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Notice of Construction Worksheet

NOC No. **1200**	Source: **BP West Coast Products LLC** **Cherry Point Refinery** **4519 Grandview** **Blaine, WA 98230**
Permit Engineer: **Agata McIntyre**	
NOC Received: **9/30/14**	NOC Contact: **Scott Inloes** NWCAA No.: **011-V-W**

A. Project Description

Summary: NSR triggered

Replace two existing coker heaters used for thermal cracking with two new, larger, coker heaters. Each new coker heater is rated at 303 MMBtu/hr (HHV) and will be fired on coker off gas.

Install lean oil absorption system with compressor to recover additional light components from coker off gas. These recovered hydrocarbons will be sent to downstream units to recover light components.

Install new bypasses for heat exchangers in the crude unit preheat system to accommodate online cleaning capability.

Summary: NSR not triggered

Change the coker fractionator overhead accumulator to accommodate additional sour water generation associated with online spalling capability.

Replace the boiler feed water circulation pump to recover heat from the coker unit.

Note that emission increases from numerous additional existing units are discussed in BP's application, which was prepared for both the PSD and this OAC. These additional units are not "modified" as per the definition of a modification in NWCAA 200. Therefore, while their emissions are accounted for in the PSD, they are not part of this OAC review.

Details

The 2 existing coker heaters were installed in the 1970s and are nearing the end of their useful life. The existing heaters are smaller (190 MMBtu/hr) than the units that will replace them (303 MMBtu/hr). In addition, the existing units have to be brought down for decoking up to 3 times per year. The new heaters will have online cleaning capabilities (online spalling) which will reduce the frequency of offline cleaning. The increase on time availability will increase the coker utilization by approximately 22% and crude rate by approximately

1.6%. NSR applies to these new coker heaters which will be added. The new heaters will be a balanced draft design with overall heat efficiency (absorbed duty divided by fired duty) near 90 percent. The heater efficiency will be obtained through use of a heat recovery system to preheat combustion air and generate 25,000 pounds of steam per hour from each heater. Steam generated by the heat recovery system will be added to the refinery 140 pound steam header.

BP will change the main fractionator overhead accumulator which separates water from hydrocarbon vapors at the coker to accommodate additional sour water generated during spalling. The overhead accumulator separates overhead vapor, distillate, and sour water from the main fractionator tower in the coker unit. Online coker heater cleaning will result in additional water vapor directed to the overhead accumulator, which may require BP to increase the size of the overhead accumulator. (No direct emission increases are expected from this change).

BP will replace the feed water circulation pump to recover heat from the coker unit. (No emission increase expected from this unit as it handles water, not product.)

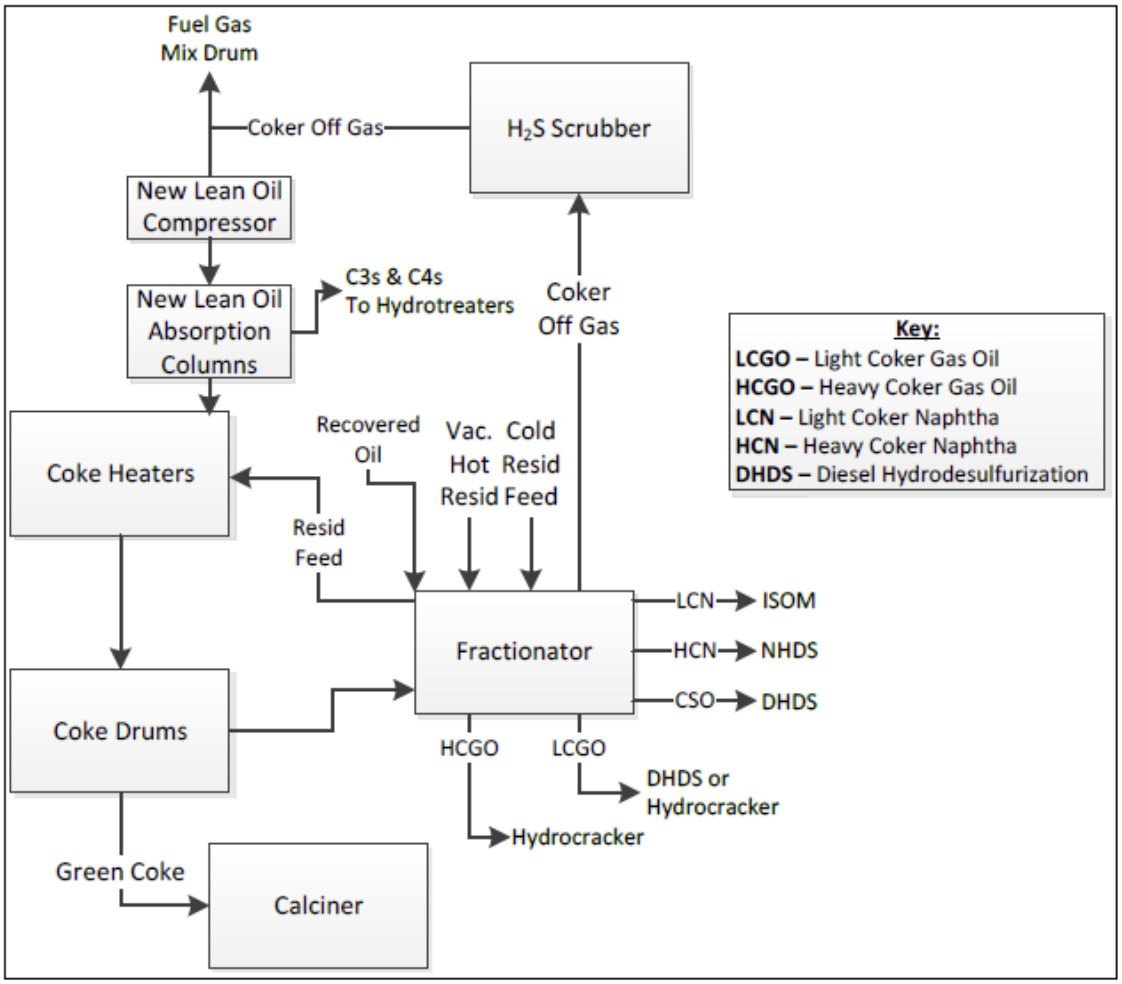
BP will install a new lean oil absorption system in the coker offgas system to recover propane and butane vapors (process appox. 44% of coker off gas generated). These intermediates will be routed to downstream units to recover light components, then sold as product. (Previous to this project, this propane/butane was burned as fuel gas.) Installation of the lean oil adsorption system will decrease emission of sulfur species (by about 39% annual avg.) because sulfur present in the stream will be removed prior to th propane/butane cut being taken. The coker off-gas that doesn't go to the light ends unit will be burned at the new coker heaters. This new fuel gas stream will be subject to the requirement of 40 CFR 60 Subpart NNN representing an additional emissions discharge.

BP will install new heat exchanger bypasses to reduce fouling at the crude unit, which in turn will increase the length of time the crude unit can operate without significant maintenance. The addition of new heat exchanger bypasses is expected to increase annual crude utilization by 2.4 percent (5.1 kbpd). The crude unit itself will not be modified.

For this OAC, the emission increase being evaluated is TAPs from the two new coker heaters, the increase from the aggregate of all equipment components at the modified delayed coker process unit and crude process unit, and the gas discharge stream to fuel gas from the new delayed coker overhead accumulator.

The overall effect of all of these projects will be an increase in long-term capacity (due to reduced downtime) and debottlenecking of the refinery. The resulting increase in emissions from the new and modified equipment along with the increased annual utilization of the refinery will trigger PSD for all criteria pollutants (see Section J). As such, minor source NSR is not required for these pollutants, and is not discussed in the OAC or this worksheet. Minor source NSR is, however, required for Washington State Toxic Air Pollutants (TAPs) and EPA listed Hazardous Air Pollutants (HAPs) as these pollutants are not included in the PSD review.

Note that BP submitted a revised application in March 2016. The analysis in this worksheet is based on the revised application, and not on the initial application submitted in 2014.



B. New Source Review (NSR) Fees

NWCAA NSR fees have been assessed in accordance with the fee schedule adopted November 14, 2013 and effective January 1, 2014. The NSR fees assessed and amount paid are listed in the NSR Fee Worksheet posted on the OAC Whiteboard for this project.

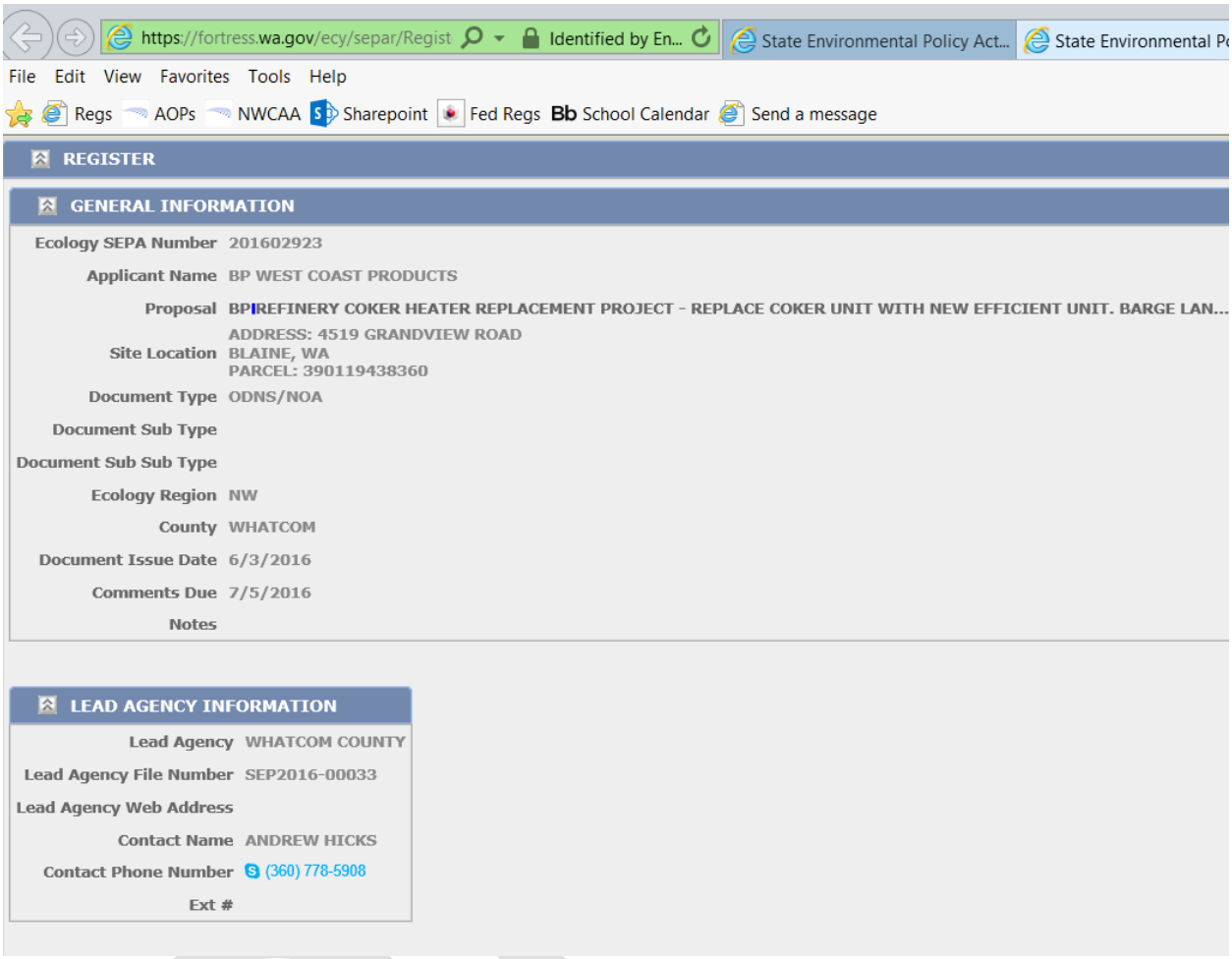
C. Public Notice

In accordance with NWCAA Section 305.1, an internet notice that the NWCAA received this NOC application was posted on the NWCAA website (http://www.nwcleanair.org/publicNotices/publicNotices.htm#legalNotices) for a minimum of 15 consecutive days ending October 16, 2014.

In accordance with NWCAA Section 305.2, formal public involvement and notification (i.e., comment period and/or hearing) **IS** required for this project because a PSD permit is required for the project, the NWCAA considers the project to have substanitial public interest and public notice is required under 305(A)(10), PSD thresholds. Since the PSD permit is written by WA Ecology, NWCAA will coordinate with Ecology to post the draft OAC permit (for toxics) for public comment at the same time.

D. SEPA Review

Whatcom County is the SEPA lead agency for this project.



No comments were received, and the DNS went final. See OAC folder for copy of the County's determination.

GHG Disclosure and Mitigation

Under "Guidance for Ecology, Including Greenhouse Gas Emissions in SEPA Reviews", projects with GHG emissions over 25,000 metric tons per year are expected to mitigate, if those emissions are not otherwise regulated. For this project GHG emissions are regulated under the PSD. Therefore, no additional mitigation is needed under SEPA.

(Guidance doc saved on NWCAA's Sharepoint site, under NSR permitting).

E. Permit History

The 2 coker heaters that are being replaced were installed in the 1970's as part of the original refinery. The following permits have been issued for the heaters:

- OAC 211c – This OAC limited PM emissions from the aggregate of the original equipment at the refinery to 60 tons per calendar month and 2,354 pounds per hour.

The OAC listed the North and South Coker Charge Heaters by name. These heaters will be removed, and the limits in OAC 211c will not apply to the new coker heaters. The PSD Ecology will issue for this project will provide alternate limits. Since OAC 211c includes numerous other pieces of equipment which will not be removed, this OAC will not be cancelled/superseded.

- OAC 689b – This OAC includes permit conditions for several units besides the old coker heaters. The permit limits for the coker heaters will no longer apply once the old heaters are decommissioned. The limits for other equipment will continue to apply. Since OAC 689b includes numerous other pieces of equipment which will not be removed, this OAC will not be cancelled/superseded.
- OAC 1054 - This OAC includes permit conditions for several units besides the old coker heaters. The permit limits for the coker heaters will no longer apply once the old heaters are decommissioned. The limits for other equipment will continue to apply. Since OAC 1054 includes numerous other pieces of equipment which will not be removed, this OAC will not be cancelled/superseded.
- BART Order 7836 Rev. 1 – The BART order was issued by the Washington Department of Ecology for a number of units at the Cherry Point Refinery. Among these were the old coker heaters. The BART permit limits for the coker heaters will no longer apply once the old heaters are decommissioned. The limits for other equipment will continue to apply. Since the BART Order includes numerous other pieces of equipment which will not be removed, it is not appropriate to ask Ecology to cancelled/superseded this order. Condition 9 of the BART order requires that BP certify in writing that the old coker heaters are decommissioned in order the formalize the exemption from the BART requirments for the coker heaters.

F. Air Pollutant Emissions as a Basis for NSR

Consistent with NWCAA NSR regulations (NWCAA 300.1-300.300.5) and NWCAA's Feb. 11, 2015 NSR Applicability Determination Considerations memo, NSR applies to the new and modified units as described in Section A. Debottlenecked units which are not modified are excluded. The new heaters, lean oil absorption system, and components associated with the crude unit heat exchanger bypasses trigger NSR for one or more pollutants for one or more of the following reasons:

- New equipment with emissions above de-minimis levels in NWCAA 300.5
- Modified equipment with an increase above de-minimis levels in NWCAA 300.5
- Modified equipment which triggers NSPS or NESHAP

NWCAA's Feb. 11, 2015 NSR Applicability Determination Considerations memo discusses triggering NSR on a pollutant-by-pollutant basis for each new or modified unit. In most cases, this would require a detailed analysis for each new/modified unit and each pollutant to determine whether it should be evaluated further in this OAC. However, in this case, this analysis is unnecessary because BP is obtaining a PSD permit for NOx, CO, SO2, PM, PM10, PM2.5, VOC, H2SO4, and CO2e from the emission units described in Section A. Consistent with WAC 173-400, either minor NSR (this OAC) or PSD apply on a pollutant-by-pollutant basis. Both cannot apply at the same time, for the same pollutant. Since BP is obtaining a

PSD for all criteria pollutants for all of the units discussed in Section A, no further analysis is needed for criteria pollutants.

TAPs and HAPs are not addressed in the PSD. NSR review for TAPs and HAPs is addressed in Section H.

G. Criteria Air Pollutant Emissions and Impacts

Since the project is major and going through PSD review for NOx, CO, SO_2, PM, PM_{10}, $PM_{2.5}$, VOC, H_2SO_4, and CO_2e, a review under this OAC is not required for these pollutants.

Table 1: PSD Netting Analysis Summary

	Coker Heater Project Only (TPY)	Net emissions, after taking account for projects in contemporaneous window (TPY)	Threshold above which net emissions are subject to PSD (TPY)	Subject to PSD?
NO_x	412	266	40	YES
CO	195	216	100	YES
SO_2	296	221	40	YES
PM (filterable)	41	41	25	YES
PM_{10} (total)	49	43	15	YES
$PM_{2.5}$ (total)	45	62	10	YES
VOC	48	79	40	YES
H_2SO_4	45	39	7	YES
CO_2e	683,367	1,097,792	75,000	YES

H. Toxic and Hazardous Air Pollutant Emissions and Impacts

This section discusses emissions of WA state toxic air pollutants (TAPs) as well as EPA hazardous air pollutants (HAPs). All of the HAPs emitted from this project are also TAPs. The analysis presents emissions of TAPs that are emitted at levels above de-minimis.

The methodology for calculating TAP and HAP emissions as part of minor NSR (this OAC) is slightly different than for PSD pollutants. The application must still evaluate the potential emissions of pollutants from new and modified units and new components. However, debottlenecking existing units doesn't meet the definition of a modification under this OAC, so emission increases from debottlenecked units are excluded from the TAP analysis. This distinction is important because BP submitted a single application for both the PSD and this OAC, and the calculations for PSD purposes do include emissions from debottlenecked units. This can cause confusion.

Table 3-6 of the application presents the TAP emission increases from the 2 new heaters and components. The lean oil absorption system and compressor, as well as the new bypasses for heat exchangers in the crude unit preheater, contribute fugitive TAPs from potential component leaks. These emissions are included in Table 3-4 of the application.

The emission calculations assume maximum burner capacity (303 MMBtu/hr per heater), 24-hr per day, and 8760 hr/yr operation. Potential emissions from fugitives (3,837 new

components) are also accounted. BACT has been applied, so the emissions presented represent post-BACT emission levels.

In accordance with WAC 173-460-080(3), the applicant may offset emissions on a pollutant-by-pollutant basis based on the emission decreases that will occur due to the decommissioning of old emission units, such as the old coker heaters, and old fugitive components (2,558 components). BP's application includes this analysis, with results presented in Table 3-4, and Appendix C and summarized below.

In accordance with WAC 173-460-080, emission increases above the small quantity emission rate thresholds (SQERs) must be modeled using dispersion modeling and compared to the Ambient Source Impact Levels (ASILs). If all impacts are below the ASILs, no further review is needed for TAPs. Ramboll Environ completed dispersion modeling for TAPs and well as PSD pollutants using AERMOD. AERMOD was run using five years of meteorological data (2009 – 2013) from the meteorological tower operated by BP, surface observations from National Weather Service station in Bellingham, and upper air data from the NWS site Quillayute, WA. See Section 5 of the application for additional details about model set-up. All modeled pollutants were below their corresponding ASILs.

Table 2: Toxic Air Pollutant Emission Increases compared to SQERs and ASILs (after applying BACT and taking credit for old heaters & components)

TAP	EF (lb/ MMBtu)	Emissions (lb/avg pd)	SQER (lb/avg. pd)	SQER Avg. Pd.	Over SQER & Modeling Needed?	ASIL (ug/m^3)	Modeled Emissions (ug/m^3)	Modeled Emissions Below ASIL?
1,3-Butadiene	--	0.1	1.13	Yr	No	--	--	--
Acetaldehyde [e]	1.2E-05	38.4	71	Yr	No	--	--	--
Acrolein [e]	1.7E-05	0.09	0.00789	24-hr	Yes	0.06	0.00028	Yes
Arsenic	2.0E-07	0.6	0.0581	Yr	Yes	0.000303	9.42E-7	Yes
Benzene	2.1E-06	6.8	6.62	Yr	Yes	0.0345	1.01E-5	Yes
Beryllium [e]	1.3E-07	0.42	0.08	Yr	Yes	0.000417	6.23E-7	Yes
Cadmium	1.1E-06	3.5	0.0457	Yr	Yes	0.000238	5.19E-6	Yes

CO [c]	--	149.7	50.4	1-hr	Yes	23,000	44 (normal) ; 164.7 (su/sd/sb)	Yes
Chromium VI [d]	5.5E-08	0.18	0.00128	Yr	Yes	6.67E-6	2.64E-7	Yes
Cobalt	8.2E-08	4.5E-4	0.013	24-hr	No	--	--	--
Copper	8.3E-07	1.9E-4	0.219	1-hr	No	--	--	--
Cumene	--	6.7E-4	52.6	24-hr	No	--	--	--
Cyclohexane	--	0.0019	789	24-hr	No	--	--	--
Dichlorobenzene [e]	1.2E-06	3.8	17.4	Yr	No	--	--	--
Diethanolamine	--	0.0005	0.394	24-hr	No	--	--	--
Ethylbenzene [e]	1.6E-05	51.7	76.8	Yr	No	--	--	--
Formaldehyde	7.4E-05	235.5	32	Yr	Yes	0.167	0.00035	Yes
Hexane	1.8E-03	9.6	92	24-hr	No	--	--	--
H2S [c]	--	0.3	0.263	24-hr	Yes	2	0.014	Yes
H2SO4 [c]	0.0053 / 0.0046	19.6	0.131	24-hr	Yes	1	0.057	Yes
Lead	4.9E-07	1.6	16	Yr	No	--	--	--
Manganese	3.7E-07	0.002	0.00526	24-hr	No	--	--	--
Mercury	2.5E-07	1.4E-3	0.0118	24-hr	No	--	--	--
Naphthalene	6.0E-07	3.9	5.64	Yr	No	--	--	--
Nickel	2.1E-06	6.6	0.806	Yr	Yes	0.0042	1.0E-5	Yes
NO_2 [c]	6.0E-02	6.0	1.03	1-hr	Yes	470	11	Yes
Phenol [e]	4.0E-06	0.022	26.3	24-hr	No	--	--	--
Propylene [e]	1.5E-04	0.8	394	24-hr	No	--	--	--
Selenium [e]	8.8E-07	4.8E-3	2.63	24-hr	No	--	--	--
SO2 [c]	--	10.1	1.45	1-hr	Yes	660	12.8	Yes
Toluene	3.3E-06	0.02	657	24-hr	No	--	--	--
Vanadium	2.3E-06	0.012	0.0263	24-hr	No	--	--	--
Xylenes	--	0.005	29	24-hr	No	--	--	--
Benz(a)-anthracene [e]	2.2E-08	0.070	1.74	Yr	No	--	--	--
Benzo(a)-pyrene [e]	5.7E-08	0.183	0.174	Yr	Yes	0.000909	2.74E-7	Yes
Benzo(b)fluor-anthene [e]	2.7E-08	0.086	1.74	Yr	No	--	--	--
Benzo(k)fluor-anthene [e]	1.7E-08	0.054	1.74	Yr	No	--	--	--

CO [c]	--	149.7	50.4	1-hr	Yes	23,000	44 (normal) ; 164.7 (su/sd/sb)	Yes
Chrysene [e]	1.6E-09	0.005	17.4	Yr	No	--	--	--
Dibenzo(a,h)anthrancene	1.2E-09	0.004	0.16	Yr	No	--	--	--
Indeno(1,2,3-cd)pyrene [e]	7.1E-08	0.227	1.74	Yr	No	--	--	--
3-Methyl-cholanthrene	1.8E-09	0.006	0.0305	Yr	No	--	--	--
7,12-Dimethylbenz[a]anthracene	1.6E-08	0.05	0.00271	Yr	Yes	0.0000141	7.54E-8	Yes

Notes:
a TAP emission factors based on AP-42, Section 1.4 (Natural Gas Combustion) corrected to lb/MMBtu using natural gas heat content (1,020 btu/cf).
b Potential hourly emission rates (lb/hr) based on maximum burner capacity (303 MMBtu/hr per heater) and two coker heaters, daily emission rates (lb/day) based on 24 hours operation per day, and annual emissions based on continuous operation (8,760 hours/year).
c NO2, CO, SO2, H2S, and H2SO4 emissions discussed in Table 3-5. CO short-term emissions based on startup/shutdown/standby operations. NO_2 emissions are assumed to be 100% of NOx.
d EPA's 2002 National-Scale Air Toxics Assessment (NATA) released June 2009 includes a chromium speciation profile for gas-fired process heaters, which indicates 4 percent of total chromium is chromium VI and 96 percent is chromium III. RE assumed 4 percent of total chromium emissions were emitted as chromium VI.
e TAP emission factors from Hansell and England, 1998 (EPA's Emissions Estimation Protocol for Petroleum Refineries, August 2014).

Table 3 below summarizes impacts for those pollutants that were found to be above the SQERs, and hence modeled.

Table 3: Toxic Air Pollutant Emission Increases as % of ASIL (after applying BACT and taking credit for old heaters & components)

Pollutant	Modeled Conc as % of ASIL	Expected Emissions from App. (lb/avg. pd)	Emissions at ASIL (lb/avg. pd)	Avg Pd	Comment
Acrolein	0.5%	0.09	19.3	24-hr	PSD limits total VOC to 0.0054 lb/MMBtu (1.6 lb/MMBtu)
Arsenic	0.3%	0.6	193	Yr	PSD limits total PM10 to 0.010 lb/MMBtu
Benzene	0.03%	6.8	23228	Yr	PSD limits total VOC to 0.0054 lb/MMBtu (1.6 lb/MMBtu)
Beryllium	0.1%	0.42	281	Yr	PSD limits total PM10 to 0.010 lb/MMBtu
Cadmium	2.2%	3.5	161	Yr	PSD limits total PM10 to 0.010 lb/MMBtu
CO	0.7%	149.7	20905 (based on su/sd conc.)	1-hr	PSD limit is more restrictive than emissions that would trigger ASIL
Chromium VI	4.0%	0.18	4.5	Yr	PSD limits total PM10 to 0.010 lb/MMBtu
Formaldehyde	0.2%	235.5	112367	Yr	PSD limits total VOC to 0.0054 lb/MMBtu (1.6 lb/MMBtu)
H2S	0.7%	0.3	43	24-hr	Based on fuel gas composition
H2SO4	2.9%	19.6	688	24-hr	PSD limit is more restrictive than emissions that would trigger ASIL
Nickel	0.2%	6.6	2772	Yr	PSD limits total PM10 to 0.010 lb/MMBtu

NOx	2.3%	6	256	1-hr	NSPS Ja & PSD limit is more restrictive than emissions that would trigger ASIL
SO2	1.9%	10.1	521	1-hr	PSD limit is more restrictive than emissions that would trigger ASIL
Benzo(a)-pyrene	0.03%	0.183	607	Yr	PSD limits total PM10 to 0.010 lb/MMBtu
7,12-Dimethylbenz[a] anthracene	0.5%	0.05	9.4	Yr	PSD limits total PM10 to 0.010 lb/MMBtu

NWCAA could require additional source testing to ensure emissions of toxics from this project do not exceed ASILs. This is not required because:

- For CO, H2SO4, NOx, and SO2: PSD limits (and NSPS Ja for NOx) are lower (more stringent) than the level of emissions which would cause an exceedance of the ASIL. The PSD will have monitoring for each of these pollutants (some continuous, and some stack-testing) to prove emissions are below permitted limits. For CO, H2SO4, NOx, and SO2, the monitoring listed in the PSD is sufficient, and additional monitoring in this OAC would be duplicative.

- For acrolein, benzene, and formaldehyde: The PSD limits total VOC to 0.054 lb/MMBtu (1.6 lb/hr), and will include monitoring to ensure emissions of VOC stay below this limit. Acrolein, benzene, and formaldehyde are VOCs and will comprise a portion of the total VOC emissions. BP's dispersion modeling showed that the potential emissions of each of these pollutants are less than 0.5% of their corresponding ASILs. For benzene and formaldehyde, the PSD total VOC limit is lower than the level of emissions at which each separate pollutant would need to be emitted to exceed the ASIL. So, even if each pollutant was 100% of the total VOC, and VOC was emitted at the PSD limit of 0.054 lb/MMBtu (1.6 lb/hr), the ASIL would not be exceeded. For acrolein, emissions of acrolein would need to be 50% of the 1.6 lb/hr total VOC limit before the ASIL was exceeded. This is not reasonable and not expected. NWCAA determines that a VOC limit of 0.054 lb/MMBtu (1.6 lb/hr) is sufficiently protective for acrolein, benzene, and formaldehyde, and additional monitoring (beyond what is in the PSD) is not needed.

- For arsenic, beryllium, cadmium, chromium VI, nickel, benzo(a)-pyrene and 2,12-dimethylbenz(a)antracene: For each of these pollutants except cadmium, the modeled emission rate was less than 1% of the ASIL. For cadmium, the modeled emission rate was 2.2% of the ASIL. In all cases, there is a large margin of compliance. In addition, the PSD limits total PM10 to 0.010 lb/MMBtu (3.0 lb/hr), and will include monitoring to ensure particulate emissions stay below 0.010 lb/MMBtu (3.0 lb/hr). NWCAA determines that no further monitoring is necessary because PM10 testing will be done under the PSD and because of the large margin of compliance with the ASILs for arsenic, beryllium, cadmium, chromium VI, nickel, benzo(a)-pyrene and 2,12-dimethylbenz(a)antracene.

- For H2S: The modeled emission rate was 0.7% of the H2S ASIL. This is a large margin of compliance. The validity of the conclusion that H2S emissions will be below the ASIL can be tested using a different analysis than in the OAC application: BP tests its fuel drum for H2S content, and submits these the results to NWCAA. Historical data shows that H2S content runs at 5 ppm or less. This is the H2S content in the gas prior to combustion, while the H2S we're concerned with in this OAC is the H2S that may come out of the stack after combustion. During combustion, a large amount of the H2S (90%+) will be converted to SO2. For purposes of calculation, we'll conservatively assume incoming H2S content in the coker off-gas at 10 ppm. 2 heaters, running at 303 MMBtu/hr, will require 9,901 cf/min of fuel gas (using the Btu/cf gas content for natural gas from AP-42, 1020 Btu/cf). Given a 10 ppm H2S concentration, the mass of H2S in the fuel gas is 0.53 lb/hr. This, in itself, is below the ASIL even before taking into account H2S conversion to SO2 during combustion. Given the margin of compliance and the expected H2S content in the gas to the heaters, no further monitoring (other than the H2S fuel gas monitoring in 40 CFR 60 Subpart Ja) is needed.

I. Greennhouse Gas Emissions

This project is going through PSD for CO2e. Therefore, additional review of greenhouse gas emissions is not required under the OAC.

J. Prevention of Significant Deterioration (PSD) Program

Emission increases associated with this project were reviewed for Prevention of Significant Deterioration (PSD) Program applicability. As discussed in the Statement of Basis for the Air Operating Permit, the BP Cherry Point facility is an existing PSD major source. This project is over the PSD significance thresholds for NO_x, CO, SO_2, PM, PM_{10}, and $PM_{2.5}$, VOC, H_2SO_4, and CO_2e.

BP applied for a PSD to the Washington Department of Ecology for the above-mentioned pollutants. A copy of the application is stored on the NWCAA server, see *J:\AOP Sources Working Files\BP\NSR\OAC 1200 - BP Coke Heater Replacement Project*. Section G of this OAC worksheet includes a summary of NO_x, CO, SO_2, PM, PM_{10}, and $PM_{2.5}$, VOC, H_2SO_4, and CO_2e emission increases and how/why they trigger PSD.

See Section G of this worksheet for a summary of the netting analysis presented in the application.

K. Registration Program

This project will not change that facility's registration category with the NWCAA. The facility is currently, and will continue to be, a major source with an AOP.

L. Air Operating Permit (AOP) Program

Because of its facility-wide emissions, this facility has a Title V AOP. In accordance with WAC 173-401-730, the AOP will not need to be re-opened to incorporate this OAC because

the AOP has a remaining permit term of less than 3 years. Therefore, this OAC will be incorporated into the AOP during the next AOP renewal or reopening.

CAM: The heaters will not be equipped with any add-on control technologies, and the low NOx burners do not qualify as "controls" under CAM. Therefore, CAM requirements will not need to be crafted when the heaters go into the AOP.

M. Applicable Regulations

The most relevant sections of NWCAA, state and federal regulations as they relate to this project are:

1. Northwest Clean Air Agency

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

Visual Emissions

Section 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 at emission, or within a reasonable distance of the point of emission, exceeds 20% opacity.

PM is evaluated under the PSD. The requirements to meet this standard will be part of the PSD.

Particulate Matter ($PM_{2.5}$)

Section 455.11 - From all gaseous and distillate fuel burning equipment, emissions shall not exceed 0.05 grain/dscf (0.11 g/m3) corrected to 7% oxygen.

PM is evaluated under the PSD. The requirements to meet this standard will be part of the PSD.

Sulfur Dioxide

Section 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.

> The Cherry Point Refinery is subject to Section 460 and therefore this limit of the sulfur content of gaseous fuels does not apply.

Section 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).

> SO2 is evaluated under the PSD. However, this limit applies to all emissions units in the refinery as an aggregate heat input. The evaluation of facility-wide emissions is outside of the scope of the PSD, so an analysis is provided here.

The refinery reports SO_2 emissions in terms of lb/MMBtu in each monthly report. These reports indicate that the refinery is in compliance with this requirement. The additional new and modified emission units discussed in Section A are not expected to increase, and may decrease, the refinery's overall SO_2 lb/MMBtu value. The installation of the lean oil system will remove sulfur that is currently going to the fuel gas system. This may decrease the refinery's overall SO2 lb/MMBtu value.

Section 462 – Emissions of SO2 limited 1,000 ppmv, at 7% oxygen, 60 minute average. SO2 is evaluated under the PSD. The PSD limits will be sufficiently low such that this limit will not be exceeded when complying with the PSD.

Hazardous Air Pollutants

Section 428.3 - Formaldehyde in the ambient air shall not exceed five hundredths of a part per million by volume (0.05 ppmv) 24-hour average concentration.

Modeling completed under WAC 173-460 for ambient toxic air pollutant impacts demonstrates compliance with this ambient standard. See Section H of this Worksheet for details.

2. State

Chapter 173-400 WAC contains requirements similar to those listed above. Therefore, no additional review is needed for state requirements, other toxics (Chapter 173-460 WAC). Toxics are discussed in Section H of this worksheet.

3. Federal

40 CFR Part 60 New Source Performance Standards (NSPS)

New Source Performance Standards (NSPS) are standards that apply to specific categories of stationary sources that are constructed, modified, or reconstructed after the standard was proposed. The NSPS standards are published in Title 40, Part 60 of the Code of Federal Regulations (CFR). NSPS standards represent a minimum level of control that is required for new, modified or reconstructed emission units. There are a number of NSPS standards that apply to emissions units associated with the Coker Heater project. A summary of each potentially applicable NSPS is presented in Table 4, followed by a more detailed description of applicability and compliance issues for each standard.

Table 4: Summary of NSPS Applicability for Coker Heater Project

NSPS Subpart	Equipment Components: Crude Unit & Delayed Coker	Coker Overhead Accumulator	New Coker Heaters	Low Pressure Flare	Lean Oil Adsorption System
Db (Steam Generating Units)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
J (Petroleum Refineries)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Ja (Petroleum Refineries)	Not Applicable	Not Applicable	Yes	Yes, but flare is already subject	Not Applicable
GGG (VOC Leaks - Petroleum Refineries)	Yes, existing components are already subject	Not Applicable	Not Applicable	Not Applicable	Not Applicable
GGGa (VOC Leaks - Petroleum Refineries)	Not Applicable*	Not Applicable	Not applicable	Not applicable	Not Applicable
NNN (Synthetic Organic Chemical Manufacturing - Distillation)	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Yes
QQQ (Wastewater VOC Emissions - Petroleum Refineries)	No new drain systems				

* Compliance with GGGa is BACT for components. Therefore, the equipment will be subject to GGGa (enhanced LDAR) requirements, but the basis for why they're subject is BACT.

Subpart Db: This subpart applies to steam generating units. The units from this project that are most likely to trigger applicability are the new coker heaters. However, the coker heaters are process heaters, not steam generating units as those terms are defined in Subpart Db. Therefore, 40 CFR 60 Subpart Db doesn't apply.

Subpart J: Does not apply. Project occurs after May 14, 2007.

Subpart Ja: Applies to the coker since the project occurred after May 14, 2007 and the coker is one of the affected facilities under this subpart.

Heaters: The rule includes NOx limits for process heaters greater than 40 MMBtu/hr (the new heaters qualify).

1) Balanced draft heaters must comply with 60 ppmv (0% O2), or 0.06 lb/MMBtu, both determined daily on a 30-day rolling average basis, and
2) Natural draft heaters must comply with 40 ppmv or 0.04 lb/MMBtu.

PSD BACT for NOx is set at these same levels for normal (day to day) operation. BP stated that they will have trouble meeting these limits in stand-by mode and will submit a request to EPA for an alternative mass-based NOx emission limit during standby operations. The PSD provides a higher emission limit during stand-by operations.

> The rule also includes a choice of either an SO2 limit at the stack or an H2S limit in the fuel gas which will apply to the heaters beause they are fuel gas combustion devices. In the past, BP has chosen to comply with the H2S limit (162 ppmv, 3-hr rolling avg and 60 ppmv, 365 day basis), and BP has indicated that they intend to use this option in the future.

Flares: New connections to flares, such as those from this project, are considered modifications. However, both the low and high pressure flares are already subject to Ja and are complying with the 162 ppm H2S limit.

Delayed coker drums: The rule includes coke drum depressurization limits for new, modified, or reconstructed delayed coking units. BP's proposed changes include changes to the main fractionator overhead accumulator. The project doesn't meet the threshold for "new" or "reconstructed" units because the units aren't new, and the cost of the main fractionator overhead accumulator changes don't exceed the reconstruction cost threshold. In addition, per the application, the delayed coker capacity will not increase and there will be no increase in hourly emissions. Therefore, there is also no modification to the delayed coker drums under Ja.

Subpart GGG/GGGa and VV/VVa: These requirements apply to components (like valves and pumps) in VOC service. Existing components in VOC service at the delayed coker were previously subject to GGG and the provisions of VV. 40 CFR 60.590a(d) states that:

> "(d) Facilities subject to subpart VV, subpart VVa, subpart GGG, or subpart KKK of this part are excluded from this subpart"

Because of the above-mentioned statement, the new components at the coker will remain subject to GGG/VV and are not considered to be subject to GGGa based on rule applicability criteria. However, per the PSD, WA State BACT for this project includes compliance with GGGa. The PSD requires compliance with GGGa for new components only. However, as dicussed in the BACT section (Section N below), and consistent with NWCAA policy as well as the GGGa definition of an affected facility, all components (including existing ones) will be required to comply with the substantive requirements of GGGa.

Subpart NNN: Subpart NNN applies to distillation units that produce any of the chemicals listed in 40 CFR 60.667 that discharges these chemicals. The new lean oil absorption system qualifies because it will produce both propane and butane, which are listed chemicals.

From the application: "NSPS Subpart NNN requires that discharge of emissions from atmospheric vents from distillation columns be routed to a control device or the firebox of a heater. Coker off gas routed to the lean oil absorption system is burned as fuel gas in the coker heaters or routed to the refinery mix drum and burned as refinery fuel gas throughout the refinery. This specific operation is not directly addressed in the monitoring and testing requirements provided in Subpart NNN. BP stated that they "may request an alternative monitoring plan approval consistent with similar requests made and approved at other refineries with similar operations." BP may also choose an alternative compliance option from the Consolidated Federal Air Rule (CAR).

Subpart QQQ: Subpart QQQ applies to new drain systems, oil-water separators. Per the application, no new drain systems or oil separators will be installed. Therefore, Subpart QQQ doesn't apply.

National Emission Standards for Hazardous Air Pollutants (NESHAPS) are emission standards published under Title 40, Part 61 and 63 of the Code of Federal Regulations (CFR). The BP refinery is considered a major HAP source because it has the potential to emit more than 10 tons of a single HAP and more than 25 tons of total HAPs.

NESHAPS apply to specific industry source categories and require facilities to meet emission limits, install emission control technologies, monitor emissions and/or operating parameters, and use specified work practices. In addition, the standards typically include recordkeeping and reporting provisions. A summary of NESHAPS standards applicable to the Coker Heater Project are presented in Table 5.

Table 5: Summary of NESHAP Applicability for Coker Heater Project

NESHAPS 40 CFR 61 & 63	Equipment Components: Crude Unit & Delayed Coker	Coker Overhead Accumulator	New Coker Heaters	Low Pressure Flare	Lean Oil Adsorption System
61 Subpart FF (Benzene Waste Operations)	Not Applicable	Yes, sour water generated from coker will increase as a result of the project. Regulation already applies facility-wide to benzene containing streams			
63 Subpart CC (Petroleum Refineries)	Yes	Not Applicable	Not Applicable to heaters	Already subject	Not Applicable
63 Subpart DDDDD (Boilers)	Not Applicable	Not Applicable	Yes	Not Applicable	Not Applicable

Subpart FF: This subpart applies to benzene containing wastes, and already applies throughout the refinery. The amount of sour water generated by the coker will increase as a result of this project. Therefore, this rule applies. The application states that "the sour water stripper stream is already included in the facility's total annual benzene quantity, and annual quantities will be calculated and reported as required."

Subpart CC: Many units throughout the refinery are already subject to this regulation for petroleum refineries. Per the application, the only affected sources being added as part of this project are components in organic HAP service. The new components are subject to the leak requirements.

Refinery Sector rule & Subpart CC: This new rule includes requirements for the coker drums. The drums are not modified under this project, and they are considered "existing". The NESHAP was amended Feb. 1 2016, and a new compliance date 3 years after was set. BP stated in the application that they will meet the requirements of the revised subpart CC in this timeframe.

Subpart DDDDD (Major source boiler MACT): This subpart applies to process heaters. The coker heaters approved under this OAC are subject. The fuel burned in the units is considered "refinery fuel gas". Under Subpart DDDDD, the heaters are required to undergo periodic tuning.

Note that BP's application included an extensive review of rule applicabililty for the NSPS and NESHAP rules discussed above. See the application, stored at J:\AOP Sources Working

Files\BP\NSR\OAC 1200 - BP Coke Heater Replacement Project\Application, for additional details.

N. Best Available Control Technology (BACT) Technology Review

NWCAA BACT review is limited to TBACT for this project since criteria pollutants are being permitted under the PSD instead of this OAC.

From the application:

> "The new heaters will be a balanced draft design with overall heat efficiency (absorbed duty divided by fired duty) near 90 percent. The heater efficiency will be obtained through use of a heat recovery system to preheat combustion air and generate 25,000 pounds of steam per hour from each heater. Steam generated by the heat recovery system will be added to the refinery 140 pound steam header.
>
> The new heaters will primarily operate in balanced draft mode (forced draft and induced draft fans); however, they will have the option to operate in natural draft mode (i.e. without the air preheater) under certain operating conditions. Operating in natural draft mode lowers the heater efficiency and constrains coker unit throughput. BP does not plan to operate the heaters in natural draft mode during normal operations, but BP also recognizes the need for operational flexibility if an air preheater (balanced draft) needs to be taken offline. BP will typically operate in balanced draft mode in order to utilize the air preheater and maximize the heater efficiency."

The application included BACT analyses for NOx, CO, SO2, PM10/PM2.5, VOC, and H2SO4, and requires the use of ultra-low NOx burners. The BACT limits in the PSD are sufficient to satisfy TBACT for this OAC for TAP emissions from the new heaters, considering the net reduction in TAPs from decommissioning of the old heaters. The criteria air pollutants serve as surrogate for TAP emission control.

With regard to TAP emissions from process unit equipment component leaks, BACT is considered an LDAR program implemented in accordance with 40 CFR 60 Subpart GGGa/VVa for all the equipment components at the delayed coker unit and crude unit. The PSD permit requires that only "new" equipment components at these process unit be monitored under a LDAR program in accordance with Subpart GGGa/VVa. NWCAA's permitting practices and policy is different. To be consistent with NWCAA permitting practices and the definition of affected facility under Subpart GGGa, the NWCAA is requiring that a Subpart GGGa/VVa LDAR program be implemented on all equipment components at both process units, not just the new components.

The PSD BACT limits are:

Table 6: PSD BACT limits

Pollutant	Limit (for each heater, unless indicated otherwise)
NOX	Balanced Draft: 60 ppmdv (0% O2) 30-day rolling average (including startup/shutdown). 18.2 lb/hr, calendar day average (including startup/shutdown) Natural Draft: 40 ppmdv (0% O2), 30-day rolling ave. (including startup/shutdown) 12.1 lb/hr, calendar day average (including startup/shutdown) Standby: 8.0 lb/hr, calendar day average
CO	Normal: 33 ppmdv (0% O2) 30-day rolling average 6.1 lb/hr, calendar day average Startup/Shutdown/Standby: 75.0 lb/hr, calendar day average
SO2	132 tpy annual average (includes startup/shutdown) 37 lb/hr, calendar day average (combined for both heaters)
PM, PM10 / PM2.5	PM filterable: 0.0025 lb/MMBtu, hourly average PM10/PM2.5 filterable and condensable: 0.010 lb/MMBtu, hourly average
VOC	0.0054 lb/MMBtu, hourly average
H2SO4	0.0053 lb/MMBtu (combined for two heaters), hourly average 0.011 lb/MMBtu (single heater operating), hourly average
Pollutant	**Limit for new Components**
VOC	Comply with 40 CFR 60 Subpart GGGa

O. Timeline and Review

Timeline	Date
NOC Received	9/30/14
NOC Incompleteness Determined	10/23/14
NOC Completeness Determined	5/6/16
Final Decision Due (complete + 60 days)	(public comment needed at same time as PSD)
Final OAC issued	

Review		Date
NWCAA Engineering	Dan Mahar	7/26/16
Source	Scott Inloes	9/16/16 (emailed comments)

P. Correspondence

10/23/14: NOC incomplete email sent to Scott Inloes, with cc to Jim Verburg and Gary Huitsing:
Thank you for submitting a permit application for a New Source Review permit for the Coker Heater Replacement project. I've reviewed the information submitted and request the following information and fees to complete the application:

1. *The toxics emission factors used in the application were from AP-42 for natural gas combustion. Coker offgas is different from natural gas, and emission factors specific to coker offgas should be used if available. If coker offgas emission factors are not available, the California Air Resources Board has published toxics emission factors for refinery fuel gas. These appear to be more applicable than the emission factors for natural gas. These factors can be downloaded from http://www.arb.ca.gov/research/apr/past/96-333_1_pt2.pdf. Please conduct an additional emission factor review and revise the application with emissions factors that best characterize coker offgas.*
2. *If the toxics emission factors are updated, or changes that would affect the toxics modeling are made in response to Ecology's comments on the PSD, please also re-run the dispersion model and compare the results with the ASILs.*
3. *Discuss the reason for not including a short term ppm limit for SO2. The SO2 ASIL is on a 1-hr basis.*
4. *TBACT analysis of SO2 control costs using Merox: Provide additional information to explain the $/ton cost estimate. Include:*
   - *Explain why the annual maintenance cost is 5% of TCI.*
   - *Explain basis for each "BP estimate" in the table.*
   - *Discuss the interest rate selected. Is an interest rate of 7% appropriate in today's low interest rate environment?*
   - *Provide a copy of the equipment cost quote for the Merox unit.*
   - *Provide spreadsheets used for calculation.*
5. *Does BP plan to install the new compressor discussed in Section 2.6.2.3 of the application? Section 2.6.2.3 indicates this decision still hasn't been made. If the decision is still pending, provide information similar to #5 above for the Merox unit.*
6. *Provide electronic copies of the spreadsheets used to calculate toxics emissions.*
7. *A copy of the final SEPA determination from Whatcom County.*
8. *Fees: An itemized invoice for the NOC fee will be sent by our accounting department. The invoice should arrive early next week.*

3/25/16: Received revised project application. Answers to questions posed in incompleteness letter:

1. Done: Environ submitted additional information about toxics emission factors in a 5/23/16 email stored in J:\AOP Sources Working Files\BP\NSR\OAC 1200 - BP Coke Heater Replacement Project. In addition, Environ and BP followed-up with a 6/1/16 call to explain the information provided. Based on the

information provided, I agree that the application includes the most appropriate toxics emission factors.

2. Done: The toxics emission factors didn't change, but the project scope changed slightly. The dispersion modeling was rerun. New Aeromod modeling files were provided.
3. Done: Application includes 40.0 lb/hr limit (combined for two heaters), calendar day average
4. NWCAA will not pursue further at this time. Lean oil system will provide part of the sulfur reduction which could otherwise have been done through the Merox unit.
5. Done: Compressor will be installed.
6. Electronic copies of the spreadsheets were not provided. However, after discussion with Environ, BP's consultant, the printed information submitted is sufficient.
7. SEPA determination issued by Whatcom County.
8. Done: Invoice 9062 for $57,830.00 was sent to BP, and paid on 2/6/15.

9/16/16: Email from Scott Inloes with BP's comments on this permit.

11/4/16: Email from Scott Inloes with revised Class I area modeling and a reduction in the proposed hourly SO2 limit (now 37 lb/hr) for the PSD.

Additional correspondence stored in: J:\AOP Sources Working Files\BP\NSR\OAC 1200 - BP Coke Heater Replacement Project\Application