State Form 4336

DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

INDIANAPOLIS

OFFICE MEMORANDUM

Date: July 28, 2006

To: Steve Roush
Permits Branch

From: John Elliott
Permits Branch

Subject: Wasteload Allocation Report for BP Products in Lake County (IN0000108, WLA000541)

Reasonable potential and antidegradation analyses for individual toxic pollutants were done for the renewal of the NPDES permit for BP Products. In addition, a reasonable potential analysis was done for whole effluent toxicity (WET). The analyses were done for the existing discharge through Outfall 001. Two scenarios were considered for discharge through Outfall 001. The first scenario was for a discharge through the existing shoreline outfall structure without an approved alternate mixing zone and the second was for a discharge through a submerged diffuser to be located about 3500 feet from the shoreline with an approved alternate mixing zone. The effluent flow used in the analyses was 21.4 mgd.

Under both scenarios, discharge is to the open waters of Lake Michigan. Therefore, the discharge is covered under the rules for the Great Lakes system. The Indiana portion of the open waters of Lake Michigan is designated in 327 IAC 2-1.5-5(a)(3)(G) as a salmonid water and shall be capable of supporting a salmonid fishery. Public water system intakes are located in the Indiana portion of the open waters of Lake Michigan so it is designated in 327 IAC 2-1.5-5(a)(4) as a public water supply. The Indiana portion of the open waters of Lake Michigan is also designated in 327 IAC 2-1.5-19(b)(2) as an outstanding state resource water. Discharges to outstanding state resource waters are subject to the antidegradation implementation procedure for outstanding state resource waters in 327 IAC 5-2-11.7.

Under 327 IAC 5-2-11.4(b)(2), except for a zone of initial dilution for acute aquatic life criteria, wasteload allocations for discharges to the open waters of Lake Michigan shall be based on meeting water quality criteria in the undiluted discharge unless a mixing zone demonstration is conducted and approved under 327 IAC 5-2-11.4(b)(4). If an alternate mixing zone is approved for a discharge to the open waters of Lake Michigan, wasteload allocations shall be based on meeting water quality criteria outside the applicable alternate mixing zone. Under 327 IAC 5-2-11.4(b)(4)(E), an alternate mixing zone shall not be granted for a discharge into the open waters of Lake Michigan that exceeds the area where discharge-induced mixing occurs.

BP Products submitted an alternate mixing zone demonstration in accordance with 327 IAC 5-2-11.4(b)(4) for discharge through the submerged diffuser. This WLA report only includes a review of the mixing zone modeling portion of the demonstration and the determination of the dilution factor to be used for the calculation of wasteload allocations. The demonstration included a site-specific study in which the ambient currents at the proposed diffuser location were measured over a 45 day period. Based on the information obtained as part of the site-specific study, BP Products modeled the discharge through the submerged diffuser for sixteen different current directions and associated average current velocities. They used the U.S. EPA supported mixing zone model CORMIX to determine the dilution that occurs at the edge of the discharge-induced mixing zone.

After reviewing the mixing zone demonstration submitted by BP Products and conducting additional mixing zone modeling using CORMIX, a design case for the diffuser was chosen to calculate the dilution factor under critical conditions. At an effluent flow of 21.4 mgd, the diffuser will achieve a dilution factor of 37.1 at the edge of the discharge-induced mixing zone. The dilution factor is a weighted average that was calculated using the dilution obtained from the CORMIX model for each current direction and the frequency of occurrence of each current direction. The discharge-induced mixing zone will extend a distance of 182 feet from the diffuser and its location will change as the current direction changes. The dilution factor was used in accordance with 327 IAC 5-2-11.4(c) to calculate wasteload allocations for all of the pollutants of concern except mercury. A mixing zone for mercury has not been approved for the BP Products discharge to the open waters of Lake Michigan through Outfall 001.

The calculation of the monthly average and daily maximum projected effluent quality for individual toxic pollutants is included in Table 1. The results of the reasonable potential procedure for the case without an approved alternate mixing zone are included in Table 2. The results show that of the pollutants considered, WQBELs are required for ammonia-N, copper, lead, mercury, selenium, strontium, vanadium, chloride, fluoride, sulfate, total dissolved solids and benzo(a)pyrene. The reasonable potential analysis for WET for the case without an approved alternate mixing zone showed that WQBELs are required for both acute and chronic WET.

The results of the reasonable potential procedure for the case with an approved alternate mixing zone are included in Table 3. The results show that of the pollutants considered, WQBELs are required for mercury and vanadium. The reasonable potential analysis for WET for the case with an approved alternate mixing zone showed that WQBELs are not required for either acute or chronic WET.

Water quality-based effluent limitations for the pollutants of concern that demonstrated reasonable potential using the procedure for individual toxic pollutants and the procedure for WET are included in Table 4 for the case without an approved alternate mixing zone and in Table 5 for the case with an approved alternate mixing zone. Although reasonable potential for WET was not demonstrated for the case with an approved alternate mixing zone, WQBELs for WET are included in Table 5 in the event that toxicity reduction evaluation (TRE) triggers are included in the permit. Water quality-based effluent limitations are also included in Tables 4 and 5 for any pollutants of concern that are included in the effluent limitations guidelines for this industry, but did not demonstrate reasonable potential based on the procedure for individual toxic pollutants.

Antidegradation for OSRWs under 327 IAC 5-2-11.7 was considered for this discharge. BP Products is not proposing to increase the effluent flow and they are not proposing to add any new pollutants, but there are new permit limits required for Outfall 001. It was determined that these new permit limits are allowable based on the provision in 327 IAC 5-2-11.7(b)(2). The documentation of the wasteload allocation analysis is included as an attachment.

TABLE 1
Calculation of Projected Effluent Quality
For BP Products in Lake County
(IN0000108, WLA000541)

Parameter	Monthly Average PEQ					Daily Maximum PEQ				
	Maximum Monthly Average (mg/l)	Number of Monthly Averages	CV	Multiplying Factor	Monthly Average PEQ (mg/l)	Maximum Daily Sample (mg/l)	Number of Daily Samples	CV	Multiplying Factor	Daily Maximum PEQ (mg/l)
Antimony	0.00091	1	0.6	6.2	0.0056	0.0014	5	0.6	2.3	0.0032
Arsenic III	0.0071	2	0.6	3.8	0.027	0.0077	7	0.6	2.0	0.015
Barium	0.1	2	0.6	3.8	0.38	0.14	7	0.6	2.0	0.28
Beryllium	0.001	2	0.6	3.8	0.0038	0.001	7	0.6	2.0	0.002
Cadmium	0.0005	2	0.6	3.8	0.0019	0.0005	7	0.6	2.0	0.001
Chromium (VI)	0.005	38	0.0	1.0	0.005	0.005	166	0.0	1.0	0.005
Total Chromium	0.01	38	0.0	1.0	0.01	0.01	165	0.0	1.0	0.01
Cobalt	0.0028	2	0.6	3.8	0.011	0.005	7	0.6	2.0	0.01
Copper	0.0029	1	0.6	6.2	0.018	0.0058	5	0.6	2.3	0.013
Lead	0.0077	2	0.6	3.8	0.029	0.021	7	0.6	2.0	0.042
Manganese	0.073	1	0.6	6.2	0.45	0.089	5	0.6	2.3	0.2
Mercury	0.000049	2	0.6	3.8	0.00019	0.000077	16	1.2	1.9	0.00015
Molybdenum	0.0033	2	0.6	3.8	0.013	0.0054	7	0.6	2.0	0.011
Nickel	0.002	2	0.6	3.8	0.0076	0.016	7	0.6	2.0	0.032
Selenium	0.022	6	0.6	2.1	0.046	0.034	24	0.5	1.2	0.041
Strontium	0.53	2	0.6	3.8	2.0	0.78	7	0.6	2.0	1.6
Thallium	0.001	2	0.6	3.8	0.0038	0.001	7	0.6	2.0	0.002
Tin	0.01	2	0.6	3.8	0.038	0.01	7	0.6	2.0	0.02
Titanium	0.025	2	0.6	3.8	0.095	0.025	7	0.6	2.0	0.05
Vanadium	0.37	9	0.6	1.8	0.67	0.63	29	0.7	1.2	0.76
Zinc	0.026	2	0.6	3.8	0.099	0.082	7	0.6	2.0	0.16
Benzo(b)fluoranthene	0.000075	2	0.6	3.8	0.00029	0.000088	7	0.6	2.0	0.00018
Benzo(k)fluoranthene	0.000024	2	0.6	3.8	0.000091	0.00003	7	0.6	2.0	0.00006
Benzo(g,h,i)perylene	0.00056	2	0.6	3.8	0.0021	0.00075	7	0.6	2.0	0.0015
Benzo(a)pyrene	0.00021	2	0.6	3.8	0.0008	0.00033	7	0.6	2.0	0.00066
Fluoranthene	0.00058	2	0.6	3.8	0.0022	0.0016	7	0.6	2.0	0.0032
Boron	0.17	2	0.6	3.8	0.65	0.21	7	0.6	2.0	0.42
Chloride	263	3	0.6	3.0	789	424	10	0.3	1.3	551
Sulfate	315	3	0.6	3.0	945	370	10	0.4	1.5	555
Total Dissolved Solids	905	3	0.6	3.0	2715	980	10	0.1	1.1	1078
Fluoride					1.5	0.4	2	0.6	3.8	1.5
Iron, Dissolved	0.05	2	0.6	3.8	0.19	0.05	7	0.6	2.0	0.1
Total Ammonia (as N)										
Summer	3.1	9	0.6	1.8	5.6	7.0	198	1.4	0.8	5.6
Winter	1.0	32	0.8	1.2	1.2	10.7	693	2.5	0.7	7.5

TABLE 2
Results of Reasonable Potential Statistical Procedure without Approved Alternate Mixing Zone
For BP Products in Lake County
(IN0000108, WLA000541)

Parameter	Monthly Average Comparison			Daily Maximum Comparison			WQBELs Required?
	Monthly Average PEQ (mg/l)	Monthly Average PEL (mg/l)	PEQ > PEL?	Daily Maximum PEQ (mg/l)	Daily Maximum PEL (mg/l)	PEQ > PEL?	
Antimony	0.0056	0.066	No	0.0032	0.13	No	No
Arsenic III	0.027	0.12	No	0.015	0.24	No	No
Barium	0.38	0.51	No	0.28	1.0	No	No
Beryllium	0.0038	0.0046	No	0.002	0.0092	No	No
Cadmium	0.0019	0.0026	No	0.001	0.0053	No	No
Chromium (VI)	0.005	0.009	No	0.005	0.018	No	No
Total Chromium	0.01	0.1	No	0.01	0.2	No	No
Cobalt	0.011	0.016	No	0.01	0.031	No	No
Copper	0.018	0.01	Yes	0.013	0.02	No	Yes
Lead	0.029	0.0081	Yes	0.042	0.016	Yes	Yes
Manganese	0.45	0.58	No	0.2	1.2	No	No
Mercury	0.00019	0.0000013	Yes	0.00015	0.0000032	Yes	Yes
Molybdenum	0.013	0.66	No	0.011	1.3	No	No
Nickel	0.0076	0.057	No	0.032	0.11	No	No
Selenium	0.046	0.0041	Yes	0.041	0.0082	Yes	Yes
Strontium	2.0	0.7	Yes	1.6	1.4	Yes	Yes
Thallium	0.0038	0.0049	No	0.002	0.0099	No	No
Tin	0.038	0.11	No	0.02	0.23	No	No
Titanium	0.095	2.0	No	0.05	4.1	No	No
Vanadium	0.67	0.0098	Yes	0.76	0.02	Yes	Yes
Zinc	0.099	0.13	No	0.16	0.26	No	No
Benzo(b)fluoranthene	0.00029	0.0021	No	0.00018	0.0043	No	No
Benzo(k)fluoranthene	0.000091	0.0021	No	0.00006	0.0043	No	No
Benzo(g,h,i)perylene	0.0021	0.0021	No	0.0015	0.0043	No	No
Benzo(a)pyrene	0.0008	0.000096	Yes	0.00066	0.00023	Yes	Yes
Fluoranthene	0.0022	0.0029	No	0.0032	0.0059	No	No
Boron	0.65	1.3	No	0.42	2.6	No	No
Chloride	789	188	Yes	551	378	Yes	Yes
Sulfate	945	205	Yes	555	411	Yes	Yes
Total Dissolved Solids	2715	614	Yes	1078	1232	No	Yes
Fluoride	1.5	0.82	Yes	1.5	1.6	No	Yes
Iron, Dissolved	0.19	0.25	No	0.1	0.49	No	No
Total Ammonia (as N)							
Summer	5.6	0.48	Yes	5.6	1.1	Yes	Yes
Winter	1.2	0.49	Yes	7.5	1.1	Yes	Yes

TABLE 3
Results of Reasonable Potential Statistical Procedure with Approved Alternate Mixing Zone
For BP Products in Lake County
(IN0000108, WLA000541)

Parameter	Monthly Average Comparison			Daily Maximum Comparison			WQBELs Required?
	Monthly Average PEQ (mg/l)	Monthly Average PEL (mg/l)	PEQ > PEL?	Daily Maximum PEQ (mg/l)	Daily Maximum PEL (mg/l)	PEQ > PEL?	
Chromium (VI)	0.005	0.3	No	0.005	0.61	No	No
Total Chromium	0.01	3.8	No	0.01	7.6	No	No
Copper	0.018	0.35	No	0.013	0.7	No	No
Lead	0.029	0.29	No	0.042	0.57	No	No
Mercury	0.00019	0.0000013	Yes	0.00015	0.0000032	Yes	Yes
Selenium	0.046	0.14	No	0.041	0.28	No	No
Strontium	2.0	23	No	1.6	47	No	No
Vanadium	0.67	0.28	Yes	0.76	0.56	Yes	Yes
Benzo(a)pyrene	0.0008	0.0037	No	0.00066	0.0089	No	No
Chloride	789	6750	No	551	13542	No	No
Sulfate	945	7040	No	555	14123	No	No
Total Dissolved Solids	2715	18020	No	1078	36152	No	No
Fluoride	1.5	28	No	1.5	56	No	No
Total Ammonia (as N)							
Summer	5.6	18	No	5.6	42	No	No
Winter	1.2	19	No	7.5	42	No	No

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TABLE 4
Water Quality-based Effluent Limitations without Approved Alternate Mixing Zone For BP Products in Lake County (IN0000108, WLA000541)

Parameter	Quality or Concentration			Quantity or Loading*			Monthly Sampling Frequency
	Monthly Average	Daily Maximum	Units	Monthly Average	Daily Maximum	Units	
Chromium (VI)	0.009	0.018	mg/l	1.6	3.2	lbs/day	4
Total Chromium	0.1	0.2	mg/l	18	37	lbs/day	4
Copper	0.01	0.02	mg/l	1.8	3.6	lbs/day	4
Lead	0.0081	0.016	mg/l	1.4	2.9	lbs/day	4
Mercury	0.0000013	0.0000032	mg/l	0.00023	0.00057	lbs/day	1
Selenium	0.0041	0.0082	mg/l	0.73	1.5	lbs/day	4
Strontium	0.7	1.4	mg/l	125	250	lbs/day	4
Vanadium	0.0098	0.02	mg/l	1.8	3.6	lbs/day	4
Benzo(a)pyrene	0.000096	0.00023	mg/l	0.017	0.041	lbs/day	4
Chloride	188	378	mg/l	33575	67508	lbs/day	4
Sulfate	205	411	mg/l	36611	73401	lbs/day	4
Total Dissolved Solids	614	1232	mg/l	109655	220025	lbs/day	4
Fluoride	0.82	1.6	mg/l	146	286	lbs/day	4
Total Ammonia (as N)							
Summer	0.48	1.1	mg/l	86	196	lbs/day	8
Winter	0.49	1.1	mg/l	88	196	lbs/day	8
Whole Effluent Toxicity							
Acute		1.0	TUa				
Chronic	1.0		TUc				

*Based on an effluent flow of 21.4 mgd.

7/28/2006

TABLE 5
Water Quality-based Effluent Limitations with Approved Alternate Mixing Zone For BP Products in Lake County (IN0000108, WLA000541)

Parameter	Quality or Concentration Monthly Average	Daily Maximum	Units	Quantity or Loading* Monthly Average	Daily Maximum	Units	Monthly Sampling Frequency
Chromium (VI)	0.3	0.61	mg/l	54	109	lbs/day	4
Total Chromium	3.8	7.6	mg/l	681	1366	lbs/day	4
Mercury	0.0000013	0.0000032	mg/l	0.00023	0.00057	lbs/day	1
Vanadium	0.28	0.56	mg/l	50	100	lbs/day	4
Total Ammonia (as N)							
Summer	18	42	mg/l	3215	7501	lbs/day	8
Winter	19	42	mg/l	3393	7501	lbs/day	8
Whole Effluent Toxicity							
Acute (with MZ)		11	TUa				
Chronic	38		TUc				

*Based on an effluent flow of 21.4 mgd.

7/28/2006

Documentation of Wasteload Allocation Analysis For Discharges to the Great Lakes System

Analysis By: John Elliott JE
Date: July 28, 2006
WLA Number: 541

Facility Information

- **Name:** BP Products
- **NPDES Permit Number:** IN0000108
- **Permit Expiration Date:** February 28, 1995
- **County:** Lake
- **Purpose of Analysis:** Permit renewal

Outfall 001

- **Facility Operations:** Refinery process wastewater, cooling water and stormwater
- **Applicable Effluent Guidelines:** 40 CFR Part 419 - Petroleum Refining, Subpart B - Cracking Subcategory
- **Current Permitted Flow:** There are no current effluent limits based on discharge flow. An average flow of 17 mgd and a maximum flow of 24.3 mgd are listed in the Fact Sheet of the current permit. These values are based on DMR data from 9-88 through 9-89.
- **Type of Treatment:** Screening, grit removal, oil/water separator, storm surge tank, equalization tank, flocculation/flotation, activated sludge, settling and multimedia filtration
- **Current Effluent Limits:**

Parameter	Monthly Average		Daily Maximum*	
	(mg/l)	(lbs/day)	(mg/l)	(lbs/day)
TBOD5	Report	4161	Report	8164
TSS	Report	3646	Report	5694
COD	Report	30323	Report	58427
Oil and Grease	Report	1368	Report	2600
Phenolics (4AAP)	Report	20.33	Report	73.01
Ammonia-N	Report	1030	Report	2060
Sulfide	Report	23.1	Report	51.4
Total Chromium	Report	23.9	Report	68.53
Hex. Chromium	Report	2.01	Report	4.48
Residual Chlorine	Report	--	0.05	--
Selenium	--	--	Report	Report

- **Effluent Flow for WLA Analysis:** 21.4 mgd (Under 327 IAC 5-2-11.4(a)(9) the effluent flow used to develop WLAs for industrial dischargers is the highest monthly average flow from the previous two years of monitoring. An alternate effluent flow value may be used if the discharger provides flow data that supports the alternate value. The highest monthly average flow from January 2004 through December 2005 was 17.6 mgd and occurred during September 2004. The permit application dated April 2002 lists the highest monthly average flow as 19.9 mgd. In the period between the submittal of the permit application and January 2004, a higher monthly average flow occurred. This value was 21.4 mgd and occurred during July 2002. It was decided to use the value of 21.4 mgd since data are available to support it.)

Outfall 002

- **Facility Operations:** Non-contact cooling water
- **Applicable Effluent Guidelines:** 40 CFR Part 419 – Petroleum Refining, Subpart B - Cracking Subcategory
- **Current Permitted Flow:** There are no current effluent limits based on discharge flow. An average flow of 119.5 mgd and a maximum flow of 123.8 mgd are listed in the Fact Sheet of the current permit. These values are based on DMR data from 9-88 through 9-89.
- **Type of Treatment:** Oil/water separator
- **Current Effluent Limits:**

Parameter	Monthly Average		Daily Maximum	
	(mg/l)	(lbs/day)	(mg/l)	(lbs/day)
TOC (Intake)	Report	--	Report	--
TOC (Discharge)	Report	--	Report	--
TOC (Net) *	Report	--	5.0	--
Total Residual Chlorine	Report	--	0.05	--
Oil and Grease (Intake)	Report	--	Report	--
Oil and Grease (Discharge)	Report	--	Report	--
Oil and Grease (Net)	Report	--	5.0	--
Temperature	Report	--	*	--

*The net result shall be calculated by subtracting the temperature value of the intake water from the temperature value of the gross discharge. The net heat discharged shall be maintained at or below the following limits:

2.0×10^9 BTU/Hour maximum daily average
1.7×10^9 BTU/Hour maximum monthly average

- **Effluent Flow for WLA Analysis:** (The highest monthly average flow from January 2004 through December 2005 was 88.4 mgd and occurred during October 2004. The permit application dated April 2002 lists the highest monthly average flow as 119.6 mgd.)

Pollutants of Concern for WLA Analysis for Outfall 001

BP Products no longer sends sanitary wastewater to their wastewater treatment plant and no longer chlorinates their effluent. Therefore, total residual chlorine was not considered a pollutant of concern.

Pollutants of Concern for WLA Analysis for Outfall 001	
Parameter	**Reason for Inclusion on Pollutants of Concern List**
Ammonia-N, total chromium, hexavalent chromium and selenium	Limited or monitored in current permit.
Aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chloride, cobalt, copper, total cyanide, free cyanide, fluoride, iron, lead, manganese, molybdenum, mercury, nickel, selenium, silver, strontium, sulfate, thallium, tin, titanium, total dissolved solids, vanadium, zinc, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, benzo(a)pyrene, fluoranthene, acute and chronic whole effluent toxicity	Effluent data submitted with renewal application.

Receiving Stream Information for Outfall 001

- **Receiving Stream:** Lake Michigan; in addition to the existing shoreline outfall, discharge through a submerged diffuser to be located about 3500 ft from the shoreline was considered (see Attachment 1; this map (except for the locations of Outfall 001 and Outfall 002 which were added) was submitted by BP Products in April 2002 as part of their updated alternate mixing zone demonstration; the proposed diffuser location is S3500)
- **Drainage Basin:** Lake Michigan
- **Public Water System Intakes Downstream:** The City of Whiting has a public water system intake in Lake Michigan about 1,640 feet from the proposed diffuser location and a similar distance from the current shoreline outfall location. Since drinking water criteria apply at the point of the public water system intake (327 IAC 2-1.5-8(b)(2)(B)(iv) and (C)(iv)), they were not considered in this WLA analysis due to the available dilution between the existing and proposed outfall locations and the intake.
- **Designated Stream Use:** The Indiana portion of the open waters of Lake Michigan is designated for full-body contact recreation and shall be capable of supporting a well-balanced, warm water aquatic community. The Indiana portion of the open waters of Lake Michigan is designated in 327 IAC 2-1.5-5(a)(3)(G) as a salmonid water and shall be capable of supporting a salmonid fishery. Public water system intakes are located in the Indiana portion of the open waters of Lake Michigan so it is designated in 327 IAC 2-1.5-5(a)(4) as a public water supply. The Indiana portion of the open waters of Lake Michigan is designated in 327 IAC 2-1.5-19(b)(2) as an outstanding state resource water (OSRW). Discharges directly to OSRWs are subject to the antidegradation implementation procedure for OSRWs in 327 IAC 5-2-11.7.
- **303(d) List:** The Lake Michigan shoreline is on the 2004 303(d) list for *E. coli* and because of a fish consumption advisory for mercury and PCBs.
- **Nearby Dischargers:** None that will impact this analysis.

Stream Design Flows for Outfall 001 without Approved Alternate Mixing Zone

- **Q7,10 (Outfall):** 0.0 cfs (According to 327 IAC 5-2-11.4(b)(2)(A)(ii)(AA), for discharges to Lake Michigan, a WLA based on a chronic criterion or value shall be set equal to the criterion or value unless an alternate mixing zone demonstration is conducted and approved under 327 IAC 5-2-11.4(b)(4). Therefore, the stream design flows for chronic aquatic life (Q7,10), human health (harmonic mean flow) and wildlife (Q90,10) criteria were set equal to zero.)
- **Q1,10 (Outfall):** 33 cfs (21.4 mgd) (According to 327 IAC 5-2-11.4(b)(2)(A)(i)(AA), for discharges to Lake Michigan, the acute aquatic life criterion or value shall not be exceeded outside the zone of initial dilution and the final acute value shall not be exceeded in the undiluted discharge unless a mixing zone demonstration is conducted and approved under 327 IAC 5-2-11.4(b)(4). There is no Q1,10 for Lake Michigan, therefore, the Q1,10 was set equal to the discharge flow in order to allow for a zone of initial dilution.)
- **Q90,10 (Outfall):** 0.0 cfs
- **Harmonic Mean Flow (Outfall):** 0.0 cfs

Stream Design Flows for Outfall 001 with Approved Alternate Mixing Zone

- **Dilution Factor:** 37.1 (The dilution factor is used in 327 IAC 5-2-11.4(c) to calculate wasteload allocations for discharges with approved alternate mixing zones. Alternate mixing zone demonstrations are conducted under 327 IAC 5-2-11.4(b)(4). According to 327 IAC 5-2-11.4(b)(4)(E), an alternate mixing zone shall not be granted for a discharge into the open waters of Lake Michigan that exceeds the area where discharge-induced mixing occurs. The area where discharge-induced mixing occurs can be defined as the area where the mixing of the discharge with the receiving water is controlled by the initial flux of the momentum and buoyancy of the discharge. The CORMIX mixing zone model is used to define the area where discharge-induced mixing occurs (the discharge-induced mixing zone (DIMZ)). The facility submitted an alternate mixing zone demonstration in accordance with 327 IAC 5-2-11.4(b)(4) in March 1998. The facility submitted an update to the March 1998 demonstration in April 2002. The update included additional Lake Michigan biomonitoring data and a revised CORMIX model. In response to IDEM concerns that the CORMIX model did not adequately account for the dynamic nature of the currents in Lake Michigan, BP Products contracted with a firm that specializes in coastal engineering to review the modeling aspects of the mixing zone demonstration and to measure the currents in Lake Michigan at the proposed diffuser location. The results of the mixing zone review and current measurements are included in the January 2006 report "Mixing Zone Evaluation, BP Products North America Whiting Business Unit" prepared by the Woods Hole Group, Inc. Based on the recommendations in the January 2006 report, the facility revised the design of the proposed diffuser and provided a revised CORMIX model. The inputs to the revised CORMIX model are included in Attachment 2 and the results of the CORMIX modeling are included in Attachments 3 and 4. The change in the diffuser design (the discharge ports now point directly to the surface) has resulted in buoyancy being a sensitive model input. The discharge is positively buoyant as a result of the heated discharge entering the cooler Lake Michigan water. The facility currently monitors temperature daily at their Lake Michigan water intake and just prior to discharge through Outfall 001. The average temperature difference between Outfall 001 and the intake for each month from January 2003 through May 2006 is included in Attachment 5. The results show that seasonal variation in temperature difference will occur. To determine the sensitivity of mixing to buoyancy, model runs were conducted using

CORMIX-GI version 4.3GT for several temperature differences. The model results are included in Attachments 6 through 10 and a summary is included in Attachment 11. Considering that the effluent will travel about 3500 feet underground to the diffuser, some heat loss will occur prior to discharge through the diffuser. Considering the heat loss in the underground discharge pipe and the need to protect aquatic life during all seasons, a temperature difference of 10 °C was chosen for the CORMIX model. The model inputs for the alternate mixing zone that is being approved are included in Attachment 12. These inputs are for the design case for critical conditions. The alternate mixing zone used to calculate PELs will be based on the maximum monthly average flow of 21.4 mgd. The CORMIX model printouts for the predominant Lake Michigan current direction are included in Attachments 13 and 14. The CORMIX model results for all current directions at a temperature difference of 10 °C are included in Attachment 8 which was previously referenced. The frequency of projected dispersion is included in Attachment 15. The edge of the discharge-induced mixing zone is 182 feet at the maximum monthly average flow of 21.4 mgd. Considering that the location of the mixing zone will change with the direction of the current, it was decided that it would be reasonable to set the dilution factor equal to the weighted average dispersion (37.1 at the maximum monthly average flow of 21.4 mgd). Based on the frequency of projected dispersion in Attachment 15, this dilution factor is exceeded about 59% of the time at the maximum monthly average flow of 21.4 mgd and about 78% of the time at the long-term average flow of 15.9 mgd. Based on the results of the current measurements (see "Current Direction Occurrence (%)" in Attachment 8), the frequency of occurrence of currents in the southwest direction (202.5 to 270 degrees) from the proposed diffuser location to the public water system intake is only 21 percent. This is further justification for not considering drinking water criteria in the WLA analysis.)

- **Q7,10 (Outfall):** 1228 cfs (793.94 mgd) (The dilution flow for chronic aquatic life criteria and Lake Michigan criteria based on the alternate mixing zone is 100% of the flow calculated by multiplying the dilution factor by the effluent flow.)
- **Q1,10 (Outfall):** Not Applicable (For the case with an approved alternate mixing zone, the WLA spreadsheet will calculate the dilution flow for acute aquatic life criteria by multiplying the dilution factor by the effluent flow.)
- **Q90,10:** 0.0 cfs (An alternate mixing zone has not been approved for any wildlife criteria.)
- **Harmonic Mean Flow (Outfall):** 1228 cfs (793.94 mgd) (The dilution flow for human health criteria based on the alternate mixing zone is 100% of the flow calculated by multiplying the dilution factor by the effluent flow.)

Calculation of Preliminary Effluent Limitations for Outfall 001

For discharges to the open waters of Lake Michigan without an approved alternate mixing zone, WLAs based on chronic aquatic life, human health and wildlife criteria are calculated using no dilution and WLAs based on acute aquatic life criteria are calculated using a zone of initial dilution (327 IAC 5-2-11.4(b)(2)). Considering the pollutants of concern, the PELs for chromium (VI), copper, molybdenum and zinc calculated without a zone of initial dilution are based on the acute aquatic life criterion. Therefore, it was necessary to determine background concentrations for these pollutants to ensure that assimilative capacity is available. The PELs for the other pollutants of concern are based on chronic aquatic life, human health or wildlife criteria. Since the WLAs based on these criteria are calculated using no dilution, it was not necessary to determine background concentrations for these pollutants.

For discharges to Lake Michigan with an approved alternate mixing zone, background concentrations are needed for all of the pollutants for which PELs are calculated. Considering the number of pollutants of concern, it was decided to only calculate PELs using an approved alternate mixing zone for those pollutants that showed reasonable potential without an approved alternate mixing zone and for those pollutants for which technology-based effluent limits are required. Therefore, in addition to chromium (VI), copper, molybdenum and zinc, background concentrations were determined for ammonia-N, benzo(a)pyrene, chloride, total chromium, total dissolved solids, lead, selenium, strontium, sulfate and vanadium.

Water quality data for Lake Michigan are available from fixed water quality monitoring station LM W Lake Michigan at Whiting. The data are collected from water withdrawn from the Whiting public water system intake. Water quality data for copper obtained from fixed station LM W are not representative due to copper being leached from the intake piping. Therefore, Lake Michigan data for copper were obtained from fixed water quality monitoring station LM M Lake Michigan at Michigan City. The time periods chosen for the fixed station data sets are based on the availability of data, improvement in the limit of detection for some pollutants and the desire to have data for whole years. Data were limited to the last five years. Based on 327 IAC 5-2-11.4(b)(1), a mixing zone is not allowed for BCCs so stream data were not required for mercury. The background concentrations of chromium (VI) and organic pollutants were set equal to zero based on the nature of the pollutants. For some pollutants of concern, data are not collected at the fixed station. BP Products collected Lake Michigan data for these pollutants and provided the data as part of their permit renewal application.

The background concentration for each pollutant was determined by calculating the geometric mean of the data for the pollutant (327 IAC 5-2-11.4(a)(8)). In 327 IAC 5-2-11.4(a)(8) a procedure is included for calculating background concentrations when the data set includes values below the limit of detection. In this procedure, values in the data set below the limit of detection (LOD) are assigned the value (V) and then the geometric mean of the data set is calculated. The value (V) is determined as follows:

$$V = (LOD) \times [1 - (\text{Number of nondetects})/(\text{Total number of values})]$$

The fixed station data are actually reported as less than the limit of quantitation (LOQ). Therefore, a procedure based on best professional judgment was used for the fixed station data. If less than one-half the values in the data set were below the LOQ, the values below the LOQ were assigned the value (V) and then the geometric mean of the data set was calculated. The value (V) was determined as follows:

$$V = (LOQ) \times [1 - (\text{Number below LOQ})/(\text{Total number of values})]$$

If one-half or more of the values in the data set were below the LOQ, the values below the LOQ were set equal to one-half the LOQ. The determination of background concentrations is included in Attachments 16 through 19. Considering the number of ammonia-N samples reported as less than the LOQ and that the high sample in 2000 was flagged by the Assessment Branch for contamination in the blank, it was decided to set the background concentration of ammonia-N equal to zero for both summer and winter. As further justification for setting the background

concentration of ammonia-N equal to zero, the other fixed stations on Lake Michigan have reported similar results for ammonia-N.

According to 327 IAC 5-2-11.4(a)(13), for discharges to Lake Michigan, the 50th percentile hardness outside the applicable mixing zone is to be used to determine the criteria for those metals whose criteria are dependent on hardness. The 50th percentile hardness value at fixed station LM W calculated using the last five years of data is 140 mg/l. The data are included in Attachment 20.

According to 327 IAC 5-2-11.4(a)(13), for discharges to Lake Michigan, the 75th percentile temperature and pH outside the applicable mixing zone are to be used to determine the ammonia-N criteria. For Lake Michigan, field data are only collected at fixed water quality monitoring station LM DSP Lake Michigan at Dunes State Park. These data are collected from the beach. The summer/winter 75th percentile pH values are 8.3/8.4 s.u. and the summer/winter 75th percentile temperatures are 22/13 °C. The summer period was defined as July through September and the winter period was defined as October through June to be consistent with how these periods for Lake Michigan have been defined historically by IDEM. The data are included in Attachments 21 and 22. In addition, the facility collected pH data at the proposed diffuser location during a biomonitoring program conducted for the alternate mixing zone demonstration. The summer/winter 75th percentile values of pH are 8.2/8.2 s.u. The data are included in Attachments 23 and 24. Considering the fixed station data and the data collected by the facility, it was decided to use summer/winter pH values of 8.3/8.3 s.u. to determine the ammonia-N criteria.

Aquatic life criteria or ambient screening values are currently not available for silver so PELs could not be calculated for silver. Human health noncancer criteria for benzo(g,h,i)perylene are not available and ambient screening values could not be verified. Therefore, the PELs for benzo(g,h,i)perylene are only based on aquatic life ambient screening values.

The coefficient of variation used to calculate monthly average and daily maximum PELs was set equal to the default value of 0.6. The number of samples per month used to calculate monthly average PELs was based on the expected monitoring frequency. For ammonia-N the number of samples per month was set equal to 8 and for mercury the number of samples per month was set equal to 1. For the other pollutants the number of samples per month was set equal to 4. The spreadsheet used to calculate PELs without an approved alternate mixing zone is included in Attachment 25. The spreadsheet used to calculate PELs with an approved alternate mixing zone is included in Attachment 26.

Reasonable Potential Analysis

Calculation of Projected Effluent Quality

BP Products currently monitors Outfall 001 for ammonia-N, total chromium, hexavalent chromium and selenium. They provided the effluent data for these pollutants in electronic format. Data for ammonia-N for the period October 2002 through February 2006 were used in the reasonable potential analysis. The data are not included in this report due to the large number of samples. Data for total chromium and hexavalent chromium for the period January 2003

through February 2006 were used in the analysis. The data are included in Attachment 27. BP Products is only required to monitor for selenium two times per year so the last five years of available data were used in the analysis to obtain more effluent samples. The data are included in Attachment 28. For the other pollutants of concern, BP Products provided effluent data for Outfall 001 as part of their permit renewal application in April 2002 and in subsequent electronic submittals. The data are included in Attachments 29 through 33. The effluent data include values reported as less than (<) the LOD. These values were assigned the reported less than value. Monthly averages were calculated for those months for which at least two data points were available. For mercury, a duplicate sample was collected each month. The duplicate sample was averaged with the normal sample to give one daily value. Only one effluent sample for total cyanide and one effluent sample for free cyanide were provided and both samples were reported as less than the LOD so these were not included in the reasonable potential analysis.

Comparison of PEQs to PELs Calculated without Approved Alternate Mixing Zone
For cadmium, in an initial assessment of reasonable potential, the monthly average PEQ of 3.8 ug/l exceeded the monthly average PEL of 2.6 ug/l. This was based on only having two monthly averages and setting the daily effluent data equal to the LOD. Considering the amount of data already collected for cadmium, it was decided to determine whether it would be reasonable to assign a value other than the LOD to the data that were reported as less than the LOD. There is no procedure in the rules for handling effluent data reported as less than the LOD. As a conservative first test of reasonable potential, they are typically set equal to the LOD. For cadmium, over three months of sampling, all seven samples were less than the LOD of 1 ug/l. Considering the results of the sampling, it was decided that setting the daily values reported as less than the LOD of 1 ug/l equal to 1 ug/l was overly conservative. Instead, these values were set equal to 0.5 ug/l.

The reasonable potential analysis is included in Attachment 34. The results show that WQBELs are required for ammonia-N, copper, lead, mercury, selenium, strontium, vanadium, chloride, fluoride, sulfate, total dissolved solids and benzo(a)pyrene.

Comparison of PEQs to PELs Calculated with Approved Alternate Mixing Zone
The reasonable potential analysis is included in Attachment 35. The results show that WQBELs are required for mercury and vanadium.

Reasonable Potential Analysis for WET
USEPA disapproved the reasonable potential procedure for whole effluent toxicity at 327 IAC 5-2-11.5(c)(1). In place of 327 IAC 5-2-11.5(c)(1), IDEM is required to apply Paragraphs C.1 and D of Procedure 6 in Appendix F of 40 CFR Part 132. The following analysis is based on Paragraphs C.1 and D of Procedure 6 in Appendix F of 40 CFR Part 132.

Effluent Data
BP Products conducted acute and chronic WET tests over five months to provide data for the renewal of their NPDES permit. In addition to *Ceriodaphnia Dubia* and Fathead Minnow, they conducted WET tests for Rainbow Trout and Selenastrum at the request of IDEM. The WET data are included in Attachment 36. Chronic toxicity was calculated using the IC_{25} values.

Reasonable Potential Analysis for Acute WET
The WET of an effluent is or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above the numeric interpretation of the narrative criterion for acute WET at 327 IAC 2-1.5-8(b)(1)(E)(ii) when effluent specific WET data demonstrates that:

(TUa effluent) x (B) x (effluent flow)/(Qad + effluent flow) > AC

where,

TUa effluent = maximum acute WET result
B = multiplying factor from 327 IAC 5-2-11.5(h), Table 11.5-1
effluent flow = effluent flow used to calculate WQBELs for individual pollutants
Qad = amount of receiving water available for dilution
AC = numeric interpretation of the narrative criterion for acute WET

A. BP Products without Approved Alternate Mixing Zone

TUa effluent = 2.8 TUa (Rainbow Trout was the most sensitive species)
B = 2.3 (based on 5 samples and a CV of 0.6)
effluent flow = 21.4 mgd
Qad = 0.0 mgd (no dilution is allowed for the case without an approved alternate mixing zone for acute WET)
AC = 1.0 TUa (the applicable numeric interpretation of the narrative criterion for acute WET for the case without an approved alternate mixing zone for acute WET)

(2.8 TUa) x (2.3) x (21.4 mgd)/(0.0 mgd + 21.4 mgd) = 6.4 TUa

Since the calculated value is greater than 1.0 TUa, there is reasonable potential for acute WET.

B. BP Products with Approved Alternate Mixing Zone

TUa effluent = 2.8 TUa (Rainbow Trout was the most sensitive species)
B = 2.3 (based on 5 samples and a CV of 0.6)
effluent flow = 21.4 mgd
Qad = 793.94 mgd (for the case with an approved alternate mixing zone for acute WET, the dilution is calculated by multiplying the dilution factor by the effluent flow)
AC = 0.3 TUa (the applicable numeric interpretation of the narrative criterion for acute WET for the case with an approved alternate mixing zone for acute WET)

(2.8 TUa) x (2.3) x (21.4 mgd)/(793.94 mgd + 21.4 mgd) = 0.17 TUa

Since the calculated value is not greater than 0.3 TUa, there is no reasonable potential for acute WET.

Reasonable Potential Analysis for Chronic WET
The WET of an effluent is or may be discharged at a level that will cause, have the reasonable potential to cause, or contribute to an excursion above the numeric interpretation of the narrative criterion for chronic WET at 327 IAC 2-1.5-8(b)(2)(A)(iv) when effluent specific WET data demonstrates that:

(TUc effluent) x (B) x (effluent flow)/(Qad + effluent flow) > CC

where,

TUc effluent = maximum chronic WET result
B = multiplying factor from 327 IAC 5-2-11.5(h), Table 11.5-1
effluent flow = effluent flow used to calculate WQBELs for individual pollutants
Qad = amount of receiving water available for dilution
CC = numeric interpretation of the narrative criterion for chronic WET

A. BP Products without Approved Alternate Mixing Zone

TUc effluent = 16 TUc (Fathead Minnow was the most sensitive species)
B = 2.3 (based on 5 samples and a CV of 0.6)
effluent flow = 21.4 mgd
Qad = 0.0 mgd (no dilution is allowed for the case without an approved alternate mixing zone for chronic WET)
CC = 1.0 TUc

(16 TUc) x (2.3) x (21.4 mgd)/(0.0 mgd + 21.4 mgd) = 37 TUc

Since the calculated value is greater than 1.0 TUc, there is reasonable potential for chronic WET.

B. BP Products with Approved Alternate Mixing Zone

TUc effluent = 16 TUc (Fathead Minnow was the most sensitive species)
B = 2.3 (based on 5 samples and a CV of 0.6)
effluent flow = 21.4 mgd
Qad = 793.94 mgd (for the case with an approved alternate mixing zone for chronic WET, the dilution is calculated by multiplying the dilution factor by the effluent flow)
CC = 1.0 TUc

(16 TUc) x (2.3) x (21.4 mgd)/(793.94 mgd + 21.4 mgd) = 0.97 TUc

Since the calculated value is not greater than 1.0 TUc, there is no reasonable potential for chronic WET.

Antidegradation Analysis for OSRWs

The discharge is to the Indiana portion of the open waters of Lake Michigan which is designated in 327 IAC 2-1.5-19(b)(2) as an outstanding state resource water (OSRW). Discharges directly to OSRWs are subject to the antidegradation implementation procedure for OSRWs in 327 IAC 5-2-11.7. The pollutants of concern in this WLA analysis are either pollutants that currently exist in the discharge, but are not currently limited, or pollutants that are currently limited. No new pollutants were considered in the WLA analysis. The effluent flow used in the WLA analysis is based on historical effluent flow data so an increased flow was not considered in the WLA analysis.

For the case without an approved alternate mixing zone, WQBELs are required for a number of pollutants of concern that are not limited in the current permit. The WQBELs are required based on the pollutants showing reasonable potential. For these pollutants of concern, the applicable antidegradation provision for the new WQBELs is 327 IAC 5-2-11.7(b)(2). This provision allows new limits for an existing permitted discharger that are not a result of increases in pollutant loading and will not allow an increase in pollutant loading including new limits that are a result of the following:

(A) New or improved monitoring data.
(B) New or improved analytical methods.
(C) New or modified water quality criteria or values.
(D) New or modified effluent limitations guidelines, pretreatment standards, or control requirements for POTWs.

The new limits may be a result of the reasonable potential procedure that was established after the permit was last issued or a result of one or more of the reasons listed above. It is not believed that these new limits are the result of an increase in pollutant loading. The new limits will not allow an increase in pollutant loading. Therefore, the new limits are allowed under 327 IAC 5-2-11.7.

In addition, for the case without an approved alternate mixing zone, WQBELs were calculated for ammonia-N, hexavalent chromium and total chromium that are more stringent than the limits in the current permit. For these pollutants of concern, the applicable antidegradation provision for the new WQBELs is also 327 IAC 5-2-11.7(b)(2).

For the case with an approved alternate mixing zone, WQBELs are only required for mercury and vanadium based on these pollutants showing reasonable potential. The antidegradation provision in 327 IAC 5-2-11.7(b)(2) would still apply to the new WQBELs for mercury since they are the same as those for the case without an approved alternate mixing zone and it would also apply to the new WQBELs for vanadium calculated with an approved alternate mixing zone. The WQBELs for ammonia-N, hexavalent chromium and total chromium calculated with an approved alternate mixing zone are less stringent than the limits in the current permit. Therefore, the current limits for ammonia-N, hexavalent chromium and total chromium would be allowed and antidegradation would not apply since there are no new or increased permit limits.

ATTACHMENT 2
CORMIX v4.1 MODEL INPUTS SUBMITTED BY BP PRODUCTS

PARAMETER	UNITS	VALUE	RATIONALE
Average Effluent Flow	mgd	15.9	2002-2005 ETL average (w/o cooling water return)
WQBEL Effluent Flow	mgd	21.4	2002-2005 maximum monthly average
Diffuser Length	feet	330	Exceeds minimum requirement Table 1
Number of Ports	#	12	Maintain at least 10 ft/sec exit velocity
Port Diameter	inches	6	Standard design
Port Exit Velocity @ Average Flow	ft/sec	10.4	EPA TSD recommendation
Vertical Port Angle	degrees	90	Account for varying current directions
Port Spacing	feet	30	Exceeds minimum requirement Table 1
Diffuser height off bottom	feet	1.5	Practical estimate
Distance from Shore to 1st Port	feet	3,500	Optimizes water depth
Distance from Shore to Last Port	feet	3,830	Optimizes water depth
Effluent Temperature	degrees C	30	Long term average = 28 °C
Lake Temperature	degrees C	10	Long term average = 11 °C
Temperature Difference	degrees C	20	Conservative input (average = 17 °C)
Lake Depth	feet	28.5	Measurement (map verified)
Lake Velocity	ft/sec	Variable	WHG measurement

Diffuser header is oriented north-south

ATTTACHMENT 3
CORMIX v4.1 MODEL RESULTS SUBMITTED BY BP PRODUCTS

Case	Current Direction To (deg)	Current Direction Occurrence (%)	CORMIX INPUTS			CORMIX RESULTS			
						MMA flow = 21.4 mgd		LTA flow = 15.9 mgd	
			Mean Lake Velocity (cm/s)	Angle Gamma (deg)	Distance to Last Port (ft)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)
1	0	4.20	3.53	0	3,500.00	26.8	112.7	32.7	137.5
2	22.5	4.00	3.46	22.5	3,626.29	28.6	114.5	35.3	141.3
3	45	4.07	2.92	45	3,733.35	38.6	157.3	48.4	197.2
4	67.5	5.27	2.89	67.5	3,804.88	41.7	219.8	52.8	278.3
5	90	16.00	4.78	90	3,830.00	55.7	891.0	72.5	1159.8
6	112.5	14.27	3.44	112.5	3,804.88	44.7	637.8	57.1	814.8
7	135	6.06	2.18	135	3,733.35	36.5	221.3	45.2	274.0
8	157.5	3.25	1.93	157.5	3,626.29	27.4	89.2	33.5	109.0
9	180	2.89	1.66	180	3,500.00	26.8	77.6	32.7	94.6
10	202.5	3.27	1.83	22.5	3,626.29	27.3	89.2	33.4	109.2
11	225	4.28	2.08	45	3,733.35	36.2	154.8	44.8	191.6
12	247.5	6.64	2.58	67.5	3,804.88	40.2	266.8	50.6	335.9
13	270	6.32	2.95	90	3,830.00	43.3	273.7	55.1	348.3
14	292.5	6.39	3.59	112.5	3,804.88	45.6	291.5	58.3	372.7
15	315	6.98	3.82	135	3,733.35	41.9	292.6	53.1	370.8
16	337.5	6.09	4.18	157.5	3,626.29	29.3	178.5	36.4	221.7
						Weighted Disp (__:	40.7	Weighted Disp (__:	51.6

MMA = Maximum monthly average
LTA = Long term average

Diffuser Length = 330 ft
Length of DIMZ = 145 ft

ATTACHMENT 4
FREQUENCY OF PROJECTED DISPERSION SUBMITTED BY BP PRODUCTS

Current Direction Occurrence (%)	Cumulative Exceedance (%)	CORMIX RESULTS	
		MMA flow = 21.4 mgd	LTA flow = 15.9 mgd
		Dispersion (__:1)	Dispersion (__:1)
4.20	100.00	26.8	32.7
2.89	95.80	26.8	32.7
3.27	92.90	27.3	33.4
3.25	89.63	27.4	33.5
4.00	86.38	28.6	35.3
6.09	82.38	29.3	36.4
4.28	76.29	36.2	44.8
6.06	72.01	36.5	45.2
4.07	65.95	38.6	48.4
6.64	61.87	40.2	50.6
5.27	55.23	41.7	52.8
6.98	49.96	41.9	53.1
6.32	42.98	43.3	55.1
14.27	36.66	44.7	57.1
6.39	22.39	45.6	58.3
16.00	16.00	55.7	72.5

ATTACHMENT 5
Average Temperature Difference Between Outfall 001 and Lake Michigan

Temperature of Discharge through Outfall 001 Minus the Intake Temperature (°C)				
Month	**Year**			
	2003	**2004**	**2005**	**2006**
January	23	26	26	16
February	25	26	27	31
March	22	21	26	30
April	19	18	26	27
May	15	17	25	24
June	14	14	23	
July	15	12	13	
August	13	13	10	
September	15	14	11	
October	18	18	7	
November	19	21	16	
December	24	27	12	

ATTACHMENT 6
CORMIX v4.3 MODEL RESULTS WITH 0 °C TEMPERATURE DIFFERENCE

Case	Current Direction To (deg)	Current Direction Occurrence (%)	CORMIX INPUTS			CORMIX RESULTS			
						MMA flow = 21.4 mgd		LTA flow = 15.9 mgd	
			Mean Lake Velocity (cm/s)	Angle Gamma (deg)	Distance to Last Port (ft)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)
1	0	4.20	3.53	0	3,500.00	26.3	110.6	35.4	148.8
2	22.5	4.00	3.46	22.5	3,626.29	23.8	95.3	32.1	128.5
3	45	4.07	2.92	45	3,733.35	15.4	62.8	20.7	84.4
4	67.5	5.27	2.89	67.5	3,804.88	24.9	131.2	33.5	176.5
5	90	16.00	4.78	90	3,830.00	44.5	711.9	60.0	959.8
6	112.5	14.27	3.44	112.5	3,804.88	29.6	422.4	39.9	569.3
7	135	6.06	2.18	135	3,733.35	14.4	87.3	19.3	117.0
8	157.5	3.25	1.93	157.5	3,626.29	13.3	43.3	17.9	58.2
9	180	2.89	1.66	180	3,500.00	12.4	35.9	16.7	48.3
10	202.5	3.27	1.83	22.5	3,626.29	12.6	41.2	17.0	55.6
11	225	4.28	2.08	45	3,733.35	11.0	47.0	14.8	63.3
12	247.5	6.64	2.58	67.5	3,804.88	22.2	147.4	29.9	198.5
13	270	6.32	2.95	90	3,830.00	27.5	173.8	37.0	233.9
14	292.5	6.39	3.59	112.5	3,804.88	30.9	197.5	41.6	266.0
15	315	6.98	3.82	135	3,733.35	25.2	176.0	33.9	236.7
16	337.5	6.09	4.18	157.5	3,626.29	28.8	175.4	38.8	236.3
						Weighted Disp (__:	26.6	Weighted Disp (__:	35.8

MMA = Maximum monthly average
LTA = Long term average

Diffuser Length = 330 ft
Length of DIMZ = 179 ft at 21.4 mgd and 15.9 mgd

ATTACHMENT 7
CORMIX v4.3 MODEL RESULTS WITH 5 °C TEMPERATURE DIFFERENCE

Case	Current Direction To (deg)	Current Direction Occurrence (%)	CORMIX INPUTS			CORMIX RESULTS			
						MMA flow = 21.4 mgd		LTA flow = 15.9 mgd	
			Mean Lake Velocity (cm/s)	Angle Gamma (deg)	Distance to Last Port (ft)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)
1	0	4.20	3.53	0	3,500.00	18.8	79.0	22.9	96.3
2	22.5	4.00	3.46	22.5	3,626.29	21.3	85.3	26.5	106.1
3	45	4.07	2.92	45	3,733.35	30.4	123.9	38.6	157.3
4	67.5	5.27	2.89	67.5	3,804.88	34.2	180.2	44.1	232.4
5	90	16.00	4.78	90	3,830.00	50.4	806.3	66.5	1063.8
6	112.5	14.27	3.44	112.5	3,804.88	37.8	539.4	49.1	700.6
7	135	6.06	2.18	135	3,733.35	27.6	167.3	34.6	209.7
8	157.5	3.25	1.93	157.5	3,626.29	19.6	63.8	24.1	78.4
9	180	2.89	1.66	180	3,500.00	18.8	54.4	22.9	66.3
10	202.5	3.27	1.83	22.5	3,626.29	19.5	63.7	24.0	78.4
11	225	4.28	2.08	45	3,733.35	27.2	116.3	34.1	145.8
12	247.5	6.64	2.58	67.5	3,804.88	32.4	215.1	41.4	274.8
13	270	6.32	2.95	90	3,830.00	36.2	228.8	46.8	295.8
14	292.5	6.39	3.59	112.5	3,804.88	38.8	248.1	50.5	322.9
15	315	6.98	3.82	135	3,733.35	34.5	240.9	44.4	310.1
16	337.5	6.09	4.18	157.5	3,626.29	22.3	135.8	28.0	170.5
						Weighted Disp (__:	33.5	Weighted Disp (__:	43.1

MMA = Maximum monthly average
LTA = Long term average

Diffuser Length = 330 ft
Length of DIMZ = 214 ft at 21.4 mgd and 183 ft at 15.9 mgd

ATTACHMENT 8
CORMIX v4.3 MODEL RESULTS WITH 10 °C TEMPERATURE DIFFERENCE

Case	Current Direction To (deg)	Current Direction Occurrence (%)	CORMIX INPUTS			CORMIX RESULTS			
						MMA flow = 21.4 mgd		LTA flow = 15.9 mgd	
			Mean Lake Velocity (cm/s)	Angle Gamma (deg)	Distance to Last Port (ft)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)
1	0	4.20	3.53	0	3,500.00	23.0	96.7	28.0	117.7
2	22.5	4.00	3.46	22.5	3,626.29	25.0	100.1	31.0	124.1
3	45	4.07	2.92	45	3,733.35	34.6	141.0	43.6	177.7
4	67.5	5.27	2.89	67.5	3,804.88	38.0	200.3	48.5	255.6
5	90	16.00	4.78	90	3,830.00	53.0	847.8	69.4	1110.2
6	112.5	14.27	3.44	112.5	3,804.88	41.3	589.3	53.1	757.7
7	135	6.06	2.18	135	3,733.35	32.1	194.6	40.0	242.5
8	157.5	3.25	1.93	157.5	3,626.29	23.7	77.1	29.0	94.4
9	180	2.89	1.66	180	3,500.00	23.0	66.6	28.0	81.0
10	202.5	3.27	1.83	22.5	3,626.29	23.6	77.1	28.9	94.5
11	225	4.28	2.08	45	3,733.35	31.9	136.4	39.6	169.3
12	247.5	6.64	2.58	67.5	3,804.88	36.3	241.0	46.1	306.0
13	270	6.32	2.95	90	3,830.00	39.8	251.6	51.0	322.4
14	292.5	6.39	3.59	112.5	3,804.88	42.2	269.8	54.4	347.8
15	315	6.98	3.82	135	3,733.35	38.2	266.8	48.7	340.1
16	337.5	6.09	4.18	157.5	3,626.29	25.9	157.7	32.3	196.7
						Weighted Disp (__:	37.1	Weighted Disp (__:	47.4

MMA = Maximum monthly average
LTA = Long term average

Diffuser Length = 330 ft
Length of DIMZ = 182 ft at 21.4 mgd and 135 ft at 15.9 mgd

ATTACHMENT 9
CORMIX v4.3 MODEL RESULTS WITH 15 °C TEMPERATURE DIFFERENCE

Case	Current Direction To (deg)	Current Direction Occurrence (%)	CORMIX INPUTS			CORMIX RESULTS			
						MMA flow = 21.4 mgd		LTA flow = 15.9 mgd	
			Mean Lake Velocity (cm/s)	Angle Gamma (deg)	Distance to Last Port (ft)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)
1	0	4.20	3.53	0	3,500.00	25.4	106.8	31.0	130.3
2	22.5	4.00	3.46	22.5	3,626.29	27.3	109.3	33.7	134.9
3	45	4.07	2.92	45	3,733.35	37.1	151.2	46.6	189.9
4	67.5	5.27	2.89	67.5	3,804.88	40.4	212.9	51.2	269.8
5	90	16.00	4.78	90	3,830.00	54.7	875.0	71.4	1142.2
6	112.5	14.27	3.44	112.5	3,804.88	43.4	619.3	55.6	793.4
7	135	6.06	2.18	135	3,733.35	34.9	211.6	43.3	262.5
8	157.5	3.25	1.93	157.5	3,626.29	26.0	84.6	31.9	103.8
9	180	2.89	1.66	180	3,500.00	25.4	73.5	31.0	89.7
10	202.5	3.27	1.83	22.5	3,626.29	25.9	84.7	31.8	103.9
11	225	4.28	2.08	45	3,733.35	34.6	148.0	42.9	183.5
12	247.5	6.64	2.58	67.5	3,804.88	38.8	257.6	48.9	324.6
13	270	6.32	2.95	90	3,830.00	42.0	265.5	53.6	338.8
14	292.5	6.39	3.59	112.5	3,804.88	44.3	283.2	56.8	363.1
15	315	6.98	3.82	135	3,733.35	40.5	282.8	51.5	359.6
16	337.5	6.09	4.18	157.5	3,626.29	28.1	171.1	34.9	212.6
						Weighted Disp (__:	39.4	Weighted Disp (__:	50.0

MMA = Maximum monthly average
LTA = Long term average

Diffuser Length = 330 ft
Length of DIMZ = 157 ft at 21.4 mgd and 116 ft at 15.9 mgd

ATTACHMENT 10
CORMIX v4.3 MODEL RESULTS WITH 20 °C TEMPERATURE DIFFERENCE

Case	Current Direction To (deg)	Current Direction Occurrence (%)	CORMIX INPUTS			CORMIX RESULTS			
						MMA flow = 21.4 mgd		LTA flow = 15.9 mgd	
			Mean Lake Velocity (cm/s)	Angle Gamma (deg)	Distance to Last Port (ft)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)	Dispersion (__:1)	Weighted Dispersion (__:1) x (%)
1	0	4.20	3.53	0	3,500.00	26.8	112.7	32.7	137.5
2	22.5	4.00	3.46	22.5	3,626.29	28.6	114.5	35.3	141.3
3	45	4.07	2.92	45	3,733.35	38.6	157.3	48.4	197.2
4	67.5	5.27	2.89	67.5	3,804.88	41.7	219.8	52.8	278.3
5	90	16.00	4.78	90	3,830.00	55.7	891.0	72.5	1159.8
6	112.5	14.27	3.44	112.5	3,804.88	44.7	637.8	57.1	814.8
7	135	6.06	2.18	135	3,733.35	36.5	221.3	45.2	274.0
8	157.5	3.25	1.93	157.5	3,626.29	27.4	89.2	33.5	109.0
9	180	2.89	1.66	180	3,500.00	26.8	77.6	32.7	94.6
10	202.5	3.27	1.83	22.5	3,626.29	27.3	89.2	33.4	109.2
11	225	4.28	2.08	45	3,733.35	36.2	154.8	44.8	191.6
12	247.5	6.64	2.58	67.5	3,804.88	40.2	266.8	50.6	335.9
13	270	6.32	2.95	90	3,830.00	43.3	273.7	55.1	348.3
14	292.5	6.39	3.59	112.5	3,804.88	45.6	291.5	58.3	372.7
15	315	6.98	3.82	135	3,733.35	41.9	292.6	53.1	370.8
16	337.5	6.09	4.18	157.5	3,626.29	29.3	178.5	36.4	221.7
						Weighted Disp (__:	40.7	Weighted Disp (__:	51.6

MMA = Maximum monthly average
LTA = Long term average

Diffuser Length = 330 ft
Length of DIMZ = 145 ft at 21.4 mgd and 107 ft at 15.9 mgd

ATTACHMENT 11
CORMIX Sensitivity Analysis

CORMIX Sensitivity Analysis with Buoyancy					
Effluent Flow (mgd)	Temperature Difference				
	0 (°C)	5 (°C)	10 (°C)	15 (°C)	20 (°C)
	Weighted Dispersion	Weighted Dispersion	Weighted Dispersion	Weighted Dispersion	Weighted Dispersion
15.9	35.8	43.1	47.4	50	51.6
21.4	26.6	33.5	37.1	39.4	40.7

CORMIX Sensitivity Analysis with Buoyancy					
Effluent Flow (mgd)	Temperature Difference				
	0 (°C)	5 (°C)	10 (°C)	15 (°C)	20 (°C)
	Length of DIMZ (ft)	Length of DIMZ (ft)	Length of DIMZ (ft)	Length of DIMZ (ft)	Length of DIMZ (ft)
15.9	179	183	135	116	107
21.4	179	214	182	157	145

ATTACHMENT 12
CORMIX v4.3 MODEL INPUTS

PARAMETER	UNITS	VALUE	RATIONALE
Average Effluent Flow	mgd	15.9	2002-2005 average (w/o cooling water return)
WQBEL Effluent Flow	mgd	21.4	2002-2005 maximum monthly average
Diffuser Length	feet	330	BP Products Diffuser Design
Number of Ports	#	12	BP Products Diffuser Design
Port Diameter	inches	6	BP Products Diffuser Design
Port Exit Velocity @ Average Flow	ft/sec	10.4	BP Products Diffuser Design
Vertical Port Angle (theta)	degrees	90	BP Products Diffuser Design
Alignment Angle (gamma)	degrees	Variable	Varied to account for variable current direction
Port Spacing	feet	30	BP Products Diffuser Design
Diffuser height off bottom	feet	1.5	BP Products Diffuser Design
Distance from Shore to 1st Port	feet	3,500	BP Products Diffuser Design
Distance from Shore to Last Port	feet	Variable	The diffuser header is oriented north-south, but this parameter was varied to account for the variable current direction.
Effluent Temperature	degrees C	30	BP Products model input
Lake Temperature	degrees C	20	Establishes 10 °C temperature difference
Lake Depth	feet	28.5	BP Products model input
Lake Velocity	ft/sec	Variable	Recommended by Woods Hole Group

ATTACHMENT 13

```
CORMIX SESSION REPORT:
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX
                      CORMIX MIXING ZONE EXPERT SYSTEM
                          CORMIX-GI Version 4.3GT
                      HYDRO2:Version-4.3.0.2  June,2005
SITE NAME/LABEL:
  DESIGN CASE:                  BP 2006 Proposal
  FILE NAME:                    C:\Program Files\CORMIX-GI 4.3\Docs\BP 2006 Proposal.prd
Using subsystem CORMIX2:        Submerged Multiport Diffuser Discharges
  Start of session:             06/16/2006--14:43:12
*****************************************************************************
SUMMARY OF INPUT DATA:
-----------------------------------------------------------------------------
AMBIENT PARAMETERS:
  Cross-section                           = unbounded
  Average depth                 HA        = 8.69 m
  Depth at discharge            HD        = 8.69 m
  Ambient velocity              UA        = 0.0478 m/s
  Darcy-Weisbach friction factor F        = 0.0642
    Calculated from Manning's n           = 0.041
  Wind velocity                 UW        = 2 m/s
Stratification Type             STRCND = U
  Surface temperature                     = 20
 degC
  Bottom temperature                      = 20 degC
  Calculated FRESH-WATER DENSITY values:
  Surface density               RHOAS  = 998.2051 kg/m^3
  Bottom density                RHOAB  = 998.2051 kg/m^3
-----------------------------------------------------------------------------
DISCHARGE PARAMETERS:           Submerged Multiport Diffuser Discharge
  Diffuser type                 DITYPE = alternating perpendicular
  Diffuser length               LD     = 100.58 m
  Nearest bank                         = left
  Diffuser endpoints            YB1    = 1066.8 m;    YB2 = 1167.38 m
  Number of openings            NOPEN  = 12
  Spacing between risers/openings SPAC = 9.14 m
  Port/Nozzle diameter          D0     = 0.1524 m
    with contraction ratio             = 1
  Equivalent slot width         B0     = 0.0022 m
  Total area of openings        TA0     = 0.2189 m^2
  Discharge velocity            U0     = 4.28 m/s
  Total discharge flowrate      Q0     = 0.937590 m^3/s
  Discharge port height         H0     = 0.46 m
  Nozzle arrangement            BETYPE = near vertical discharge
  Diffuser alignment angle      GAMMA  = 90 deg
  Vertical discharge angle      THETA  = 90 deg
  Horizontal discharge angle    SIGMA  = 0 deg
  Relative orientation angle    BETA   = 90 deg
  Discharge temperature (freshwater)   = 30 degC
    Corresponding density       RHO0   = 995.6470 kg/m^3
  Density difference            DRHO   = 2.5581 kg/m^3
  Buoyant acceleration          GP0    = 0.0251 m/s^2
  Discharge concentration       C0     = 100 %
  Surface heat exchange coeff.  KS     = 0 m/s
  Coefficient of decay          KD     = 0 /s
-----------------------------------------------------------------------------
FLUX VARIABLES PER UNIT DIFFUSER LENGTH:
  Discharge (volume flux)       q0     = 0.009321 m^2/s
  Momentum flux                 m0     = 0.039926 m^3/s^2
  Buoyancy flux                 j0     = 0.000234 m^3/s^3
-----------------------------------------------------------------------------
DISCHARGE/ENVIRONMENT LENGTH SCALES:
  LQ  = 0.00 m          Lm  = 17.47 m          LM  = 10.48 m
  lm' = 99999 m         Lb' = 99999 m          La  = 99999 m
  (These refer to the actual discharge/environment length scales.)
-----------------------------------------------------------------------------
NON-DIMENSIONAL PARAMETERS:
Slot Froude number              FR0    = 579.17
  Port/nozzle Froude number     FRD0   = 69.21
  Velocity ratio                R      = 89.61
-----------------------------------------------------------------------------
MIXING ZONE / TOXIC DILUTION ZONE / AREA OF INTEREST PARAMETERS:
  Toxic discharge                      = no
  Water quality standard specified     = no
  Regulatory mixing zone               = no
  Region of interest                   = 1000 m downstream
*****************************************************************************
HYDRODYNAMIC CLASSIFICATION:
  *------------------------*
  | FLOW CLASS    = MU8 |
  *------------------------*
  This flow configuration applies to a layer corresponding to the full water
  depth at the discharge site.
  Applicable layer depth = water depth = 8.69 m
```

```
*****************************************************************************
MIXING ZONE EVALUATION (hydrodynamic and regulatory summary):

-----------------------------------------------------------------------------
X-Y-Z Coordinate system:
  Origin is located at the bottom below the port center:
    1117.09 m from the left bank/shore.
  Number of display steps NSTEP = 20 per module.
-----------------------------------------------------------------------------
NEAR-FIELD REGION (NFR) CONDITIONS :
Note: The NFR is the zone of strong initial mixing.  It has no regulatory
  implication.  However, this information may be useful for the discharge
  designer because the mixing in the NFR is usually sensitive to the
  discharge design conditions.
  Pollutant concentration at edge of NFR = 1.726 %
  Dilution at edge of NFR                = 57.9
  NFR Location:                        x = 97.99 m
    (centerline coordinates)           y = 0 m
                                       z = 8.69 m
  NFR plume dimensions:        half-width = 85.10 m
                                 thickness = 6.68 m
Cumulative travel time:        890.1375 sec.
-----------------------------------------------------------------------------
Buoyancy assessment:
  The effluent density is less than the surrounding ambient water
  density at the discharge level.
  Therefore, the effluent is POSITIVELY BUOYANT and will tend to rise towards
  the surface.
-----------------------------------------------------------------------------
Near-field instability behavior:
  The diffuser flow will experience instabilities with full vertical mixing
  in the near-field.
  There may be benthic impact of high pollutant concentrations.
-----------------------------------------------------------------------------
UPSTREAM INTRUSION SUMMARY:
Plume exhibits upstream intrusion due to low ambient velocity or strong
  discharge buoyancy.
  Intrusion length                        =  22.55 m
  Intrusion stagnation point              =  32.90 m
  Intrusion thickness                     =  10.53 m
  Intrusion half width at impingement     =  85.10 m
  Intrusion half thickness at impingement =  6.68 m
-----------------------------------------------------------------------------
FAR-FIELD MIXING SUMMARY:
  Plume becomes vertically fully mixed WITHIN NEAR-FIELD at 0 m
  downstream, but RE-STRATIFIES LATER and is not mixed in the far-field.
-----------------------------------------------------------------------------
PLUME BANK CONTACT SUMMARY:
  Plume in unbounded section does not contact bank in this simulation.
************************ TOXIC DILUTION ZONE SUMMARY ************************
No TDZ was specified for this simulation.
********************** REGULATORY MIXING ZONE SUMMARY **********************
No RMZ and no ambient water quality standard have been specified.
******************** FINAL DESIGN ADVICE AND COMMENTS ********************
CORMIX2 uses the TWO-DIMENSIONAL SLOT DIFFUSER CONCEPT to represent
  the actual three-dimensional diffuser geometry.  Thus, it approximates
  the details of the merging process of the individual jets from each
  port/nozzle.
In the present design, the spacing between adjacent ports/nozzles
  (or riser assemblies) is of the order of, or less than, the local
  water depth so that the slot diffuser approximation holds well.

Nevertheless, if this is a final design, the user is advised to use a
  final CORMIX1 (single port discharge) analysis, with discharge data
  for an individual diffuser jet/plume, in order to compare to
  the present near-field prediction.
-----------------------------------------------------------------------------
REMINDER:  The user must take note that HYDRODYNAMIC MODELING by any known
  technique is NOT AN EXACT SCIENCE.
Extensive comparison with field and laboratory data has shown that the
  CORMIX predictions on dilutions and concentrations (with associated
  plume geometries) are reliable for the majority of cases and are accurate
  to within about +-50% (standard deviation).
As a further safeguard, CORMIX will not give predictions whenever it judges
  the design configuration as highly complex and uncertain for prediction.
```

ATTACHMENT 14

```
CORMIX2 PREDICTION FILE:
2222222222222222222222222222222222222222222222222222222222222222222222222222222
                    CORMIX MIXING ZONE EXPERT SYSTEM
        Subsystem CORMIX2:  Submerged Multiport Diffuser Discharges
                         CORMIX-GI Version 4.3GT
                       HYDRO2 Version 4.3.0.2 June 2005
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
CASE DESCRIPTION
 Site name/label:
 Design case:        BP 2006 Proposal
 FILE NAME:          C:\...ram Files\CORMIX-GI 4.3\Docs\BP 2006 Proposal.prd
 Time stamp:         Fri Jun 16 14:43:12 2006

ENVIRONMENT PARAMETERS (metric units)
 Unbounded section
 HA    =      8.69  HD    =      8.69
 UA    =     0.048  F     =     0.064 USTAR =0.4282E-02
 UW    =     2.000 UWSTAR=0.2198E-02
 Uniform density environment
 STRCND=  U          RHOAM =  998.2051

DIFFUSER DISCHARGE PARAMETERS (metric units)
 Diffuser type:      DITYPE= alternating_perpendicular
 BANK  =  LEFT       DISTB =   1117.09  YB1   =   1066.80  YB2   =   1167.38
 LD    =    100.58  NOPEN =   12        SPAC  =      9.14
 D0    =     0.152  A0    =     0.018  H0    =      0.46
 Nozzle/port arrangement:   near_vertical_discharge
 GAMMA =     90.00  THETA =     90.00  SIGMA =      0.00  BETA  =     90.00
 U0    =     4.283  Q0    =     0.938        =0.9376E+00
 RHO0  =  995.6470  DRHO0 =0.2558E+01  GP0   =0.2513E-01
 C0    =0.1000E+03  CUNITS=  %
 IPOLL =  1         KS    =0.0000E+00  KD    =0.0000E+00

FLUX VARIABLES - PER UNIT DIFFUSER LENGTH (metric units)
 q0    =0.9321E-02  m0    =0.3993E-01  j0    =0.2343E-03  SIGNJ0=      1.0
 Associated 2-d length scales (meters)
 lQ=B  =     0.002 lM    =     10.48  lm    =     17.47
 lmp   =  99999.00  lbp   =  99999.00  la    =  99999.00

FLUX VARIABLES - ENTIRE DIFFUSER (metric units)
 Q0    =0.9376E+00  M0    =0.4016E+01  J0    =0.2356E-01
 Associated 3-d length scales (meters)
 LQ    =     0.47  LM    =     18.48  Lm    =     41.92  Lb    =    215.75
                                      Lmp   =  99999.00  Lbp   =  99999.00

 THETA =     90.00  Up/downward directed jet/plume

NON-DIMENSIONAL PARAMETERS
 FR0   =    579.17  FRD0  =     69.21  R     =     89.61  PL    =     64.
 (slot)             (port/nozzle)

FLOW CLASSIFICATION
 222222222222222222222222222222222222222222
 2  Flow class (CORMIX2)      =    MU8    2
 2  Applicable layer depth HS =     8.69  2
 222222222222222222222222222222222222222222

MIXING ZONE / TOXIC DILUTION / REGION OF INTEREST PARAMETERS
 C0    =0.1000E+03  CUNITS=  %
 NTOX  =  0
 NSTD  =  0
 REGMZ =  0
 XINT  =   1000.00  XMAX  =   1000.00

X-Y-Z COORDINATE SYSTEM:
    ORIGIN is located at the bottom and the diffuser mid-point:
      1117.09 m  from the LEFT  bank/shore.
    X-axis points downstream, Y-axis points to left, Z-axis points upward.
NSTEP =  20 display intervals per module
-----------------------------------------------------------------------------
-----------------------------------------------------------------------------
BEGIN MOD201: DIFFUSER DISCHARGE MODULE

 Due to complex near-field motions:  EQUIVALENT SLOT DIFFUSER (2-D) GEOMETRY

 Profile definitions:
   BV = Gaussian 1/e (37%) half-width, in vertical plane normal to trajectory
   BH = top-hat half-width, in horizontal plane normal to trajectory
   S  = hydrodynamic centerline dilution
   C  = centerline concentration (includes reaction effects, if any)

      X        Y        Z        S        C        BV       BH
    0.00     0.00     0.46      1.0 0.100E+03    0.00    50.29
```

END OF MOD201: DIFFUSER DISCHARGE MODULE

BEGIN MOD234: UNSTABLE RECIRCULATION REGION OVER LAYER DEPTH

INITIAL LOCAL VERTICAL INSTABILITY REGION:
Bulk dilution (S = 53.02) occurs in a limited region (horizontal extent = 55.44 m) surrounding the discharge location.

Control volume inflow:

X	Y	Z	S	C	BV	BH
0.00	0.00	0.46	1.0	0.100E+03	0.00	50.29

Control volume outflow:

X	Y	Z	S	C	BV	BH
55.44	0.00	4.34	53.0	0.189E+01	8.69	72.01

END OF MOD234: UNSTABLE RECIRCULATION REGION OVER LAYER DEPTH

BEGIN MOD234a: UPSTREAM SPREADING AFTER NEAR-FIELD INSTABILITY

UPSTREAM INTRUSION PROPERTIES:

Upstream intrusion length	=	22.55 m
X-position of upstream stagnation point	=	32.90 m
Thickness in intrusion region	=	8.69 m
Half-width at downstream end	=	85.10 m
Thickness at downstream end	=	6.68 m

Control volume inflow:

X	Y	Z	S	C	BV	BH
55.44	0.00	4.34	53.0	0.189E+01	8.69	72.01

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

X	Y	Z	S	C	BV	BH	ZU	ZL
32.90	0.00	8.69	9999.9	0.000E+00	0.00	0.00	8.69	8.69
34.20	0.00	8.69	176.2	0.568E+00	3.17	17.30	8.69	5.52
40.58	0.00	8.69	74.2	0.135E+01	7.52	42.03	8.69	1.16
46.96	0.00	8.69	58.2	0.172E+01	8.69	56.86	8.69	0.00
53.34	0.00	8.69	53.3	0.188E+01	8.69	68.56	8.69	0.00
59.72	0.00	8.69	53.2	0.188E+01	8.69	80.41	8.69	0.00
66.09	0.00	8.69	54.1	0.185E+01	8.69	81.36	8.69	0.00
72.47	0.00	8.69	55.3	0.181E+01	8.69	82.21	8.69	0.00
78.85	0.00	8.69	56.5	0.177E+01	7.83	83.01	8.69	0.86
85.23	0.00	8.69	57.2	0.175E+01	7.22	83.74	8.69	1.47
91.61	0.00	8.69	57.7	0.173E+01	6.89	84.44	8.69	1.80
97.99	0.00	8.69	57.9	0.173E+01	6.68	85.10	8.69	2.01

Cumulative travel time = 890.1371 sec

END OF MOD234a: UPSTREAM SPREADING AFTER NEAR-FIELD INSTABILITY

** End of NEAR-FIELD REGION (NFR) **

BEGIN MOD241: BUOYANT AMBIENT SPREADING

Profile definitions:
BV = top-hat thickness, measured vertically
BH = top-hat half-width, measured horizontally in y-direction
ZU = upper plume boundary (Z-coordinate)
ZL = lower plume boundary (Z-coordinate)
S = hydrodynamic average (bulk) dilution
C = average (bulk) concentration (includes reaction effects, if any)

Plume Stage 1 (not bank attached):

X	Y	Z	S	C	BV	BH	ZU	ZL
97.99	0.00	8.69	57.9	0.173E+01	6.68	85.10	8.69	2.01
143.09	0.00	8.69	63.0	0.159E+01	5.24	117.82	8.69	3.45
188.19	0.00	8.69	66.6	0.150E+01	4.46	146.39	8.69	4.22
233.29	0.00	8.69	69.6	0.144E+01	3.96	172.31	8.69	4.72
278.39	0.00	8.69	72.3	0.138E+01	3.61	196.33	8.69	5.08
323.49	0.00	8.69	74.6	0.134E+01	3.34	218.87	8.69	5.34
368.59	0.00	8.69	76.8	0.130E+01	3.14	240.23	8.69	5.55
413.69	0.00	8.69	79.0	0.127E+01	2.97	260.62	8.69	5.72
458.79	0.00	8.69	81.0	0.123E+01	2.84	280.16	8.69	5.85
503.90	0.00	8.69	83.1	0.120E+01	2.72	298.98	8.69	5.96
549.00	0.00	8.69	85.1	0.118E+01	2.63	317.17	8.69	6.06

594.10	0.00	8.69	87.1	0.115E+01	2.55	334.79	8.69	6.13
639.20	0.00	8.69	89.2	0.112E+01	2.49	351.91	8.69	6.20
684.30	0.00	8.69	91.3	0.110E+01	2.43	368.56	8.69	6.26
729.40	0.00	8.69	93.5	0.107E+01	2.38	384.80	8.69	6.30
774.50	0.00	8.69	95.7	0.104E+01	2.34	400.66	8.69	6.34
819.60	0.00	8.69	98.0	0.102E+01	2.31	416.17	8.69	6.38
864.70	0.00	8.69	100.4	0.996E+00	2.28	431.35	8.69	6.40
909.80	0.00	8.69	102.8	0.973E+00	2.26	446.23	8.69	6.43
954.90	0.00	8.69	105.3	0.950E+00	2.24	460.84	8.69	6.45
1000.00	0.00	8.69	107.9	0.927E+00	2.23	475.18	8.69	6.46

Cumulative travel time = 19760.6055 sec

Simulation limit based on maximum specified distance = 1000.00 m.
This is the REGION OF INTEREST limitation.

END OF MOD241: BUOYANT AMBIENT SPREADING

CORMIX2: Submerged Multiport Diffuser Discharges End of Prediction File
2222222222222222222222222222222222222222222222222222222222222222222222222222

ATTACHMENT 15
FREQUENCY OF PROJECTED DISPERSION

Current Direction Occurrence (%)	Cumulative Exceedance (%)	Temperature Difference = 10 (°C)	
		MMA flow = 21.4 mgd	LTA flow = 15.9 mgd
		Dispersion (__:1)	Dispersion (__:1)
4.20	100.00	23.0	28.0
2.89	95.80	23.0	28.0
3.27	92.90	23.6	28.9
3.25	89.63	23.7	29.0
4.00	86.38	25.0	31.0
6.09	82.38	25.9	32.3
4.28	76.29	31.9	39.6
6.06	72.01	32.1	40.0
4.07	65.95	34.6	43.6
6.64	61.87	36.3	46.1
5.27	55.23	38.0	48.5
6.98	49.96	38.2	48.7
6.32	42.98	39.8	51.0
14.27	36.66	41.3	53.1
6.39	22.39	42.2	54.4
16.00	16.00	53.0	69.4

ATTACHMENT 16
Data From Fixed Station LM W
Lake Michigan at Whiting

Date	Summer Ammonia-N (mg/l)	Adjusted Summer Ammonia-N (mg/l)
7/25/2000	< 0.1	0.05
8/30/2000	< 0.1	0.05
9/27/2000	< 0.1	0.05
7/23/2001	< 0.1	0.05
8/22/2001	< 0.1	0.05
9/24/2001	< 0.1	0.05
7/24/2002	< 0.1	0.05
8/26/2002	< 0.1	0.05
9/23/2002	< 0.1	0.05
7/7/2003	< 0.1	0.05
8/11/2003	< 0.1	0.05
9/10/2003	< 0.1	0.05
7/19/2004	< 0.1	0.05
8/16/2004	< 0.1	0.05
9/20/2004	< 0.1	0.05
Geomean		**0.05**

Date	Winter Ammonia-N (mg/l)	Adjusted Winter Ammonia-N (mg/l)
10/27/1999	< 0.1	0.05
11/23/1999	< 0.1	0.05
12/14/1999	< 0.1	0.05
1/26/2000	< 0.1	0.05
2/28/2000	< 0.1	0.05
3/29/2000	1.2	1.2
4/26/2000	< 0.1	0.05
5/30/2000	< 0.1	0.05
6/26/2000	< 0.1	0.05
10/30/2000	< 0.1	0.05
11/28/2000	< 0.1	0.05
12/19/2000	< 0.1	0.05
1/30/2001	< 0.1	0.05
2/26/2001	< 0.1	0.05
3/20/2001	< 0.1	0.05
4/18/2001	< 0.1	0.05
5/29/2001	< 0.1	0.05
6/25/2001	< 0.1	0.05
10/16/2001	< 0.1	0.05
11/26/2001	< 0.1	0.05
12/17/2001	< 0.1	0.05
1/23/2002	< 0.1	0.05
2/25/2002	< 0.1	0.05
3/27/2002	< 0.1	0.05
4/22/2002	< 0.1	0.05
5/13/2002	< 0.1	0.05
6/24/2002	< 0.1	0.05
10/30/2002	< 0.1	0.05
11/20/2002	< 0.1	0.05
12/18/2002	< 0.1	0.05
1/15/2003	< 0.1	0.05
2/19/2003	< 0.1	0.05
3/19/2003	< 0.1	0.05
4/23/2003	< 0.1	0.05
5/12/2003	< 0.1	0.05
6/11/2003	< 0.1	0.05
10/22/2003	< 0.1	0.05
11/19/2003	< 0.1	0.05
12/17/2003	< 0.1	0.05
1/7/2004	< 0.1	0.05
2/18/2004	< 0.1	0.05
3/30/2004	< 0.1	0.05
4/21/2004	< 0.1	0.05
5/26/2004	< 0.1	0.05
6/16/2004	< 0.1	0.05
Geomean		**0.05**

ATTACHMENT 17
Data From Fixed Station LM W
Lake Michigan at Whiting

Date	Chloride (mg/l)	Total Chromium (ug/l)	Adjusted Total Chromium (ug/l)	Total Dissolved Solids (mg/l)	Fluoride (mg/l)	Adjusted Fluoride (mg/l)	Total Lead (ug/l)	Adjusted Total Lead (ug/l)	Total Selenium (ug/l)	Adjusted Total Selenium (ug/l)	Sulfate (mg/l)	Total Zinc (ug/l)	Adjusted Total Zinc (ug/l)
1/26/2000	15			191	0.1	0.1			< 2		26	< 6	3
2/28/2000	11			163	0.1	0.1			< 2		21	< 6	3
3/29/2000	15			181	0.1	0.1			< 2		27	< 6	3
4/26/2000	16			182	0.1	0.1			< 2		25	< 6	3
5/30/2000	13			166	0.3	0.3			< 2		26	16	16
6/26/2000	11			171	0.2	0.2			< 1		23	< 6	3
7/25/2000	12			166	0.2	0.2			< 2		23	< 6	3
8/30/2000	12			165	0.1	0.1			< 2		22	< 6	3
9/27/2000	12			176	0.2	0.2			< 1	0.5	24	< 6	3
10/30/2000	16			186	0.3	0.3			1.5	1.5	31	< 6	3
11/28/2000	12			175	0.1	0.1			< 1	0.5	23	< 6	3
12/19/2000	15			185	0.2	0.2			< 1	0.5	26	< 6	3
1/30/2001	20	< 1.2	0.7	196	0.2	0.2			< 1	0.5	30	< 6	3
2/26/2001	14	< 1.2	0.7	173	0.2	0.2			< 1	0.5	27	< 6	3
3/20/2001	19	1.9	1.9	185	0.2	0.2			2	2	30	< 6	3
4/18/2001	19	2.4	2.4	181	0.2	0.2	2.4	2.4	< 1.2	0.6	21	25	25
5/29/2001	14	< 1.2	0.7	169	0.2	0.2	< 1	0.5	< 1.2	0.6	27	< 6	3
6/25/2001	12	< 1.2	0.7	168	0.2	0.2	< 1	0.5	< 1.2	0.6	23	< 6	3
7/23/2001	13	1.5	1.5	175	0.2	0.2	< 1	0.5	< 1.2	0.6	24	< 6	3
8/22/2001	13	< 1.2	0.7	180	0.2	0.2	< 1	0.5	< 1.2	0.6	25	< 6	3
9/24/2001	12	3	3	170	0.2	0.2	4.4	4.4	< 1.2	0.6	26	11	11
10/16/2001	13	1.6	1.6	175	0.2	0.2	1.5	1.5	< 1.2	0.6	25	< 6	3
11/26/2001	15	< 1.2	0.7	182	0.2	0.2	< 1	0.5	< 1.2	0.6	24	< 6	3
12/17/2001	20	1.2	1.2	203	0.2	0.2	< 1	0.5	< 1.2	0.6	27	< 6	3
1/23/2002	17	1.21	1.21	183	0.2	0.2	< 1	0.5	< 1.2	0.6	27	< 6	3
2/25/2002	13	2.2	2.2	171	0.1	0.1	1.96	1.96	< 1.2	0.6	24	7.96	7.96
3/27/2002	13	2.21	2.21	170	0.1	0.1	2.31	2.31	< 1.2	0.6	23	9.28	9.28
4/22/2002	15	1.88	1.88	175	0.1	0.1	1.27	1.27	< 1.2	0.6	24	< 6	3
5/13/2002	14	1.24	1.24	175	0.1	0.1	< 1	0.5	< 1.2	0.6	23	< 6	3
6/24/2002	13	1.48	1.48	168	< 0.1	0.075	< 1	0.5	< 1.2	0.6	21	< 6	3
7/24/2002	14	1.63	1.63	173	0.1	0.1	< 1	0.5	< 1.2	0.6	22	< 6	3
8/26/2002	14	< 1.2	0.7	178	0.1	0.1	< 1	0.5	< 1.2	0.6	22	< 6	3
9/23/2002	14	2.24	2.24	173	0.1	0.1	< 1	0.5	< 1.2	0.6	24	< 6	3
10/30/2002	13	1.47	1.47	172	0.1	0.1	1.06	1.06	< 1.2	0.6	24	< 6	3
11/20/2002	12	< 1.2	0.7	175	< 0.1	0.075	< 1	0.5	< 1.2	0.6	24	< 6	3
12/18/2002	12	1.67	1.67	168	< 0.1	0.075	< 1	0.5	< 1.2	0.6	24	< 6	3
1/15/2003	17	< 1.2	0.7	181	0.1	0.1	< 1	0.5	< 1.2	0.6	28	< 6	3
2/19/2003	15	< 1.2	0.7	188	0.2	0.2	< 1	0.5	< 1.2	0.6	27	< 6	3
3/19/2003	14	1.4	1.4	177	0.1	0.1	< 1	0.5	< 1.2	0.6	26	< 6	3
4/23/2003	18	1.54	1.54	326	< 0.1	0.075	1.12	1.12	< 1.2	0.6	26	< 6	3
5/12/2003	16			170	< 0.1	0.075	< 1	0.5	< 1.2	0.6	26	< 6	3
6/11/2003	16			170	< 0.1	0.075	< 1	0.5	< 1.2	0.6	22	< 6	3
7/7/2003	11			163	< 0.1	0.075	< 1	0.5	< 1.2	0.6	23	< 6	3
8/11/2003	12	< 1.2	0.7	169	< 0.1	0.075	< 1	0.5	< 1.2	0.6	24	< 6	3
9/10/2003	15	< 1.2	0.7	177	0.1	0.1	< 1	0.5	< 2		24	< 6	3
10/22/2003	12	1.3	1.3	171			1.69	1.69	< 2		24	9.54	9.54
11/19/2003	17	1.26	1.26	174			< 1	0.5	< 2		29	< 6	3
12/17/2003	15	1.46	1.46	172			1.03	1.03	< 2		27	< 6	3
1/7/2004	15	1.21	1.21	164	0.1	0.1	< 1	0.5	< 2		26	6.35	6.35
2/18/2004	16	2.27	2.27	184	< 0.1	0.075	< 1	0.5	2.8		26	< 6	3
3/30/2004	16	< 1.2	0.7	190	0.1	0.1	< 1	0.5	< 2.2		26	< 6	3
4/21/2004	19	< 1.2	0.7	188	< 0.1	0.075	< 1	0.5	< 2.2		26	< 6	3
5/26/2004	15	< 1.2	0.7	162	< 0.1	0.075	< 1	0.5	< 2.2		25	< 6	3
6/16/2004	14	< 1.2	0.7	171	0.1	0.1	< 1	0.5	< 2.2		19	< 6	3
7/19/2004	13	< 1.2	0.7	158	0.1	0.1	< 1	0.5	< 2.2		24	< 6	3
8/16/2004	13	< 1.2	0.7	174	< 0.1	0.075	< 1	0.5	< 2.2		23	< 6	3
9/20/2004	13	< 1.2	0.7	173	< 0.1	0.075	< 1	0.5	< 2.2		23	< 6	3
10/25/2004	16	< 1.2	0.7	176			< 1	0.5	< 2.2		29	< 6	3
11/29/2004	16	1.77	1.77	174	< 0.1	0.075	1.17	1.17	< 2.2		27	< 6	3
12/20/2004	18	2.44	2.44	183	0.1	0.1	1.96	1.96	< 2.2		30	9.71	9.71
Geomean	**14**		**1.1**	**177**		**0.1**		**0.7**		**0.6**	**25**		**3.6**

ATTACHMENT 18
Data From Fixed Station LM M
Lake Michigan at Michigan City

Date	Total Copper (ug/l)	Adjusted Total Copper (ug/l)
1/10/2001	2.1	2.1
2/12/2001	1	1
3/13/2001	1.1	1.1
4/9/2001	1.3	1.3
5/10/2001	< 1	0.5
6/7/2001	< 1	0.5
7/10/2001	< 1	0.5
8/13/2001	< 1	0.5
9/20/2001	1.1	1.1
10/10/2001	< 1	0.5
11/8/2001	< 1	0.5
12/4/2001	< 1	0.5
1/29/2002	< 1	0.5
2/20/2002	1.09	1.09
3/14/2002	1.45	1.45
4/17/2002	1.01	1.01
5/16/2002	< 1	0.5
6/11/2002	1.12	1.12
7/18/2002	1.5	1.5
8/7/2002	< 1	0.5
9/11/2002	2.74	2.74
10/10/2002	< 1	0.5
11/12/2002	1.37	1.37
12/11/2002	1.91	1.91
1/9/2003	1	1
2/5/2003	1.07	1.07
3/10/2003	< 1	0.5
4/10/2003	< 1	0.5
5/8/2003	6.25	6.25
6/4/2003	< 1	0.5
7/2/2003	< 1	0.5
8/5/2003	1.43	1.43
9/3/2003	< 1	0.5
10/6/2003	< 1	0.5
11/18/2003	< 1	0.5
12/2/2003	1.21	1.21
1/6/2004	< 1	0.5
2/24/2004	< 1	0.5
3/16/2004	1.15	1.15
4/13/2004	1.47	1.47
5/18/2004	< 1	0.5
6/1/2004	< 1	0.5
7/6/2004	< 1	0.5
8/9/2004	1.05	1.05
9/2/2004	< 1	0.5
10/4/2004	< 1	0.5
11/4/2004	< 1	0.5
12/16/2004	1.39	1.39
Geomean		**0.8**

ATTACHMENT 19
Lake Michigan Data From BP Products Permit Application

Date	Total Boron (mg/l)	Total Strontium (mg/l)	Total Molybdenum (mg/l)	Adjusted Total Molybdenum (mg/l)	Total Vanadium (mg/l)
9/5/2001		0.13	0.001	0.001	
9/10/2001		0.13	0.0012	0.0012	
9/12/2001		0.12	<0.001	0.00085	
9/13/2001		0.13	<0.001	0.00085	
9/18/2001		0.12	0.0009	0.0009	
10/1/2001		0.12	0.00086	0.00086	
10/3/2001		0.12	0.00078	0.00078	
6/24/1998	0.029		0.00129	0.00129	0.00169
6/24/1998	0.0209		0.00053	0.00053	0.0022
8/31/1998	0.064		0.00134	0.00134	0.00317
8/31/1998	0.0196		0.00115	0.00115	0.0026
8/31/1998	0.06		0.00127	0.00127	0.00336
11/4/1998			0.0015	0.0015	0.0092
Geomean	**0.034**	**0.12**		**0.001**	**0.0031**

ATTACHMENT 20
Data From Fixed Station LM W
Lake Michigan at Whiting

Date	Hardness (mg/l)
1/26/2000	172
2/28/2000	129
3/29/2000	113
4/26/2000	155
5/30/2000	162
6/26/2000	132
7/25/2000	141
8/30/2000	141
9/27/2000	145
10/30/2000	159
11/28/2000	139
12/19/2000	143
1/30/2001	145
2/26/2001	135
3/20/2001	147
4/18/2001	147
5/29/2001	127
6/25/2001	125
7/23/2001	133
8/22/2001	124
9/24/2001	133
10/16/2001	141
11/26/2001	141
12/17/2001	145
1/23/2002	139
2/25/2002	140
3/27/2002	142
4/22/2002	142
5/13/2002	138
6/24/2002	138
7/24/2002	142
8/26/2002	134
9/23/2002	134
10/30/2002	164
11/20/2002	138
12/18/2002	138
1/15/2003	146
2/19/2003	164
3/19/2003	146
4/23/2003	141
5/12/2003	139
6/11/2003	129
7/7/2003	128
8/11/2003	130
9/10/2003	131
10/22/2003	143
11/19/2003	145
12/17/2003	148
1/7/2004	139
2/18/2004	140
3/30/2004	146
4/21/2004	139
5/26/2004	131
6/16/2004	125
7/19/2004	122
8/16/2004	133
9/20/2004	137
10/25/2004	134
11/29/2004	153
12/20/2004	147
50th %	**140**

ATTACHMENT 21
Data From Fixed Station LM-DSP
Lake Michigan at Dunes State Park (Beach Sample)

Date	Summer pH (s.u.)
7/26/2000	8.3
8/23/2000	8.19
9/28/2000	8.19
7/24/2001	8.39
8/23/2001	8.19
9/25/2001	7.8
7/18/2002	8.4
8/8/2002	8.6
9/12/2002	8.1
7/2/2003	8.3
8/12/2003	8.2
9/11/2003	8.2
7/20/2004	8.2
8/10/2004	8.2
9/2/2004	8.4
75th %	**8.3**

Date	Winter pH (s.u.)
10/19/1999	8.39
11/30/1999	8.5
12/29/1999	7.9
2/29/2000	8.19
3/21/2000	8.3
4/25/2000	8.19
5/31/2000	8.6
6/22/2000	8.39
10/24/2000	8.1
11/29/2000	7.8
3/21/2001	8
4/19/2001	8
5/10/2001	8.39
6/7/2001	8.19
10/17/2001	8.5
11/27/2001	8.39
12/18/2001	8.1
1/28/2002	8.19
2/19/2002	8.1
3/13/2002	8.19
4/17/2002	8.19
5/16/2002	8.3
6/11/2002	8.5
10/31/2002	8.19
11/12/2002	8.4
12/11/2002	8.1
1/8/2003	8.2
4/10/2003	8
5/13/2003	8.4
6/5/2003	8.2
10/7/2003	8.3
11/20/2003	8.1
12/3/2003	8
1/5/2004	7.9
4/21/2004	8.3
5/18/2004	8.4
6/2/2004	8.2
75th %	**8.4**

ATTACHMENT 22
Data From Fixed Station LM-DSP
Lake Michigan at Dunes State Park (Beach Sample)

Date	Summer Temperature (C)
7/26/2000	20.1
8/23/2000	16.8
9/28/2000	13.4
7/24/2001	22.6
8/23/2001	22.1
9/25/2001	13.6
7/18/2002	22.7
8/8/2002	21.79
9/12/2002	22.6
7/2/2003	18.3
8/12/2003	21.9
9/11/2003	18.5
7/20/2004	21.7
8/10/2004	21.1
9/2/2004	19
75th %	**22**

Date	Winter Temperature (C)
10/19/1999	12.4
11/30/1999	7.5
12/29/1999	7.4
2/29/2000	4.7
3/21/2000	11.3
4/25/2000	9.1
5/31/2000	15.3
6/22/2000	20.2
10/24/2000	15.6
11/29/2000	4
3/21/2001	4
4/19/2001	6
5/10/2001	14.19
6/7/2001	14.69
10/17/2001	9.8
11/27/2001	10.39
12/18/2001	6.8
1/28/2002	8.3
2/19/2002	4.19
3/13/2002	6.69
4/17/2002	12.3
5/16/2002	13.39
6/11/2002	18.89
10/31/2002	8.69
11/12/2002	9.1
12/11/2002	4
1/8/2003	6.1
4/10/2003	3.4
5/13/2003	11.4
6/5/2003	13.7
10/7/2003	11.5
11/20/2003	8.2
12/3/2003	3.6
1/5/2004	1.7
4/21/2004	13
5/18/2004	14.1
6/2/2004	15.7
75th %	**13**

ATTACHMENT 23
Data From BP Products Sampling at Site C3501

Date	Summer pH (s.u.)	Date	Winter pH (s.u.)
7/1/1997	7.9	5/23/1995	8.2
7/16/1997	8	5/24/1995	8.2
8/4/1997	8	5/25/1995	8.2
8/6/1997	8	10/21/1996	8.1
8/29/1997	8	10/24/1996	8.2
7/6/1998	7.8	4/28/1997	7.9
7/30/1998	7.6	6/20/1997	7.9
8/12/1998	8.4	6/19/1998	7.9
8/13/1998	8.2		
8/27/1998	7.8	**75th %**	**8.2**
9/17/1998	7.8		
8/12/1999	8.3		
8/23/2000	8.4		
75th %	**8.2**		

ATTACHMENT 24
Data From BP Products Sampling at Site S3500

Date	Summer pH (s.u.)	Date	Winter pH (s.u.)
7/1/1997	7.9	5/23/1995	8.2
7/16/1997	8	5/24/1995	8.1
8/4/1997	8	5/25/1995	8.1
8/6/1997	8	6/5/1996	8.1
8/29/1997	8	10/21/1996	8.2
7/6/1998	7.8	10/22/1996	8.1
7/30/1998	7.7	4/28/1997	8
8/12/1998	8.2	4/29/1997	7.1
8/13/1998	8.2	6/20/1997	7.9
8/27/1998	7.8	6/19/1998	7.8
9/17/1998	7.8		
8/12/1999	8.3	**75th %**	**8.1**
8/23/2000	8.4		
75th %	**8.2**		

ATTACHMENT 25

Calculation of Preliminary Effluent Limitations for BP Products without Approved Alternate Mixing Zone

Discharger Name:	BP Products
Receiving Stream:	Lake Michigan

7/28/2006
4:35 PM

			Mixing Zone
Discharge Flow	=	21.4 mgd	
Q1,10 receiving stream (Outfall)	=	21.4 mgd	
Q7,10 receiving stream (Outfall)	=	0 mgd	25%
Q7,10 receiving stream (Industrial Water Supply)	=	0 mgd	25%
Harmonic Mean Flow (Outfall)	=	0 mgd	25%
Harmonic Mean Flow (Drinking Water Intake)	=	0 mgd	25%
Q90,10 receiving stream	=	0 mgd	25%
Discharge-Induced Mixing Dilution Ratio (S)	=	0	
Hardness (50th percentile)	=	140 mg/l	
Stream pH (50th percentile)	=	s.u.	
Summer Stream Temperature (75th percentile)	=	22 C	
Summer Stream pH (75th percentile)	=	8.3 s.u.	
Winter Stream Temperature (75th percentile)	=	13 C	
Winter Stream pH (75th percentile)	=	8.3 s.u.	

Discharge-Induced Mixing (DIM)	No
Drinking Water Intake Downstream	No
Industrial Water Supply Downstream	No

Metals Translators
(dissolved to total recoverable)

	Acute	Chronic
Aluminum	1.000	1.000
Antimony	1.000	1.000
Arsenic	1.000	1.000
Barium	1.000	1.000
Beryllium	1.000	1.000
Cadmium	0.930	0.895
Chromium III	0.316	0.860
Chromium VI	0.982	0.962
Cobalt	1.000	1.000
Copper	0.960	0.960
Iron	1.000	1.000
Lead	0.742	0.742
Manganese	1.000	1.000
Mercury	0.850	0.850
Molybdenum	1.000	1.000
Nickel	0.998	0.997
Selenium	0.922	0.922
Silver	0.850	1.000
Strontium	1.000	1.000
Thallium	1.000	1.000
Tin	1.000	1.000
Titanium	1.000	1.000
Vanadium	1.000	1.000
Zinc	0.978	0.986

Source of Criteria [1]							Background	BCC	Add.	Samples/	CV	CAS		Indiana Water Quality Criteria for the Great Lakes System (ug/l)							Preliminary Effluent Limitations					
														A	B	C	D	E	F	G						
														Aquatic Life Criteria		Human Health Noncancer Criteria		Human Health Cancer Criteria		Wildlife Criteria					
A	B	C	D	E	F	G	(ug/l)			Month		Number	Parameters[2]	Acute (CMC)	Chronic (CCC)	Drinking (HNC-D)	Nondrinking (HNC-N)	Drinking (HCC-D)	Nondrinking (HCC-N)	(WC)	Concentration (ug/l)[3] Average	Maximum	Mass (lbs/day) Average	Maximum	Criteria Type	Basis
4	4	3	3							4	0.6	7440360	Antimony	720	80	10	2000				66	130	12	23	Tier II	CCC
1	1	3	3							4	0.6	7440382	Arsenic III[4]	339.8	147.9	10	230				120	240	21	43	Tier I	CCC
4	4									4	0.6	7440393	Barium	1786.25	626.01						510	1000	91	179	Tier II	CCC
4	4	3	3							4	0.6	7440417	Beryllium[4]	50.42	5.60	40	300				4.6	9.2	0.82	1.6	Tier II	CCC
1	1	3	3							4	0.6	7440439	Cadmium[4]	6.14	2.87	14	1400				2.6	5.3	0.46	0.95	Tier I	CCC
1	1	3	3							4	0.6	16065831	Chromium (III)	751	98	410000	43000000				92.95	186.48	16.60	33.30	Tier I	CCC
1	1	3	3				0			4	0.6	18540299	Chromium (VI)	15.73	10.56	230	25000				9	18	1.6	3.2	Tier I	CCC
												7440473	Total Chromium								100	200	18	37	Tier I	CCC
4	4	5	5							4	0.6	7440484	Cobalt	120	19	140	11000				16	31	2.9	5.5	Tier II	CCC
1	1	3	3				0.8			4	0.6	7440508	Copper	18.45	11.94	280	56000				10	20	1.8	3.6	Tier I	CCC
3	3									4	0.6	7439921	Lead[4]	139.39	7.31						8.1	16	1.4	2.9	Tier I	CCC
4	4	5	5							4	0.6	7439965	Manganese	1530	711	3900	320000				580	1200	104	214	Tier II	CCC
1	1	1	1			1		Y		1	0.6	7439976	Mercury[6]	1.440	0.772	0.0018	0.0018			0.0013	0.0013	0.0032	0.00023	0.00057	Tier I	WC
4	4	5	5				1			4	0.6	7439987	Molybdenum	1200	800	130	10000				660	1300	118	232	Tier II	CCC
1	1	3	3							4	0.6	7440020	Nickel	622.43	69.13	460	42000				57	110	10	20	Tier I	CCC
	1	3	3							4	0.6	7782492	Selenium		4.61	140	3400				4.1	8.2	0.73	1.5	Tier I	CCC
4	4	5	5							4	0.6	7440246	Strontium	7700	860	18000	1400000				700	1400	125	250	Tier II	CCC
4	4	3	3							4	0.6	7440280	Thallium	54	6	2	5				4.9	9.9	0.88	1.8	Tier II	CCC
5	5									4	0.6	7440315	Tin	1300	140						110	230	20	41	EASV[7]	CCC
5	5									4	0.6	7440326	Titanium	23000	2500						2000	4100	357	732	EASV[7]	CCC
4	4	3	3							4	0.6	7440622	Vanadium	110	12	230	2300				9.8	20	1.8	3.6	Tier II	CCC
1	1	3	3				3.6			4	0.6	7440666	Zinc	155.84	157.11	9000	250000				130	260	23	46	Tier I	CCC
5	5	5	5							4	0.6	205992	Benzo(b)fluoranthene[4]	23	2.6	6	6				2.1	4.3	0.38	0.77	EASV[7]	CCC
5	5	5	5							4	0.6	207089	Benzo(k)fluoranthene[4]	23	2.6	6	6				2.1	4.3	0.38	0.77	EASV[7]	CCC
5	5									4	0.6	191242	Benzo(g,h,i)perylene[4]	23	2.6						2.1	4.3	0.38	0.77	EASV[7]	CCC
				3	3				Y	4	0.6	50328	Benzo(a)pyrene[4]					0.032	0.096		0.096	0.23	0.017	0.041	Tier I	HCC-N
4	4	4	4							4	0.6	206440	Fluoranthene	17	3.6	9.4	9.5				2.9	5.9	0.52	1.1	Tier II	CCC

					7664417	Total Ammonia (as N)													
			8	0.6		Summer	2913.31	664.00						480	1100	86	196	Tier I	CCC
			8	0.6		Winter	2930.65	667.96						490	1100	88	196	Tier I	CCC
			4	0.6	7440428	Boron	10000	1600	2500	200000				1300	2600	232	464	Tier II	CCC
			4	0.6	1688706	Chloride	860000	230000	250000					188000	378000	33575	67508	Tier I	CCC
			4	0.6	57125	Cyanide, Free	22	5.2						4.3	8.5	0.77	1.5	Tier I	CCC
			4	0.6	57125	Cyanide, Total			600	48000				48000	117000	8572	20895	Tier I	HNC-N
						Whole Effluent Toxicity (WET)													
						Acute (TUa) without Mixing Zone	1.0								1.0				
						Chronic (TUc)		1.0						1.0					
						Additional Criteria for Lake Michigan													
			4	0.6	14808798	Sulfate		250000						205000	411000	36611	73401	Lake M	CCC
			4	0.6		Total Dissolved Solids		750000						614000	1232000	109655	220025	Lake M	CCC
			4	0.6	16984488	Fluoride		1000						820	1600	146	286	Lake M	CCC
			4	0.6		Iron, Dissolved		300						250	490	45	88	Lake M	CCC

1 Number of Carcinogenic pollutants present in the effluent

:eria

:meric water quality criterion; 327 IAC 2-1.5-8(b)(3), Table 8-1; 327 IAC 2-1.5-8(b)(5), Table 8-3; 327 IAC 2-1.5-8(b)(6), Table 8-4; 327 IAC 2-1.5-8(c)(5); and 327 IAC 2-1.5-8(f).

; Criteria for Lake Michigan, 327 IAC 2-1.5-8(j), Table 8-9. These criteria are not aquatic life criteria, however, since they are treated as 4-day average criteria, they are included in the chronic aquatic criteria column.

:rion calculated using the methodology in 327 IAC 2-1.5-11, 327 IAC 2-1.5-14, and 327 IAC 2-1.5-15.

ue calculated using the methodology in 327 IAC 2-1.5-12, 327 IAC 2-1.5-14, and 327 IAC 2-1.5-15.

ambient screening value (EASV) calculated in accordance with 327 IAC 5-2-11.5(b)(3)(A)(i).

:iteria for the metals are dissolved criteria. The human health criteria for the metals are total recoverable. The aquatic criteria for cyanide are free cyanide. The human health criteria for cyanide are total cyanide.

for the metals are total recoverable (with the exception of Chromium (VI) which is dissolved).

:ed substances are probable or known human carcinogens. If an effluent contains more than one of these substances, the additivity provisions contained in 327 IAC 5-2-11.4(a)(4)(A) shall be applied. This spreadsheet automatically

ıdditivity provisions by reducing each human health wasteload allocation for a carcinogen by an equal amount. This allocation between carcinogens can be altered on a case-specific basis.

:ed substance is a chlorinated dibenzo-p-dioxin. If an effluent contains more than one chlorinated dibenzo-p-dioxin or chlorinated dibenzofuran, the additivity provisions contained in 327 IAC 5-2-11.4(a)(4)(C) shall be applied.

:ed substances are bioaccumulative chemicals of concern (BCCs). Dilution is not allowed for new discharges of BCCs to streams and for any discharges of BCCs to the open waters of Lake Michigan. Dilution is not allowed for

ırges of BCCs to streams after January 1, 2004 unless the discharge meets an exception. To not allow for dilution for BCCs, place a "Y" in the "BCC" column.

n estimated ambient screening values (as indicated by EASV) ARE NOT to be used as water quality-based effluent limitations. These are solely to be used as preliminary effluent limitations.

2002

ATTACHMENT 26

Calculation of Preliminary Effluent Limitations for BP Products with Approved Alternate Mixing Zone

7/28/2006
4:36 PM

Discharger Name:	BP Products
Receiving Stream:	Lake Michigan

			Mixing Zone
Discharge Flow	=	21.4 mgd	
Q1,10 receiving stream (Outfall)	=	mgd	
Q7,10 receiving stream (Outfall)	=	793.94 mgd	100%
Q7,10 receiving stream (Industrial Water Supply)	=	mgd	25%
Harmonic Mean Flow (Outfall)	=	793.94 mgd	100%
Harmonic Mean Flow (Drinking Water Intake)	=	mgd	25%
Q90,10 receiving stream	=	0 mgd	25%
Discharge-Induced Mixing Dilution Ratio (S)	=	37.1	
Hardness (50th percentile)	=	140 mg/l	
Stream pH (50th percentile)	=	s.u.	
Summer Stream Temperature (75th percentile)	=	22 C	
Summer Stream pH (75th percentile)	=	8.3 s.u.	
Winter Stream Temperature (75th percentile)	=	13 C	
Winter Stream pH (75th percentile)	=	8.3 s.u.	

Discharge-Induced Mixing (DIM)	Yes
Drinking Water Intake Downstream	No
Industrial Water Supply Downstream	No

Metals Translators
(dissolved to total recoverable)

	Acute	Chronic
Aluminum	1.000	1.000
Antimony	1.000	1.000
Arsenic	1.000	1.000
Barium	1.000	1.000
Beryllium	1.000	1.000
Cadmium	0.930	0.895
Chromium III	0.316	0.860
Chromium VI	0.982	0.962
Cobalt	1.000	1.000
Copper	0.960	0.960
Iron	1.000	1.000
Lead	0.742	0.742
Manganese	1.000	1.000
Mercury	0.850	0.850
Molybdenum	1.000	1.000
Nickel	0.998	0.997
Selenium	0.922	0.922
Silver	0.850	1.000
Strontium	1.000	1.000
Thallium	1.000	1.000
Tin	1.000	1.000
Titanium	1.000	1.000
Vanadium	1.000	1.000
Zinc	0.978	0.986

Source of Criteria [1]							Background	BCC	Add.	Samples/	CV	CAS		Indiana Water Quality Criteria for the Great Lakes System (ug/l)							Preliminary Effluent Limitations					
														A	B	C	D	E	F	G						
														Aquatic Life Criteria		Human Health Noncancer Criteria		Human Health Cancer Criteria		Wildlife Criteria					
A	B	C	D	E	F	G	(ug/l)			Month		Number	Parameters[2]	Acute (CMC)	Chronic (CCC)	Drinking (HNC-D)	Nondrinking (HNC-N)	Drinking (HCC-D)	Nondrinking (HCC-N)	(WC)	Concentration (ug/l)[3] Average	Maximum	Mass (lbs/day) Average	Maximum	Criteria Type	Basis
1	1	3	3				1.1			4	0.6	16065831	Chromium (III)	751	98	410000	43000000				3508.08	7037.88	626.51	1256.91	Tier I	CCC
1	1	3	3				0			4	0.6	18540299	Chromium (VI)	15.73	10.56	230	25000				300	610	54	109	Tier I	CMC
												7440473	Total Chromium								3800	7600	681	1366	Tier I	CCC
1	1	3	3				0.8			4	0.6	7440508	Copper	18.45	11.94	280	56000				350	700	63	125	Tier I	CMC
3	3						0.7			4	0.6	7439921	Lead[4]	139.39	7.31						290	570	52	102	Tier I	CCC
1	1	1	1			1		Y		1	0.6	7439976	Mercury[6]	1.440	0.772	0.0018	0.0018			0.0013	0.0013	0.0032	0.00023	0.00057	Tier I	WC
	1	3	3				0.6			4	0.6	7782492	Selenium		4.61	140	3400				140	280	25	50	Tier I	CCC
4	4	5	5				120			4	0.6	7440246	Strontium	7700	860	18000	1400000				23000	47000	4108	8394	Tier II	CCC
4	4	3	3				3.1			4	0.6	7440622	Vanadium	110	12	230	2300				280	560	50	100	Tier II	CCC
				3	3		0		Y	4	0.6	50328	Benzo(a)pyrene[4]					0.032	0.096		3.7	8.9	0.66	1.6	Tier I	HCC-N
												7664417	Total Ammonia (as N)													
1	1						0			8	0.6		Summer	2913.31	664.00						18000	42000	3215	7501	Tier I	CCC
1	1						0			8	0.6		Winter	2930.65	667.96						19000	42000	3393	7501	Tier I	CCC
1	1	1					14000			4	0.6	1688706	Chloride	860000	230000	250000					6750000	13542000	1205493	2418487	Tier I	CCC
													Whole Effluent Toxicity (WET)													
1							0						Acute (TUa) with Mixing Zone	0.3								11				
	1						0						Chronic (TUc)		1.0						38					
													Additional Criteria for Lake Michigan													
	2						25000			4	0.6	14808798	Sulfate		250000						7040000	14123000	1257285	2522249	Lake M	CCC
	2						177000			4	0.6		Total Dissolved Solids		750000						18020000	36152000	3218220	6456442	Lake M	CCC
	2						100			4	0.6	16984488	Fluoride		1000						28000	56000	5001	10001	Lake M	CCC

1 Number of Carcinogenic pollutants present in the effluent

[1] Source of Criteria
1) Indiana numeric water quality criterion; 327 IAC 2-1.5-8(b)(3), Table 8-1; 327 IAC 2-1.5-8(b)(5), Table 8-3; 327 IAC 2-1.5-8(b)(6), Table 8-4; 327 IAC 2-1.5-8(c)(5); and 327 IAC 2-1.5-8(f).

2) Additional Criteria for Lake Michigan, 327 IAC 2-1.5-8(j), Table 8-9. These criteria are not aquatic life criteria, however, since they are treated as 4-day average criteria, they are included in the chronic aquatic criteria column.
3) Tier I criterion calculated using the methodology in 327 IAC 2-1.5-11, 327 IAC 2-1.5-14, and 327 IAC 2-1.5-15.
4) Tier II value calculated using the methodology in 327 IAC 2-1.5-12, 327 IAC 2-1.5-14, and 327 IAC 2-1.5-15.
5) Estimated ambient screening value (EASV) calculated in accordance with 327 IAC 5-2-11.5(b)(3)(A)(i).

[2] The aquatic criteria for the metals are dissolved criteria. The human health criteria for the metals are total recoverable. The aquatic criteria for cyanide are free cyanide. The human health criteria for cyanide are total cyanide.

[3] The WQBELs for the metals are total recoverable (with the exception of Chromium (VI) which is dissolved).

[4] The above-noted substances are probable or known human carcinogens. If an effluent contains more than one of these substances, the additivity provisions contained in 327 IAC 5-2-11.4(a)(4)(A) shall be applied. This spreadsheet automatically applies these additivity provisions by reducing each human health wasteload allocation for a carcinogen by an equal amount. This allocation between carcinogens can be altered on a case-specific basis.

[5] The above-noted substance is a chlorinated dibenzo-p-dioxin. If an effluent contains more than one chlorinated dibenzo-p-dioxin or chlorinated dibenzofuran, the additivity provisions contained in 327 IAC 5-2-11.4(a)(4)(C) shall be applied.

[6] The above-noted substances are bioaccumulative chemicals of concern (BCCs). Dilution is not allowed for new discharges of BCCs to streams and for any discharges of BCCs to the open waters of Lake Michigan. Dilution is not allowed for existing discharges of BCCs to streams after January 1, 2004 unless the discharge meets an exception. To not allow for dilution for BCCs, place a "Y" in the "BCC" column.

[7] Limits based on estimated ambient screening values (as indicated by EASV) ARE NOT to be used as water quality-based effluent limitations. These are solely to be used as preliminary effluent limitations.

Last revised: 12 December 2002

ATTACHMENT 27
BP Products Effluent Data

Date	Total Chromium (mg/l) Daily	Adjusted Daily	Monthly Average
1/1/03	< 0.01	0.01	
1/8/03	< 0.01	0.01	
1/15/03	< 0.01	0.01	
1/22/03	< 0.01	0.01	
1/29/03	< 0.01	0.01	0.01
2/5/03	< 0.01	0.01	
2/12/03	< 0.01	0.01	
2/19/03	< 0.01	0.01	
2/26/03	< 0.01	0.01	0.01
3/5/03	< 0.01	0.01	
3/12/03	< 0.01	0.01	
3/19/03	< 0.01	0.01	
3/26/03	< 0.01	0.01	0.01
4/2/03	< 0.01	0.01	
4/9/03	< 0.01	0.01	
4/16/03	< 0.01	0.01	
4/23/03	< 0.01	0.01	
4/30/03	< 0.01	0.01	0.01
5/7/03	< 0.01	0.01	
5/14/03	< 0.01	0.01	
5/21/03	< 0.01	0.01	
5/28/03	< 0.01	0.01	0.01
6/4/03	< 0.01	0.01	
6/11/03	< 0.01	0.01	
6/18/03	< 0.01	0.01	
6/25/03	< 0.01	0.01	0.01
7/2/03	< 0.01	0.01	
7/9/03	< 0.01	0.01	
7/16/03	< 0.01	0.01	
7/23/03	< 0.01	0.01	
7/30/03	< 0.01	0.01	0.01
8/6/03	< 0.01	0.01	
8/13/03	< 0.01	0.01	
8/20/03	< 0.01	0.01	
8/27/03	< 0.01	0.01	0.01
9/3/03	< 0.01	0.01	
9/10/03	< 0.01	0.01	
9/17/03	< 0.01	0.01	
9/24/03	< 0.01	0.01	0.01
10/1/03	< 0.01	0.01	
10/8/03	< 0.01	0.01	
10/15/03	< 0.01	0.01	

Date	Hexavalent Chromium (mg/l) Daily	Adjusted Daily	Monthly Average
1/3/03	< 0.005	0.005	
1/10/03	< 0.005	0.005	
1/17/03	< 0.005	0.005	
1/24/03	< 0.005	0.005	
1/31/03	< 0.005	0.005	0.005
2/7/03	< 0.005	0.005	
2/13/03	< 0.005	0.005	
2/20/03	< 0.005	0.005	
2/27/03	< 0.005	0.005	0.005
3/6/03	< 0.005	0.005	
3/13/03	< 0.005	0.005	
3/20/03	< 0.005	0.005	
3/27/03	< 0.005	0.005	0.005
4/3/03	< 0.005	0.005	
4/10/03	< 0.005	0.005	
4/17/03	< 0.005	0.005	
4/24/03	< 0.005	0.005	0.005
5/1/03	< 0.005	0.005	
5/8/03	< 0.005	0.005	
5/15/03	< 0.005	0.005	
5/22/03	< 0.005	0.005	
5/29/03	< 0.005	0.005	0.005
6/5/03	< 0.005	0.005	
6/12/03	< 0.005	0.005	
6/18/03	< 0.005	0.005	
6/26/03	< 0.005	0.005	0.005
7/3/03	< 0.005	0.005	
7/10/03	< 0.005	0.005	
7/17/03	< 0.005	0.005	
7/24/03	< 0.005	0.005	
7/31/03	< 0.005	0.005	0.005
8/7/03	< 0.005	0.005	
8/14/03	< 0.005	0.005	
8/21/03	< 0.005	0.005	
8/28/03	< 0.005	0.005	0.005
9/4/03	< 0.005	0.005	
9/10/03	< 0.005	0.005	
9/17/03	< 0.005	0.005	
9/24/03	< 0.005	0.005	0.005
10/1/03	< 0.005	0.005	
10/8/03	< 0.005	0.005	
10/15/03	< 0.005	0.005	

10/22/03	<	0.01	0.01	
10/29/03	<	0.01	0.01	0.01
11/5/03	<	0.01	0.01	
11/12/03	<	0.01	0.01	
11/19/03	<	0.01	0.01	
11/26/03	<	0.01	0.01	0.01
12/3/03	<	0.01	0.01	
12/10/03	<	0.01	0.01	
12/17/03	<	0.01	0.01	
12/24/03	<	0.01	0.01	
12/31/03	<	0.01	0.01	0.01
1/7/04	<	0.01	0.01	
1/14/04	<	0.01	0.01	
1/21/04	<	0.01	0.01	
1/27/04	<	0.01	0.01	0.01
2/4/04	<	0.01	0.01	
2/11/04	<	0.01	0.01	
2/18/04	<	0.01	0.01	
2/25/04	<	0.01	0.01	0.01
3/3/04	<	0.01	0.01	
3/10/04	<	0.01	0.01	
3/17/04	<	0.01	0.01	
3/24/04	<	0.01	0.01	
3/31/04	<	0.01	0.01	0.01
4/7/04	<	0.01	0.01	
4/14/04	<	0.01	0.01	
4/21/04	<	0.01	0.01	
4/28/04	<	0.01	0.01	0.01
5/5/04	<	0.01	0.01	
5/12/04	<	0.01	0.01	
5/19/04	<	0.01	0.01	
5/26/04	<	0.01	0.01	0.01
6/2/04	<	0.01	0.01	
6/9/04	<	0.01	0.01	
6/16/04	<	0.01	0.01	
6/23/04	<	0.01	0.01	
6/30/04	<	0.01	0.01	0.01
7/7/04	<	0.01	0.01	
7/14/04	<	0.01	0.01	
7/21/04	<	0.01	0.01	
7/28/04	<	0.01	0.01	0.01
8/4/04	<	0.01	0.01	
8/11/04	<	0.01	0.01	
8/18/04	<	0.01	0.01	
8/25/04	<	0.01	0.01	0.01
9/1/04	<	0.01	0.01	
9/8/04	<	0.01	0.01	
9/15/04	<	0.01	0.01	
9/22/04	<	0.01	0.01	
9/29/04	<	0.01	0.01	0.01
10/6/04	<	0.01	0.01	

10/22/03	<	0.005	0.005	
10/29/03	<	0.005	0.005	0.005
11/5/03	<	0.005	0.005	
11/12/03	<	0.005	0.005	
11/19/03	<	0.005	0.005	
11/26/03	<	0.005	0.005	0.005
12/3/03	<	0.005	0.005	
12/10/03	<	0.005	0.005	
12/17/03	<	0.005	0.005	
12/24/03	<	0.005	0.005	
12/31/03	<	0.005	0.005	0.005
1/6/04	<	0.005	0.005	
1/14/04	<	0.005	0.005	
1/21/04	<	0.005	0.005	
1/28/04	<	0.005	0.005	0.005
2/4/04	<	0.005	0.005	
2/11/04	<	0.005	0.005	
2/18/04	<	0.005	0.005	
2/25/04		0.005	0.005	0.005
3/2/04	<	0.005	0.005	
3/9/04	<	0.005	0.005	
3/16/04	<	0.005	0.005	
3/23/04	<	0.005	0.005	
3/30/04	<	0.005	0.005	0.005
4/6/04	<	0.005	0.005	
4/13/04	<	0.005	0.005	
4/20/04	<	0.005	0.005	
4/27/04	<	0.005	0.005	0.005
5/4/04	<	0.005	0.005	
5/11/04	<	0.005	0.005	
5/18/04	<	0.005	0.005	
5/25/04	<	0.005	0.005	0.005
6/1/04	<	0.005	0.005	
6/8/04	<	0.005	0.005	
6/15/04	<	0.005	0.005	
6/22/04	<	0.005	0.005	
6/29/04	<	0.005	0.005	0.005
7/6/04	<	0.005	0.005	
7/13/04	<	0.005	0.005	
7/20/04	<	0.005	0.005	
7/27/04	<	0.005	0.005	0.005
8/3/04	<	0.005	0.005	
8/10/04	<	0.005	0.005	
8/17/04	<	0.005	0.005	
8/23/04	<	0.005	0.005	
8/30/04	<	0.005	0.005	0.005
9/6/04	<	0.005	0.005	
9/13/04	<	0.005	0.005	
9/20/04	<	0.005	0.005	
9/27/04	<	0.005	0.005	0.005
10/4/04	<	0.005	0.005	

10/13/04	<	0.01	0.01	
10/20/04	<	0.01	0.01	
10/27/04	<	0.01	0.01	0.01
11/3/04	<	0.01	0.01	
11/10/04	<	0.01	0.01	
11/17/04	<	0.01	0.01	
11/24/04	<	0.01	0.01	0.01
12/1/04	<	0.01	0.01	
12/8/04	<	0.01	0.01	
12/15/04	<	0.01	0.01	
12/22/04	<	0.01	0.01	
12/29/04	<	0.01	0.01	0.01
1/5/05	<	0.01	0.01	
1/12/05	<	0.01	0.01	
1/19/05	<	0.01	0.01	
1/26/05	<	0.01	0.01	0.01
2/2/05	<	0.01	0.01	
2/9/05	<	0.01	0.01	
2/16/05	<	0.01	0.01	
2/23/05	<	0.01	0.01	0.01
3/2/05	<	0.01	0.01	
3/9/05	<	0.01	0.01	
3/16/05	<	0.01	0.01	
3/23/05	<	0.01	0.01	
3/30/05	<	0.01	0.01	0.01
4/6/05	<	0.01	0.01	
4/13/05	<	0.01	0.01	
4/20/05	<	0.01	0.01	
4/27/05	<	0.01	0.01	0.01
5/4/05	<	0.01	0.01	
5/11/05	<	0.01	0.01	
5/18/05	<	0.01	0.01	
5/25/05	<	0.01	0.01	0.01
6/1/05	<	0.01	0.01	
6/8/05	<	0.01	0.01	
6/15/05	<	0.01	0.01	
6/22/05	<	0.01	0.01	
6/29/05	<	0.01	0.01	0.01
7/6/05	<	0.01	0.01	
7/13/05	<	0.01	0.01	
7/20/05	<	0.01	0.01	
7/27/05	<	0.01	0.01	0.01
8/3/05	<	0.01	0.01	
8/10/05	<	0.01	0.01	
8/17/05	<	0.01	0.01	
8/24/05	<	0.01	0.01	
8/31/05	<	0.01	0.01	0.01
9/7/05	<	0.01	0.01	
9/14/05	<	0.01	0.01	
9/21/05	<	0.01	0.01	
9/28/05	<	0.01	0.01	0.01

10/11/04	<	0.005	0.005	
10/19/04	<	0.005	0.005	
10/25/04	<	0.005	0.005	0.005
11/1/04	<	0.005	0.005	
11/8/04	<	0.005	0.005	
11/15/04	<	0.005	0.005	
11/22/04	<	0.005	0.005	
11/29/04	<	0.005	0.005	0.005
12/6/04	<	0.005	0.005	
12/13/04	<	0.005	0.005	
12/20/04	<	0.005	0.005	
12/27/04	<	0.005	0.005	0.005
1/3/05	<	0.005	0.005	
1/10/05	<	0.005	0.005	
1/17/05	<	0.005	0.005	
1/24/05	<	0.005	0.005	
1/31/05	<	0.005	0.005	0.005
2/7/05	<	0.005	0.005	
2/14/05	<	0.005	0.005	
2/20/05	<	0.005	0.005	
2/27/05	<	0.005	0.005	0.005
3/6/05	<	0.005	0.005	
3/13/05	<	0.005	0.005	
3/20/05	<	0.005	0.005	
3/27/05	<	0.005	0.005	0.005
4/3/05	<	0.005	0.005	
4/10/05	<	0.005	0.005	
4/17/05	<	0.005	0.005	
4/24/05	<	0.005	0.005	0.005
5/1/05	<	0.005	0.005	
5/8/05	<	0.005	0.005	
5/15/05	<	0.005	0.005	
5/22/05	<	0.005	0.005	
5/29/05	<	0.005	0.005	0.005
6/5/05	<	0.005	0.005	
6/12/05	<	0.005	0.005	
6/19/05	<	0.005	0.005	
6/26/05	<	0.005	0.005	0.005
7/3/05	<	0.005	0.005	
7/10/05	<	0.005	0.005	
7/17/05	<	0.005	0.005	
7/24/05	<	0.005	0.005	
7/31/05	<	0.005	0.005	0.005
8/7/05	<	0.005	0.005	
8/14/05	<	0.005	0.005	
8/21/05	<	0.005	0.005	
8/28/05	<	0.005	0.005	0.005
9/4/05	<	0.005	0.005	
9/11/05	<	0.005	0.005	
9/18/05	<	0.005	0.005	
9/25/05	<	0.005	0.005	0.005

10/5/05	< 0.01	0.01	
10/12/05	< 0.01	0.01	
10/19/05	< 0.01	0.01	
10/26/05	< 0.01	0.01	0.01
11/2/05	< 0.01	0.01	
11/9/05	< 0.01	0.01	
11/16/05	< 0.01	0.01	
11/23/05	< 0.01	0.01	
11/30/05	< 0.01	0.01	0.01
12/7/05	< 0.01	0.01	
12/14/05	< 0.01	0.01	
12/21/05	< 0.01	0.01	
12/28/05	< 0.01	0.01	0.01
1/4/06	< 0.01	0.01	
1/11/06	< 0.01	0.01	
1/18/06	< 0.01	0.01	
1/25/06	< 0.01	0.01	0.01
2/1/06	< 0.01	0.01	
2/8/06	< 0.01	0.01	
2/15/06	< 0.01	0.01	
2/22/06	< 0.01	0.01	0.01
Number		165	38
Max.		0.01	0.01
CV		0.0	0.0

10/2/05	< 0.005	0.005	
10/9/05	< 0.005	0.005	
10/16/05	< 0.005	0.005	
10/23/05	< 0.005	0.005	
10/30/05	< 0.005	0.005	0.005
11/6/05	< 0.005	0.005	
11/13/05	< 0.005	0.005	
11/20/05	< 0.005	0.005	
11/27/05	< 0.005	0.005	0.005
12/4/05	< 0.005	0.005	
12/11/05	< 0.005	0.005	
12/18/05	< 0.005	0.005	
12/25/05	< 0.005	0.005	0.005
1/1/06	< 0.005	0.005	
1/8/06	< 0.005	0.005	
1/15/06	< 0.005	0.005	
1/22/06	< 0.005	0.005	
1/29/06	< 0.005	0.005	0.005
2/1/06	< 0.005	0.005	
2/8/06	< 0.005	0.005	
2/15/06	< 0.005	0.005	
2/22/06	< 0.005	0.005	0.005
Number		166	38
Max.		0.005	0.005
CV		0.0	0.0

ATTACHMENT 28
BP Products Effluent Data

Date	Total Selenium (ug/l)		
	Daily	Adjusted Daily	Monthly Average
3/25/01	33	33	
8/31/01	16	16	
9/6/01	17.8	17.8	
9/9/01	< 5.0	5.0	
9/10/01	3.1	3.1	
9/12/01	17.3	17.3	
9/18/01	12.8	12.8	11.2
10/1/01	15.1	15.1	
10/3/01	26.2	26.2	20.7
12/19/01	< 2.0	2.0	
1/9/02	13.2	13.2	
1/16/02	17.9	17.9	15.6
2/25/02	11.7	11.7	
2/26/02	13.6	13.6	12.7
3/1/02	23	23	
3/20/02	20	20	21.5
9/17/02	15.4	15.4	
9/30/02	15.4	15.4	15.4
3/4/03	23	23	
9/25/03	7.1	7.1	
3/16/04	18	18	
9/13/04	30	30	
3/15/05	30	30	
9/29/05	34	34	
Number		**24**	**6**
Max.		**34**	**21.5**
CV		**0.5**	

ATTACHMENT 29
BP Products Effluent Data

Date	Total Mercury (ng/l)			
	Original Sample	Duplicate Sample	Daily	Monthly Average
9/5/01	7.4	8.1	7.8	
9/11/01	58.4	96	77.2	
9/18/01	65.4	59.1	62.3	49.1
12/19/01	28.6	55.4	42.0	
1/16/02	59.4	46.3	52.9	
8/2/04	2.74	2.76	2.8	
8/19/04	2.05	1.1	1.6	
8/27/04	6.24	12	9.1	4.5
9/3/04	19.4	17.5	18.5	
11/4/04	31.1	31.2	31.2	
1/7/05	8.7	7.9	8.3	
2/4/05	4.3	2.98	3.6	
3/11/05	2.62	2.86	2.7	
4/5/05	2.58	<0.5	1.5	
6/3/05	6.1	8.07	7.1	
7/8/05	3.47	0.917	2.2	
Number			**16**	**2**
Max.			**77.2**	**49.1**
CV			**1.2**	

Date	Vanadium (mg/l)	
	Daily	Monthly Average
8/10/04	0.22	
8/19/04	0.23	0.23
9/3/04	0.15	
9/10/04	0.1	
9/20/04	0.059	
9/30/04	0.26	0.14
10/11/04	0.41	
10/20/04	0.26	
10/29/04	0.31	0.33
11/10/04	0.11	
11/19/04	0.078	
11/30/04	0.1	0.096
12/10/04	0.21	
12/20/04	0.4	
12/30/04	0.16	0.26
1/7/05	0.6	
3/30/05	0.63	
4/8/05	0.25	
4/20/05	0.031	
4/29/05	0.29	0.19
5/11/05	0.49	
5/20/05	0.56	
5/31/05	0.054	0.37
6/10/05	0.31	
6/20/05	0.17	
6/30/05	0.31	0.26
7/11/05	0.37	
7/20/05	0.08	
7/29/05	0.13	0.19
Number	**29**	**9**
Max.	**0.63**	**0.37**
CV	**0.7**	

ATTACHMENT 30
BP Products Effluent Data

Date	Antimony (ug/l)			Arsenic (ug/l)			Barium (mg/l)			Beryllium (mg/l)			Boron (mg/l)		
	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average
8/31/01	0.76			5.8			0.087			< 0.001	0.001		0.14		
9/6/01	0.74			5.9			0.076			< 0.001	0.001		0.13		
9/10/01	0.76			7.2			0.10			< 0.001	0.001		0.14		
9/12/01	0.75			7.7			0.14			< 0.001	0.001		0.18		
9/18/01	1.4		0.91	7.5		7.1	0.091		0.10	< 0.001	0.001	0.001	0.21		0.17
10/1/01				5.2			0.077			< 0.001	0.001		0.15		
10/3/01				5.9		5.6	0.094		0.086	< 0.001	0.001	0.001	0.14		0.15
12/19/01															
1/9/02															
1/16/02															
Number	**5**		**1**	**7**		**2**	**7**		**2**		**7**	**2**	**7**		**2**
Max.	**1.4**		**0.91**	**7.7**		**7.1**	**0.14**		**0.10**		**0.001**	**0.001**	**0.21**		**0.17**
CV															

Date	Cadmium (mg/l)			Chloride (mg/l)			Cobalt (ug/l)			Copper (ug/l)			Total Cyanide (mg/l)		
	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average
8/31/01	< 0.001	0.001		242			0.7			5.8			< 0.0025	0.0025	
9/6/01	< 0.001	0.001		133			0.93			3.5					
9/10/01	< 0.001	0.001		277			0.59			1.8					
9/12/01	< 0.001	0.001		424			0.55			3					
9/18/01	< 0.001	0.001	0.001	218		263	0.59		0.67	3.2		2.9			
10/1/01	< 0.001	0.001		254			0.59								
10/3/01	< 0.001	0.001	0.001	270		262	5		2.8						
12/19/01				180											
1/9/02				210											
1/16/02				200		205									
Number		**7**	**2**	**10**		**3**	**7**		**2**	**5**		**1**		**1**	
Max.		**0.001**	**0.001**	**424**		**263**	**5**		**2.8**	**5.8**		**2.9**		**0.0025**	
CV				**0.3**											

ATTACHMENT 31
BP Products Effluent Data

Date	Free Cyanide (mg/l)			Fluoride (mg/l)			Total Iron (mg/l)			Dissolved Iron (mg/l)			Lead (ug/l)		
	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average
8/31/01	< 0.0025	0.0025		0.4			1.4			< 0.05	0.05		21		
9/6/01							0.21			< 0.05	0.05		4.1		
9/10/01							0.26			< 0.05	0.05		5.9		
9/12/01							0.17			< 0.05	0.05		5.3		
9/18/01							0.18		0.21	< 0.05	0.05	0.05	6.6		5.5
10/1/01							0.36			< 0.05	0.05		7.3		
10/3/01							0.22		0.29	< 0.05	0.05	0.05	8.1		7.7
12/19/01				0.3											
1/9/02															
1/16/02															
Number		**1**		**2**			**7**		**2**		**7**	**2**	**7**		**2**
Max.		**0.0025**		**0.4**			**1.4**		**0.29**		**0.05**	**0.05**	**21**		**7.7**
CV															

Date	Manganese (mg/l)			Molybdenum (ug/l)			Nickel (ug/l)			Silver (mg/l)			Strontium (mg/l)		
	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average
8/31/01	0.081			3.4			16			< 0.001	0.001		0.337		
9/6/01	0.056			2.8			2.3			< 0.001	0.001		0.34		
9/10/01	0.071			2.6			1.8			< 0.001	0.001		0.58		
9/12/01	0.089			2.3			2			< 0.001	0.001		0.78		
9/18/01	0.076		0.073	5.4		3.3	2		2.0	< 0.001	0.001	0.001	0.43		0.53
10/1/01				2.2			1.7			< 0.001	0.001		0.43		
10/3/01				2.9		2.6	1.9		1.8	< 0.001	0.001	0.001	0.44		0.44
12/19/01															
1/9/02															
1/16/02															
Number	**5**		**1**	**7**		**2**	**7**		**2**		**7**	**2**	**7**		**2**
Max.	**0.089**		**0.073**	**5.4**		**3.3**	**16**		**2.0**		**0.001**	**0.001**	**0.78**		**0.53**
CV															

ATTACHMENT 32
BP Products Effluent Data

Date	Sulfate (mg/l)			Thallium (mg/l)			Tin (mg/l)			Titanium (mg/l)			Total Dissolved Solids (mg/l)		
	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average
8/31/01	194			< 0.001	0.001		< 0.01	0.01		< 0.025	0.025		740		
9/6/01	143			< 0.001	0.001		< 0.01	0.01		< 0.025	0.025		630		
9/10/01	132			< 0.001	0.001		< 0.01	0.01		< 0.025	0.025		720		
9/12/01	168			< 0.001	0.001		< 0.01	0.01		< 0.025	0.025		850		
9/18/01	177		155	< 0.001	0.001	0.001	< 0.01	0.01	0.01	< 0.025	0.025	0.025	770		743
10/1/01	123			< 0.001	0.001		< 0.01	0.01		< 0.025	0.025		760		
10/3/01	162		143	< 0.001	0.001	0.001	< 0.01	0.01	0.01	< 0.025	0.025	0.025	720		740
12/19/01	180												680		
1/9/02	260												830		
1/16/02	370		315										980		905
Number	**10**		**3**		**7**	**2**		**7**	**2**		**7**	**2**	**10**		**3**
Max.	**370**		**315**		**0.001**	**0.001**		**0.01**	**0.01**		**0.025**	**0.025**	**980**		**905**
CV	**0.4**												**0.1**		

Date	Zinc (mg/l)		
	Daily	Adjusted Daily	Monthly Average
8/31/01	0.082		
9/6/01	0.015		
9/10/01	0.019		
9/12/01	0.019		
9/18/01	0.05		0.026
10/1/01	0.016		
10/3/01	0.02		0.018
12/19/01			
1/9/02			
1/16/02			
Number	**7**		**2**
Max.	**0.082**		**0.026**
CV			

ATTACHMENT 33
BP Products Effluent Data

Date	Benzo(b)fluoranthene (ug/l)			Benzo(k)fluoranthene (ug/l)			Benzo(g,h,i)perylene (ug/l)			Benzo(a)pyrene (ug/l)			Fluoranthene (ug/l)		
	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average	Daily	Adjusted Daily	Monthly Average
8/31/01	< 0.018	0.018		< 0.017	0.017		0.23	0.23		0.33			< 0.21	0.21	
12/19/01	< 0.018	0.018		< 0.017	0.017		0.13	0.13		0.033			< 0.21	0.21	
1/9/02	0.045	0.045		< 0.017	0.017		0.11	0.11		0.073			< 0.21	0.21	
1/16/02	0.036	0.036	0.041	< 0.017	0.017	0.017	< 0.076	0.076	0.093	0.081		0.077	< 0.21	0.21	0.21
2/25/02	0.088	0.088		< 0.017	0.017		0.74	0.74		0.25			< 0.21	0.21	
2/26/02	0.062	0.062	0.075	0.03	0.03	0.024	0.37	0.37	0.56	0.16		0.21	0.94	0.94	0.58
3/1/02	0.073	0.073		< 0.017	0.017		0.75	0.75		0.2			1.6	1.6	
Number		**7**	**2**		**7**	**2**		**7**	**2**	**7**		**2**		**7**	**2**
Max.		**0.088**	**0.075**		**0.03**	**0.024**		**0.75**	**0.56**	**0.33**		**0.21**		**1.6**	**0.58**
CV															

ATTACHMENT 34

Reasonable Potential Statistical Procedure for BP Products without Approved Alternate Mixing Zone

7/28/2006
4:35 PM

		Monthly Average Determination							Daily Maximum Determination						
Parameters	WQBELs Required*	Maximum Monthly Average (ug/l)	Number of Monthly Averages	CV	MF	PEQ (ug/l)	PEL (ug/l)	PEQ > PEL?	Maximum Daily Sample (ug/l)	Number of Daily Samples	CV	MF	PEQ (ug/l)	PEL (ug/l)	PEQ > PEL?
Antimony	No	0.91	1	0.6	6.2	5.6	66	No	1.4	5	0.6	2.3	3.2	130	No
Arsenic III	No	7.1	2	0.6	3.8	27	120	No	7.7	7	0.6	2.0	15	240	No
Barium	No	100	2	0.6	3.8	380	510	No	140	7	0.6	2.0	280	1000	No
Beryllium	No	1	2	0.6	3.8	3.8	4.6	No	1	7	0.6	2.0	2	9.2	No
Cadmium	No	0.5	2	0.6	3.8	1.9	2.6	No	0.5	7	0.6	2.0	1	5.3	No
Chromium (III)															
Chromium (VI)	No	5	38	0.0	1.0	5	9	No	5	166	0.0	1.0	5	18	No
Total Chromium	No	10	38	0.0	1.0	10	100	No	10	165	0.0	1.0	10	200	No
Cobalt	No	2.8	2	0.6	3.8	11	16	No	5	7	0.6	2.0	10	31	No
Copper	Yes I	2.9	1	0.6	6.2	18	10	Yes	5.8	5	0.6	2.3	13	20	No
Lead	Yes I	7.7	2	0.6	3.8	29	8.1	Yes	21	7	0.6	2.0	42	16	Yes
Manganese	No	73	1	0.6	6.2	453	580	No	89	5	0.6	2.3	205	1200	No
Mercury	Yes I	0.049	2	0.6	3.8	0.19	0.0013	Yes	0.077	16	1.2	1.9	0.15	0.0032	Yes
Molybdenum	No	3.3	2	0.6	3.8	13	660	No	5.4	7	0.6	2.0	11	1300	No
Nickel	No	2	2	0.6	3.8	7.6	57	No	16	7	0.6	2.0	32	110	No
Selenium	Yes I	22	6	0.6	2.1	46	4.1	Yes	34	24	0.5	1.2	41	8.2	Yes
Strontium	Yes II	530	2	0.6	3.8	2014	700	Yes	780	7	0.6	2.0	1560	1400	Yes
Thallium	No	1	2	0.6	3.8	3.8	4.9	No	1	7	0.6	2.0	2	9.9	No
Tin	No	10	2	0.6	3.8	38	110	No	10	7	0.6	2.0	20	230	No
Titanium	No	25	2	0.6	3.8	95	2000	No	25	7	0.6	2.0	50	4100	No
Vanadium	Yes II	370	9	0.6	1.8	666	9.8	Yes	630	29	0.7	1.2	756	20	Yes
Zinc	No	26	2	0.6	3.8	99	130	No	82	7	0.6	2.0	164	260	No
Benzo(b)fluoranthene	No	0.075	2	0.6	3.8	0.29	2.1	No	0.088	7	0.6	2.0	0.18	4.3	No
Benzo(k)fluoranthene	No	0.024	2	0.6	3.8	0.091	2.1	No	0.03	7	0.6	2.0	0.06	4.3	No
Benzo(g,h,i)perylene	No	0.56	2	0.6	3.8	2.1	2.1	No	0.75	7	0.6	2.0	1.5	4.3	No
Benzo(a)pyrene	Yes I	0.21	2	0.6	3.8	0.80	0.096	Yes	0.33	7	0.6	2.0	0.66	0.23	Yes
Fluoranthene	No	0.58	2	0.6	3.8	2.2	2.9	No	1.6	7	0.6	2.0	3.2	5.9	No
Total Ammonia (as N)															
Summer	Yes I	3100	9	0.6	1.8	5580	480	Yes	7000	198	1.4	0.8	5600	1100	Yes
Winter	Yes I	1000	32	0.8	1.2	1200	490	Yes	10700	693	2.5	0.7	7490	1100	Yes
Boron	No	170	2	0.6	3.8	646	1300	No	210	7	0.6	2.0	420	2600	No
Chloride	Yes I	263000	3	0.6	3.0	789000	188000	Yes	424000	10	0.3	1.3	551200	378000	Yes
Cyanide, Free															
Cyanide, Total															
Whole Effluent Toxicity (WET)															
Acute (TUa) without Mixing Zone															
Chronic (TUc)															
Additional Criteria for Lake Michigan															
Sulfate	Yes I	315000	3	0.6	3.0	945000	205000	Yes	370000	10	0.4	1.5	555000	411000	Yes
Total Dissolved Solids	Yes I	905000	3	0.6	3.0	2715000	614000	Yes	980000	10	0.1	1.1	1078000	1232000	No
Fluoride	Yes I					1520	820	Yes	400	2	0.6	3.8	1520	1600	No
Iron, Dissolved	No	50	2	0.6	3.8	190	250	No	50	7	0.6	2.0	100	490	No

*WQBELs Required:

[1] "Yes I" means that a projected effluent quality (PEQ) exceeded a preliminary effluent limitation (PEL) based on a Tier I criterion and WQBELs must be included in the NPDES permit.

[2] "Yes II" means that a PEQ exceeded a PEL based on a Tier II value and WQBELs must be included in the NPDES permit.

[3] "No" means that a PEQ did not exceed a PEL and WQBELs do not have to be included in the NPDES permit based on the reasonable potential statistical procedure.

[4] "Data" means that a PEQ exceeded a PEL based on an "estimated ambient screening value" and the permittee must generate sufficient data to develop a Tier I criterion or Tier II value for the parameter.

ATTACHMENT 35

Reasonable Potential Statistical Procedure for BP Products with Approved Alternate Mixing Zone

7/28/2006
4:36 PM

		Monthly Average Determination							Daily Maximum Determination						
Parameters	WQBELs Required*	Maximum Monthly Average (ug/l)	Number of Monthly Averages	CV	MF	PEQ (ug/l)	PEL (ug/l)	PEQ > PEL?	Maximum Daily Sample (ug/l)	Number of Daily Samples	CV	MF	PEQ (ug/l)	PEL (ug/l)	PEQ > PEL?
Chromium (III)															
Chromium (VI)	No	5	38	0.0	1.0	5	300	No	5	166	0.0	1.0	5	610	No
Total Chromium	No	10	38	0.0	1.0	10	3800	No	10	165	0.0	1.0	10	7600	No
Copper	No	2.9	1	0.6	6.2	18	350	No	5.8	5	0.6	2.3	13	700	No
Lead	No	7.7	2	0.6	3.8	29	290	No	21	7	0.6	2.0	42	570	No
Mercury	Yes I	0.049	2	0.6	3.8	0.19	0.0013	Yes	0.077	16	1.2	1.9	0.15	0.0032	Yes
Selenium	No	22	6	0.6	2.1	46	140	No	34	24	0.5	1.2	41	280	No
Strontium	No	530	2	0.6	3.8	2014	23000	No	780	7	0.6	2.0	1560	47000	No
Vanadium	Yes II	370	9	0.6	1.8	666	280	Yes	630	29	0.7	1.2	756	560	Yes
Benzo(a)pyrene	No	0.21	2	0.6	3.8	0.80	3.7	No	0.33	7	0.6	2.0	0.66	8.9	No
Total Ammonia (as N)															
Summer	No	3100	9	0.6	1.8	5580	18000	No	7000	198	1.4	0.8	5600	42000	No
Winter	No	1000	32	0.8	1.2	1200	19000	No	10700	693	2.5	0.7	7490	42000	No
Chloride	No	263000	3	0.6	3.0	789000	6750000	No	424000	10	0.3	1.3	551200	13542000	No
Whole Effluent Toxicity (WET)															
Acute (TUa) with Mixing Zone															
Chronic (TUc)															
Additional Criteria for Lake Michigan															
Sulfate	No	315000	3	0.6	3.0	945000	7040000	No	370000	10	0.4	1.5	555000	14123000	No
Total Dissolved Solids	No	905000	3	0.6	3.0	2715000	18020000	No	980000	10	0.1	1.1	1078000	36152000	No
Fluoride	No					1520	28000	No	400	2	0.6	3.8	1520	56000	No

*WQBELs Required:

[1] "Yes I" means that a projected effluent quality (PEQ) exceeded a preliminary effluent limitation (PEL) based on a Tier I criterion and WQBELs must be included in the NPDES permit.
[2] "Yes II" means that a PEQ exceeded a PEL based on a Tier II value and WQBELs must be included in the NPDES permit.
[3] "No" means that a PEQ did not exceed a PEL and WQBELs do not have to be included in the NPDES permit based on the reasonable potential statistical procedure.
[4] "Data" means that a PEQ exceeded a PEL based on an "estimated ambient screening value" and the permittee must generate sufficient data to develop a Tier I criterion or Tier II value for the parameter.

ATTACHMENT 36
BP Products Whole Effluent Toxicity Data

Species: ***Ceriodaphnia Dubia***

Date	LC50 (%)	Acute (TU_a)	NOEC (%)	IC_{25} (%)	Chronic (TU_c)
Aug-01	>100	<1	50	64.2	1.6
Sep-01	>100	<1	--	--	--
Oct-01	>100	<1	50	92.3	1.1
Jan-02	>100	<1	50	66.5	1.5
Feb-02	>100	<1	25	36.7	2.7

Species: **Rainbow Trout**

Date	LC50 (%)	Acute (TU_a)	NOEC (%)	IC_{25} (%)	Chronic (TU_c)
Aug-01	35.4	2.8	--	--	--
Sep-01	35.4	2.8	--	--	--
Oct-01	35.4	2.8	--	--	--
Jan-02	>100	<1	--	--	--
Feb-02	70.7	1.4	--	--	--

Species: **Fathead Minnow**

Date	LC50 (%)	Acute (TU_a)	NOEC (%)	IC_{25} (%)	Chronic (TU_c)
Aug-01	62.2	1.6	25	32.7	3.1
Sep-01	58	1.7	<6.25	6.1	16
Oct-01	60	1.7	6.25	51.4	1.9
Jan-02	>100	<1	12.5	21.5	4.7
Feb-02	>100	<1	25	41.1	2.4

Species: **Selenastrum**

Date	LC50 (%)	Acute (TU_a)	NOEC (%)	IC_{25} (%)	Chronic (TU_c)
Aug-01	--	--	100	>100	<1
Sep-01	--	--	100	>100	<1
Oct-01	--	--	100	>100	<1
Jan-02	--	--	--	--	--
Feb-02	--	--	--	--	--