EXHIBIT J

APPENDIX A

NPDES Effluent Limits and Permit Calculations
Newcastle Refinery (WY0001163)

This refinery's effluent limits are based upon EPA Effluent Guidelines and Standards for Petroleum and Petroleum Refining (Cracking Subcategory). Therefore, requirements associated with Best Practical Control Technology (BPT), Best Available Technology (BAT), and Best Conventional Pollutant Control Technology (BCT) limits shall be considered.

Below are calculations and factors considered during technology-based effluent limit establishment for the Newcastle refinery.

PART I (process wastewater effluent limits, outfall 001)

Establishing BPT effluent limits for BOD, TSS, COD, Oil and Grease, Ammonia, and Sulfide

According to EPA Effluent Guidelines and Standards, BPT effluent limits for BOD, TSS, COD, Oil and Grease, Ammonia, and Sulfide for petroleum refineries shall be based upon the following calculation:

Effluent Limit =

Effluent Limitation Factor * Size Factor * Process Factor * Refinery Feedstock

Step 1
Determine the "Size Factor"

The BPT Size Factor calculation is based upon refinery feedstock rates, and is uses total process feedstock rates for four distinct categories (Crude, Cracking and Coking, Lube, Asphalt). This facility does not produce any lubrication oils or compounds, or any asphaltic products, so the 'Lube' and 'Asphalt' categories are therefore not discussed in this permit. Feedstock rate information was provided by the operator and is displayed in **Table 1F.**

The refinery feedstock rate is defined as the largest of all the crude process feedstock rates. According to the **Table 1F**, the refinery feedstock rate for the sum of 'Crude/Atmospheric Crude Distillation' and 'Crude/Desalting' categories is the largest at 20.0.

Using a refinery feedstock rate of 20.0, the Size Factor is determined by comparing refinery feedstock rates to the "Size Factor Table" in Part 419.22(b)(1) of the Effluent Guidelines and Standards.

Because the highest refinery feedstock rate = 20.0, and is less than 24.9, expressed in 1000 bbl/day, this facility's '**size factor' = 0.91**, as per 40 CFR 419.22(b)(1).

Therefore, a 'size factor' of 0.91 shall be used to calculate effluent limits for this facility, see **Table 1F** for calculations.

Table 1F – 'Size Factor' Calculations	
Process	**Process Feedstock (1000 bbl of feedstock)**
Crude	
Atmospheric crude distillation	20.0
Desalting	20.0
Total Feed Rate for Crude Processes Group	**40.00**
Cracking and Coke	
Fluid catalytic cracking	8.0
Hydrocracking	12.2
Total Feed Rate for Cracking and Coke Processes Group	**20.2**
Reforming and Alkylation	
Catalytic Reforming	4.5
Alkylation	1.9
Total Feed Rate for Reforming and Alkylation Processes Group	**6.4**

Step 2

Determine the BPT "Process Factor"

The BPT 'Process Factor' is based upon the total refinery process configuration. The total process configuration considers processes, process feedstocks, ratios between process feedstocks and refinery feedstock rates (20.0), and a 'weight factor'. 'Weight factor' is a default multiplier established by the U.S. EPA. See **Table 1G**.

Table 1G: Total Refinery Process Configuration					
Process	**Process Feedstock (1000 bbl feedstock)**	**Process Feedstock Rate Relative to Refinery Feedstock Rate**		**Weight Factor**	**Process Configuration**
Crude Processes:					
Atmospheric Crude Distillation	20.0	20.0/20.0=	1		
Crude Desalting	20.0	20.0/20.0=	1		
TOTAL	**40.0**	**Sum=**	**2.0**	**1**	**2.0**
Cracking & Coking Processes:					
Fluid Catalytic Cracking	8.0	8.0/20.0=	0.4		
Hydrocracking	12.2	12.2/20.0=	0.61		
TOTAL	**20.2**	**Sum=**	**1.01**	**6**	**6.06**
Reforming & Alkylation Alkylation Catalytic Reforming **TOTAL**	 1.9 4.5 6.4	*Reforming and Alkylation processes do not contribute to 'process factor' calculations, but are used elsewhere in permit limit calculations.*			
TOTAL REFINERY PROCESS CONFIGURATION					**8.06**

Process Configuration = process feedstock rate relative to refinery feedstock rate * weight factor
Total Refinery Process Configuration = process configurations total (8.06).

Process Factor Determination: Because process configuration is 8.06 (between 8.0 and 8.49), **process factor = 1.53,** as per 40 CFR 419.22(b)(2),
Step 3

Calculate BPT Effluent Limits

BPT effluent limits are calculated by multiplying the size factor, the process factor, the refinery feedstock rate and the effluent limitation factors that are established in Part 419.22 of the Effluent Guidelines and Standards.

Table 1H displays the calculations and associated values used to establish BPT effluent limits.

Table 1H: BPT Effluent Limit Calculations							
Pollutant Parameter	**Size Factor**	**Process Factor**	**Refinery Feedstock Rate (1000 bbl/day)**	**Limitation Factor (lb/1000 bbl) Daily Max[1]**	**Effluent Limit (lbs/day) Daily Max**	**Effluent Limitation Factor (lb/1000 bbl) Monthly Avg[1]**	**Effluent Limit (lbs/day) Monthly Average**
BOD_5	**0.91**	**1.53**	**20.0**	9.9	275.68	5.5	153.15
TSS				6.9	192.14	4.4	122.52
COD				74.0	2060.60	38.4	1069.29
Oil and Grease				3.0	83.54	1.6	44.55
Phenolic Compounds				0.074	2.06	0.036	1.00
Ammonia as N				6.6	183.78	3.0	83.54
Sulfide				0.065	1.81	0.029	0.81
Total Chromium				0.15	4.18	0.088	2.45
Hexavalent Chromium				0.012	0.33	0.0056	0.16
pH[2]	All effluent measurements shall remain within the range of 6.0 to 9.0 standard units						

[1] Source: 40 CFR 419.22(a).
[2]All pH samples shall remain within the range of 6.0 to 9.0 standard units.

Effluent Limit = size factor * process factor * refinery feedstock rate * effluent limitation factor

PART II

Establishing Amended BAT Limits for Phenolic Compounds, Total Chromium, and Hexavalent Chromium

BAT Limits for phenolic compounds, total chromium, and hexavalent chromium are based on a revised procedure (1979 Flow Model). These limits are based upon the total process feedstock rates for five distinct categories (Crude, Cracking and Coking, Lube, Asphalt, and Reforming and Alkylation). This facility does

not produce any lubrication oils or compounds, so the 'Lube' category is not discussed in this permit. The total process feedstock rates for this refinery are listed in **Table 1I**.

Table 1I: Amended BAT Limit Calculations for Phenolic Compounds, Total Chromium, and Hexavalent Chromium	
Process	**Process Feedstock (1000 bbl of feedstock)**
Crude	
Desalter	20.0
ATM Distillation	20.0
Total	**40.0**
Cracking & Coking	
Fluid CAT Cracking	8.0
Hydrocracking	12.2
Total	**20.2**
Reforming & Alkylation	
Alkylation	1.9
Catalytic Reforming	4.5
Total	**6.4**

Step 4
Calculate BAT Effluent Limits

BAT effluent limits for phenolic compounds, total chromium, and hexavalent chromium are calculated by taking the sum of the products of each effluent limitation factor times the applicable total process feedstock rate. **Tables 1J and IK** display the factors and applicable effluent limits for the parameters listed above.

Table 1J: BAT Daily Maximum Limit Calculations for Phenolic Compounds, Total Chromium, and Hexavalent Chromium			
Constituent	**Phenolic Compounds**	**Total Chromium**	**Hexavalent Chromium**
Daily Max. Process Limit (Crude)	40.0 X 0.013 = **0.52**	40.0 X 0.011 = **0.44**	40.0 X 0.0007 = **0.028**
Daily Max. Process Limit (Cracking and Coking)	20.2 X 0.147 = **2.9694**	20.2 X 0.119 = **2.4038**	20.2 X 0.0076 = **0.1535**
Daily Max. Process Limit (Reforming and Alkylation)	6.4 X 0.132 = **0.8448**	6.4 X 0.107 = **0.6848**	6.4 X 0.0069 = **0.0442**
Total Daily Maximum Limit (lbs/day)	**4.33**	**3.53**	**0.23**

Daily Max. Process Limit = Effluent limitation factor X Total process feed stock rate (in 1000 bbls)
Total Daily Max. Limit = Sum of daily max. process limits.

Table 1K: BAT Monthly Average Limit Calculations for Phenolic Compounds, Total Chromium, and Hexavalent Chromium			
Constituent	**Phenolic Compounds**	**Total Chromium**	**Hexavalent Chromium**
Monthly Avg. Process Limit (Crude)	40.0 X 0.003 = **0.12**	40.0 X 0.004 = **0.16**	40.0 X 0.0003 = **0.012**
Monthly Avg. Process Limit (Cracking and Coking)	20.2 X 0.036 = **0.7272**	20.2 X 0.041 = **0.8282**	20.2 X 0.0034 = **0.0687**
Monthly Avg. Process Limit (Reforming and Alkylation)	6.4 X 0.032 = **0.2048**	6.4 X 0.037 = **0.2368**	6.4 X 0.0031 = **0.02**
Total Monthly Avg. Limit (lbs/day)	**1.052**	**1.225**	**0.101**

Monthly Avg. Process Limit = Effluent limitation factor X Total process feed stock rate (in 1000 bbls) = 'Process Limit'
Total Monthly Avg. Limit = Sum of daily max. 'Process Limits'.

BAT effluent limits for COD, Ammonia as N, and Sulfide are calculated by multiplying the BAT effluent limits established in 40 CFR §419.23 by the appropriate facility 'size factor', 'process factor', and facility feedstock rate, see **Table 1L**. According to 40 CFR §419.23, the appropriate size factor for a facility with less than 24.9 thousand bbls/day of feedstock input is 0.91, the appropriate facility process factor is 1.53.

Table 1L: BAT Effluent Limit Calculations for COD, Ammonia as N, and Sulfide							
Constituent	**Facility Size Factor**	**Facility Process Factor**	**Feedstock Rate, 1,000 bbls/day**	**BAT Daily Maximum ELG Effluent Limit, lbs/1000bbls feedstock**	**BAT Daily Maximum Calculated Effluent limit, lbs/day**	**BAT Monthly Average ELG Effluent Limit, lbs/1000bbls feedstock**	**BAT Monthly Average Calculated Effluent limit, lbs/day**
COD	0.91	1.53	20.0	74.0	2,060.6	38.4	1,069.3
Ammonia as N				6.6	183.8	3.0	83.5
Sulfide				0.065	1.81	0.029	0.81
pH	All pH measurements shall remain within the range of 6.0 to 9.0 standard units.						

Part III:

Calculate BCT Effluent Limits

BCT effluent limits for BOD, TSS, and Oil and Grease are calculated by multiplying the BAT effluent limits established in 40 CFR §419.24(a) by the appropriate facility 'size factor', 'process factor', and facility feedstock rate, see **Table 1M**. According to 40 CFR §419.24(b)(2), the appropriate size factor for a facility with less than 24.9 thousand bbls/day of feedstock input is 0.91. For a facility with a process configuration (see **Table 1F**) of 8.06, the appropriate process factor is 1.53.

Table 1M: BCT Effluent Limit Calculations for BOD_5, TSS, Oil and Grease and pH.							
Constituent	**Facility Size Factor**	**Process Factor**	**Feedstock Rate, 1,000 bbls/day**	**BCT Daily Maximum Effluent Limitation, lbs/1000bbls feedstock**	**BCT Daily Maximum Effluent Limit, lbs/day**	**BCT Monthly Average Effluent Limitation, lbs/1000bbls feedstock**	**BCT Monthly Average Effluent Limit, lbs/day**
BOD_5	0.91	1.53	20.0	9.9	275.7	5.5	153.2
TSS				6.9	192.1	4.4	122.5
Oil and Grease				3.0	83.5	1.6	44.6
pH	All pH measurements shall remain within the range of 6.0 to 9.0 standard units.						

Step 5

Compare BAT, BCT, and BPT Limits

Finally, BAT, BCT, and BPT effluent limits are compared. The most stringent of these limits shall be used in the final effluent limit calculations.

Table 1N displays the comparison between BAT, BCT, and BPT effluent limits calculated for this facility.

Table 1N: BAT, BCT, and BPT Effluent Limit Comparison								
Constituent	**Calculated BAT Effluent Limit (lbs/ day)[1]**		**Calculated BCT Effluent Limit (lbs/day)[1]**		**Calculated BPT Effluent Limit (lbs/day)**		**Final Effluent Limit**	
	D.M.	M.A.	D.M.	M.A.	D.M.	M.A.	D.M.	M.A.
Ammonia as N	183.8	83.5			183.8	83.5	183.8	83.5
BOD – 5			275.7	153.2	275.7	153.2	275.7	153.2
COD	2,060.6	1,069.3			2,060.6	1069.3	2,060.6	1069.3
Hexavalent Chromium	0.23	0.101			0.33	0.16	0.23	0.101
Oil and Grease			83.5	44.6	83.5	44.6	83.5	44.6
Phenolic Compounds	4.33	1.05			2.06	1.00	2.06	1.00
Sulfide	1.81	0.81			1.81	0.81	1.81	0.81
Total Chromium	3.53	1.23			4.18	2.45	3.53	1.23
TSS			192.1	122.5	192.1	122.5	192.1	122.5
pH	All measurements shall remain within the range of 6.0 to 9.0 standard units							

[1]No effluent limit provided in EPA ELGs for blank spaces in **Table 1N**.
D.M. = Daily Maximum, M. A. = Monthly Average

PART IV

Storm water Runoff Limits (outfall 002 discharges)

According to the Effluent Guidelines and Standards, effluent limits for refinery storm water runoff shall also be considered. Storm water runoff is defined as any precipitation that comes in contact with the refinery property. Storm water runoff may be classified as either contaminated or uncontaminated. Contaminated storm water runoff is any runoff coming into direct contact with any raw materials, intermediate product, finished product, by-product or waste product. Uncontaminated storm water runoff is defined as any other runoff.

Step 6
Calculate Storm water Runoff Limits

Table 1O contains all values used to calculate storm water runoff effluent limits. With the exception of total chromium, BAT, BPT and BCT limits for contaminated storm water runoff are calculated using the same formulas. In the case of total chromium, the effluent limitation factors for the BAT and BPT limits are different. As the calculated BAT limits for total chromium are more stringent, the calculated BAT total chromium limits for contaminated storm water runoff will be established in the permit as end-of-pipe effluent limits. Numbers in bold and gray shading in **Table IO** represent the effluent limits established in this permit as end-of-pipe effluent limits for contaminated storm water runoff.

Table 1O: Storm water Runoff Effluent Limit Calculations

Pollutant Parameter and Limit Derivation	Commingled Storm water Volume (1000 gals/day)	Effluent Limitation Factor (lb/1000 gal) Daily Max.	Effluent Limit (lb/day) Daily Max.	Effluent Limitation Factor (lb/1000 gal) Monthly Avg.	Effluent Limit (lb/day) Monthly Avg.
BOD5 (BPT, BCT)	91.882*	0.40	**36.75**	0.22	**20.2**
COD (BAT, BPT)		3.00	**275.6**	1.5	**137.8**
Hexavalent Chromium (BAT, BPT)		0.00052	**0.048**	0.00023	**0.021**
Oil and Grease (BPT, BCT)		0.13	**11.95**	0.067	**6.16**
Phenolic Compounds (BAT, BPT)		0.0029	**0.27**	0.0014	**0.13**
Total Chromium (BAT)		0.0050	**0.46**	0.0018	**0.17**
Total Chromium (BPT)		0.0060	**0.55**	0.0035	**0.32**

Table 1O: Storm water Runoff Effluent Limit Calculations					
Pollutant Parameter and Limit Derivation	**Commingled Storm water Volume (1000 gals/day)**	**Effluent Limitation Factor (lb/1000 gal) Daily Max.**	**Effluent Limit (lb/day) Daily Max.**	**Effluent Limitation Factor (lb/1000 gal) Monthly Avg.**	**Effluent Limit (lb/day) Monthly Avg.**
Total Suspended Solids (TSS) (BPT, BCT)	91.882*	0.28	**25.7**	0.18	**16.5**
pH	**All measurements shall remain within the range of 6.0 to 9.0 standard units**				

*Estimated using the following parameters:

a. Highest average monthly precipitation – 2.59 inches*

b. Refinery Surface Area –54 acres of contaminated runoff

c. Average Runoff Coefficient – 75%

d. Calculated Runoff – 3,797,799 Gallons/Month

e. Assume Runoff Coefficient at 75% - 2,848,349 Gallons/Month

f. 31 Day Average – 91,882 Gallons/Day

* Precipitation data from Western Regional Climate Center database (www.wrcc.dri.edu/htmfiles/wy/wy.ppt.html).

Storm water Effluent Limit = effluent limitation factor * volume of contaminated water.

Step 7: Calculating Final Effluent Limits

The last step is to calculate final technology-based effluent limits applicable at this facility. Final technology-based effluent limits are established by calculating the sum of the applicable process water BAT/BPT/BCT limit and the storm water runoff effluent limits. In this instance, the permittee has opted to apply separate limits to discharges from outfalls 001 and 002.

Final technology-based effluent limits for outfall 001 are established in **Table 1P**.

Table 1P: Final Technology-Based Effluent Limits, Outfall 001		
Constituent	**BAT/BPT/BCT Final Effluent Limit (lb/day) Daily Max.**	**BAT/BPT/ BCT Final Effluent Limit (lb/day) Monthly Avg.**
Ammonia	183.8	83.5
BOD5	275.7	153.2
COD	2,060.60	1069.3

Table 1P: Final Technology-Based Effluent Limits, Outfall 001		
Constituent	**BAT/BPT/BCT Final Effluent Limit (lb/day) Daily Max.**	**BAT/BPT/ BCT Final Effluent Limit (lb/day) Monthly Avg.**
Hexavalent Chromium	0.23	0.101
Oil and Grease	83.5	44.6
Phenolic Compounds	2.06	1
Sulfide	1.81	0.81
Total Chromium	3.53	1.23
TSS	192.1	122.5
pH	All effluent pH measurements shall remain within the range of 6.0 to 9.0 standard units	

Final technology-based effluent limits for outfall 002 are established in **Table 1Q**.

Table 1Q: Final Technology-Based Effluent Limits, Outfall 002		
Constituent	**Storm water Effluent Limit (lb/day) Daily Max.**	**Storm water Effluent Limit (lb/day) Monthly Avg.**
Ammonia	N/A	N/A
BOD5	36.75	20.2
COD	275.6	137.8
Hexavalent Chromium	0.048	0.021
Oil and Grease	11.95	6.16
Phenolic Compounds	0.27	0.13
Sulfide	N/A	N/A
Total Chromium	0.46	0.17
TSS	25.7	16.5
pH	All effluent pH measurements shall remain within the range of 6.0 to 9.0 standard units	

Appendix B: Water Treatment Chemicals Used at the Newcastle Refinery – See Table 1R

Table 1R: Characterization of Water Treatment Chemicals Used at Newcastle Refinery			
Chemical	**Identified LC50?**	**Toxic/Harmful to Aquatic Life?**	**Description**
Caustic Soda, 50%	No, but product should be kept out of waterways and sewers	Yes	Corrosive
Sulfuric Acid, 70-100%	LC50 between 500 mg/L (*Brachydanio*) and 42 mg/L (*Gambusia*)	Yes	Corrosive
Caustic Potash Liquid	Identified as 'moderately toxic' EC50 (*Daphnia*) 60 mg/L	Yes	Corrosive
Cortrol IS3080	LC50 (*Pimephales*) 210 mg/L, LC50 200 mg/L (*Daphnia*)	Yes	Oxygen Scavenger
Embreak 2W2021	Not provided, listed as hazardous	Yes	Emulsion Breaker
Embreak 2126	LC50 (*Pimephales*) 19.6 mg/L, LC50 9.2 mg/L, (*Daphnia*), LC50	Contains substances known to be toxic/harmful to aquatic life	Reverse Emulsion Breaker
Gengard GN7004	LC50 (*Ceriodaphnia*) 1707.6 mg/L, LC50 (*Daphnia*) 3677 mg/L, LC50 ((*Pimephales*) 2367 mg/L	Not listed as hazardous, but should not be discharged into drains or waterways.	Dispersant
Gengard GN7210	LC50 (*Daphnia*) 2000 mg/L, LC50 (*Pimephales*) 345 mg/L	Not listed as hazardous but should not be discharged into drains or waterways.	Corrosion Inhibitor
Hypersperse MDC772	LC50 (*Daphnia*) 2205 mg/L, LC50 (*Pimephales*) 5944 mg/L	Yes	Membrane Deposit Control Agent
Klaraid CDP1336	LC50 (*Daphnia*) 8 mg/L, LC50 (*Pimephales*) 16 mg/L	Yes	Coagulant
Losalt 80L	100% mortality for *Daphnia magna* at 500 mg/L	Yes	Neutralizing Amines
Philmplus 5K1642	LC50 (*Daphnia*) 5.4 mg/L, LC50 (*Pimephales*) 2 mg/L	Yes, and listed as environmentally hazardous	Filming Amine
Polyfloc AS1002	LC50 (*Daphnia*) 25466 mg/L, LC50 (*Pimephales*) 30944 mg/L	Yes	Flocculant
Sodium Hypochlorite	None given	Yes	Corrosive

Table 1R: Characterization of Water Treatment Chemicals Used at Newcastle Refinery			
Chemical	**Identified LC50?**	**Toxic/Harmful to Aquatic Life?**	**Description**
Solus AP26	LC50 (*Daphnia*) >10000 mg/L, LC50 (*Pimephales*) >10000 mg/L	Yes	Internal Boiler Treatment
Spectrus NS1102	LC50 (*Daphnia*) 3.3 mg/L, LC50 (*Pimephales*) 8.7 mg/L	Yes	Microbial Control Agent
Steamate NA0520	LC50 (*Daphnia*) 517 mg/L, LC50 (*Pimephales*) 307 mg/L	Yes	Neutralizing Amine
Steamate LSA1793	LC50 (*Daphnia*) 4.9 mg/L, LC50 (*Pimephales*) 5.7 mg/L	Yes	Steam Condensate Treatment
WR Buffer Injection Solution	None Given	No	Buffering Solution