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March 24, 2008  
NTH Project 16-061026

Mr. David Riddle  
Senior Environmental Engineer  
Michigan Department of Environmental Quality  
Air Quality Division  
Permit Section, Thermal Process Unit

**RECEIVED**

**MAR 24 2008**

**AIR QUALITY DIV.**

**RE: Response to Request for Additional TAC Modeling  
Consumers Energy Company – Application No. 341-07**

Dear Mr. Riddle:

As requested, NTH performed an additional modeling analysis in support of Consumers Energy Company (Consumers) air permit application (PTI No. 341-07) for the construction of a proposed new ASCPC boiler at the existing Karn/Weadock Generating Complex. It was requested that the modeling analysis for toxic air contaminants (TACs) include emissions from the auxiliary boiler and diesel-fired emergency generators with the proposed ASCPC boiler.

This letter is being submitted to summarize the results of this additional modeling analysis. The modeling has been conducted to determine the ambient impacts resulting from TAC emissions associated with the simultaneous operation of the ASCPC boiler, auxiliary boiler, and the diesel-fired emergency equipment. The results of this analysis should be viewed as extremely conservative based on the fact that the emergency equipment would most likely not be in operation during times of typical, normal operation of the ASCPC boiler (and auxiliary boiler).

We have completed the additional TAC modeling analysis and are providing a brief explanation of the modeling methodology and discussion of the results in this letter. A full table of the analysis results is provided in Attachment 1 and shows that the ambient impacts for all TACs of concern are well below the applicable screening levels.

#### **Additional TAC Modeling – Methodology**

The TAC modeling analysis has been performed utilizing an initial, conservative method of estimating ambient impacts. Specifically, instead of modeling each TAC separately using the expected emission rate from each modeled source, each modeled source was assigned a 1.0 gram per second emission rate to determine “modeled impacts” for each of the 1, 8, and 24 hour, and annual averaging periods, per modeled source. These modeled impacts (based on 1 gram/sec)



were then used to determine a conservative, “combined” impact by scaling the modeled impacts to the emission rate of each source, and then simply adding these together. This is a conservative method of determining combined impacts, as the sum of the individual impacts will always be greater than a combined impact based on modeling each pollutant-specific emission rate from each modeled source. Using this methodology, it is possible to determine the ambient impacts for multiple pollutants based on one model run instead of running a model for each TAC individually.

#### **Additional TAC Modeling - Results**

The emission rates and calculated ambient impacts for all TACs (including HAPs) are presented in Table 2 of Attachment 1. In addition, the results of the modeling are summarized in Table 1 of Attachment 1. Table 1 provides the “modeled impacts” from each source (ASCPC boiler, Auxiliary boiler, diesel-fired emergency generator, diesel-fired main fire pump, diesel-fired wet FGD pump, and diesel-fired fire booster pump) for each averaging period.

These modeled impacts were used to scale the emission rate of each pollutant for each source, depending on the averaging time associated with each pollutant’s screening level. After the individual impacts were determined, they were summed together to determine a conservative combined impact, which was then compared to the applicable screening level(s) for each TAC.

Table 2 shows that the highest emitted TAC (hydrogen chloride), results in an ambient impact of less than 1% of the allowable screening level (SL) of  $20 \mu\text{g}/\text{m}^3$  on a 24-hour averaging period basis. It should be noted that the results show that the pollutants with highest impacts versus the applicable screening levels are those pollutants that are emitted only from the ASCPC boiler and auxiliary boiler, which are identical to, and were included in, the TAC analysis that was submitted with the original permit application on October 15, 2007.

Overall, the results presented in Table 2 show that all TACs will easily comply with the applicable screening levels at the maximum predicted emission rates and thus comply with the Michigan AQD air toxics rules. The additional sources (i.e. diesel fired emergency equipment) result in only slight increases in the ambient concentrations of the TACs already modeled from the ASCPC boiler and auxiliary boiler.



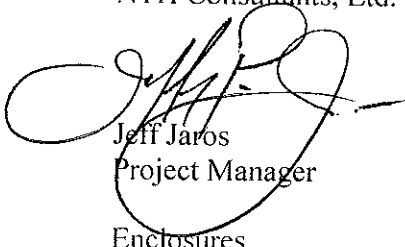
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Again, the results of the TAC screening analysis should be viewed as conservative estimates of the ambient impacts for these pollutants due to the fact that the maximum impacts from individual stacks are not completely additive in nature (i.e. they occur at different locations), thus directly adding the impacts together over predicts the combined impacts.

Copies of the AERMOD modeling files are being supplied as Attachment 2 of this letter in electronic format. If you have any further questions, please feel free to contact me at (517) 484-6900.

Sincerely,

NTH Consultants, Ltd.



Jeff Jaros  
Project Manager

Enclosures

cc: Ms. Linda Hilbert, Consumers Energy Company  
Mr. Steve Yambor, HDR|Cummins & Barnard, Inc.

JPJ/mjb

**ATTACHMENT 1**  
**Emission Estimates and TAC Analysis**  
**ASCPC and Aux Boilers with Diesel-fired Engines**

**TABLE 1. Gram per Second "Modeled Impact" Results**

Source	Annual	24 Hour	8 Hour	1 Hour
	Impacts based on 1.0 Gram/Sec (ug/m3)			
ASCPC Boiler	0.0037	0.047	0.109	0.382
Auxiliary Boiler	0.2705	3.43	4.39	9.60
Emergency Generator	0.5413	9.13	17.68	106.10
Fire Pump	0.5168	9.98	26.51	159.02
Fire Booster Pump	0.5946	9.14	21.15	126.72
WFGD Quench Pump	0.7358	11.55	27.02	162.06
Summed Impacts	2.663	43.27	96.86	563.88
Combined Impact (1 g/s each source)	2.429	37.41	92.46	554.47

**TABLE 2. Emission Rates and TAC Ambient Impact Results**

Compound	CAS Number	ASCPC Boiler		Auxiliary Boiler		Generator		Main Fire Pump		Fire Booster Pump		Wet FGD Pump	
		Emission Rates		Emission Rates		Emission Rates		Emission Rates		Emission Rates		Emission Rates	
		(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)
<b>Hazardous Air Pollutants</b>													
Acetaldehyde	75070	2.81E-01	3.54E-02			5.26E-04	6.62E-05	2.82E-03	3.55E-04	3.22E-04	4.06E-05	2.44E-03	3.08E-04
Acetophenone	98862	7.40E-03	9.32E-04										
Acrolein	107028	1.43E-01	1.80E-02			1.64E-04	2.07E-05	3.40E-04	4.28E-05	3.89E-05	4.90E-06	2.95E-04	3.71E-05
Antimony	7440360	8.88E-03	1.12E-03										
Arsenic	7440382	2.02E-01	2.55E-02	4.31E-05	5.44E-06								
Benzene	71432	6.41E-01	8.08E-02	4.53E-04	5.71E-05	1.62E-02	2.04E-03	3.43E-03	4.32E-04	3.92E-04	4.94E-05	2.97E-03	3.74E-04
Benzyl chloride	100447	3.45E-01	4.35E-02										
Beryllium	7440417	1.04E-02	1.31E-03	2.59E-06	3.26E-07								
Bis(2-Ethylhexyl)phthalate	117817	3.60E-02	4.54E-03										
Bromoform	75252	1.92E-02	2.42E-03										
Bromomethane (Methyl bromide)	74839	7.89E-02	9.95E-03										
1,3 - Butadiene	106990							1.44E-04	1.81E-05	1.64E-05	2.07E-06	1.25E-04	1.57E-05
Cadmium	7440439	2.52E-02	3.17E-03	2.37E-04	2.99E-05								
Carbon disulfide	75150	6.41E-02	8.08E-03										
Chlorobenzene	108907	1.09E-02	1.37E-03										
Chloroform	67663	2.91E-02	3.67E-03										
Chromium, total	7440473	1.28E-01	1.62E-02	3.02E-04	3.80E-05								
Chromium, hexavalent	18540299	3.90E-02	4.91E-03										
Cobalt	7440484	4.93E-02	6.22E-03	1.81E-05	2.28E-06								
Cumene	98828	2.61E-03	3.29E-04										
Cyanide	57125	1.23E+00	1.55E-01										
1,4-Dichlorobenzene	106467			2.59E-04	3.26E-05								
Dichloromethane (Methylene chloride)	75092	1.43E-01	1.80E-02										
Dimethyl sulfate	77781	2.37E-02	2.98E-03										
2,4-Dinitrotoluene	121142	1.38E-04	1.74E-05										
Ethylbenzene	100414	4.64E-02	5.84E-03										
Ethylchloride (Chloroethane)	75003	2.07E-02	2.61E-03										
Ethylene dibromide (Dibromoethane)	106934	5.92E-04	7.46E-05										
Ethylene dichloride (1,2-Dichloroethane)	107062	1.97E-02	2.49E-03										
Formaldehyde	50000	1.18E-01	1.49E-02	1.62E-02	2.04E-03	1.65E-03	2.07E-04	4.34E-03	5.46E-04	4.96E-04	6.24E-05	3.76E-03	4.74E-04
Hexane	110543	3.31E-02	4.16E-03	3.88E-01	4.89E-02								
Hydrogen chloride (HCl)	7647010	1.78E+01	2.24E+00										
Hydrogen fluoride (HF)	7664393	2.00E+00	2.52E-01										
Isophorone	78591	2.86E-01	3.61E-02										
Manganese	7439965	2.42E-01	3.05E-02	8.20E-05	1.03E-05								
Methyl chloride (Chloromethane)	74873	2.61E-01	3.29E-02										

Compound	ITSL (ug/m3)	IRSL (ug/m3)	Averaging Period	Preliminary Impact (ug/m3)	Percent of SL (%)
<b>Hazardous Air Pollutants</b>					
Acetaldehyde	9		24 hour	9.75E-03	0.11%
Acetaldehyde		0.5	Annual	5.99E-04	0.12%
Acetophenone	490		8 hour	1.02E-04	0.00%
Acrolein	0.02		Annual	1.29E-04	0.65%
Acrolein	0.5		1 hour	2.25E-02	4.51%
Antimony	0.2		24 hour	5.29E-05	0.03%
Arsenic		0.0002	Annual	9.45E-05	47.25%
Benzene	30		24 hour	3.17E-02	0.11%
Benzene		0.1	Annual	1.94E-03	1.94%
Benzyl chloride		0.02	Annual	1.59E-04	0.79%
Beryllium	0.02		24 hour	6.28E-05	0.31%
Beryllium		0.0004	Annual	4.85E-06	1.21%
Bis(2-Ethylhexyl)phthalate		0.2	Annual	1.66E-05	0.01%
Bromoform		0.9	Annual	8.85E-06	0.00%
Bromomethane (Methyl bromide)	5		24 hour	4.70E-04	0.01%
1,3 - Butadiene	2		24 hour	3.81E-04	0.02%
1,3 - Butadiene		0.03	Annual	2.21E-05	0.07%
Cadmium		0.0006	Annual	1.97E-05	3.28%
Carbon disulfide	700		24 hour	3.82E-04	0.00%
Chlorobenzene	70		24 hour	6.47E-05	0.00%
Chloroform		0.4	Annual	1.34E-05	0.00%
Chromium, total	0.1		Annual	6.93E-05	0.07%
Chromium, hexavalent	0.1		24 hour	2.32E-04	0.23%
Chromium, hexavalent		8.30E-05	Annual	1.79E-05	21.60%
Cobalt	0.2		8 hour	6.89E-04	0.34%
Cumene	400		24 hour	1.56E-05	0.00%
Cyanide	50		1 hour	5.94E-02	0.12%
1,4-Dichlorobenzene	800		24 hour	1.12E-04	0.00%
1,4-Dichlorobenzene		0.14	Annual	8.82E-06	0.01%
Dichloromethane (Methylene chloride)		2	Annual	6.58E-05	0.00%
Dimethyl sulfate	0.5		8 hour	3.26E-04	0.07%
2,4-Dinitrotoluene	2		8 hour	1.90E-06	0.00%
2,4-Dinitrotoluene		0.009	Annual	6.35E-08	0.00%
Ethylbenzene	1000		24 hour	2.76E-04	0.00%
Ethylbenzene		3	Annual	2.13E-05	0.00%
Ethylchloride (Chloroethane)	10000		24 hour	1.23E-04	0.00%
Ethylene dibromide (Dibromoethane)	9		24 hour	3.53E-06	0.00%
Ethylene dibromide (Dibromoethane)		0.002	Annual	2.72E-07	0.01%
Ethylene dichloride (1,2-Dichloroethane)		0.04	Annual	9.08E-06	0.02%
Formaldehyde		0.08	Annual	1.39E-03	1.73%
Hexane	700		24 hour	1.68E-01	0.02%
Hydrogen chloride (HCl)	20		24 hour	1.06E-01	0.53%
Hydrogen fluoride (HF) (Short-term)	26		1 hour	9.83E-02	0.37%
Isophorone	280		1 hour	1.38E-02	0.00%
Isophorone		3.7	Annual	1.32E-04	0.00%
Manganese	0.05		24 hour	1.48E-03	2.95%
Methyl chloride (Chloromethane)	90		24 hour	1.56E-03	0.00%
Methyl chloride (Chloromethane)		1.6	Annual	1.20E-04	0.01%

**ATTACHMENT 1**  
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		(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)	(lb/hr)	(g/sec)
Methyl hydrazine	60344	8.39E-02	1.06E-02										
Methyl methacrylate	80626	9.87E-03	1.24E-03										
Methyl tert butyl ether	1634044	1.73E-02	2.18E-03										
Nickel	7440020	1.38E-01	1.74E-02	4.53E-04	5.71E-05								
Phenol	108952	7.89E-03	9.95E-04										
Propionaldehyde (Propanal)	123386	1.87E-01	2.36E-02										
Selenium	7782492	6.41E-01	8.08E-02	5.18E-06	6.52E-07								
Styrene	100425	1.23E-02	1.55E-03										
Tetrachloroethylene (Perchloroethylene)	127184	1.23E-02	1.55E-03										
Toluene	108883	1.18E-01	1.49E-02	7.33E-04	9.24E-05	5.86E-03	7.39E-04	1.50E-03	1.89E-04	1.72E-04	2.16E-05	1.30E-03	1.64E-04
Vinyl acetate	108054	3.75E-02	4.72E-03										
Xylenes	1330207	1.83E-02	2.30E-03			4.03E-03	5.07E-04	1.05E-03	1.32E-04	1.20E-04	1.51E-05	9.08E-04	1.14E-04
<b>Polycyclic Organic Matter (POMs)</b>													
2-Chloroacetophenone	532274	3.45E-03	4.35E-04										
2-Methylnaphthalene	91576			5.18E-06	6.52E-07								
3-Methylcholanthrene	56495			3.88E-07	4.89E-08								
5-Methyl chrysene	3697243	1.09E-05	1.37E-06										
7,12-Dimethylbenz(a)anthracene	57976			3.45E-06	4.35E-07								
Acenaphthene	83329	2.52E-04	3.17E-05	3.88E-07	4.89E-08	9.76E-05	1.23E-05	5.22E-06	6.58E-07	5.96E-07	7.51E-08	4.52E-06	5.70E-07
Acenaphthylene	208968	1.23E-04	1.55E-05	3.88E-07	4.89E-08	1.93E-04	2.43E-05	1.86E-05	2.34E-06	2.13E-06	2.68E-07	1.61E-05	2.03E-06
Anthracene	120127	1.04E-04	1.31E-05	5.18E-07	6.52E-08	2.57E-05	3.23E-06	6.87E-06	8.66E-07	7.85E-07	9.90E-08	5.96E-06	7.50E-07
Benzo(a)anthracene	56553	3.95E-05	4.97E-06	3.88E-07	4.89E-08	1.30E-05	1.63E-06	6.17E-06	7.78E-07	7.06E-07	8.89E-08	5.35E-06	6.74E-07
Benzo(a)pyrene	50328	1.87E-05	2.36E-06	2.59E-07	3.26E-08	5.36E-06	6.75E-07	6.91E-07	8.71E-08	7.90E-08	9.95E-09	5.99E-07	7.54E-08
Benzo(b)fluoranthene	205992			3.88E-07	4.89E-08	2.32E-05	2.92E-06	3.64E-07	4.59E-08	4.16E-08	5.24E-09	3.16E-07	3.98E-08
Benzo(b,j,k)fluoranthene		5.43E-05	6.84E-06										
Benzo(g,h,i)perylene	191242	1.33E-05	1.68E-06	2.59E-07	3.26E-08	1.16E-05	1.46E-06	1.80E-06	2.26E-07	2.05E-07	2.59E-08	1.56E-06	1.96E-07
Benzo(k)fluoranthene	205823			3.88E-07	4.89E-08	4.55E-06	5.73E-07	5.70E-07	7.18E-08	6.51E-08	8.20E-09	4.94E-07	6.22E-08
Biphenyl	92524	8.39E-04	1.06E-04										
Chrysene	218019	4.93E-05	6.22E-06	3.88E-07	4.89E-08	3.19E-05	4.02E-06	1.30E-06	1.63E-07	1.48E-07	1.87E-08	1.12E-06	1.42E-07
Dibenzo(a,h)anthracene	53703			2.59E-07	3.26E-08	7.22E-06	9.09E-07	2.14E-06	2.70E-07	2.45E-07	3.09E-08	1.86E-06	2.34E-07
Fluoranthene	206440	3.50E-04	4.41E-05	6.47E-07	8.15E-08	8.41E-05	1.06E-05	2.80E-05	3.52E-06	3.20E-06	4.03E-07	2.42E-05	3.05E-06
Fluorene	86737	4.49E-04	5.66E-05	6.04E-07	7.61E-08	2.67E-04	3.36E-05	1.07E-04	1.35E-05	1.23E-05	1.55E-06	9.30E-05	1.17E-05
Indeno(1,2,3,c,d)pyrene	193395	3.01E-05	3.79E-06	3.88E-07	4.89E-08	8.64E-04	1.09E-04	1.38E-06	1.74E-07	1.58E-07	1.98E-08	1.19E-06	1.50E-07
Naphthalene	91203	6.41E-03	8.08E-04	1.32E-04	1.66E-05	2.71E-03	3.42E-04	3.12E-04	3.93E-05	3.56E-05	4.49E-06	2.70E-04	3.40E-05
Phenanthrene	85018	1.33E-03	1.68E-04	3.67E-06	4.62E-07	8.51E-04	1.07E-04	1.08E-04	1.36E-05	1.23E-05	1.56E-06	9.36E-05	1.18E-05
Pyrene	129000	1.63E-04	2.05E-05	1.08E-06	1.36E-07	7.74E-05	9.75E-06	1.76E-05	2.21E-06	2.01E-06	2.53E-07	1.52E-05	1.92E-06
<b>Non-HAP Toxic Air Contaminants</b>													
Barium	7440393			9.49E-04	1.20E-04								
Copper	7440508			1.83E-04	2.31E-05								
Magnesium	7439954	5.43E+00	6.84E-01										
Methyl ethyl ketone	78933	1.92E-01	2.42E-02										
Molybdenum	7439987			2.37E-04	2.99E-05								
Propylene (Propene)	115071					5.82E-02	7.33E-03	9.48E-03	1.19E-03	1.08E-03	1.37E-04	8.22E-03	1.04E-03
1,1,1-Trichloroethane (Methyl chloroform)	71556	9.87E-03	1.24E-03										
Vanadium	7440622			4.96E-04	6.25E-05								
Zinc	7440666			6.25E-03	7.88E-04								

Compound	ITSL (ug/m3)	IRSL (ug/m3)	Averaging Period	Preliminary Impact (ug/m3)	Percent of SL (%)
Methyl hydrazine	0.1		Annual	3.86E-05	0.04%
Methyl methacrylate	700		24 hour	5.88E-05	0.00%
Methyl tert butyl ether	3000		24 hour	1.03E-04	0.00%
Nickel		0.0042	Annual	7.90E-05	1.88%
Phenol	600		1 hour	3.80E-04	0.00%
Propionaldehyde (Propanal)	4		Annual	8.62E-05	0.00%
Selenium	2		8 hour	8.83E-03	0.44%
Styrene	1000		24 hour	7.35E-05	0.00%
Styrene		1.7	Annual	5.67E-06	0.00%
Tetrachloroethylene (Perchloroethylene)		1.7	Annual	9.76E-06	0.00%
Toluene	5000		24 hour	1.17E-02	0.00%
Vinyl acetate	200		24 hour	2.23E-04	0.00%
Xylenes	100		24 hour	7.51E-03	0.01%
<b>Polycyclic Organic Matter (POMs)</b>					
2-Chloroacetophenone	0.03		24 hour	2.06E-05	0.07%
2-Methylnaphthalene	10		Annual	1.76E-07	0.00%
3-Methylcholanthrene	0.1		Annual	1.32E-08	0.00%
5-Methyl chrysene	0.1		Annual	4.99E-09	0.00%
7,12-Dimethylbenz(a)anthracene	0.1		Annual	1.18E-07	0.00%
Acenaphthene	210		24 hour	1.28E-04	0.00%
Acenaphthylene	35		24 hour	2.72E-04	0.00%
Anthracene	1000		24 hour	4.86E-05	0.00%
Benzo(a)anthracene	0.1		Annual	1.87E-06	0.00%
Benzo(a)pyrene		0.0005	Annual	4.90E-07	0.10%
Benzo(b)fluoranthene	0.1		Annual	1.65E-06	0.00%
Benzo(b,j,k)fluoranthene	0.1		Annual	2.50E-08	0.00%
Benzo(g,h,i)perylene	12		24 hour	1.83E-05	0.00%
Benzo(k)fluoranthene	0.1		Annual	4.11E-07	0.00%
Biphenyl	15		8 hour	1.15E-05	0.00%
Chrysene	0.1		Annual	2.41E-06	0.00%
Dibenzo(a,h)anthracene	0.1		Annual	8.31E-07	0.00%
Fluoranthene	140		24 hour	1.73E-04	0.00%
Fluorene	140		24 hour	5.94E-04	0.00%
Indeno(1,2,3,c,d)pyrene	0.1		Annual	5.91E-05	0.06%
Naphthalene	3		24 hour	4.04E-03	0.13%
Naphthalene		0.08	Annual	2.40E-04	0.30%
Phenanthrene	0.1		Annual	7.54E-05	0.08%
Pyrene	100		24 hour	1.37E-04	0.00%
<b>Non-HAP Toxic Air Contaminants</b>					
Barium	5		8 hour	5.24E-04	0.01%
Copper	2		8 hour	1.01E-04	0.01%
Magnesium	100		8 hour	7.47E-02	0.07%
Methyl ethyl ketone	5000		24 hour	1.15E-03	0.00%
Molybdenum	0.1		Annual	8.09E-06	0.01%
Propylene (Propene)	1500		24 hour	9.21E-02	0.01%
1,1,1-Trichloroethane (Methyl chloroform)	1000		24 hour	5.88E-05	0.00%
Vanadium	0.1		Annual	1.69E-05	0.02%
Zinc (as ZnO)	50		8 hour	3.46E-03	0.01%

Note: An ITSL of 0.1 that is red bolded is a default screening level per AQD air toxics policy