F. Response to Comments Concerning CWA § 316(a) Variance -Based Thermal Discharge Limits

Comment F1: Mirant Kendall argues that EPA has not addressed whether the existing discharge has caused appreciable harm.

Response to F1: With respect to the relation between Mirant Kendall's current (i.e., post-upgrade) thermal discharge as opposed to its historical thermal discharge, see Responses B1 through B3. With respect to appreciable harm, see Responses C1 and C3.

Comment F2: Mirant Kendall argues that (1) the daily maximum permitted heat load is not a sound basis for evaluating the potential heat load to the Basin because "the permitted monthly limit is only 487 mmBTU per hour and the actual discharge is far below that"; (2) there has been no appreciable harm from Mirant Kendall's discharge; and (3) EPA used the wrong standard in finding that Mirant Kendall's heat load has "a reasonable potential to cause or contribute to eutrophication-related and aesthetic and aquatic life impairments in the Charles River."

Response to F2:
1. Under the permit during the summer months, when thermal impacts are the greatest, Mirant Kendall would be allowed to discharge water with a heatload of 556 million BTUs per hour for a period of weeks, as long as the overall average for the month is 487 million BTUs per hour. This is an extended period of time and can exacerbate existing water quality impairments. Another possible option would be for the permittee to discharge for close to its maximum temperature with a discharge flow of 80 MGD (resulting in 556 million BTUs per hour) for the hottest portion of the day with the greatest electricity demand and then reduce electricity loads, discharge temperature and flows during later hours in such days, when electricity demand is reduced. This pattern could be followed for an entire month and the permittee could still achieve its monthly average or annual average flow limit of 70 MGD. The upgraded Station has the potential to operate at high flows for longer periods of time and more efficiently than in the past. Mirant Kendall's claim that "the actual discharge is far below that" cannot be relied on, as the summer of 2005 thermal discharge data reveal. See Responses to B1 through B3. Consequently, EPA has based its analysis on what Mirant Kendall will be lawfully authorized to discharge.

2. With respect to appreciable harm, see Response to C3.

3. The "reasonable potential" standard was cited in the context of eutrophication concerns, and is applicable in that context. See Response to E2.

Comment F3: Mirant Kendall argues that the Charles River meets the Massachusetts Water Quality Standards for temperature. To support this thesis, Mirant Kendall observes that MassDEP's most recent CWA §§ 303(d) and 305(b) lists determined that the Charles River segment that receives Kendall Station's discharge complied with the Massachusetts Water Quality Standards for temperature.

Comment related to F3 from CLF: CLF argues that the Charles River does not meet the Massachusetts water quality standards. CLF notes that Massachusetts has designated the lower Basin Class B, which means that all permits must be consistent with its use as designated habitat for fish, other aquatic life, and wildlife, for primary and secondary contact recreation (which includes swimming, boating and fishing), and ensure consistently good aesthetic value. CLF argues that the proposed variance does not support habitat or recreation; creates a habitat that does not support certain indigenous fish, including game fish such as American shad, alewife and yellow perch; exacerbates ongoing problems with eutrophication, thereby compromising aesthetics; and, by failing to protect existing uses, the draft permit violates the anti-degradation standards of the MA WQS as well as the Clean Water Act.

Response to F3 and related comment:

1. The river is known to exceed the State's 83º F temperature criterion. For example, water quality data collected by EPA on August 11, 2005 documented ambient temperatures at the reference station (Station 1 - just downstream of the B.U. Bridge) which were near the protective limits identified in the permit. The maximum temperature recorded at Station 1 was 81.1° F at the surface. Surface temperatures at monitoring locations downstream ranged from a low of 85.2° F (Station 8 - just upstream of New Charles River Dam) to a high of 89.6° F (Station 6 - Cambridge side of In Zone Transect). The surface water temperature measured in close proximity of the discharge was approximately 9° F higher than the Station 6 reading. See Table F4.P2.CLF-1. See also Response to F4 (Part 2) regarding August 2006 temperatures.

2. Whether the state lists a segment on its CWA §§ 303(d) and 305(b) lists is a similar, but not identical, question to whether the relevant water quality standard was violated. Massachusetts interprets the temperature criterion for 303(d) impairment of a stream segment or waterbody by comparing the average of maximum daily temperatures for a month to the criterion to determine impairment. By contrast, an NPDES permit violation for temperature would occur if the instantaneous temperature of the waterbody receiving a thermal discharge was either: (a) raised more than 5 °F above ambient as a result of the discharge; or was (b) raised above the 83 °F warm water Class B criterion as a result of the discharge. Furthermore, all fixed Monitoring Stations established in the permit are not located directly in Kendall Station's thermal plume. Finally, the §§ 303(d) and 305(b) lists are based on data from several years before and hence do not always reflect current conditions.

3. EPA agrees with CLF that the designated habitat uses are not being achieved, and that the thermal discharge exacerbates eutrophication.

4. EPA developed the permit's temperature limits independently of the Massachusetts State WQS, by considering literature and empirically derived values of temperature effects to the most sensitive resident and anadromous species. See Responses C1- C52. The temperature regime in this permit will both protect and maintain the BIP, as required under CWA § 316(a), and maintain and protect the existing instream water uses and the level of water quality necessary to protect those existing uses, as required by 40 C.F.R. § 131.12(a)(1) and 314 C.M.R. § 4.04(1).

5. EPA and MassDEP do not agree with CLF's statement that "by failing to protect existing uses, the Draft Permit violates the anti-degradation standards of the MA WQS as well as the Clean Water Act." The core requirement in the anti-degradation provisions of the MA WQS is that "[i]n all cases existing uses and the level of water quality necessary to protect the existing uses shall be maintained and protected." 314 CMR 4.04(1). First, the limits in the Final Permit on temperature and the cooling water intake activity are far more protective than the provisions in the former permit. These permit provisions will only improve the existing conditions in the Basin associated with its designated use as a fish habitat. Second, as set forth in Massachusetts' Section 401 Water Quality Certification ("WQC"), the thermal discharge limits established by EPA and MassDEP in the permit will assure compliance with the BIP standard, as required by Section 316(a) of the CWA, and by the state's parallel thermal variance standard (314 CMR 3.12) and state WQS. Massachusetts' WQC also specifies additional conditions on the cooling water intake activity to address entrainment impacts, that are required to satisfy the MA WQS. EPA has included these WQC conditions in the Final Permit. In summary, the Final Permit, as conditioned by Massachusetts' WQC, assures compliance with the WQS, including the anti-degradation standards.

Comment F4 (part 1): Mirant Kendall argues that EPA misunderstands the reason Mirant Kendall requested a variance.

Comment related to F4 (part 1) from CLF: In its original 2001 NPDES permit application, and subsequent requests, Mirant requested a section 316(a) variance. The variance would have allowed noncompliance with MA WQS and mixing zone standards during certain summer and fall months and allowed a T of 5°F on the edge of the ZPH. In November 2002, the permittee modified its initial submission and requested a T of not less than 8 °F. The permittee based this request on field data it had collected showing river herring distribution based on temperature variation. Due to the scientific methodology employed, neither EPA nor DEP were convinced by this science and did not increase the proposed T. Mirant then submitted additional information showing that fish have been observed in parts of the river where they would experience a surface to bottom (i.e. vertical) temperature gradient of 15-18 ˚F in the Lower Basin. Again, DEP and EPA questioned the conclusions reached by this study and properly refused to increase the proposed T. Then, in January 2003, Mirant proposed a T gradient that separated the Basin into separate thermal temperature blocks. According to EPA, theoretically the proposal's designs would allow a T of 15°F between the first and last thermal blocks. Mirant attempted to justify the monitoring arrangement by arguing that fish are unlikely to swim past all monitoring stations in a short period, and thus unlikely to experience the T of 15˚F in its entirety. EPA and DEP both correctly rejected this proposal. There are a variety of sound biological reasons why large thermal gradients will interfere with the goal of promoting a balanced indigenous population of fishes and other animals. This is particularly true for migratory fish species.

Response to F4 (part 1) and related comment: EPA agrees in broad terms with CLF's recitation of the history of the various rationales and substantive elements of Mirant Kendall's

requests and modifications of those requests. (EPA also agrees with CLF that scientific data supports the premise that large thermal gradients would interfere with the goal of promoting a balanced indigenous population of aquatic organisms.) With respect to Mirant Kendall's claim that EPA incorrectly determined that a variance was required with respect to the Massachusetts Water Quality Standards' Mixing Zone Policy, see part 2 of Response F4 below.

Comment F4 (part 2): Mirant Kendall argues that the facility's proposed discharge would comply with the MA mixing zone policy. Mirant Kendall argues that (1) just because the discharge at the Outfall is authorized to be 105° F does not mean the River ever experiences that temperature, (2) monitoring "at full heat load on the warmest days (e.g., August 22, 2003)" in the immediate vicinity of the outfall have not recorded temperatures above 90° F, and (3) 90° F is not a lethal temperature.

Comment related to F4 (part 2) from CLF: CLF argues that that the facility's proposed discharge would not comply with the MA mixing zone policy. Under MA WQS, the maximum allowable mixing zone temperature is set at 90° F to avoid short-term adverse effects to aquatic life within the mixing zone. To ensure 90° F is not exceeded, the MA DEP recommends an end of pipe temperature limit of 95° F. CLF notes that EPA set no specific temperature limits for the ZD and an end of pipe temperature limit of 105° F. Further, MA WQS also require mixing zone areas to have a "safe and adequate passage for swimming and drifting organisms [causing] no deleterious effects on their populations." CLF argues that the draft permit fails to meet these requirements as well. Finally, CLF argues, EPA did not comply with Massachusetts policy urging site-specific studies to show the adequacy of the zone of passage in waterways used by anadromous and catadromous fishes.

CLF further argues that these inconsistencies with the MA mixing zone policy cannot be permitted under a CWA § 316(a) variance because § 316(a) only allows variances from federal thermal effluent limitations.

Response to F4 (part 2) and related comment: EPA agrees with CLF, and disagrees with Mirant Kendall, with respect to MA mixing zone policy compliance: the facility's proposed discharge would not comply with the MA mixing zone policy. However, EPA disagrees with CLF's position that a § 316(a) variance cannot be granted with respect to this policy.

Mirant Kendall raises three reasons why its proposed discharge would comply with the MA mixing zone policy. All are incorrect. River temperatures near the outfall are projected to exceed 90º F and approach 100º F; monitoring indicates that actual temperatures near the outfall do in fact exceed 90º F; and 90º F is in fact a lethal temperature. Each of these issues is discussed in turn below:

1. To determine the temperatures in the river near the outfall, water temperature projections and historical data were submitted by the permittee as part of the document Supplemental Surface Water Modeling Report In Support of Kendall Station NPDES Permitting (May, 2001). As

explained in Section 5.5.1 of the DD, EPA determined that the model was not acceptable for evaluating receiving water conditions because of concerns with the permittee's approach to calibrating the model and the absence of documentation to validate the method used to interface the near field and far field mixing associated with operation of the proposed diffuser. However, model results excluding the use of the deep water diffuser (all wall discharge scenario) were examined as a general guideline of water temperatures in the receiving Basin. Specifically, the Transverse Cross Section, In-Discharge Zone MP-7-MP4A Cross Section was reviewed. Historical 1999 temperatures at 0.25 meters were above 90º F at position 13 and 12 (Cambridge side near discharge, Tab 4) on July 6th and at position 13 on July 19th. More importantly, when the Future Transient All Wall Discharge (the only discharge configuration allowed by the permit) model results at this station were reviewed, temperatures above 90º F were routinely projected at points 0.25 meters deep and sometimes seen at 0.75 meters deep in several positions from the Cambridge side out toward the middle of the lower Basin. Temperatures above 90º F were seen at 0.25 meters on all days the model was run for All Wall Discharge (July 6, 19, 27, 31, August 1, 2, 3). Temperatures as high as 98.38º F were projected near the discharge, in the ZD.

2. In order to prepare a meaningful response to Mirant Kendall's comment claiming that monitoring "at full heat load on the warmest days (e.g., August 22, 2003)" in the immediate vicinity of the outfall have not recorded temperatures above 90˚ F, EPA found it prudent not just to rely on the general guidance provided by the model, but also to collect in-stream data to verify Mirant Kendall's claim. The data collected did, in fact, confirm that water temperatures in the Zone of Dilution exceed 90º F. For example, on August 11, 2005, and August 3, 2006, EPA personnel measured Charles River water temperatures at stations that coincided with the continuous, real time compliance locations selected in the Draft Permit. Sampling was conducted after noon, in order to measure lower Basin waters that had been exposed to several hours of solar radiation in addition to Kendall Station thermal discharge. During the August 11, 2005, monitoring event, the highest temperature recorded at the Background Station (Station 1 of the permit) was 81.1 ºF. In the vicinity of the discharge (noted as "Discharge" on the Table, but this location was actually about 150 meters downstream of the Broad Canal), temperatures were 98.7 º F at the surface, 100.0º F at 0.6 meters and 100.6º F at one meter (Table F4.P2.CLF-1). The hourly average heatload recorded at the Station for the entire day of August 11, 2005 at Kendall Station was approximately 504 MMBTU/hr (Mirant Kendall, April 2006). The maximum daily heatload allowed by the permit in effect on August 11, 2005 was 556 MMBTU/hr. Therefore, when these in-situ water temperature readings were taken, the Station was operating at approximately 91% of capacity. See also Response L2. While not all stations were visited on August 3, 2006, temperatures in the vicinity of the discharge were recorded from 95.9 ºF at the surface to 101.4 ºF at 1.3 meters deep (Table F4.P2.CLF-2).

Both modeling information and field data confirm that temperatures over the 90º F threshold occur in the ZD. Therefore, this exceedance of the temperature criterion would not qualify as a Mixing Zone under the Massachusetts Water Quality Standards.

Table F4.P2.CLF-1. Water Chemistry Profiles Collected from the Charles River								
		Page 1 of 2. (EPA, August 11, 2005)						
Time (hours)	Depth (m)	Temp Deg C	Temp Deg F	SpCond (uS/cm)	DO % (%)	DO Conc (mg/L)	pH	Total Depth (m)
Station 1								
14:41	Surface	27.3	81.1	1061	111	8.8	8.2	4.6
14:42	0.6	27.2	81.0	1063	111	8.8	8.2	
14:43	1.0	27.1	80.8	1073	110	8.7	8.2	
14:44	2.0	26.5	79.8	1260	100	8.0	8.0	
14:46	3.0	26.0	78.8	1175	84	6.8	7.6	
14:49	4.0	23.8	74.9	2122	3	0.3	6.9	
14:50	4.6	22.7	72.9	8749	3	0.3	6.9	
Station 2								
15:14	Surface	30.0	86.0	1554	127	9.5	8.7	6.7
15:15	0.6	30.0	86.0	1554	126	9.5	8.7	
15:16	1.0	30.0	86.0	1553	126	9.5	8.8	
15:18	2.0	29.3	84.8	1528	120	9.2	8.7	
15:19	3.0	27.4	81.3	1387	112	8.9	8.5	
15:20	4.0	26.7	80.0	2179	61	4.9	7.4	
15:22	5.0	20.8	69.5	23764	2	0.1	7.1	
15:24	6.0	20.5	68.8	29700	2	0.1	7.1	
Intake								
15:35	Surface	30.2	86.3	1541	151	11.3	8.9	2.4
15:36	0.6	29.9	85.7	1536	154	11.6	8.9	
15:37	1.0	29.7	85.5	1531	152	11.5	8.9	
15:39	2.0	29.1	84.4	1530	131	10.0	8.7	
Discharge								
15:51	Surface	37.1	98.7	1635	126	8.4	8.6	3.0
15:55	0.6	37.8	100.0	1642	126	8.3	8.6	
15:56	1.0	38.1	100.6	1640	128	8.4	8.6	
Station 3								
16:10	Surface	30.7	87.2	1595	118	8.8	8.6	4.8
16:11	0.6	30.8	87.4	1603	121	9.0	8.6	
16:12	1.0	30.7	87.2	1598	120	8.9	8.6	
16:14	2.0	30.7	87.3	1601	120	9.0	8.6	
16:16	3.0	27.8	82.1	1470	106	8.3	8.3	
16:18	4.0	26.3	79.4	6677	11	0.9	7.1	
16:20	4.8	21.2	70.1	30217	1	0.1	7.2	

Table F4.P2.CLF-1. Water Chemistry Profiles Collected from the Charles River								
		Page 2 of 2. (EPA, August 11, 2005)						
Time (hours)	Depth (m)	Temp ©	Temp Deg F	SpCond (uS/cm)	DO % (%)	DO Conc (mg/L)	pH	Total Depth (m)
Station 4								
16:29	Surface	30.5	86.9	1596	125	9.3	8.6	8.4
16:30	0.6	30.4	86.8	1596	124	9.3	8.6	
16:31	1.0	30.5	86.9	1593	124	9.3	8.6	
16:32	2.0	30.2	86.4	1587	120	9.0	8.6	
16:33	3.0	27.8	82.1	1480	110	8.6	8.4	
16:34	4.0	27.0	80.7	4864	38	3.0	7.3	
16:35	5.0	21.7	71.0	26165	1	0.1	7.2	
16:35	6.0	21.7	71.0	26154	1	0.1	7.2	
16:37	7.0	19.6	67.3	34171	3	0.2	7.3	
Station 5								
16:43	Surface	31.1	88.0	1612	131	9.7	8.6	7.6
16:43	0.6	31.1	88.0	1612	132	9.7	8.6	
16:44	1.0	30.8	87.5	1614	129	9.6	8.6	
16:45	2.0	30.7	87.3	1615	128	9.5	8.6	
16:46	3.0	30.4	86.8	1616	125	9.4	8.6	
16:47	4.0	27.7	81.9	1529	108	8.5	8.2	
16:49	5.0	27.1	80.7	4911	58	4.5	7.4	
16:51	6.0	21.3	70.3	29570	2	0.1	7.2	
16:52	7.0	20.0	68.0	34949	17	1.3	7.3	
Station 6								
17:00	Surface	32.0	89.6	1614	144	10.5	8.8	3.2
17:01	0.6	31.6	88.8	1611	148	10.9	8.9	
17:03	1.0	31.5	88.8	1611	145	10.7	8.9	
17:03	2.0	30.6	87.0	1614	135	10.0	8.8	
17:04	3.0	28.4	83.1	1918	97	7.5	8.0	
Station 7								
17:18	Surface	30.0	86.0	1794	118	8.9	8.7	7.2
17:19	0.6	30.0	86.0	1804	118	8.9	8.6	
17:20	1.0	29.9	85.9	1819	117	8.8	8.6	
17:21	2.0	29.3	84.8	1980	101	7.7	8.2	
17:22	3.0	28.8	83.8	1900	92	7.1	8.0	
17:23	4.0	26.7	80.1	9810	60	4.7	7.5	
17:24	5.0	21.8	71.2	27914	24	1.9	7.3	
17:25	6.0	19.5	67.2	37635	37	2.9	7.4	
17:26	7.0	18.9	66.1	39527	50	4.0	7.5	
Staion 8								
17:36	Surface	29.5	85.2	1734	121	9.2	8.7	5.7
17:37	0.6	29.5	85.2	1732	121	9.2	8.7	
17:38	1.0	29.5	85.1	1733	121	9.2	8.7	
17:39	2.0	29.2	84.5	1743	108	8.2	8.4	
17:40	3.0	28.8	83.8	1767	96	7.4	8.1	
17:42	4.0	27.0	80.7	9877	89	6.8	8.0	
17:44	5.0	21.8	71.2	30212	61	4.8	7.7	
17:45	5.7	19.4	66.8	37993	50	4.0	7.6	

Table F4.P2.CLF-2.			Water chemistry profiles collected from the Charles River. (EPA, August 3, 2006)				
	Time (hours)	Depth (m)	Temp (°C)	Temp (°F)	SpCond (us/cm)	pH	Total Depth (m)
Station 1							
	15:30	Surface	28.7	83.6	702	7.2	5
	15:40	0.5	28.7	83.6	702	7.2	
	15:49	1	28.7	83.6	702	7.2	
	15:52	2	28.1	82.7	690	7.1	
	15:56	3	27.6	81.6	748	7.0	
	16:01	4	25.9	78.6	863	6.7	
	16:07	4.7	24.2	75.5	727	6.7	
Station 2							
	16:27	Surface	30.2	86.3	757	8.0	4.5
	16:31	0.5	30.1	86.2	755	8.0	
	19:47	1	30.0	86.0	770	7.5	
	16:34	2	29.8	85.7	744	7.8	
	16:38	3	28.8	83.8	708	7.4	
	16:44	4	28.4	83.1	784	7.3	
	16:54	4.3	27.1	80.7	2797	7.0	
Intake							
	17:07	Surface	30.6	87.2	780	7.8	1.5
	17:10	0.5	30.6	87.1	780	7.8	
	17:12	1	30.6	87.1	780	7.8	
Discharge							
	17:38	Surface	35.5	95.9	793	7.5	1.5
	17:42	0.5	37.0	98.7	808	7.5	
	17:45	1	38.1	100.7	810	7.5	
	17:50	1.3	38.6	101.4	817	7.4	
Station 4							
	18:58	Surface	30.8	87.4	802	7.7	8.5
	19:01	0.5	30.8	87.4	801	7.7	
	19:06	1	30.7	87.2	797	7.6	
	19:12	2	29.6	85.3	772	7.5	
	19:15	3	28.9	84.0	762	7.4	
	19:18	4	28.2	82.7	1479	7.2	
	19:21	5	22.9	73.1	24517	7.1	
	19:24	6	18.7	65.6	32885	7.0	
	19:27	7	17.4	63.3	33505	7.1	
	19:28	8	18.0	64.3	34196	7.2	

3. For purposes of enhancing compliance with those standards the Massachusetts WQS

forbid a temperature above 90° F in a mixing zone, it is irrelevant whether 90º F is or is not a lethal temperature. That said, it is not controversial that 90° F is, in fact, a lethal temperature for species of concern. The upper incipient lethal temperature limit for juvenile yellow perch, defined as the temperature where mortality is observed for 50% of the organisms tested, is given as a range between 29.2 ºC (84.6º F) and 34 ºC (93.2º F) (Hokanson, 1977). Krieger *et al*., (1983) placed the upper lethal limit for adult yellow perch at 32.2 ºC (90º F), based on work by Ferguson (1958). The upper lethal limit is typically defined as the 50% survival figure and toxicity to a portion of adults tested would have taken place at temperatures below 90 ºF Hokanson reported that upper incipient lethal temperatures for summer tests using juvenile yellow perch at the acclimation temperature of 25 ºC (77º F) resulted in an ultimate upper incipient lethal temperature of 32.3 ºC (90.1º F). Based on the definition of incipient lethal, this result implies that mortality to a portion of the organisms tested also occurred at temperatures lower than 90.1 ºF, i.e. lower than 90 ºF. The habitat suitability model (Pardue, 1983) lists optimal habitat temperatures for juvenile alewife. Under this model, 30 ºC (86 ºF) was assigned a zero suitability value, or completely unsuitable (Table 5.7.3i-3 of DD). In addition, Otto, et. al. (1977) found a 10% reduction in survival to juvenile alewives in short-term tests when fish acclimated to 24-26 ºC (75.2 - 78.8 ºF) were transferred to 30 ºC (86 ºF) water.

Based on the information above, EPA and MassDEP assert, contrary to Mirant's contention that 90 ºF is not a lethal temperature, that temperatures even below 90 ºF have been shown to induce toxicity to alewife juveniles, adult yellow perch and juvenile yellow perch when these organisms were acclimated to typical, warm water, summertime temperatures and transferred to higher temperatures. For these reasons, EPA agrees with CLF that a mixing zone could not be granted under the Massachusetts Water Quality Standards.

However, CLF argues that § 316(a) precludes a variance from these state WQS. CLF argues that § 316(a) only allows variances from federal thermal effluent limitations. Cf. In re Dominion Energy Brayton Point, L.L.C., NPDES Appeal No. 03-12, 12 E.A.D. __ (Feb. 1, 2006), slip op. at 142 (noting that CLF raised this argument but not deciding it because it was untimely raised).

By its terms, § 316(a) allows a variance whenever the permit applicant can demonstrate "that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the [protection] and propagation of a [BIP]." 33 U.S.C. § 1326(a). When Congress uses the word "any" in a statute, it is generally interpreted expansively. See New York v. EPA, 443 F.3d 880 (D.C. Cir. 2006). See also CWA §§ 301(b)(1)(C), 502(11).

Of course, a § 316(a) variance is only available "for the control of the thermal component of any discharge"; in other words, § 316(a) does not provide a mechanism for varying from effluent limitations (whether technology or water quality-based) that do not directly relate to the thermal component of the discharge. See Response E2 of this document.

Admittedly, CLF cites legislative history which, at first glance, appears to support its view. The Senate Report on the 1977 CWA amendments stated:

> The Congress intended that there be a very limited waiver for those major sources of thermal effluents which could establish beyond any question the lack of relationship between federally established effluent limitations and that water quality which assures the protection of public water supplies and the protection and propagation of a balanced, indigenous population of fish, shellfish, and wildlife, and allows recreational activities, in and on the water. That limited exemption has been turned into a gaping loophole.
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> The cumbersome process which the Agency initiated resulted in part in a decision to avoid any application of 1977 regulatory requirements for steam electric power plants. There is no basis for that decision in the law. The committee does not expect, however, that the Agency will now impose any additional 1977 requirement other than State water quality standards. The Agency also concluded that the 1972 act was preemptive with respect to the application of State water quality standards and effluent limits for heat. This is a determination for which there is no substance in law and which is wholly contrary to the committee's long-held view that the States are free to establish any more strict standards or effluent limitations, as specifically set forth in section 510 of the act.

S. Rep. No. 95-370 (1977), reprinted in 1977 U.S.C.C.A.N. 4326, 4334 (emphases added). However, the influence of this report should not be overstated. Obviously, the Senate's intent in 1977 is poor authority for construing the CWA as enacted in 1972. Indeed, the 1977 Senate did not actually propose to amend section 316(a). See id. Moreover, in the 1977 amendment process, the House bill was passed in lieu of the Senate bill after amending its language to contain much of the text of the Senate bill. See id. at 4326; H.R. Conf. Rep. No. 830(1977), reprinted in 1977 U.S.C.C.A.N. 4424, 4424. The House Conference Report specifically stated that "[t]hese amendments do not in any way change statutory requirements for the control of the discharge of heat or affect any pending administrative or judicial proceedings under provisions of this Act addressing heat, including but not limited to, sections 301, 303, 304, 306, and 316." Id. at 4460. Most importantly, the 1977 CWA amendments did not amend § 316(a) at all. See Pub. L. No. 95-217, 91 Stat. 1566.

For these reasons, the plain language of § 316(a) trumps any possible contrary intent, never enacted into law, of the Senate in 1977. Consequently, EPA adheres to its position that § 316(a) authorizes variances from state water quality standards for heat.

Comment F5: Mirant Kendall argues that the temperature limits proposed for the ZPH are more stringent than the state's numeric temperature standard for the Charles River, or temperatures actually experienced elsewhere in the river. Thus, Mirant Kendall argues, there is no meaningful "variance" under § 316(a).

Response to F5: EPA is not misapplying the requirements of 316(a) in its design for the ZPH in this permit. Rather, EPA is simply implementing the provision with a permit that has a unique design for how to assure compliance with the requirements of 316(a).

As a threshold matter, the assertion that the variance provided in this permit is more strict than Massachusetts' Water Quality Standards (WQS) is unfounded. The permit provides for a Zone of Dilution that both EPA and Mirant agree will experience temperatures substantially above the water quality criterion of 83 °F. As detailed in Response L2, modeling submitted by Mirant shows that discharges under the "All Wall Discharge" scenario, the only configuration currently allowed by the permit, will predictably yield temperatures in the ZD above 90 °F. While there is provision in the state's WQS for a mixing zone to allow for dilution of heat concentrations after they leave the outfall, the applicant and EPA have undertaken a variance analysis under 316(a) precisely because neither Mirant, MassDEP, nor EPA expect the Station to be able to meet the requirements for a mixing zone under the state's policy. See 314 CMR 4.03(2). The state requires that the mixing zone shall not diminish the existing or designated uses of the segment of water disproportionately. 314 CMR 4.03(2)(c). The EPA and Commonwealth interpret this requirement to provide that the mixing zone should not create temperatures that result in lethal effects that are significant to the biological community in the receiving water. See Massachusetts Surface Water Quality Standards Implementation Policy for Mixing Zones, IV(b) (January 8, 1993) and EPA's Water Quality Standards Handbook, 5-1 (September 15, 1993). Again, both EPA and MassDEP expect temperatures in excess of 90° F in the ZD with temperatures as high as 98° F in the area of the discharge. Indeed, on August 11, 2005, and August 3, 2006, EPA monitored temperatures of approximately 100 °F in the lower Basin approximately 150 meters down stream from the Broad Canal. EPA has concluded that temperatures this high would cause lethality in the Zone of Dilution. As discussed in more detail in Response F4, juvenile yellow perch suffer 50% mortality at temperatures between 85° F and 93° F, and water above 86° F is "completely unsuitable" as habitat for juvenile alewife. It is the permitting agencies' judgment that the 90° F temperatures predicted in the zone of dilution would have a significant effect on the biological community in the lower Basin. Therefore, EPA undertook the development of the 316(a) variance to accommodate the fact that Mirant's thermal discharge will violate this provision of state WQS by creating lethal conditions in the Zone of Dilution around the discharge point.

It is true that the permit implements the variance by enforcing specific temperatures in the Zone of Passage and Habitat, and many of those temperatures are lower than the highest temperature allowed under the state's WQS, 83° F. But these temperatures are designed to assure that some portion of the lower Basin in the area of the discharge provides suitable habitat to support the BIP and provide a Zone of Passage and Habitat, after having ceded a portion of that area to temperatures in the Zone of Dilution that will exceed both the temperature criterion in the State's WQS and the temperatures EPA has determined are required to support all life stages of the BIP.

It is the unique design of the compliance requirements in this permit which cause EPA to require the facility to meet in-stream temperature limits below the maximum spelled out in the state's thermal criterion. Normally, EPA would rely on a model to project in-stream temperature levels that would result from a higher temperature discharge limit which the permit would enforce at the point of discharge. With such a traditionally designed permit, the resulting in-stream temperatures that EPA would be seeking to protect outside the Zone of Dilution would be at or

below the state's WQS. But because the permit would be implicitly relying on the model to demonstrate the correlation between the higher temperature limit enforced at the outfall with those lower in-stream numbers, the permit itself need not present in an enforceable form what the lower in-stream target temperatures would be, although they would typically be discussed in the fact sheet and record supporting the permit.

This permit does not rely on a model to assure in-stream temperatures that protect the BIP, because Mirant failed to provide an acceptable verified model. Pursuant to Mirant's suggestion, the permit instead relies on a real-time in-stream monitoring network to ensure that temperatures in the Zone of Passage and Habitat protect the BIP. What makes this permit uniquely structured is that it protects the BIP by enforcing temperatures outside the Zone of Dilution and in the Zone of Passage and Habitat. Therefore, the permit sets forth temperatures to define the conditions that will protect the BIP in the ZPH that are below the highest numeric criteria specified in the state's WQS because of this unique structure for assuring compliance with the requirements of 316(a). The result is not a permit that is more strict than the WQS. Indeed, if Mirant were to submit a showing using an acceptably verified model that it could operate the facility consistent with a requirement that there be no significant lethal effects within the Zone of Initial Dilution, as the Commonwealth defines and implements that term, the permit might be considerably simpler and easier to enforce.

In addition, it is not accurate to claim that any temperature lower than 83° F imposes a requirement that is more strict than the criteria in Massachusetts' Water Quality Standards. The criterion for temperature in Class B inland waters provides that:

> There shall be no changes from background conditions that would impair any use assigned to this Class, *including site-specific limits necessary to protect normal species diversity, successful migration, reproductive functions or growth of aquatic organisms.*

314 CMR 4.05(3)(b)(2)(b) (emphasis added). Massachusetts' water quality standard effectively requires a permit to include site-specific limits to protect values in the water segment that are functionally very similar to the standard EPA is implementing under section 316(a) - assuring the protection and propagation of the BIP. Where EPA has concluded pursuant to 316(a), and with the Massachusetts' concurrence, that it is necessary to provide for temperatures in the Zone of Passage and Habitat that are lower than the maximum temperatures enumerated in the state's temperature criterion, that conclusion does not result in temperature requirements that are more stringent than the standard. At most, these lower temperatures simply implement the standard's narrative requirement for site-specific temperature limits to protect normal species diversity, successful migration, reproductive functions, or growth of aquatic organisms. Therefore, it is not correct that EPA is being more strict under this 316(a) variance than would be required under the Massachusetts' water quality standard. MassDEP has confirmed EPA's analysis of its water quality standards.

EPA also does not agree that the limits in the permit enforce temperatures that are well below "temperatures that have been regularly experienced in the Charles River at locations not

influenced by the Kendall discharge." When EPA configured the site-specific temperature limits, it analyzed a large body of background temperature information to ensure that the prescribed limits were appropriate and reasonable for a water body considered one of the warmest in Massachusetts. As a threshold matter, historic background temperatures during the summer are not often above the 81 to 82° F range and winter temperatures have generally been well below the 50° F required during the "chill period" provided for in the permit. Therefore, EPA disagrees with implication of this comment that the levels in the permit are "regularly" below background levels in the sense that this happens frequently.

It is true that there are times background temperatures have occasionally exceeded the levels set in the permit and these spikes in temperature are "regular" in the sense that the area experiences heat wave conditions occasionally during most summers. The permit provides for an increase in temperature of up to 5° F above background levels when the background temperatures are lower than the levels required for the zone of passage and habitat. This authorization to increase temperatures above background levels is capped ultimately by the temperatures EPA is requiring in the zone of passage and habitat. EPA acknowledges that there will likely be instances where the temperature regime in this permit will effectively cap or limit Mirant's ability to add further heat to the basin when background temperatures occasionally peak. But agreeing that there are instances where background temperatures expose the BIP to heat levels above those provided for in the permit does not lead to the conclusion that the temperatures in the permit are too low. These are precisely the days when the totality of the conditions in the river is most severely stressing the ecosystem supporting the BIP. EPA's regulations direct the Agency to consider "the cumulative impact of [the applicant's] thermal discharge together with all other significant impacts on the species affected." 40 CFR 125.73(a). Therefore, EPA must consider the potential cumulative impact of both existing high background temperatures and the additional heat that could be added from the Station's discharge. Even if we accept Mirant's apparent premise that the BIP has survived, though not necessarily flourished, during some days with high background temperatures, EPA finds that there is no adequate basis for concluding that the BIP would be adequately protected when exposed to even higher temperatures during the most stressful days of the summer. And based on the extensive review of the scientific literature detailed in our Determination Document, EPA concludes that there is significant risk that the BIP would be impaired if the Station added yet more heat on days when the river was already relatively hot.

EPA also recognizes that this control regime may require Mirant to curtail its operations on certain hot summer days. Section 316(a) directs EPA to set thermal discharge limits that assure protection of the BIP, and it provides no authority for EPA to set lower permit limits because of electricity demand or economic impact on the discharger.

Comment F6: Mirant Kendall argues that EPA has failed to consider that Massachusetts has designated the Charles River for use for industrial cooling.

Comment related to F6 from ECPT: The Charles River should not be used as an industrial cooling pond.

Comment related to F6 from ACN: The use of the (Charles River) basin as a cooling pond is not the best long term use of this space.

Comment related to F6 from CLF: The Charles is a public resource that is valued by the community for its wildlife, aesthetic values, and for fishing, boating and other recreational activities. The plant uses antiquated technology: once-through, open cycle cooling, that discharges millions of gallons of heated water into the river every day. Facilities in other locations have adopted modern technologies that allow power generation with much lower environmental impact, such as closed cycle systems, helper cooling towers, or the use of the heat-energy by-product for heating (i.e., co-generation). The proposed permit would allow unacceptable degradation of a critical public resource for private gain.

Response to F6 and related comments: According to the Massachusetts surface water quality standards, Class B waters such as the Charles River "are designated as a habitat for fish, other aquatic life, and wildlife, and for primary and secondary contact recreation. . . . They shall be suitable for . . . compatible industrial cooling and process uses." 314 C.M.R. § 4.05(3)(b) (emphasis added). Nothing in this regulation suggests that the water quality standards would be satisfied by putting the river to industrial cooling use that is incompatible with fish habitat. Moreover, EPA is unaware of any provision of Massachusetts or federal law which places a ceiling on the level of water quality that can be achieved.

Mirant Kendall seems to suggest that the standard of "suitab[ility] for . . . industrial cooling and process uses" means that industrial cooling and process uses must be allowed, even if other uses would thereby be precluded. Under this view, the standard of "suitab[ility] for . . . industrial cooling and process uses" places a ceiling on the river's water quality: neither Massachusetts nor EPA could ever seek to improve water quality if it would inconvenience an industrial discharger.

But this appears to be a gross misreading of the standard. Rather, EPA interprets "suitab[ility] for . . . industrial cooling and process uses" not to mean that those uses must trump all others, but rather simply that (1) those uses are not inherently undesirable in the river, and may be permitted where compatible with other designated uses, and (2) the water must be of sufficiently good quality to serve as inputs for those uses. In the case of the lower Basin, Mirant Kendall's desired thermal discharge would not be compatible with other designated uses, such as fish habitat.

With respect to Mirant Kendall's arguments about lack of prior adverse impact, see Responses to B1-B3 and C3.

G. Response to Comments Concerning Permanent Hydrological Modifications

Comment G1: Failure to consider and grant a variance due to permanent hydrologic modifications. The Agencies' permitting documents acknowledge that the water quality of the Lower Charles River Basin is impaired for many reasons entirely unrelated to Kendall Station's thermal discharge, including hydrologic modifications. Those hydrologic modifications – the channelization, the bridges, and most importantly, the impounded water caused by the dams, locks, and fishways, create the Lower Charles River Basin as we know it, and certainly are not feasible or desirable to modify to restore the water body to its original estuarine condition of tidal mudflats.

Instead of a natural tidal cycle, the former estuary is now more riverine or, during low flow conditions, characteristic of an impoundment. Due to the impounded water, water temperatures different and higher than would be seen from the natural seasonal and daily variations required by the Massachusetts WQS are normal in the Lower Charles River Basin even without Kendall's thermal discharge, and are a principal factor in causing the occasional eutrophic conditions.

Accordingly, in its February 2001 supplemental application, Mirant Kendall specifically requested that the Agencies grant a water quality variance, partial use designation, or site-specific standard that would account for the fact that the Massachusetts WQS are not fully attainable in the Charles River Basin due to the permanent impacts of those hydrologic modifications on water temperatures and other parameters. Such relief is explicitly authorized under 314 C.M.R. 4.03(4)(d), which provides that DEP may grant a variance to authorize the discharge if "Dams, diversions or other types of hydrologic modifications preclude the attainment of the use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of the use…" Such relief also is authorized by EPA pursuant to 40 C.F.R. § 131.10.

A variance or other relief under these provisions is appropriate because there is no realistic prospect that the Massachusetts WQS will be fully attained in the Lower Charles River Basin for as long as the dams and other hydraulic modifications are present. Forcing curtailments of Kendall Station's operations will not produce attainment; the Agencies do not claim otherwise. Nor do the Agencies claim or demonstrate that curtailing Kendall Station's operations will lead to any material improvement in attainment, or that the curtailments actually bring any other material benefit or effect.

Response to G1: Section 4.03(4) of 314 CMR states that MassDEP *may* remove a national goal use that is not an existing use, designate a segment as partial use, or grant a variance to authorize a discharge, provided that the applicant demonstrates that certain naturally occurring or anthropogenically-induced situations exist that prevent the attainment of the use or that the controls required would result in "substantial and widespread economic and social impact".

It is true that anthropogenic alterations of the system preclude attainment of original aquatic life

uses of the system. The lower Basin is no longer an estuary, and salt water intrusion through the New Charles River Dam and Locks has caused widespread anoxia along the bottom of the wide section of the lower Charles, downstream of the B.U. Bridge during the summer. Anthropogenic modifications to the watershed of the lower Basin and the impoundment-like retention times of Basin waters under lower river flow conditions can raise instream temperatures in the lower Basin. Due in large part to these factors, this river has been described as among the warmest rivers in the Commonwealth of Massachusetts. The permittee's discharge adds to this elevated temperature regime and has been documented to further elevate water temperatures to levels which are not protective of the BIP. See Response to F4.P2.

Notwithstanding the anthropogenic alterations cited above, the system has shown enormous improvements in water quality due to the efforts of volunteer as well as federal, state and private institutions. The introduction of large amounts of federal and state aid to build sewage treatment plants, construct CSO controls, and fund state and private environmental groups has led to substantial improvements in water quality within the Charles. Further improvements are certainly needed.

The attainable aquatic life uses within the Charles continue to expand from those available 30 years ago and the agencies have no wish to limit further expansion. To the contrary, state and federal agencies (Massachusetts DMF and the U.S. Fish and Wildlife Service) are cooperating to re-introduce American shad into the Charles and a stocking program was initiated in June of 2006. Moreover, structural improvements, such as those to fish ladders, and changes in methods used to move anadromous fish into the Charles, have recently been made which should allow these fish greater potential for stock expansion in the Charles. Suggested methods to control seawater input to the system also need attention by the agencies.

Neither the state nor EPA wish to downgrade this waterbody, or to curtail the progress that state and federal agencies, environmental advocates and other citizens of the Commonwealth have achieved in improving both its aquatic life and recreational potential. EPA has shown (see Responses to C3 and C44) that Mirant's thermal discharge has caused appreciable harm to bluebacks and alewives in both 2004 and 2005. This is a condition that must be addressed through the NPDES permitting process. The final NPDES for MKS allows a limited variance to WQS with respect to the Massachusetts Mixing Zone Policy and its requirements regarding toxicity within that zone. The permit limits established for this permit and conditions outlined in the Massachusetts Section 401 Certification are considered by EPA to be the least stringent needed that will still allow the promotion of the BIP within the lower Charles.