene, naphthalene, and ethylbenzene). The other TAPs were divided into two groups, one for 24-hour averaging periods (manganese and vanadium) and one for annual averaging periods (arsenic, cadmium, chromium (hexavalent), formaldehyde, and 7,12-dimethyl benz(a)anthracene). The TAPs in each of these two groups were emitted from the same emission units in the same proportion. As such, the model result from each of the group runs can be scaled to determine the ambient impact from each TAP within the group.

As can be seen in Table 5, the project will not exceed any ASIL. Note that the NO_2 impact comes close to the ASIL (95.2%). The boiler during startup is the primary contributor to that impact. As such, to avoid a potential exceedance of the ASIL, Tesoro is required to install a continuous emission monitor for NO_X and a continuous fuel flow meter to accurately track emissions to demonstrate that they are not exceeding the emission limitation set to protect the 1-hour ASIL (i.e., estimated emissions in this application). A mass emission rate limit (i.e., 40.0 lb/hr) on a 1-hour basis during startup was chosen because it is directly related to ambient impact. Because the boiler fires almost exclusively natural gas, which is a fuel with a relatively consistent composition and heat content, it is adequate to determine compliance based on EPA Method 19 using a certified fuel flow meter rather than a continuous exhaust flow meter. **[OAC Conditions (2)(b) & (3)]**

The fuel flow meter must be maintained in accordance with 40 CFR Part 98 except that calibration frequency is mandated because fuel flow meter calibrations are not required for these types of boilers. The meter must be calibrated in accordance with the manufacturer's recommendations but at least once every five years as part of their major maintenance turnaround. The higher heating value of 1,100 Btu/scf was chosen as a conservatively high value proposed by Tesoro with which to simply calculate emissions (AP-42 states natural gas has a higher heating value of 1,020 Btu/scf). However, the emissions may be recalculated using the daily value from the Northwest Pipeline website for the Sumas compressor site if the 1,100 Btu/scf is too conservative. **[OAC Condition (3)]**

The SO_2 impact also comes close to the ASIL (86.3%). Similar to the NAAQS modeling, the VCU is the primary contributor to that impact. The VCU sulfur monitoring as outlined earlier under the NAAQS modeling will also serve to protect the ASIL. **[OAC Conditions (12)(a) & (13)]**

Note that NO_2 and SO_2 are both criteria pollutants and TAPs. As can be seen in Tables 4 and 5, the modeling results for the TAP analysis was higher than that for the NAAQS. This is due to the fact that the TAP ASIL demonstration is based on the maximum modeled value for the averaging period (i.e., maximum 1 hour). However, the NAAQS demonstration is based on the average of the 98^{th} percentile 1-hour daily maximum concentrations during each year for NO_2 and the average 99^{th} percentile 1-hour daily maximum concentrations during each year for SO_2.

H. Prevention of Significant Deterioration (PSD) Program

Emission increases associated with this project were reviewed for Prevention of Significant Deterioration (PSD) Program applicability.

The facility is an existing PSD major source. As discussed above, the project triggers Prevention of Significant Deterioration (PSD) program review as a major modification for PM_{10}, $PM_{2.5}$, and GHG emissions.

However, because PSD non-applicability was based on the actual-to-projected-actual emissions increase calculation methodology, Tesoro is required to conduct recordkeeping and reporting to ensure that a significant emissions increase does not actually occur (referred to as reasonable-possibility recordkeeping). Preconstruction documentation (e.g., permit application) is required for NO_X, SO_2, CO, PM, and VOC because the project emissions increase plus the demand growth exclusion is greater than 50% of the PSD

Significant Emission Rate (SER). Recordkeeping of post-project annual actual emissions is required for NO_X, SO_2, PM, and VOC because the project emission increase is greater than 50% of the PSD SER. The post-project recordkeeping is required for five years because none of the existing units for which the projected actual methodology was used will have an increase in design capacity or PTE. Note that WAC 173-400-720(4)(b)(iii)(D) requires that the emissions in tons per year for the project, the baseline actual emissions, and the pre-construction projected emissions be reported annually to NWCAA. These requirements are not included in the OAC or PSD permit because they apply regardless and are listed in Section 2 of the AOP. Therefore, it does not need to be reflected in either the PSD or minor NSR permit.

As stated in Table 1, Tesoro estimated the NO_X PSD emissions increase from the project to be 36.7 tons per year. This included increases from the VCU (3.1 tpy), the boiler (27.9 tpy), and the increased utilization of the unmodified Heater F-6602 (5.7 tpy). In the emission calculation for the VCU, it was assumed that the VCU potentially operates for 8,760 hours per year but the annual emissions were based on an assumed flow rate rather than just scaling the hourly rate. As such, upon request and to avoid exceeding the PSD triggering threshold, this permit includes an annual NO_X emission limit on the VCU (3.1 tpy); compliance is determined through annual source testing on one of the three units such that each unit is tested at least every three years to determine an emission factor in lb/scf. The emission factor is to be determined during testing during worst-case conditions for the generation of NO_X (at least 90% capacity while loading gasoline during the last 20% of loading of a tank or compartment).[3] This worst-case emission factor and the continuous flow monitor will be used to calculate emissions to demonstrate compliance with the annual limit. **[OAC Condition (14)]**

Similarly, upon request, the permit includes an annual SO_2 emission limit on the VCU (32.6 tpy). Compliance is determined by adding the lb/hr values calculated to determine compliance with the short-term ambient impact limit. The short-term values are calculated using the CMS for total sulfur (assuming all sulfur converts to SO_2) and the flow meter. **[OAC Conditions (12)(b) & (13)]**

I. Air Operating Permit (AOP) Program

The facility is a Title V air operating permit source and conditions of this OAC will be incorporated into the AOP during the ongoing renewal.

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[3] NO_X emissions from fuel combustion are generated via three mechanisms: thermal, fuel, and prompt. Thermal NO_X is the predominant mechanism in high-temperature combustion (> 2,000°F) and increases exponentially with temperature. Prompt NO_X is the predominant mechanism in low-temperature combustion and in fuel-rich conditions. Fuel NO_X is dependent on the nitrogen content of fuel – refined gaseous fuels such as gasoline and natural gas have little nitrogen content. Regarding combustion at the VCU, it will be high temperature combustion (i.e., > 2,000°F) and the fuel NO_X for both natural gas and gasoline is assumed to be minimal. As such, thermal NO_X will be the predominant NO_X formation mechanism. Based on the adiabatic (constant pressure) flame temperature, gasoline has a higher combustion temperature than natural gas (3,880°F vs. 3,565°F); therefore, combustion of gasoline vapors will result in more NO_X emissions than natural gas.

J. NWCAA Compliance Database (Stratus)

The NWCAA Stratus database has not been updated to include the emission unit(s) approved by this OAC.

K. Confidential Business Information (CBI)

The NOC application does not contain any information deemed by the applicant to be CBI.

L. Applicable/Inapplicable Regulations

As they may directly relate to emissions from the project, the most relevant sections of the NWCAA regulation are:

1. Northwest Clean Air Agency

Visible Emissions

NWCAA 451.1 - No person shall cause or permit the emission, for any period aggregating more than 3 minutes in any 1 hour, of an air contaminant from any source which, at the point of emission, or within a reasonable distance of the point of emission, exceeds 20% opacity. Compliance is demonstrated using Ecology Method 9A.

Particulate Matter ($PM_{2.5}$)

NWCAA 455.11 - From all gaseous and distillate fuel burning equipment, emissions shall not exceed 0.05 grain/dscf (0.11 g/m^3) corrected to 7% oxygen.

Sulfur Dioxide

NWCAA 520.14 - Gaseous fuel shall contain 50 grains (412 ppm @ standard conditions) or less sulfur per 100 standard cubic feet except that this subsection shall not apply to those sources subject to Section 460. As a facility with an aggregate heat input greater than 500 MMBtu/hr, the Tesoro refinery is subject to Section 460 and therefore this NWCAA 520.14 limit on the sulfur content of gaseous fuels does not apply.

NWCAA 460.1 - Emission of sulfur compounds, calculated as a calendar month average of sulfur dioxide, shall not exceed one and one-half pounds per million Btu of heat input per hour (1.5 lb SO_2/MMBtu, calendar month average of hourly values). Tesoro estimated the site-specific natural gas sulfur content to be 0.0025 lb/MMBtu. Also, the Northwest Pipeline natural gas tariff states that the natural gas will not contain more than 5 grains total sulfur per 100 cubic feet. Assuming a heat content of 1,020 Btu/cf and that all sulfur is converted to SO_2, this translates to 0.014 lb SO_2/MMBtu, which is much less than this NWCAA 460.1 limit.

Section 462 - It shall be unlawful for any person to cause or permit the emission of air contaminants from any equipment if the air contaminants emitted as measured in the stack contain sulfur compounds calculated as sulfur dioxide, of more than 1,000 parts per million corrected to 7% oxygen (2.62 mg/m^3), averaged for a sixty consecutive minute period. For the purpose of this section, all sulfur present in gaseous compounds containing oxygen shall be deemed present as sulfur dioxide. Tesoro estimated the maximum hourly normal operation concentration from the VCU to be 564 ppmvd SO_2 at 7% oxygen, which is less than the NWCAA Section 462 limit.

Volatile Organic Compounds

Section 560 – A person shall not place, store or hold in any stationary tank, reservoir or other container of more than 40,000 gallons, any petroleum liquids or a tank greater than 6,000 gallons capacity or greater containing other organic liquids or solvents having a True Vapor Pressure of 1.5 pounds per square inch or greater under actual storage conditions, unless such tank, reservoir or other container is a pressure tank maintaining working pressure sufficient at all times to prevent hydrocarbon vapor or gas loss to the atmosphere, or is designed and equipped with either a floating roof or a vapor recovery system that is properly installed, in good working order, and in operation.

Section 580 – Requirements that apply to petroleum refinery activities and equipment including noncondensable VOC disposal, process unit depressurization, high vapor pressure volatile organic compound storage tanks, petroleum refinery equipment leaks, and high vapor pressure volatile organic compound storage in external floating roof tanks.

2. State

Chapter 173-400 WAC contains requirements similar to those listed above. Chapter 173-460 WAC contains requirements for new sources of Toxic Air Pollutants.

3. Federal

40 CFR Part 60 – New Source Performance Standards (NSPS)

- ✓ **40 CFR 60 Subpart A – General Provisions:** Because the project is subject to equipment-specific NSPS subparts, the general provisions of NSPS also apply to the project.

- ✓ **40 CFR 60 Subpart Db – Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units:** The provisions of 40 CFR 60 Subpart Db are applicable to owners and operators of steam-generating units (SGUs) that commence construction, reconstruction, or modification after June 19, 1984, and have a heat-input capacity greater than 100 MMBtu/hr. As a steam generating unit with a rating greater than 100 MMBtu/hr that will commence construction after the applicability date, the new boiler is subject to 40 CFR 60 Subpart Db. The boiler is subject to a NO_X emission limit of either 0.10 lb/MMBtu for low heat release units or 0.20 lb/MMBtu for high heat release units on a 30-day rolling average basis, which the boiler is expected to meet.

- **40 CFR 60 Subpart Ja – Standards of Performance for Petroleum Refineries For Which Construction, Reconstruction, or Modification Commenced After May 14, 2007:** 40 CFR 60 Subpart Ja applies to FCCUs, fluid coking units (FCU), delayed coking units (DCU), fuel gas combustion devices, flares, and sulfur recovery plants generally constructed, modified, or reconstructed after May 14, 2007. A fuel gas burning device is defined as a process heater or boiler that combusts fuel gas. Fuel gas is defined as any gas generated at a petroleum refinery excluding pure natural gas and vapors from marine loading operations.

The boiler burns primarily natural gas but may also combust vent streams routed from the ARU. Because the ARU is used to produce an organic chemical product (as defined in 40 CFR 60 Subpart NNN), it is not considered a petroleum refinery process unit. Therefore, because neither natural gas nor ARU column vent streams are considered fuel gas, the new boiler is not considered a fuel gas combustion device under 40 CFR 60 Subpart Ja and is not subject to this subpart.

The MVEC will combust natural gas (as assist or enrichment gas) and vapors collected from marine vessel loading operations. The fuel gas definition explicitly excludes vapors from marine tank vessel loading operations. Therefore, the MVEC will not combust fuel gas, is not a fuel gas combustion device, and is not subject to this subpart.

✓ **40 CFR 60 Subpart Kb – Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced After July 23, 1984:** 40 CFR 60 Subpart Kb regulates storage vessels with a capacity greater than or equal to 75 m^3 that are used to store volatile organic liquids. This subpart does not apply to storage vessels with a capacity greater than or equal to 151 m^3, storing a liquid with a maximum true vapor pressure of less than 3.5 kilopascals (kPa), or with a capacity greater than or equal to 75 m^3 but less than 151 m^3, storing a liquid with a maximum true vapor pressure of less than 15.0 kPa.

The three proposed storage tanks (Tanks 285, 286, and 287) each have capacities greater than the applicability thresholds and will store material with a true vapor pressure greater than 0.5 psia. Therefore, the storage tanks are each subject to 40 CFR 60 Subpart Kb. Because the tanks are equipped with either an IFR or EFR, they meet the requirements of 40 CFR 60 Subpart Kb.

✓ **40 CFR 60 Subpart VVa – Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry for Which Construction, Reconstruction, or Modification Commenced After November 7, 2006:** 40 CFR 60 Subpart VVa applies to equipment leaks of VOC in Synthetic Organic Chemicals Manufacturing Industry (SOCMI) units constructed, modified, or reconstructed after November 7, 2006. SOCMI units are process units that produce for sale, as intermediate or final products, one or more of the chemicals listed in 40 CFR 60.489 of the standard. "Xylenes (mixed)" is a listed chemical in the table in 60.489; therefore, the ARU and ARU Tankage is an affected process unit and is subject to the provisions of 40 CFR 60 Subpart VVa and is expected to be able to meet the applicable requirements. The new Isom Unit and modified NHT do not produce any listed chemicals for sale and are therefore not subject to 40 CFR 60 Subpart VVa.

✓ **40 CFR 60 Subparts GGG & GGGa – Standards of Performance for Equipment Leaks of VOC in Petroleum Refineries:** 40 CFR 60 Subpart GGG applies to process units with equipment components in VOC service that have been constructed, reconstructed, or modified between January 4, 1983, and November 7, 2006. 40 CFR 60 Subpart GGGa applies to process units with equipment components in VOC service that have been constructed, reconstructed, or modified on or after November 7, 2006. The rules provide an applicability exception under 60.590a(d): those process units subject to 40 CFR 60 Subpart GGG and modified after November 7, 2006, remain subject only to 40 CFR 60 Subpart GGG.

Because this project takes place after November 7, 2006, 40 CFR 60 Subpart GGGa is potentially triggered for any constructed, reconstructed, or potentially modified source. According to the Tesoro application, the project qualifies as construction or modification under NSPS for the fugitive components for the MVEC (construction) and CR/NHT (modification). Therefore, the MVEC is subject to 40 CFR 60 Subpart GGGa. According to the AOP, the CR/NHT is currently subject to 40 CFR 60 Subpart GGG (enhanced LDAR); as such, it cannot move to 40 CFR 60 Subpart GGGa applicability. Tesoro stated that they voluntarily accept 40 CFR 60 Subpart GGGa applicability for the CR/NHT process unit. The new components in the Isom unit will be rolled into the existing 40 CFR 60 Subpart GGGa-subject Benzene Saturation Unit; Tesoro did not include an analysis to determine if the addition qualifies as construction or modification under NSPS. The subject fugitive components are expected to be able to meet the applicable requirements of 40 CFR 60 Subpart GGGa.

- ✓ **40 CFR 60 Subpart NNN - Standards of Performance for VOC Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Distillation Operations:** 40 CFR 60 Subpart NNN applies to distillation operations at SOCMI units. Xylenes is a listed SOCMI chemical under 40 CFR 60 Subpart NNN and the ARU utilizes distillation to separate out the mixed xylenes product. The ARU column process vent streams will be routed to either the firebox of the new boiler, the refinery fuel gas system via the flare gas recovery system, or to the flare system for control. As such, the ARU is subject to 40 CFR 60 Subpart NNN and is expected to be able to meet the applicable requirements.

- ✓ **40 CFR 60 Subpart QQQ - Standards of Performance for VOC Emissions from Petroleum Refinery Wastewater Systems:** 40 CFR 60 Subpart QQQ applies to individual drain systems, oil-water separators, and aggregate facilities in refinery wastewater systems that were constructed, modified, or reconstructed after May 4, 1987. Tesoro is installing a new individual drain system at the ARU to be tied into the existing refinery sewer system. In addition, new drains will be constructed at the Isom Unit and tied into the existing individual drain system in the Benzene Saturation Unit. As such, the project is subject to 40 CFR 60 Subpart QQQ and is expected to be able to meet the applicable requirements.

- **40 CFR 60 Subpart RRR - Standards of Performance for VOC Emissions From Synthetic Organic Chemical Manufacturing Industry (SOCMI) Reactor Processes:** 40 CFR 60 Subpart RRR applies to reactor processes at SOCMI units. Xylenes is a listed SOCMI chemical under 40 CFR 60 Subpart RRR; however, the ARU does not utilize any reactor processes to extract the mixed xylenes product. As such, the ARU is not subject to 40 CFR 60 Subpart RRR.

40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants (NESHAPs)

- ✓ **40 CFR 61 Subpart A – General Provisions:** Because the project is subject to equipment-specific NESHAP subparts, the general provisions of NESHAP Part 61 also apply to the project.

- ✓ **40 CFR 61 Subpart J - National Emission Standard for Equipment Leaks (Fugitive Emission Sources) of Benzene:** 40 CFR 61 Subpart J applies to fugitive emission sources (i.e., pumps, compressors, pressure relief devices, sampling connection systems, open-ended valves or lines, valves, connectors, surge control vessels, bottoms receivers, and control devices or systems) in benzene service. In benzene service is defined as contacting a fluid, either gaseous or liquid, that is at least 10 percent benzene by weight.

  40 CFR 61 Subpart J applies to existing equipment in the Benzene Saturation Unit (BSU), and will continue to apply to the BSU after the Isom Unit is started-up. As such, the Isom Unit is considered subject to 40 CFR 61 Subpart J and is expected to be able to meet the applicable requirements.

- ✓ **40 CFR 61 Subpart FF - National Emission Standard for Benzene Waste Operations:** 40 CFR 61 Subpart FF applies to the treatment, storage, and disposal of benzene-containing hazardous waste at petroleum refineries. 40 CFR 61 Subpart FF contains control requirements, limits, and work practice standards for equipment that handles and treats benzene-containing waste (e.g. tanks, individual drain systems, containers). The project includes equipment with waste streams and related control systems that <u>is subject</u> to 40 CFR 61 Subpart FF. This equipment and any other NESHAP-subject equipment added as a result of the project described in the application will be incorporated into the refinery's existing compliance program for 40 CFR 61 Subpart FF.

- **40 CFR 61 Subpart BB – National Emission Standards for Hazardous Air Pollutants: Benzene Operations:** 40 CFR 61 Subpart BB applies to benzene distribution activities at the refinery. If the liquid loaded contains less than 70 wt% benzene, the refinery is only required to comply with the recordkeeping and reporting requirements of 40 CFR 61 Subpart BB. The refinery has the potential to trigger 40 CFR 61 Subpart BB during an event where the BSU/Isom Unit is shut down for an extended period and the refinery is in a position to ship out the benzene-rich BSU feedstock in lieu of processing. As such, should this occur, Tesoro is potentially subject to the recordkeeping and reporting requirements under 40 CFR 61 Subpart BB. However, the refinery does not anticipate a scenario where an extended BSU/Isom Unit shutdown is likely. Therefore, these requirements are not listed as applicable in the OAC. However, in the unlikely event that Tesoro does ship the BSU/Isom Unit feed stream offsite, it will be subject to 40 CFR 61 Subpart BB requirements.

<u>40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants (NESHAPs) (also referred to as Maximum Achievable Control Technology (MACT))</u>

- ✓ **40 CFR 63 Subpart A – General Provisions:** Because the project is subject to equipment-specific MACT subparts, the general provisions of 40 CFR Part 63 also apply to the project.

- ✓ **40 CFR 63 Subparts F, G, and H – National Emission Standards for Hazardous Air Pollutants for the Synthetic Organic Chemical Manufacturing Industry:** 40 CFR 63 Subparts F, G, and H apply to organic hazardous air pollutants (HAPs) emissions from the manufacture of specified organic chemicals in the Synthetic Organic Chemical

Manufacturing Industry (SOCMI). Xylene is a listed SOCMI chemical under MACT. As such, the ARU is subject to the SOCMI requirements under MACT. The affected sources are the heat exchange systems, process vents, storage vessels, transfer operations, wastewater, and equipment leaks associated with manufacturing of mixed xylenes product in the ARU. The subject equipment is expected to be able to meet the applicable requirements of 40 CFR 63 Subparts F, G, and H.

- **40 CFR 63 Subpart Y - National Emission Standards for Marine Tank Vessel Loading Operations:** 40 CFR 63 Subpart Y applies to marine tank vessel loading operations that are major sources of HAP. However, existing offshore loading terminals (i.e., a location that has at least one loading berth that is 0.5 miles or more from the shore that is used for mooring a marine tank vessel and loading liquids from shore) are subject to 40 CFR 63 Subpart Y but are exempt from the 40 CFR 63 Subpart Y requirements except that they must meet the submerged fill requirements under 46 CFR 153.282. Tesoro's marine terminal is 0.5 miles or more from shore; therefore, it is subject only to the submerged fill requirements.

✓ **40 CFR 63 Subpart CC - National Emission Standards for Hazardous Air Pollutants From Petroleum Refineries:** 40 CFR 63 Subpart CC generally applies to fugitive HAP emission sources at the refinery. The Tesoro refinery is an existing source subject to 40 CFR 63 Subpart CC. The affected source under 40 CFR 63 Subpart CC is the entire petroleum refinery. Unless the entire petroleum refinery undergoes reconstruction or unless a new process unit is constructed at an existing source that, in and of itself, is a major source of HAPs (at least 10 tpy of one HAP or 25 tpy of total HAPs), then new-source standards are not triggered.

The proposed project does not trigger reconstruction of the petroleum refinery (the project cost does not exceed 50% of the cost of a comparable new petroleum refinery); therefore, new-source standards under 40 CFR 63 Subpart CC are not triggered.

Existing-source standards are applicable to equipment installed as part of the project including equipment leaks, heat exchangers, storage tanks, and wastewater streams. The subject equipment is expected to be able to meet the applicable requirements of 40 CFR 63 Subpart CC. The ARU and ARU Tankage process unit is not subject to any requirements under 40 CFR 63 Subpart CC because the process unit is subject to requirements under the 40 CFR 63 Subparts F, G, and H.

- **40 CFR 63 Subpart UUU - National Emission Standards for Hazardous Air Pollutants for Petroleum Refineries: Catalytic Cracking Units, Catalytic Reforming Units, and Sulfur Recovery Units:** 40 CFR 63 Subpart UUU regulates catalytic cracking units, catalytic reforming units, and sulfur recovery units. The proposed project does not involve any physical changes or changes to the method of operations to any of these types of affected facilities. Therefore, there are no new requirements under this subpart as a result of the project.

✓ **40 CFR 63 Subpart EEEE – National Emission Standards for Hazardous Air Pollutants: Organic Liquids Distribution (Non-Gasoline):** 40 CFR 63 Subpart EEEE applies to non-gasoline organic liquid distribution (OLD) activities at the refinery. Organic liquid for the purposes of 40 CFR 63 Subpart EEEE is defined as any non-crude oil liquid or liquid mixture that contains five percent by weight or greater of listed HAP. Organic liquids do not include gasoline (including aviation gasoline), kerosene, diesel, asphalt, heavier distillate oils, heavier fuel oils; any fuel dispensed directly to users; hazardous waste; wastewater; ballast water; or any non-crude oil with an annual average TVP less than 0.1 psia.

Perchloroethylene, a chemical already used within the refinery, will be stored in a new pressurized 2,245-gallon vessel within the Isom Unit and injected into the process to promote the reaction to produce isomerate. Perchloroethylene is a listed HAP in 40 CFR 63 Subpart EEEE. As such, the proposed perchloroethylene storage tank, associated transfer rack, and transport vehicles while they are unloading at the transfer rack <u>are subject</u> to 40 CFR 63 Subpart EEEE and are expected to be able to meet the applicable requirements. The equipment leak components will be subject to 40 CFR 63 Subpart CC and are therefore exempt from 40 CFR 63 Subpart EEEE.

✓ **40 CFR 63 Subpart DDDDD - National Emission Standards for Hazardous Air Pollutants for Boilers and Process Heaters:** 40 CFR 63 Subpart DDDDD applies to industrial, commercial, or institutional boilers and process heaters that are located at a major source of hazardous air pollutants (HAPs), commonly referred to as the Major Source Boiler MACT. The proposed new natural gas-fired boiler will have a heat input capacity of 584 MMBtu/hr to support the steam demand increase as a result of this project and will be designed to only combust natural gas. Therefore, the boiler is considered part of the "Unit designed to burn gas 1 subcategory" and is expected to be able to meet those requirements.

Note, however, on July 29, 2016, the U.S. Court of Appeals for the District of Columbia Circuit vacated portions of the Major Source Boiler MACT. At this writing, it is not clear which exact portions have been vacated – as such, for the purposes of this permitting action, Major Source Boiler MACT is deemed to apply to the boiler, but the specific applicable requirements remain to be seen. Tesoro states that they will comply with all applicable requirements.

M. Best Available Control Technology (BACT) Technology Review

New Source Review regulations (NWCAA Section 300, WAC 173-400-113, and WAC 173-460-040) applicable to the project require that any new source or modified emission unit associated with the project employ Best Available Control Technology for criteria pollutants (BACT) and Best Available Control Technology for toxic air pollutants (T-BACT). Emission limits representing BACT or T-BACT are short-term limits generally based on unit efficiency with averaging periods of equal to or less than 24 hours. This section presents information on BACT and T-BACT for those pollutants subject to minor new source review. BACT for those pollutants subject to the PSD program (i.e., $PM_{10}/PM_{2.5}$ and GHG) and PM are addressed in Ecology's PSD permitting action.

The BACT information was derived primarily from the EPA RACT/BACT/LAER Clearinghouse for the years 2004 through 2014 along with past NWCAA permitting for similar sources. Although these emission units have been permitted, some have not yet been constructed and/or tested, and, therefore, all of the emission limits representing BACT in this analysis cannot necessarily be assumed to be achievable in actual practice. However, this information is included in the analysis so that NWCAA can make an informed decision on the appropriate level of BACT that is currently expected.

Boiler F-6870 – Steady State Operation

NO_X: For NO_X controls on the proposed natural gas fired boiler during steady state operation, Tesoro's BACT analysis reviewed SCR, low NO_X burners (LNB) with flue gas recirculation (FGR), Selective Non-Catalytic Reduction (SNCR), ultra low NO_X burners (ULNB), and clean fuels with good design and operating practices. SCONOx was deemed to not be technically feasible for a boiler this size due to scaling issues so was not reviewed.

After reviewing vendor information and the RBLC, Tesoro determined that SCR was the most effective control (0.011 lb/MMBtu), followed by LNB with FGR (0.0125 lb/MMBtu), ULNB (0.035 lb/MMBtu), SNCR (0.051 lb/MMBtu), and Clean Fuels (0.073 lb/MMBtu). Tesoro selected SCR (0.011 lb/MMBtu), the most effective control, so no economic, environmental, or energy impact analysis was necessary.

Table 6 lists the individual BACT determinations for boilers similar to that in the project for NO_X.

Table 6: Gas-Fired Boiler BACT for Steady State NO_X

Facility Information	Permit Approval Date	Project Status	BACT Emission Limit
Boiler F-6870 – 584 MMBtu/hr natural gas	--	*Proposed*	*9 ppm @ 3% O_2 (1-hr CEMS)*
Rohm and Haas Texas Inc (TX) – Two 515 MMBtu/hr natural gas - SCR	12/20/13	Approved	0.01 lb/MMBtu (1-hr)
Air Liquide Large Industries U.S. (TX) – Three 550 MMBtu/hr natural gas boilers - SCR	9/5/13	Approved	0.01 lb/MMBtu (3-hr)
Green River Soda Ash Plant (WY) -254 MMBtu/hr natural gas – LNB & FGR	11/18/13	Approved	0.011 lb/MMBtu (30-day rolling)
Grossmont Hospital (CA) - Two 29.4 MMBtu/hr natural gas boilers - LNB	11/6/12	Approved	9 ppm @ 3% O_2 (1-hr)
Iowa Fertilizer Company (IA) – 472.4 MMBtu/hr natural gas – LNB & FGR	10/26/12	Approved	0.0125 lb/MMBtu (30-day rolling, CEMS)
Indiana Gasification, LLC (IN) – 408 MMBtu/hr natural gas – ULNB & FGR	6/27/12	Approved	0.0125 lb/MMBtu (24-hr rolling)
BP Cherry Point (NWCAA) – Two 363 MMBtu/hr natural gas – SCR	11/07	Approved (OAC 1001)	0.011 lb/MMBtu (1-hr, CEMS)
Darigold (NWCAA) – 59 MMBtu/hr natural gas boiler (new) – ULNB	1/07	Approved (OAC 979)	9 ppm @ 3% O_2 (5 year test)
BP Cherry Point (NWCAA) – 47.8 MMBtu/hr refinery fuel gas heater (retrofit) – ULNB	3/06	Approved (OAC 949)	0.040 lb/MMBtu (24-hr, CEMS)
BP Cherry Point (NWCAA) – 55.6 MMBtu/hr refinery fuel gas heater (retrofit) – ULNB	3/06	Approved (OAC 949)	0.040 lb/MMBtu (annual test)
PSE Encogen (NWCAA) – 93 MMBtu/hr natural gas boiler (new) – SCR	1/06	Approved (OAC 951)	9 ppm @ 3% O_2 (annual test)

Note: 9 ppm @ 3% O_2 is equivalent to 0.011 lb/MMBtu

Note that 40 CFR 60 Subpart Db limits NO_X from natural gas boilers (> 100 MMBtu/hr) to 0.10 or 0.20 lb/MMBtu on a 30-day rolling average basis, depending upon the heat release rate.

After consideration of the submitted BACT analysis and consistent with similar boilers installed locally and nationally, NWCAA has determined that Tesoro's proposed BACT limit of 9 ppm NO_X at 3% oxygen (equivalent to 0.011 lb/MMBtu)[4] is acceptable as BACT during steady state operation. Similar to the BP Cherry Point Boiler 6 and 7 project permitted by NWCAA under OAC 1001 in 2007, the NO_X limit is based on a 1-hour averaging period and compliance will be demonstrated using a NO_X CEMS and oxygen monitor. **[OAC Conditions (2)(a), (3), & (10)]**

A concentration limit (ppm) was chosen as opposed to lb/MMBtu so the CEMS output will indicate compliance directly with the standard – no other measurements (e.g., fuel flow) will need to be incorporated into the compliance demonstration introducing additional error.

CO: For CO controls on the proposed natural gas fired boiler during steady state operation, Tesoro's BACT analysis reviewed good design methods and operating procedures, clean fuels, and catalytic oxidation. Thermal oxidation was deemed not demonstrated in practice in boilers of this size due to prohibitive fuel consumption so was not reviewed. SCONOx was deemed to not be technically feasible for a boiler this size due to scaling issues so was not reviewed.

After reviewing vendor information, Tesoro determined that catalytic oxidation was the most effective control (up to 90% control), followed by good design (0.037 lb/MMBtu) and clean fuels (0.037 lb/MMBtu). Tesoro selected catalytic oxidation (0.0074 lb/MMBtu), the most effective control, so no economic, environmental, or energy impact analysis was necessary.

Table 7 lists the individual BACT determinations for boilers similar to that in the project for CO.

Table 7: Gas-Fired Boiler BACT for Steady State CO

Facility Information	Permit Approval Date	Project Status	BACT Emission Limit
Boiler F-6870 – 584 MMBtu/hr natural gas	--	*Proposed*	*0.0074 lb/MMBtu (annual test)*
Iowa Fertilizer Company (IA) – 472.4 MMBtu/hr natural gas – Good Combustion Practices	10/26/12	Approved	0.0013 lb/MMBtu (initial stack test)
Port Dolphin Energy LLC (FL) – Four 278 MMBtu/hr natural gas boilers - Good Combustion Practices	12/1/11	Draft Determination	0.015 lb/MMBtu (3-hr, CEMS)
Cronus Chemicals, LLC (IL) – 864 MMBtu/hr natural gas – Good Combustion Practices	9/5/14	Approved	0.020 lb/MMBtu (30-day rolling, CEMS)
John W Turk Jr. Power Plant (AR) – 555 MMBtu/hr natural gas boilers – Proper Design & Operation	11/5/08	Approved	0.035 lb/MMBtu (30-day rolling, CEMS)

[4] 0.011 lb NO_X/MMBtu / 8710 cf/MMBtu * 385.34 cf/lbmol * (20.9-3)/20.9 / 46 lb/lbmol * 1,000,000 = 9 ppmvd @ 3% O_2

BP Cherry Point (Ecology) – Two 363 MMBtu/hr natural gas – Proper Combustion	11/07	Approved (PSD 07-01)	0.0365 lb/MMBtu (calendar day avg, annual test)
Darigold (NWCAA) – 59 MMBtu/hr natural gas boiler (new)	1/07	Approved (OAC 979)	50 ppm @ 3% O_2 (5 year test)
BP Cherry Point (NWCAA) – 47.8 MMBtu/hr refinery fuel gas heater (retrofit)	3/06	Approved (OAC 949)	0.068 lb/MMBtu (3 year test)
PSE Encogen (NWCAA) – 93 MMBtu/hr natural gas boiler (new)	1/06	Approved (OAC 951)	50 ppm @ 3% O_2 (annual test)

Note: 50 ppm @ 3% O_2 is equivalent to 0.017 lb/MMBtu

The Iowa Fertilizer Company was given a lower emission factor than the proposed BACT limit. Because Iowa Department of Natural Resources did not require an ongoing compliance demonstration to determine if the boiler is operating in accordance with this factor, it was eliminated from consideration as not being demonstrated in practice.

After consideration of the submitted BACT analysis and consistent with similar boilers installed locally and nationally, NWCAA has determined that Tesoro's proposed BACT limit of 0.0074 lb/MMBtu CO is acceptable as BACT during steady state operation. **[OAC Condition (8)]**

The permits for several of the similar RBLC listings mandate a CEMS for CO. However, their BACT determinations require only good combustion practices and/or use of clean fuel which rely solely on boiler operation. Boiler operation can vary and should be continuously monitored to ensure compliance.

However, Tesoro is proposing an add-on control device to control CO emissions (catalytic oxidation). As long as the exhaust is routed to the control device and the catalyst is operating properly, CO will be controlled by the add-on control device rather than relying solely on boiler operation. Therefore, continuous monitoring is not necessary and compliance will be demonstrated based on annual stack tests and developing and operating in accordance with a catalyst monitoring plan. This catalyst monitoring plan will ensure that the catalyst is in good shape and not losing its activity. In addition, requiring annual stack tests is consistent with other NWCAA permits. **[OAC Conditions (8), (10), & (11)]**

A lb/MMBtu limit was chosen for CO because CO emissions are directly related to combustion efficiency so the composition and consistency of the natural gas can play a role in CO emissions. In addition, since compliance will be demonstrated using a stack test, the fuel flow and exhaust flow will be known more accurately and will not introduce significant additional error.

VOC: For VOC controls on the proposed natural gas fired boiler, Tesoro's BACT analysis reviewed good design methods and operating procedures and clean fuels. Thermal oxidation was deemed to be not technically feasible because it is ineffective at concentrations at which the boiler will operate (less than 13 ppm). Catalytic oxidation was deemed to be not technically feasible as well because saturated hydrocarbon removal can only be achieved at temperatures above 800°F which is above the normal operating range of the boiler.

After reviewing vendor information, Tesoro determined that good design methods and clean fuels are equally effective (0.0055 lb/MMBtu). Tesoro selected the most effective control, so no economic, environmental, or energy impact analysis was necessary.

Table 8 lists the individual BACT determinations for boilers similar to that in the project for VOC.

Table 8: Gas-Fired Boiler BACT for VOC

Facility Information	Permit Approval Date	Project Status	BACT Emission Limit
Boiler F-6870 – 584 MMBtu/hr natural gas	--	*Proposed*	*Good Design Methods and Operating Procedures and Clean Fuels*
Iowa Fertilizer Company (IA) – 472.4 MMBtu/hr natural gas – Good Combustion Practices	10/26/12	Approved	0.0014 lb/MMBtu (none)
Port Dolphin Energy LLC (FL) – Four 278 MMBtu/hr natural gas boilers - Good Combustion Practices	12/1/11	Approved	0.0054 lb/MMBtu (3-hr, annual test)
Cronus Chemicals, LLC (IL) – 864 MMBtu/hr natural gas – Good Combustion Practices	9/5/14	Approved	0.0054 lb/MMBtu (3-hr, initial test & upon request)
John W Turk Jr. Power Plant (AR) – 555 MMBtu/hr natural gas boiler	11/5/08	Approved	0.0055 lb/MMBtu (3-hr, test)
BP Cherry Point (NWCAA) – Two 363 MMBtu/hr natural gas	11/07	Approved (OAC 1001)	none
Darigold (NWCAA) – 59 MMBtu/hr natural gas boiler (new) – Clean Fuels & Good Combustion Practices	1/07	Approved (OAC 979)	none
BP Cherry Point (NWCAA) – 47.8 MMBtu/hr & 55.6 MMBtu/hr refinery fuel gas heaters (retrofit)	3/06	Approved (OAC 949)	none
PSE Encogen (NWCAA) – 93 MMBtu/hr natural gas boiler (new) – Clean Fuels & Good Combustion Practices	1/06	Approved (OAC 951)	none

Note that the emission factor in AP-42 for VOC from external combustion of natural gas (Table 1.4-2) is 5.5 lb/MMscf (C rating). Assuming a heat content of 1,020 MMBtu/MMscf for natural gas, the AP-42 factor converts to 0.0054 lb/MMBtu.

The Iowa Fertilizer Company was given a lower emission factor than the rest of the boilers in the database. However, there is no compliance demonstration (initial or ongoing) to determine if the boiler is operating in accordance with this factor. As such, it was eliminated from consideration as not being demonstrated in practice.

After consideration of the submitted BACT analysis and consistent with similar boilers installed locally and nationally, NWCAA has determined that Tesoro's proposed BACT of good design methods and operating procedures and clean fuels (i.e., natural gas) is acceptable as BACT for VOC.

SO_2: For SO_2 controls on the proposed natural gas fired boiler, Tesoro's BACT analysis reviewed clean fuels only. Dry scrubbing, absorber (wet scrubbing), and dry sorbent injection were deemed technically infeasible because the outlet concentration of SO_2 is below the exhaust concentrations that can be achieved with add-on controls.

Tesoro selected the most effective control (clean fuels), so no economic, environmental, or energy impact analysis was necessary.

After consideration of the submitted BACT analysis, NWCAA has determined that Tesoro's proposed BACT of clean fuels (i.e., locally supplied natural gas) is acceptable as BACT for SO_2.

TAPs: Toxics from the boiler can be divided into four categories: (1) toxics that are also criteria pollutants, (2) organic toxics, (3) inorganic toxic (e.g., metals), and (4) ammonia. T-BACT for toxics that are also criteria pollutants is addressed under the BACT analysis for the criteria pollutant itself. Organic toxics (e.g., formaldehyde) from fuel combustion are all considered VOC and are included in the VOC BACT analysis. Inorganic toxics (e.g., metals) emissions from natural gas combustion are emitted as particulate and are addressed in the particulate matter BACT analysis under the PSD permit.

Ammonia: Tesoro originally proposed a T-BACT limit for ammonia of 20 ppmvd @ 3% O_2. See Table 9 for a summary of the ammonia permit limits for similar boilers equipped with SCR.

Table 9: Gas-Fired Boiler BACT for Ammonia

Facility Information	**Permit Approval Date**	**Project Status**	**BACT Emission Limit**
Boiler F-6870 – 584 MMBtu/hr natural gas	--	*Proposed*	*10 ppmvd @ 3% O_2 (annual test)*
Port Dolphin Energy LLC (FL) – Four 278 MMBtu/hr natural gas boilers	12/1/11	Approved	10 ppmvd @ 3% O_2 (initial test)
BP Cherry Point (NWCAA) – Two 363 MMBtu/hr natural gas	11/07	Approved (OAC 1001)	10.0 ppmvd @ 3% O_2 (24-hr, annual test)
PSE Encogen (NWCAA) – 93 MMBtu/hr natural gas boiler (new)	1/06	Approved (OAC 951)	10 ppmvd @ 3% O_2 (annual test)

After reviewing other permitting for similar boilers installed locally and nationally NWCAA is setting T-BACT for ammonia at 10 ppmvd @ 3% O_2 and operation in accordance with a catalyst monitoring plan. Because compliance with the limit will be demonstrated via annual stack test, the averaging period is a 1-hour basis. The compliance demonstration stack test method is the Bay Area Air Quality Management District (BAAQMD) test ST-1B modified to use 60-minute test runs rather than 30-minute test runs. **[OAC Condition (9)]**

In addition, compliance will also be demonstrated by developing and operating in accordance with a catalyst monitoring plan to ensure that the catalyst is in good shape and not requiring overinjection of ammonia to maintain NO_X emissions as the catalyst decays. **[OAC Condition (11)]**

Boiler F-6870 – Startups

Boiler emissions are greater during startups than during steady-state operation for NO_X and CO because the SCR and oxidation catalyst are not functioning optimally at lower temperatures. As such, the BACT limits established in the previous sections for steady-state operations are not technically feasible during these periods. Therefore, NWCAA is establishing separate BACT limits for startups representing the most stringent emissions limits that have been achieved-in-practice or are technologically feasible/cost-effective for this type of unit.

NO_X emissions at the boiler are controlled by a two-fold process: the burner design (e.g., low NO_X or ultra low NO_X) and the add-on control device (SCR in this case). In order to work effectively, the SCR catalyst must be heated to a specific temperature by the exhaust; below that temperature, the SCR is not optimally controlling NO_X and, worst case, the burner is essentially firing uncontrolled. Therefore, the burner design dictates NO_X emissions during startup.

The two approaches to reducing startup emissions is burner design and then using best work practices to limit the amount of time spent during startups.

For the purposes of a BACT determination, boiler burners generally fall into two categories – low NO_X burners (LNBs) or ultra low NO_X burners (ULNBs). ULNBs generally have less NO_X emissions - operating with a longer flame to reduce the flame temperature and not having a continuously burning pilot. According to Tesoro, ULNB are less operationally reliable. In addition, Tesoro policy is all fired units must have a continuously burning pilot for safety and reliability reasons. Tesoro submitted a cost analysis that showed that the differential cost between an LNB and ULNB is at least $29,000/ton NO_X reduced during startup. As such, the ULNB is not cost effective.

As such, Tesoro has selected an LNB for the boiler. NWCAA is setting a short-term mass emission rate (in lb/hr) for NO_X as BACT for the LNB during startups, which will also serve to protect the ambient standards (both NAAQS and ASIL). A mass emission rate was chosen rather than concentration because startups can have high concentrations on a short-term basis but low flow rates so it would not be appropriate to set a concentration limit to accommodate that high concentration spike. Tesoro estimated worst-case emissions from the burner during startup to be 40.0 lb/hr NO_X on a 1-hour basis (based on performance at 0.073 lb/MMBtu or 60 ppm).

As part of this BACT determination, NWCAA is also requiring use of best work practices to limit the amount of time spent for each startup.

According to Tesoro, a cold startup of the boiler takes approximately 24 hours and a hot startup takes approximately 4 hours. A cold startup is defined as beginning on initiation of fuel flow to the boiler and ending either when the unit meets the steady-state limit or 24 hours elapses, whichever occurs first. It is considered a hot startup when it is a startup after a trip when the boiler was producing steam flow and meeting the steady state emission limit and the equipment has not cooled down to ambient temperature. A hot startup is defined as beginning on reinitiation of fuel flow to the boiler and ending either when the unit meets the steady-state limit or 4 hours elapses, whichever occurs first.

During this startup period, emissions must not exceed 40.0 lb/hr NO_X 1-hour average. Compliance will be demonstrated using a NO_X CEMS and continuous fuel flow meter along with specific recordkeeping. **[OAC Conditions (2)(b), (3), (4), (5), & (7)]**

This BACT determination is predicated on the fact that the boiler will not be operating without the SCR at full efficiency for extended periods – it will only be during hot and cold startups which Tesoro estimated to be 192 hours per year (i.e., 6 cold startups lasting 24 hours each and 12 hot startups lasting 4 hours each); the actual amount of time spent during startup should decrease over time once the facility becomes familiar with the equipment operation. Hours spent in startup (i.e., those hours during startup that do not meet the steady-state limit) are limited to 192 hours per year. Tesoro must keep records documenting hours spent in startup. **[OAC Conditions (6) & (7)]**

In this determination, NO_X is used as the surrogate for CO during startups because it will take longer for the SCR to come to temperature and stable operation than for the oxidation catalyst.

Emissions of the other pollutants (SO_2, VOC, TAPs) are not impacted during startup so a separate BACT determination for these pollutants is not necessary.

<u>Marine Loading</u>

VOC: For VOC controls on the proposed mixed xylenes product loading at the dock, Tesoro's BACT analysis reviewed thermal oxidation (i.e., vapor combustion unit (VCU)) and adsorption (i.e., vapor recovery unit (VRU)). Catalytic oxidation was deemed not technically feasible because of potential catalyst contamination from sulfur-containing compounds from the wide variety of vapors to be controlled. In addition, catalytic oxidation is not fully effective with a variable composition and concentration incoming gas.

Vendor budgetary pricing for a VRU was $5.5 million with a VOC control performance guarantee of > 98%. The capital cost of installing a VCU was $2.3 million with guaranteed VOC control performance > 99%. As such, Tesoro selected the most effective control, so no other economic, environmental, or energy impact analysis was necessary.

BP expanded their marine loading operations in 2000 under OAC 716. NWCAA determined BACT in this case was operation of the vapor collection and thermal oxidation with 98% control efficiency in accordance with 40 CFR 63 Subpart Y.

After consideration of the submitted BACT information, NWCAA has determined that Tesoro's proposed BACT of using an MVEC/VCU to control dock loading emissions operated generally in accordance with 40 CFR 63 Subpart Y as described below is acceptable as BACT for VOC. **[OAC Condition (15)]**

Note that the initial notification under 40 CFR 63 Subpart Y (63.567(b)(3)) is excluded in favor of the reporting in Condition 1. Also, the annual leak detection monitoring (63.563(c)) is excluded in favor of the BACT requirements in this permit (i.e., more stringent leak threshold and more frequent monitoring). **[OAC Condition (16)]**

The permit requires that the marine loading meet the 40 CFR 63 Subpart Y requirements for facilities subject to both MACT and RACT (i.e., new facilities with emissions less than 10 tpy individual HAP and 25 tpy combined HAPs and throughput greater than 10 MMbbl gasoline or 200 MMbbl crude oil annually – this reflects the actual parameters at Tesoro's dock just as a new source rather than existing) with a few modifications. The calculation in the application assumed the MVEC meets a 99% control efficiency; therefore, the MVEC must meet a 99% control efficiency rather than 98% in 40 CFR 63 Subpart Y.

In addition, Tesoro must use the temperature monitoring option under 40 CFR 63 Subpart Y. The operating temperature is a minimum threshold (i.e., baseline temperature) as determined during the initial stack test measured on a 5-minute block average rather than a 3-hour block average as in 40 CFR 63 Subpart Y. This baseline temperature may be adjusted based on subsequent stack tests. The intent is to directly substitute this 5-minute block average for the 3-hour block average in 40 CFR 63 Subpart Y. A 5-minute block average is the same period as used in the stack testing both for the marine loading and truck loading rack and also the operating temperature requirements for Shell's truck loading rack vapor combustor. Note that the intent is to preheat the unit to the minimum temperature threshold on an instantaneous basis prior to the introduction of vapors (for example, preheat up to 1,800 F for a moment and then introduce the vapors). **[OAC Conditions (15), (20), (22)]**

Pursuant to 40 CFR 63 Subpart Y, materials with a vapor pressure less than 1.5 psia at standard temperature and pressure are exempt. Based on the proposal in the application, this OAC requires that loading of mixed xylenes product, crude, and all materials with vapor pressures above 1.5 psia (such as gasoline) must be controlled and includes monitoring and recordkeeping. This will result in controlling both direct emissions from loading of these materials but also the vapors from the empty vessels that are displaced during loading. **[OAC Conditions (15) & (17)]**

40 CFR 63 Subpart Y requires that each vessel's vapor collection equipment be compatible with the onshore equipment and that the vessel be connected to the control system. This OAC added monitoring to demonstrate compliance with this requirement. In addition, recordkeeping was added to the vapor-tightness and testing requirements under 40 CFR 63 Subpart Y. **[OAC Conditions (15), (18) & (19)]**

Under 40 CFR 63 Subpart Y, only initial testing is required to demonstrate compliance with the percent efficiency threshold. Because Tesoro relied upon this control to net out of PSD and because the design utilizes three units rather than just one (operation in series with potential rotation), to ensure that each of the three control devices is functioning properly controlling VOC (as a surrogate for TAPs) and the temperature setpoint is adequate, Tesoro must perform annual testing rotating through each of the VCU units. The annual testing shall be conducted at worst-case conditions meaning at least 90% capacity while loading gasoline during the last 20% of loading of a tank or compartment. Testing during the last 20% came from 40 CFR 63 Subpart Y, presumably to ensure that testing will be only of the emissions from the loading and not of whatever vapors the vessel arrived with. **[OAC Conditions (15), (20), & (21)]**

Sulfur Compounds (e.g., H_2S): The VCU will also act to reduce sulfur species in the marine loading vapors and convert them to SO_2. Efficiency of conversion is important;

however, SO_2 emissions should not be limited because the goal is to force the more toxic sulfur compounds into less hazardous SO_2. Therefore, NWCAA is not making a BACT determination for sulfur compounds for the marine loading.

<u>Vapor Combustion Unit (VCU)</u>

The Vapor Combustion Unit (VCU) acts as both a control device reducing emissions from marine loading and also as an emission unit burning natural gas as supplemental firing support gas and the enrichment carrier gas from the Dock Safety Unit (DSU). As such, the emissions generated by the VCU process unit must be reviewed under BACT (i.e., reviewing controls to add on to the VCU). The VCU (i.e., MVEC) as control device for marine loading is reviewed under a separate BACT section above.

NO_X: For NO_X controls on the proposed VCU, Tesoro's BACT analysis reviewed clean fuels with good design and operating practices. Good design practices include premix combustion technology to burn the VOC-laden gases and use of natural gas as the assist or enrichment gas. Minimizing NO_X emissions while maintaining an acceptable VOC destruction efficiency is considered part of good combustion practices.

SCR and SNCR were deemed not technically feasible for the intermittently operated VCU. LNB and ULNB were deemed not technically feasible because of the burners' inability to cope with the variable composition and concentration of the incoming gas.

Tesoro selected the most effective control (clean fuels with good design and operating practices), so no economic, environmental, or energy impact analysis was necessary. After consideration of the submitted BACT analysis, NWCAA has determined that Tesoro's proposed BACT is acceptable as BACT for NO_X. See the marine loading BACT analysis for VOC for requirements to ensure good operating practices and adequate VOC destruction efficiency.

CO: For CO controls on the proposed VCU, Tesoro's BACT analysis reviewed clean fuels with good design and operating practices. Good design practices include premix combustion technology to burn the VOC-laden gases and use of natural gas as the assist or enrichment gas. Minimizing CO emissions while maintaining an acceptable VOC destruction efficiency is considered part of good combustion practices.

Catalytic oxidation and thermal oxidation were deemed not technically feasible for the intermittently operated VCU.

Tesoro selected the most effective control (clean fuels with good design and operating practices), so no economic, environmental, or energy impact analysis was necessary. After consideration of the submitted BACT analysis, NWCAA has determined that Tesoro's proposed BACT is acceptable as BACT for CO. See the marine loading BACT analysis for VOC for requirements to ensure good operating practices and adequate VOC destruction efficiency.

VOC: Tesoro did not submit a BACT analysis for VOC from the VCU process unit. However, similar to the boiler BACT analysis, add-on controls will not be technically feasible. As such, good design methods and operating procedures and clean fuels and assist gas (i.e., natural gas) is considered BACT. See the marine loading BACT analysis for VOC for requirements to ensure good operating practices and adequate VOC destruction efficiency.

SO_2: For SO_2 controls on the proposed VCU, Tesoro's BACT analysis reviewed clean fuels (natural gas) for assist and enrichment gases only. Dry scrubbing, absorber (wet scrubbing), and dry sorbent injection were deemed technically infeasible because the outlet concentration of SO_2 is below the exhaust concentrations that can be achieved with add-on controls.

Tesoro selected the most effective control (clean fuels (natural gas) for assist and enrichment gases), so no economic, environmental, or energy impact analysis was necessary. After consideration of the submitted BACT analysis, NWCAA has determined that Tesoro's proposed BACT is acceptable as BACT for SO_2.

TAPs: Toxics from the VCU (i.e., natural gas combustion) can be divided into three categories: (1) toxics that are also criteria pollutants, (2) organic toxics, and (3) inorganic toxic (e.g., metals). T-BACT for toxics that are also criteria pollutants is addressed under the BACT analysis for the criteria pollutant itself. Organic toxics (e.g., formaldehyde) from fuel combustion are all considered VOC and are included in the VOC BACT analysis. Inorganic toxics (e.g., metals) emissions from natural gas combustion are emitted as particulate and are addressed in the PM BACT analysis under the PSD permit.

<u>Fugitive Components – BACT for VOC and T-BACT for Toxics</u>

Leaks from project fugitive components include VOC and TAPs; note that the TAPs are all VOCs so VOC BACT satisfies the T-BACT requirement. For VOC and TAP controls on the proposed fugitive components, Tesoro's BACT analysis reviewed leak detection and repair (LDAR) monitoring and optical gas imaging LDAR monitoring. Standard Method 21 LDAR monitoring is the most effective control method and is based on the standard leak rates (e.g., 500 ppm) under NSPS and MACT. The optical gas imaging is using a camera to qualitatively find leaks; additional Method 21 monitoring is required to determine the actual leak rate.

Tesoro proposes to utilize the top control method being a Standard Method 21 LDAR monitoring program in accordance with the applicable requirements for each affected process unit. After consideration of the submitted BACT analysis, NWCAA has determined that Tesoro's proposed BACT is acceptable as BACT for VOC.

Previous BACT analyses at Tesoro for fugitive components (OAC 744a, 827b, 896a, 901a) have dictated compliance with modified 40 CFR 63 Subpart H (with leak definitions of 1,000 ppm for vapor or light liquid valves and 2,000 ppm for light liquid pumps). In addition, however, NWCAA has also determined BACT (OAC 989a, 952b, 1205) to be compliance with 40 CFR 60 Subpart GGGa (with leak definitions of 500 ppm for vapor or light liquid valves and 2,000 ppm for light liquid pumps). Note that 40 CFR 60 Subpart GGGa references 40 CFR 60 Subpart VVa for the bulk of the requirements.

The ARU and ARU tankage process unit are subject to LDAR requirements under 40 CFR 60 Subpart VVa and 40 CFR 63 Subpart H. Equipment leaks that are subject to the provisions of 40 CFR 63 Subpart H are required to comply only with the provisions of that subpart.

Therefore, Tesoro will satisfy the requirement of 40 CFR 60 Subpart VVa for equipment leaks in the ARU and associated new storage tanks by complying with 40 CFR 63 Subpart H. As such, BACT for the ARU and ARU Tankage process unit is compliance with a program that meets 40 CFR 63 Subpart H. **[OAC Condition (24)]**

Because the CR/NHT is currently subject to 40 CFR 60 Subpart GGG (enhanced LDAR), even though it was modified under NSPS by this project, it cannot move to 40 CFR 60 Subpart GGGa applicability. However, similar to previous BACT determinations, BACT for CR/NHT process unit is compliance with a program that meets 40 CFR 60 Subpart GGGa. **[OAC Condition (23)]** In addition, Tesoro stated that they voluntarily accept 40 CFR 60 Subpart GGGa applicability for the CR/NHT process unit.

The MVEC is a new unit under 40 CFR 60 Subpart GGGa so is directly subject to 40 CFR 60 Subpart GGGa. Similar to previous BACT determinations, BACT is compliance with a program that meets 40 CFR 60 Subpart GGGa. **[OAC Condition (23)]**

The new components in the Isom unit do not qualify as construction or modification under NSPS; therefore, the Isom unit does not trigger NSPS. Tesoro intends to roll the Isom components into the existing Benzene Saturation Unit (BSU) for the purposes of LDAR. As such, consistent with NWCAA policy, BACT for the new components in the Isom unit is compliance with the requirements that apply to the BSU (i.e., 40 CFR 60 Subpart GGGa). **[OAC Condition (23)]**

<u>Storage Tanks (Normal Operation) – BACT for VOC and T-BACT for Toxics</u>

The project consists of the construction of three new storage tanks: two storing mixed xylenes product – 384,000 bbl (Tank 286) and 193,000 bbl (Tank 287) - and one storing medium reformate – 384,000 bbl (Tank 285). Tesoro originally proposed BACT for all three storage tanks to be internal floating roof tanks with primary and secondary seals. Tesoro revised the application such that the two storage tanks storing mixed xylenes product (Tanks 286 and 287) are equipped with internal floating roofs with dual seals but the control on Tank 285 was changed to an external floating roof with a mechanical shoe primary seal and rim-mounted secondary seal. Note that VOC emissions were estimated based on storage of the highest vapor pressure material proposed (i.e., gasoline).

Generally, if no additional analysis is provided, NWCAA considers BACT for storage tanks to be the best generally available control, which is an internal floating roof with dual seals. However, Tesoro provided an analysis demonstrating that it is not cost effective to install an IFR rather than an EFR for VOC control on Tank 285 (i.e., $83,000/ton VOC removed). In addition, considering the worst-case toxic from any of the possible stored material (i.e., n-hexane), installing an IFR rather than an EFR is not cost effective for T-BACT either (i.e., $740,000/ton n-hexane removed).

In addition, according to Tesoro, the mixed xylenes product cannot tolerate water contamination, therefore, the mixed xylenes product storage tanks must have internal floating roofs. However, the medium reformate tank can tolerate some water contamination so an external floating roof is adequate. In addition, internal floating roof tank inspections pose some safety issues that could be avoided by utilizing an external floating roof tank that will still meet the operational needs.

Therefore, utilizing internal floating roofs with dual seals for the mixed xylenes product tanks (Tanks 286 and 287) and an external floating roof with a mechanical shoe primary seal and rim-mounted secondary seal for the medium reformate tank (Tank 285) are accepted as BACT for this permitting action. This is consistent with previous BACT determinations by NWCAA including the tanks constructed at the Bayview Products Terminal in Skagit County (OAC 618) and the tanks at the Tesoro truck rack (OAC 1171).

Tesoro is also proposing a process tank storing perchloroethylene in the Isom Unit. The proposed tank operating parameters are keeping it pressurized and the pressure relief valves are routed to the flare. The proposed operating parameters are acceptable as BACT for this storage tank.

Storage Tanks (Taking Tank Out of Service) – BACT for VOC and T-BACT for Toxics

Tesoro assumed each tank will be taken out of service and degassed once every 10 years. However, each event can have significant emissions. As such, BACT was reviewed for these emissions. Emissions from taking a tank out of service includes emissions from standing empty but not clean, refilling, and degassing. Note that the TAPs are all VOCs so VOC BACT satisfies the T-BACT requirement.

For operational flexibility, Tesoro reviewed storing mixed xylenes product, medium reformate, and gasoline in any of the three tanks and estimated taking-the-tank-out-of-service emissions from each. Understandably, out of service emissions from the lower vapor pressure materials are relatively low while emissions from gasoline are higher.

Tesoro proposed BACT could either be storage of low vapor pressure material (e.g., mixed xylenes product, medium reformate) or use of a portable thermal oxidizer. The cost estimates were between $18,000-$30,000 to control a single event at Tanks 285 and 286, and $15,000-$24,000 to control a single event at Tank 287. The vendors expect to control 99% of VOC emissions during degassing.

Because the emissions from the low vapor pressure materials were relatively low, it was not cost effective to utilize the portable thermal oxidizer while degassing tanks that had stored mixed xylenes product or medium reformate. However, it was cost effective to use the portable thermal oxidizer when taking any of the tanks out of service after storing gasoline. As such, BACT is determined to be use of a portable vapor combustor (or equivalent control device that meets 99% VOC control or better) to control the taking-the-tank-out-of-service emissions if the tank is in gasoline service prior to degassing. **[OAC Condition (25)]**

ARU Distillation Unit Process Vents

Tesoro plans to extract the mixed xylenes product using the ARU distillation unit. The process vents will be routed to either the firebox of the new boiler, the refinery fuel gas system via the flare gas recovery system, or the flare system for control. Depending upon where the process vent streams are treated, the ARU distillation unit is subject to either 40 CFR 60 Subpart NNN or 40 CFR 63 Subpart G and there are overlap provisions between these two rules. According to the application, if the vent streams are discharged to the fuel gas system, Tesoro intends to comply with 40 CFR 60 Subpart NNN by submitting an Alternative Monitoring Plan (AMP). Direct applicability of the federal rules will adequately address control of these streams so is considered acceptable as BACT for the ARU distillation unit.

N. Basis for OAC conditions

Condition (1): This startup notice informs the agency when each of the individual process units started up and is subject to the OAC requirements. A notice was required for each process unit because the process units in the project can operate relatively independently from each other.

The basis for each of the other OAC conditions is discussed throughout the worksheet and the specific condition is noted in bold.

O. Timeline and Review

Timeline	Date
NOC Received	8/10/15
NOC Incompleteness Determined	9/4/15
NOC Completeness Determined	
Final Decision Due (complete + 60 days)	
Final OAC issued	

Review		Date
NWCAA Engineering	Agata McIntyre	8/24/16
NWCAA Compliance	--	
Source	Rebecca Spurling	1/12/17