



**MIDWEST  
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**IEPA ATTACHMENT NO. UU**

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Director, Environmental Services

June 1, 2006

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**Subject: Midwest Generation (MWGen) Comments on Lower Des Plaines River  
Temperature Criteria Options Report**

Dear Toby:

We were very disappointed with the content of the recently issued report entitled "Temperature Criteria Options for the Lower Des Plaines River," prepared by the Midwest Biodiversity Institute (MBI) and Center for Applied Bioassessment and Biocriteria (CABB), dated October 11, 2005 (the "2005 MBI/CABB Report"). MWGen provided extensive comments on the draft June 11, 2004 version of this report (included for your reference with this submittal). We received no response. From our review of the 2005 MBI/CABB Report, our comments were given little or no consideration. We nevertheless hope that the Agency included MWGen's temperature standards proposal report (MWGen, October 13, 2003) with the recent distribution of the 2005 MBI/CABB Report because the Agency recognizes that appropriate thermal limits for the Lower Des Plaines River are yet to be determined.

MWGen submits that the temperatures proposed by the MBI/CABB Report are neither appropriate nor applicable to the Lower Des Plaines River. To advance the communications on this important issue between the Agency and the Lower Des Plaines UAA Workgroup (the "Workgroup"), and to enable us to understand the Agency's position on key issues relating to this UAA, we request that the Agency prepare a responsiveness summary to the comments contained in this letter, as well as those which have been submitted previously by MWGen and others regarding the UAA.

Additionally, substantive discussion on the fundamental UAA findings and conclusions from the December 2003 Lower Des Plaines Use Attainability Analysis Report ("Lower Des Plaines UAA Report") has yet to occur within the Workgroup. Key issues that should be discussed include (i) whether one or more of the six UAA factors have been

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satisfied here<sup>1</sup> and (ii) based on this information, what is the appropriate use designation for the Lower Des Plaines River segments (i.e., Brandon Pool and the Upper Dresden area). The Lower Des Plaines UAA Report is full of inconsistencies regarding these key issues. MWGen requests that a Workgroup meeting be scheduled to discuss the penultimate question of this UAA effort: What are the appropriate use designations for the reaches of the Lower Des Plaines River under consideration as part of the UAA? Answering this question was the primary goal of the Workgroup, but it has received little or no discussion since the issuance of the Lower Des Plaines UAA Report.

Because the fundamental question of the appropriate use designations for the Lower Des Plaines has yet to be decided, the 2005 MBI/CABB Report “hypothetically” presents three different potential use designations and the potentially applicable thermal standards for each of those designations. For example, the 2005 MBI/CABB Report considers a new “intermediate designation that reflects the modified habitats of [the] navigation pools and impoundments” in the Lower Des Plaines River. (2005 MBI/CABB Report at p. 1) However, there has been no discussion within the workgroup concerning this proposed new use designation and what “uses” it is intended to apply to and ultimately protect. MWGen is being asked to comment on various sets of proposed thermal water quality standards without knowing what the key findings and conclusions are concerning use designations and uses that must be protected by these proposed standards. This process is neither logical nor fair. It is the proverbial “cart” before the “horse” situation.

The identification of any new use classifications should be decided before proceeding further with this UAA. The outdated and ill-suited existing Illinois use classification system needs to be addressed. There are currently essentially only two choices – General Use or Secondary Contact. While MWGen maintains that the Secondary Contact use does still fit the Lower Des Plaines area, it appears that the Agency is not convinced that this is the case. If so, it should at least be equally apparent to the Agency that General Use is not the appropriate use classification for this waterway. New use designations are needed in Illinois. They must be developed based on established USEPA guidance, using actual in-field monitoring data. The Illinois Association of Wastewater Agencies (IAWA) also has tried to focus attention on the lack of appropriate use destinations. It already has laid the groundwork to support the development of additional designated uses in Illinois. The time has come for Illinois EPA to recognize this critical gap and to fill it before trying to conclude this or any other UAA currently in progress.

Although MWGen strongly objects to the premature proposal of new thermal water quality standards, in an effort to continue our long-standing cooperation as a member of the Workgroup, we have tried to evaluate and to comment here on the substance of the 2005 MBI/CABB Report. The 2005 MBI/CABB Report presents an approach to deriving seasonal thermal water quality standards that is questionable on many grounds,

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<sup>1</sup> MWGen provided detailed information and support to show that one or more UAA factors are met in the waterway. (See e.g., MWGen October 13, 2003 Report). All of the MWGen comments on the Lower Des Plaines UAA Report, and those of other workgroup members, were relegated to a CD-rom Appendix to the Report.

as discussed below. Additional issues and concerns regarding the methodology and data presented in the Report are set forth in detail in Attachment A to this letter.

**A. The Purpose and Scope of the 2005 MBI/CABB Needs Clarification.**

The 2005 MBI/CABB Report proposes new General Use thermal water quality standards that are more restrictive than the existing General Use standards. The Report appears to conclude that the existing General Use thermal water quality standards are not adequately protective of the Lower Des Plaines River (assuming it could be designated as a General Use waterbody), or any of the waterbodies in the state which currently have a General Use designation. (We note generally that biological monitoring data available to the Agency would refute the implication that existing General Use thermal standards are not protective of those waters with the physical and chemical characteristics associated with the General Use designation.) The intended scope of this recommendation is unclear. Is it the Agency's intention to change the General Use thermal standards for only the Lower Des Plaines River or to propose new General Use thermal standards for all Illinois waters? We believe the latter would represent a significant and extensive expansion of the scope and potential effects of this Lower Des Plaines UAA that has not been previously disclosed or discussed within the Workgroup. MWGen requests clarification from the Agency as to the intended purpose and scope of the Report's proposed General Use thermal standards.

The calculated thermal standards presented for the General Use option raise significant legal issues. To impose more stringent General Use thermal water quality standards in the context of a single UAA is not consistent with the Clean Water Act's intent or implementing regulations. If the Agency intends to propose a revision to the existing thermal standards for the General Use classification under the Illinois regulations, it must propose such a rule-making, and submit adequate justification, to the Illinois Pollution Control Board separate and apart from this UAA. The 2005 MBI/CABB Report does not address nor provide any justification for changing the General Use thermal standards on a statewide basis.

Assuming that the 2005 MBI/CABB Report's recommendations are intended to be limited to the Lower Des Plaines River, then is it the Agency's intent to create thermal standards that are unique to this waterbody? If so, it seems that this approach threatens to create a "patchwork" of thermal water quality standards that will vary from waterbody to waterbody, requiring a specific derivation process for thermal standards from stream to stream. MWGen had understood, consistent with the Clean Water Act's provisions, that based upon the use designation selected for the Lower Des Plaines River, appropriate thermal (and other) water quality standards protective of that use designation would be applied. However, this does not appear to be the approach presented in the 2005 MBI/CABB Report. Among other things, the proposed General Use standards in the 2005 MBI/CABB Report would set a more stringent thermal standard for the Lower Des Plaines River than for any other Illinois waterway. Given the current and future limitations of this waterway, this concept defies logic and good sense.

The Agency needs to explain and clarify what its intended course of action is for this UAA on the important issues of use designation and applicable water quality standards for the selected uses. Absent further clarification from the Agency, it is difficult to understand how the Report's recommendations are intended to be used and whether their proposed scope of applicability is or is not beyond that of a UAA for the Lower Des Plaines River. Moreover, absent such an understanding, it is not possible to comment substantively on these important and fundamental issues.

**B. The "Modified Use" Classification Option Does Not "Fit" the Lower Des Plaines**

Because the Agency has not followed the step-wise approach of first determining what the proper use classifications for the Lower Des Plaines River area should be, and has not developed those uses following USEPA guidance, it appears that the Agency provided three use classification options for the authors' consideration. Two of these reflect existing use designations within the Illinois classification system - - General Use and Secondary Contact. The third represents a new use classification, termed "Modified Use" in the 2005 MBI/CABB Report. If the Agency were going to suggest a new use classification for consideration here, it should at least reflect the physical conditions of the Lower Des Plaines River. The definition of the "Modified Use" designation does not do so. The Report describes it as follows: "The Modified Use option is intended to apply to physically modified riverine habitats characteristic of the areas that are inundated by artificial impoundment by **low head dams.**" (emphasis added) (Report at p. 8). There are no low-head dams on the Lower Des Plaines.

We believe that if a new use designation is to be applied to one or more portions of the Lower Des Plaines River, it should be reflective of the modified conditions that actually exist in that waterway, while generic enough to potentially apply to similarly modified streams within Illinois. The prior 2004 Draft Report was helpful in pointing out that the Modified Use option is intended to apply to "physically modified riverine habitats characteristic of the areas that are inundated by dams" and was developed primarily to address the "inundation of run and riffle habitats by resulting impoundment." (2004 Report at p. 10). (The dams at Dresden Island and Brandon Road do inundate all "run and riffle habitat," except for a small tailwater area below the Brandon Lock.) This definition was inexplicably changed in the 2005 Report. We do not understand why.

Finally, based on the definitions provided in the 2005 MBI/CABB Report, it remains clear that neither the Brandon nor Dresden pools should be classified as General Use. As both the 2004 Draft and 2005 Report versions highlight, "General Use is expected to support a diverse, warmwater fish assemblage that is expected to occur in the least disturbed, free-flowing habitats of the Lower Des Plaines main stem and similarly sized rivers in the region." (2004 Report at p. 5; 2005 Report at Page 8) As MWGen pointed out in its previous comments, it is quite obvious that neither the Brandon nor Dresden Pools are "the least disturbed, free-flowing habitats."

**C. Proposed Thermal Standards are Overly Restrictive for Both the Summer and Non-Summer Periods**

The proposed thermal standards do not “fit” the appropriate use designations for the Lower Des Plaines. The temperatures proposed by the 2005 MBI/CABB report for all three use designation options are overly restrictive to protect the fish species which reside in, and can reasonably be expected to reside in, the Lower Des Plaines River. Even absent power plant discharges, the existing, permanent habitat limitations, constant barge traffic, channelized/impounded nature of the waterway, as well as large wastewater treatment discharges, frequent combined sewer overflows (CSOs) and urban runoff, would dictate that the future fish assemblage would be dominated by the same types of species that exist there today. Extensive data previously provided to the Agency demonstrates that there are permanent physical alterations which effectively limit the degree of improvement that can be attained.

As was the case in the 2004 Draft Report, for the non-summer months, the authors recommend using essentially the same non-summer season thermal values for all three of the designated use options considered.<sup>2</sup> These values were derived using the species information assembled for the General Use option only, but are recommended for all three use options presented. No explanation has been provided for why the non-summer season limits for each use category should be essentially identical, when the summer season values for each use designation are not. The 2005 MBI/CABB Report claims there are significant differences biologically in the fish population that can be expected to exist among the three use designations considered. (Report at p. 8). If so, then each use designation should have its own seasonal temperature regime for both summer and non-summer periods. This is not the approach presented in the Fish Temperature Model-derived thermal limits presented in the 2005 MBI/CABB Report. MWGen previously requested an explanation of the rationale and justification for this proposed approach and renews that request again here. The “one-size-fits-all” approach to setting non-summer thermal standards is not supported by reason or data. It will lead to overly restrictive thermal limits that cannot realistically be met in this waterway, and moreover, should not be required to support the existing and future expected biological assemblage.

**D. The Extensive Lower Des Plaines Fish Studies Show the Fish Temperature Model Results are Overly Conservative.**

As stated in the 2005 MBI/CABB Report, “[t]he methodology uses data from the thermal effects literature to create a thermal effects database for freshwater fish.” (Report at p. 2) The Report appropriately acknowledges many of the shortcomings of this literature-based approach to deriving thermal standards. It notes that “the steady or regular increases in test temperature inherent to the methodologies do not reflect environmental reality.” (Id. at page 3) It also discloses that “few if any of the available in situ tests reflect” the real world conditions relating to thermal exposures. (Id. at page 4) Real world conditions

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<sup>2</sup> There are some minor exceptions such as options which include non-indigenous species such as sauger, walleye and stonecat madtom, in which the monthly non-summer temperatures are somewhat lower.

include the following: *“the accumulation of thermal stress to an aquatic organism is dependent on seasonal acclimation, the severity and duration of periods of thermal exposure and stress, and the duration of recovery periods, i.e. Lower temperatures that are closer to physiological optima”* and that *“thermal resistance seems to increase with slowly increasing temperatures”*. (Id. at p. 3)

Unfortunately, the authors did not use data that reflects these real world conditions. They looked only at literature values and there was not enough information available in the literature to support such an approach.<sup>3</sup> In the real world, the fish community can and does respond differently. This is acknowledged in several places in the 2005 MBI/CABB Report, but is not reflected in the temperatures proposed for any of the three use designations discussed in the report. The authors instead rely on published laboratory data and apply so-called “safety factors” to account for the inherent over-estimation of lethality. No where in the report, however, does it discuss how these “safety factors” are derived and/or how they were applied. This is extremely important, as it would appear that the laboratory-derived end-points could, and probably should, realistically be adjusted upwards by several degrees to account for differences between lab results and real world conditions.

Given these admitted shortcomings to a theoretical “literature only” approach to thermal standards, MWGen questions why the proposed methodology did not incorporate or appropriately acknowledge the many years of thermal and biological studies providing real world “data” that exist for the Lower Des Plaines River. The IEPA has actual biological and physical monitoring data from the Lower Des Plaines River covering a period of over twenty years. As MWGen has repeatedly commented, there is extensive biological data for the Lower Des Plaines River. The data demonstrates that many of the fish species which the 2005 MBI/CABB Report finds should be limited or excluded by higher temperatures are indeed present and thriving. If thermal limitations were the cause of aquatic life use impairments in this waterway, then the fish “model” results would indicate that very few of the species currently captured in the Lower Des Plaines by MWGen’s monitoring program should be found there. The reality of the thriving biological community present in the Lower Des Plaines exposes the severe flaws of the theoretical fish “model” approach. Because actual stream data exists, it can and should be relied upon to develop protective in-stream thermal limits for the Lower Des Plaines River.

Fish in a laboratory environment, even if acclimated to higher temperatures, do not behave similarly to fish in the river. They are essentially captives, and cannot retreat to

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<sup>3</sup> We also question what criteria were used to determine which reference information for use in the Fish Temperature Model was “useable”, as opposed to being “unsuitable” (Report at p. 3) and whether these determinations may have biased the final results. Until the process by which data sources were selected and/or discarded, there is no way to determine whether the database used is fully objective and/or verifiable. A better explanation of the criteria used to keep or discard data would be of great benefit. In addition, the prior version of this report contained an appendix with relevant reference information. This is conspicuously lacking in the current version. At the very least, a citation with the methodology used to determine upper lethal limits would be appropriate here.

areas with more preferred temperatures. Therefore, the end-points derived from such laboratory studies are conservatively biased and do not reflect reality. Avoidance is a valid protection mechanism for all biological organisms. It should not be totally disregarded in the development of appropriate thermal water quality standards. The proposed approach also does not take into account the specific history of species adaptation in the Lower Des Plaines River. Both acclimation and avoidance are necessary survival mechanisms that ensure fish survival and growth in waterbodies which are subject to many concurrent stressors, like the waterbody here. While there may not be literature-based information, when actual data on these real world mechanisms exists, as it does here, it can and should be used to develop appropriately protective thermal standards.

The temperatures proposed in the 2005 MBI/CABB Report cannot realistically be met in the waterway at any time of the year. This is particularly true in the winter months, because the POTW discharges, which dominate the system, never reach the 38.4 to 43.4 °F averages recommended in the 2005 MBI/CABB Report. This fact is dramatically illustrated in Attachment A, Figure 1, on page 19. It is clear that the effluent temperature for the Stickney POTW would exceed the proposed Secondary Contact limits (RAS 1, Option F in Table 5 of MBI/CABB Report) during most of the year. In the summer months, even in the absence of power plant discharges, existing conditions (e.g. POTW discharges, solar heating, surface runoff, etc.) all contribute to a gradual heating of the water as it moves downstream.<sup>4</sup>

Where actual stream studies and data exist, as they do here, relying on the actual in-stream fish monitoring data is a far superior method for characterizing the waterway. The use of the long-term Lower Des Plaines River fish study data will provide far more scientifically rigorous conclusions on in-stream temperature tolerances than does the generic, literature-based search used in the 2005 MBI/CABB Report. Reliance on actual stream data is quite simply sound science. MWGen has previously presented the Agency with a methodology that does take into account these site-specific conditions, relies on actual stream study data, and is a much more practical and appropriate approach to establishing protective thermal standards for the Lower Des Plaines River. (See October 13, 2003 Midwest Generation/EA Engineering, Science and Technology, Inc. Report, "Appropriate Thermal Water Quality Standards for the Lower Des Plaines River" ("MWGen/EA Report").

#### **E. Moving Forward with the UAA**

The principle objective of 2005 MBI/CABB Report, as defined by the authors, is "the development of seasonal temperature criteria options that are protective of the biological assemblages that are representative of **the designated use options that may be considered for the Lower Des Plaines River**" (Report at p. 2, emphasis added). It follows that the designated use(s) for the Lower Des Plaines River should be identified BEFORE the question of what thermal standards may be appropriate for each such use

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<sup>4</sup> This phenomenon is depicted graphically in Figure 2.3 of the Holly and Bradley 1995 Report referenced in the 2005 MBI/CABB Report.

should be determined. The Agency needs to seriously consider the development of more appropriate use designation categories (as suggested by the Illinois Association of Wastewater Agencies), as well as promoted by USEPA. Before the Agency can reasonably consider proposed thermal standards for the Lower Des Plaines River or otherwise conclude this UAA, it also needs to address the inaccurate information and flawed conclusions in the 2003 Lower Des Plaines UAA Report. MWGen further submits that the members of the Workgroup have worked hard to present relevant information and data for this UAA and should be able to sit down with the Agency to discuss the fundamental issue of whether one or more of the six UAA factors have been satisfied here. It is amazing that the discussion of this issue, which forms the main purpose of this UAA, has never occurred. MWGen requests that the Agency discuss with the Workgroup what the use designations should be for the Lower Des Plaines River segments before any further actions are taken concerning the appropriate thermal standards for this waterway.

The Lower Des Plaines River is particularly ill-suited to the approach taken in the 2005 MBI/CABB Report. The overall biological condition of this waterway is the result of many concurrent factors related to irretrievable habitat modifications, urbanization effects and commercial navigation, most of which are beyond IEPA's control. These relevant factors are not adequately considered under the MBI/CABB approach. They should be, because they reflect conditions that cannot be changed and which are to be taken into account under the UAA regulations. There are and will always be inherent limitations in the system due to lack of appropriate habitat, erratic flow regime and the multi-faceted impacts from ever increasing urbanization. None of these impacts is expected to be minimized or eliminated over time. The use of literature-based, laboratory-derived thermal end-point data to develop temperature limits, even if it is for species generally representative of the expected biological assemblage of the waterway, does not reflect the potential of a waterway that does not, and cannot realistically be expected to, approximate "natural" conditions. There is extensive biological data on the waterway to support an alternative approach and to ensure that the thermal standards derived are protective without causing undue economic impacts.

Requiring the massive thermal reductions by MWGen's electric generating stations contemplated by the 2005 MBI/CABB Report's thermal standards will not change the overriding fact that the Lower Des Plaines River is not, nor will it ever be, a natural waterway. In this context, the potential economic ramifications of the MBI/CABB Report's Fish Temperature Model on MWGen cooling water discharges are staggering. They will be incurred without realization of any significant improvement in the river's fish assemblage from these reductions in temperature.

To their credit, the 2005 MBI/CABB authors discuss the limitations they faced and acknowledge that *"the model output will propagate a degree of uncertainty, which can be considered in the eventual derivation and application of temperature criteria."* (Page 7). Clearly, the proposed thermal standards should not be taken as absolutes. They can and should be adjusted in response to, and in acknowledgement of, site-specific conditions defined by field-derived data.



If the Agency shares this understanding, MWGen is ready to work with you to develop standards which would reflect a positive step forward for Illinois.

Sincerely,

  
Basil G. Constantelos  
Director, Environmental Services

## Attachment A

- 1) Detailed Comments on Technical and Biological Aspects of the MBI/CABB Report
- 2) Summary critique of comparisons with IIHR Limited Distribution Report #237  
Holly and Bradley, December 1995, prepared by: Forrest M. Holly Jr., P.E.  
30 May 2006

## ATTACHMENT A

### MIDWEST GENERATION ADDITIONAL TECHNICAL COMMENTS ON THE 2005 MBI/CABB REPORT

The following comments by Midwest Generation address specific technical issues regarding the report entitled "Derivation of Temperature Criteria Options for the Lower Des Plaines River" prepared by the Midwest Biodiversity Institute (MBI) and Center for Applied Bioassessment and Biocriteria (CABB), dated October 11, 2005 (the "2005 MBI/CABB Report"). The comments were prepared with the assistance of Midwest Generation's consultants, EA Science, Engineering & Technology ("EA") and Dr. Forrest M. Holly Jr.

#### A. **BIOLOGICAL ISSUES:**

##### **1. The "Fish Temperature Model" is a "Ranking" and not a "Model."**

Throughout the 2005 MBI/CABB Report, the authors refer to the "Fish Temperature Model." This title is a misnomer. It incorrectly implies that the thermal data collected in a given category (e.g., short-term survival) were modeled or mathematically manipulated to discern the relationship between temperature and the endpoint being considered. No such modeling or mathematical manipulation occurred. The effort instead consisted of a ranking of species sensitivity data. The selected species were ranked from the most to the least sensitive (see App Tables 3A-3G). The upper lethal temperature for the most sensitive species listed became the short-term daily limit and that value less 2° C became the long-term survival limit. Under this approach, the criterion recommended is determined solely by the response of a single, sensitive species. Only the purported "most sensitive species" determines the numerical water quality standard recommended in the Report. Therefore, it is particularly important that both the correct (i.e., representative) species are selected and that the thermal tolerance data for the most sensitive of the species selected be accurate.

##### **2. The Accuracy of the Thermal Database Has Not Been Verified.**

As noted above, the criterion for each group of RAS is based solely on the endpoint value for the most sensitive member of that group. Therefore, it is critically important that the database be accurate as the thermal criterion for each use category will be based on a single endpoint value. However, no review of the endpoint values has been conducted. Instead, all values, so long as they are published in either the mainstream literature or non peer-reviewed literature were considered valid. Under the approach used, it only takes one erroneous value to yield an erroneous criterion. This makes it critically important to carefully review all of the endpoint values used. This has not been done.

EA recently had occasion to review several values in the MBI/CAAB database as part of a review of thermal standards being considered for the Ohio River by ORSANCO (Yoder

and Rankin 2005). IEPA is part of that thermal standards workgroup. Even this limited review revealed several problems with the database information. For example, the short-term upper lethal value for logperch, purportedly one of the most sensitive species in the mainstem Ohio River, was based not on a mortality endpoint but on larval hatching success, which is not a mortality endpoint. The paper (Hubbs 1964) from which the logperch data were used also had various methodological problems (e.g., lack of temperature control) rendering data from this paper unreliable for criterion development. EA also determined that the median temperature at which logperch were collected from the Ohio River was essentially equivalent to the criterion derived in that MBI/CABB Report (Yoder and Rankin 2005), which uses the same database used for the Upper Des Plaines effort (MBI/CABB 2005). In other words, half the logperch collected were found at a temperature that, according to the report, should have been toxic to them, a clear indication that the "model"-derived endpoint was wrong.

Examination of another purportedly thermally sensitive species, stonecat, indicated that the upper lethal value used was derived using winter-acclimated fish. Because the upper lethal is directly related to acclimation temperature, the upper lethal derived for winter-acclimated fish would be well below its normal summer tolerance, and thus should not be included in the database. Further, it was found that the value in the literature was based on testing only **two** stonecats; a clearly insufficient number. In fact, data from the study (Reutter and Herdendorf 1975) that produced an upper lethal based on testing two stonecats was also used to generate thermal endpoints for several other species (e.g., spotted sucker, white sucker, silver lamprey) in which only **one** specimen was tested. The invalid stonecat short-term lethal value is the main reason the proposed General Use RAS 1 and RAS 2 criteria in the 2005 MBI/CABB Report are unrealistically low.

In summary, the validity of the thermal database established by the 2005 MBI/CABB study has not been verified and contains thermal values that are not supported by adequate study data.

### **3. Estimates of Upper Lethal Temperatures are Overly Conservative.**

Upper lethal temperature estimates in the database used in the 2005 MBI/CABB Report were based primarily on UILT and CTM values. However, as acknowledged by the Report's authors (at p. 5), a new and better method to determine the thermal tolerance of fish is now available. This new and better method is called the "slow heating method." The standard UILT method involves transferring the fish from the acclimation temperature directly to a higher temperature. The CTM method involves rapidly increasing the exposure temperature at a rate of 0.5-1.0 C/hour. The UILT and CTM methods do not as closely approximate real-world conditions as does the slow heating method. In the slow heating method, the exposure temperature is raised 0.5-1.0 C/day, thereby allowing the fish to adjust to the higher temperatures (Hokanson and Koenst 1986, Reash et al. 2000). The slow heating method more closely approximates natural conditions. It yields more realistic, upper lethal estimates. The 2005 MBI/CABB Report agrees and indicates that the "slow heating method" is the preferred method. However, as noted in the report, very few studies have used this method. Thus, the database

utilized by the 2005 MBI/CABB Report is populated by data collected using the old methodologies, and, as a result, it underestimates the actual tolerance of the fish species selected for the ranking approach. This under-estimation of fish tolerances is shown by the fact that many of the fish species which the 2005 MBI/CABB Report finds should be limited or excluded by higher temperatures are indeed present and thriving in the Lower Des Plaines River. We understand that the report was constrained by the limits of the published data available. However, the Report should at least acknowledge that using such data results in overly conservative estimates.

#### **4. A Questionable Extrapolation Procedure was Used.**

In the June 2004 Draft Report, the authors describe how they extrapolate from a known to an unknown endpoint (2004 Draft Report at p. 4). They indicate that the preferred procedure (Step 1) is based on relationships within that species' family. However, species within the same family can exhibit considerable differences in their tolerances to temperature. For example, common carp, which is a member of the minnow family, is highly resistant to high temperatures (survival temp of 41.0 ° C, App Table 1) but silver shiner, another minnow species, has an upper lethal temperature that is 12 ° C cooler (29.1 ° C). Within the sucker family, white sucker is fairly sensitive (ULT temp of 31.4 ° C, App. Table 1), but smallmouth buffalo is much less so (39.3 ° C) (App Table 1). Therefore, the extrapolations performed in this manner do not produce reliable or defensible values. If empirical data for a particular endpoint do not exist, then no endpoint value should be presented.

In the final version of the report (MBI/CABB 2005), there is no description of the extrapolation procedure. In the absence of any discussion we can not be certain, but as best we can tell, extrapolations were still performed, they simply are no longer disclosed or described. This lack of disclosure leads the less-informed reader to the conclusion that all the endpoint values were empirically derived, which as best we can determine is not true. As described above, we do not believe the extrapolation process described in the June 2004 draft is appropriate. But if it, or any other extrapolation procedure was used, its use should be acknowledged and the procedure described in the report.

#### **5. RAS Selection.**

At various places in the report, the authors indicate that the selection of RAS is one of the most important factors in determining what the temperature criterion will be. We agree. Given this importance, we believe that the Biological Workgroup's input should have been solicited before the list was finalized. Several work group members have considerable expertise regarding the distribution and abundance of fishes in this area. This expertise should have been brought to bear during the RAS selection process.

Furthermore, we are confused regarding how species were either included or excluded from the RAS list. The Report lists seven criteria for choosing RAS and provides the list of the species so selected in Table 1 (Report at p. 7 and 8). It is not clear that the listed criteria were used to select the Table 1 species. Based on the text, it appears that the RAS

list included all species for which thermal endpoint data existed. If this is true, then this is not a RAS list but instead simply a listing of all species on which there are data.

Table 1 could be improved considerably if it had columns indicating the basis for each species' selection. Were there any species that had thermal endpoint data but which were not considered to be a RAS? The table of RAS selected also does not reveal whether any of these species are potential nuisance species. Finally, of the selected RAS, there is no disclosure of whether any were chosen based on Criterion 7, i.e., species not necessarily present but representative of those that are. In order to allow an evaluation of the accuracy and reliability of the RAS selection process, all of the above information should properly be disclosed in the Report. In the absence of such information, no peer review of the Report's ranking approach can be conducted. Without this information, it is extremely difficult to determine whether, and to what extent, the RAS selection process performed in the Report is appropriate for the Lower Des Plaines River.

## **6. Comments on Table 1 Species Selection**

In addition to the generic comments provided above, we offer these comments regarding specific species selected in the RAS lists included in the 2005 MBI/CABB Report.

Yellow perch is not included in the RAS Table 1 list of the Report, but for some reason it is included in the RAS2 and RAS3 lists. Yellow perch should be deleted; it is not included in Table 1 and is not a RAS.

Of the 19 species (20 counting yellow perch) added to the General Use category, 10 are poor choices and should be removed. Six of these 10 (creek chub, redbfin shiner, striped shiner, bigmouth shiner, stoneroller, and fantail darter) are small stream fishes and are NOT representative of the Lower Des Plaines River. We agree that they are historically known from the Des Plaines River but they are certainly not representative of it and likely appear in the river only rarely, mainly as "washouts" from tributaries. Three gamefish (sauger, walleye, and northern pike) are included apparently because of their occurrence in the Kankakee River (see Table 1). However, as everyone on the Lower Des Plaines UAA Workgroup has agreed, habitats in the Kankakee River are much different from those in the Lower Des Plaines, so it is not reasonable to expect any of these species to flourish in the Des Plaines River. Similarly, except in the Brandon tailwaters, habitats in the lower Des Plaines River are completely unsuitable for stonecat so it should not be a RAS. As discussed previously, the UILT value for this species should not be used because it was obtained on winter-acclimated fish and only two specimens were tested. This is the reason its UILT is 4.5° F lower than the next most sensitive species.

Pumpkinseed sunfish is predominantly a lake species and although it occasionally is found in rivers, it is not representative of large, Midwestern Rivers. It should be excluded.

White sucker is a common to abundant inhabitant of warmwater to coolwater rivers in the Midwest. However, it is rare to uncommon in large rivers (Smith 1979, Becker 1983) and thus is not representative of them. It can exist in impounded rivers, but only if it has access to suitable spawning areas (i.e., fastwater areas with gravel to cobble substrates). Such areas are essentially absent in the Lower Des Plaines River, explaining the absence or greatly reduced abundance of not only white suckers but other species with similar spawning requirements (e.g., redhorse, most darters). Based on the size of the Des Plaines and the lack of appropriate spawning habitat, the white sucker is not a RAS.

For similar reasons, silver redhorse is not an appropriate choice for the modified use designation RAS list. While it can survive under impounded conditions, it is capable of doing so only if suitable spawning habitat is available elsewhere. As discussed above, such habitat is rare to absent in the UAA study area. Thus, silver redhorse should not be included in the modified use RAS list. It appears that the authors of this report agree with this analysis in that they provide a modified RAS both with and without silver redhorse. It is only the "without" list that is appropriate here.

**7. Based on the Definitions in the Report, No Portion of the Lower Des Plaines River Should be Classified as General Use.**

According to the 2005 MBI/CAB report (p. 8), "General Use is expected to support a diverse, warmwater fish assemblage that is expected to occur in the least disturbed, free-flowing habitats of the Lower Des Plaines mainstem and similarly sized rivers in the region." The Modified Use option is intended to apply to physically modified riverine habitats characteristic of the areas that are inundated by artificial impoundment by low head dams". Later on p. 8, the Report refers to "the habitat modified conditions of the impounded portions of the Lower Des Plaines River (Modified Use)". Because both the Brandon and Dresden Pools are impounded, it is clear that the highest use classification available for this area is a form of modified use. And given the other limitations (e.g., barge traffic, channelization, legacy pollutants), the secondary use classification is appropriate for Brandon Pool.

**8. 100% Protection Is Overly Conservative and Contrary to Both Federal and Illinois Precedent for Setting Water Quality Standards.**

The approach in the 2005 MBI/CABB Report includes the selection of values that are based on the protection of 100% of the species included in the RAS list. This is an overly conservative approach that generally has not been used by the IEPA in developing water quality standards in the past. Similarly, the U.S. EPA's approach to most water quality parameters is to set the numerical limit no higher than at the 95<sup>th</sup> percentile value of the genera tested. This is a clear recognition that it is not appropriate to base water quality standards on an approach that requires protection of 100% of the species 100% of the time. The conservative approach recommended by Yoder and Rankin is even more misplaced here given the well known ability of fish to avoid elevated temperatures and the fact that many of the species considered in their analysis are thriving (MWGen/EA

Report 2003) in the Lower Des Plaines River despite the predictions of their “model” that these species should not be able to do so in the prevailing water temperatures.

#### **9. The Historical Ambient Temperature Record Is Largely Irrelevant.**

Except for determining whether a proposed temperature is reasonably achievable, the Des Plaines River historical temperature record is irrelevant to the current or expected thermal conditions in the Lower Des Plaines River. Originally, the Des Plaines River had no connection with Lake Michigan. Historically, it was shallow and certainly warmer than it is now. Creation of the Chicago Sanitary and Ship Canal, which connected the Chicago and the Des Plaines River systems, reversed the flow of the Chicago River and allowed cool water from Lake Michigan to flow into the Des Plaines River. The “ambient” temperature of the Des Plaines River is now dictated by the amount of water being diverted from Lake Michigan and the operation of the huge Stickney WWTP. However, the amount of water available from Lake Michigan for the discretionary diversion is decreasing, and is legally mandated to go to zero in the year 2019. Therefore, it is not unrealistic to project that the river’s water quality will at that time be based entirely on treated and untreated wastewater effluents and intermittent runoff.

#### **10. Tables 2 and 3 Contain Several Mistakes and the Suggested Thermal Limits are Overly Conservative.**

Table 2 indicates that the original General Use RAS list as presented in the June 2004 draft yielded long-term and short-term 100% survival values of 29.5 and 31.5 C, respectively. The actual values were 29.9 and 31.0 C (see Table 2 in the June 2004 draft). The General Use RAS 1 and RAS 2 limits in the current report are based on stonecat data, which, as discussed previously, were inappropriately derived. The General Use RAS 3 list excludes stonecat data, but should be modified to also exclude white sucker, which is not a RAS for the Lower Des Plaines River. In their discussion regarding General Use, the Report indicates that the RAS list now contains 49 species (p. 12) but Appendix Tables 3B and 3C list 50 species. This discrepancy should be addressed.

The Modified Use RAS1 and RAS2 lists yield the same short term and long term survival criterion because in both cases the most sensitive species listed is white sucker. However, as discussed herein, white sucker should not be considered as a RAS.

In reference to the Secondary Contact classification, the discussion on page 15 indicates that a daily maximum of 32.4 C will protect 100% of the RAS during the summer. However, in Table 3 (p. 14), a value of 33.3 C is indicated as being protective of 100% of the RAS in this category. This obvious discrepancy should be resolved.



## 11. Other Discrepancies.

On page 12 of the 2005 MBI/CABB Report, the authors indicate that 13 species on the General Use RAS lists are commercially or recreationally important. But on p. 15, in reference to the Modified Use classification, the authors indicate that 15 species are so classified. Given that the Modified RAS list is a subset of the General Use list, it can not contain more of these commercially or recreationally important species than the General Use list. Also, the authors should indicate which species they place in the commercially or recreationally important category because, without this information, it will be impossible for anyone else to evaluate the accuracy of the growth endpoints.

As justification for looking at alternatives including sauger, walleye, and yellow perch, the authors indicate (p. 12) that although these species currently occur in low numbers in the Lower Des Plaines "they are expected to occur in the Lower Des Plaines River as water quality conditions improve". However, as discussed elsewhere in this attachment, habitat is and will continue to be limiting to these and other species (e.g., northern pike) regardless of how much (or little) water quality changes in the Lower Des Plaines River.

In the MBI/CABB 2005 Report, the authors indicate that cool temperatures (< about 40 F) are necessary during the winter because some species need cool temperatures for successful gamete development. First, no citation is provided to support this contention. Second, the only species for which such a need has even been suggested are the large percids (i.e., yellow perch, walleye, and sauger). Even if it can be demonstrated that these species need this cool period, none of them should be considered RAS for reasons already articulated. Thus, there seems to be no justification for a winter "cool" period.

## 12. Summary

In summary, two major activities should be conducted prior to adoption of any standards generated by this approach:

- (1) Review the data to ensure their validity, and
- (2) Allow Workgroup input into the RAS lists and incorporate changes recommended by the Group.

In addition, the numerous other errors and inconsistencies pointed out herein must be addressed.

## ATTACHMENT A

### MIDWEST GENERATION ADDITIONAL TECHNICAL COMMENTS ON THE 2005 MBI/CABB REPORT

#### **B. TEMPERATURE-RELATED ISSUES:**

##### **1. The Source of the Thermal Data Relied Upon should be Disclosed to Allow Verification of its Accuracy.**

As with the 2004 Draft Report, the data source and exact locations in the waterway of the various temperature measurements reported in the 2005 MBI/CABB Report Appendix Table 2 and relied upon for “ground-truthing” the proposed thermal standards are not disclosed. There is only the general reference to using “long term temperature monitoring data in the Lower Des Plaines R. and Chicago Area Waterway System (CAWS).” Absent reference or citation to show the source of this data, it is impossible for anyone to evaluate the accuracy of the data reported. MWGen renews its request for either a map or more detailed description of these locations so it can determine whether the temperature monitoring data is being accurately presented and relied upon in the Report. Given these difficulties in evaluating the accuracy and significance of the temperature measurements set forth in the Report, MWGen’s ability to understand and accept the basis for the recommended seasonal criteria was very limited.

From the largely unreferenced temperature data provided, it is also not possible to determine whether these reported thermal readings are truly representative of either maximum or average temperatures in the waterway. Based on the number of samples reported, they do not appear to be continuous measurements. Consideration of a continuous data record for each respective monitoring location is necessary to provide a fully representative picture of how temperatures in the waterway are distributed in time and space. There is also no indication of where exactly in the water column these measurements were taken, vertically and longitudinally, or at what time of day they were collected. Without consideration of these factors, the statistics applied to this data may not be valid for use in determining a reference condition.

Also, in appendix Table 2, there is conflicting information regarding the period of record used. In the table heading, the years 1998-2004 are referenced, while in the footnote, it is stated that the maximum occurrence temperatures were taken from the time period 1995-2003. This inconsistency is another indication that the data used to develop an ambient temperature reference is suspect.

##### **2. The Proposed “Ambient” Temperature of the Lower Des Plaines is Not Appropriate.**

The implausible suggestion that thermal standards for the Lower Des Plaines River should be stricter than the existing General Use standards appears to be based, at least in

part, on an inappropriate “background” location as the source of alleged “ambient values“. In the MBI/CABB Report, it states that “Seasonal ambient temperature data was analyzed from eight locations in the Lower Des Plaines River and the CAWS (Chicago Area Waterway System) for the period 1998 through 2004 (Appendix B).” (Report at p. 15) Calling these locations representative of “ambient temperature” is very misleading. There is essentially no portion of the upstream waterway, even on the Cal-Sag, where temperature is not in some way impacted by urban effects, POTW effluents, barge traffic, diversion flow regime and/or surface run-off, even disregarding any inputs from power plants.

The Report nonetheless offers the Route 83-Cal-Sag site as a “background” location that is representative of “ambient” conditions for the Lower Des Plaines River. (See Report at Table 4 and p. 15) The Cal-Sag is far from an unimpacted waterway. It is also physically dissimilar to the Lower Des Plaines River. These factors make it very unlikely that it could be considered as a true “reference” stream for any type of temperature regime comparisons. In addition, the Cal-Sag is not dominated by the same volume of POTW effluents, as the Lower Des Plaines is due to the upstream contribution of MWRDGC’s Stickney Water Reclamation Plant, the largest POTW in the world. The Cal-Sag also does not receive nearly the level of urban runoff and CSO discharges that the Lower Des Plaines does. Urban runoff has been shown to artificially increase the temperature of receiving streams. (This has been acknowledged by USEPA as part of their urban runoff control initiatives). The Cal-Sag also has the added impact of 5 side-stream aeration stations, which serve not only to improve dissolved oxygen conditions, but may also serve to improve ambient cooling conditions. Thus, it should not be expected to have the same thermal regime as any of the other Chicago area waterways.

The ambient or “background” temperature of the waterway is described as the temperature that would exist in the absence of any thermal enrichment by other sources, such as MWGen’s electric generating stations. It must also be kept in mind that the large Publicly Owned Treatment Works (POTWs) discharges to this waterway system also exert their own independent influence upon the thermal regime, during both the summer and winter periods, apart from any other factors. These treatment plant discharges are not likely to be eliminated in the foreseeable future, and therefore must be considered as permanent contributors to the ambient temperature conditions in the waterway. This is shown very clearly in Figure 4-2 of the Holly and Bradley 1995 Report. The average daily water temperature at MWRDGC’s Stickney Plant is approx. 51-52 °F during January through March, and averages around 55 °F during December.

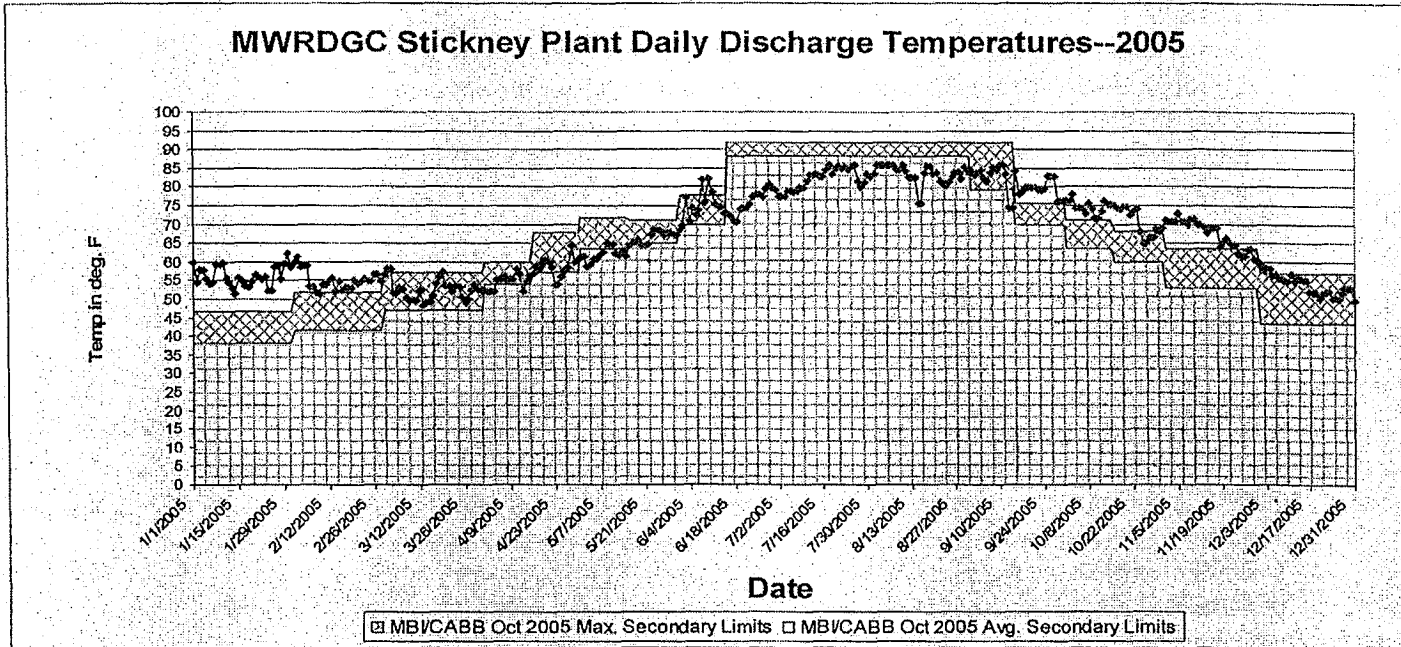
Data from the MWRDGC’s Stickney Plant discharge for 2005<sup>5</sup> show similar winter temperatures, as well as summertime values in excess of the proposed temperature limits, even for the MBI/CABB Secondary Contact option (see Figure 1, below) :

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<sup>5</sup> Data from MWRDGC website:

[http://www.mwrdd.org/RD/IEPA\\_Reports/WRP%20Data/WRP%20Effluents/WRP%20Outfall%202001-%202010/Stickney%20Outfall%20%202001%20-%202005.xls](http://www.mwrdd.org/RD/IEPA_Reports/WRP%20Data/WRP%20Effluents/WRP%20Outfall%202001-%202010/Stickney%20Outfall%20%202001%20-%202005.xls)

Figure 1:



For the Lower Des Plaines River, the large contribution of treated wastewater from the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) Stickney Plant, making up over 90% of the upstream flow during non-summer months, largely controls the temperature regime of the system. (See Figure 2.6 of Holly and Bradley 1995 Report LD237). The effluent temperature from the MWRDGC discharge effectively serves to keep the waterway at a temperature which is, in effect, elevated from that which would be found in a “natural” system, especially during the non-summer period. Therefore, the water temperatures used as a basis for the seasonal analysis (*i.e.*, the Route 83 Cal-Sag site), are not representative of the conditions in the Chicago Sanitary and Ship Canal nor the Lower Des Plaines River (even without the addition of power plant discharges). The Lower Des Plaines River follows a different thermal regime, albeit still elevated, from that proposed by the 2005 MBI/CABB Report for both the summer and non-summer months.

As discussed in the report on Page 15, “[n]on-summer season criteria are derived to maintain seasonal norms and cycles of increasing and decreasing temperatures.” MWGen agrees that seasonal variations are important and do occur in the Lower Des Plaines River—however, the seasonal and diurnal cycles observed do not correspond to what would be seen in a “natural” waterway. Due to a combination of upstream influences, including the Lake Michigan Diversion, POTW effluent flows, barge traffic and surface runoff, the waterway does not cool down in the winter to levels suggested by

the proposed thermal limits. It stays warm throughout the winter months. It also warms in the spring more quickly, and retains heat well into the fall. The Report's proposed non-summer temperature limits, such as the winter average temperature in the high 30's-low 40°C's, are both unrealistic and unachievable in this waterway, even absent the input of heat from power plant discharges.

As was found during the UAA process, the UAA work group could not come to any consensus on any appropriate reference stream to compare with the Lower Des Plaines, due to its unique history and present circumstances. The MBI/CABB analysis attempts to use an upstream, "least-disturbed" site as a reference, which would be the logical method if this were a natural waterway. Unfortunately, the Cal-Sag is not a least-disturbed site and trying to compare its thermal regime with that of the Lower Des Plaines River, or any other reach in the Chicago Area Waterway, is not applicable or appropriate. The Cal-Sag represents merely yet another permanently impacted waterway in the Chicago area.

**3. Use of Holly and Bradley Report Data LD 237, 1995 to Confirm MBI/CABB Report Conclusions is not Appropriate.**

Attached is a critique prepared by Dr. Forrest M. Holly Jr. which addresses this issue.

**“Temperature Criteria Options for the Lower Des Plaines River”**  
**Midwest Biodiversity Institute (MBI) and**  
**Center for Applied Bioassessment and Biocriteria (CABB)**  
**11 October 2005**

**Summary critique of comparisons with**  
**IIHR Limited Distribution Report #237**  
**Holly and Bradley, December 1995**

Prepared by:

Forrest M. Holly Jr., P.E.  
30 May 2006

On page 18 of the 2005 MBI/CABB Report, and in Options C and D of Table 5, reference to and use of the temperatures reported by Holly and Bradley (IIHR Limited Distribution Report #237, Dec 1995) are inappropriate and/or illogical.

One overall observation is that the MBI/CABB report fails to recognize the progressive summertime heating of the water as it flows downstream, even in the absence of thermal enrichment, due to natural processes (solar and atmospheric heating and cooling). The MBI/CABB comparisons of simulated natural I-55 temperatures with measured Cal Sag tributary temperatures some 26 miles upstream are illogical for this and other reasons summarized below.

It is meaningless to speak of a single “ambient temperature” characteristic of this unnatural waterway. The relatively cool upstream supply (directly or indirectly derived from Lake Michigan) undergoes downstream temperature evolution in the absence of any other thermal enrichment associated with power generation. When the MBI/CABB report implicitly validates its proposed ambient temperatures through comparison of Cal Sag temperatures with IIHR Figure 4.10 (lines 14-18 of the full paragraph on page 17), it totally ignores this spatial variability. Therefore the MBI/CABB report is incorrect in suggesting that its proposed ambient temperatures are consistent with the IIHR no-power simulations at I-55. This is an apples-and-oranges comparison.

Over and above this conceptual flaw, the MBI/CABB report also contains some misstatements and inaccuracies with regard to the IIHR #237 results.

1) On page 17, the MBI/CABB report states in reference to IIHR #237 Figure 4.10: “The study simulated summer season maximum temperatures at the I-55 bridge ... of 82 – 83 °F *with no thermal sources...*” With reference to the legend of Figure 3.1 of IIHR #237, it can be noted that the cited temperatures are a few outliers in the entire 46-year simulation, and are not in any way representative of statistically meaningful temperatures.

2) In the next sentence on page 17 of the MBI/CABB report, the cited maximum 75<sup>th</sup> percentile temperatures of 75 – 76 °F appear to be somewhat low; 77 – 78 °F appears to more accurate.

3) In Table 5, page 18, of the MBI/CABB report, Option D, September 16-30, the cited average temperature of 77 does not appear to come from the IIHR #237 results as stated.







MIDWEST  
GENERATION EME, LLC

An EDISON INTERNATIONAL<sup>SM</sup> Company

July 28, 2004

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Director, Environmental,  
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Mr. Toby Frevert  
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Illinois Environmental Protection Agency  
1021 North Grand Avenue East  
Springfield, IL 62794-9276

Subject: Comments on Lower Des Plaines River Temperature Criteria  
Derivation Report Prepared by Chris Yoder and Ed Rankin

Dear Toby:

We appreciate the opportunity to comment on the recently issued report entitled "Derivation of Temperature Criteria Options for the Lower Des Plaines River" prepared by the Midwest Biodiversity Institute (MBI) and Center for Applied Bioassessment and Biocriteria (CABB), (the "MBI/CABB Report"). The MBI/CABB Report presents one approach to calculate thermal criteria but it does so in a theoretical manner, without taking into consideration the relevant site-specific conditions of the Lower Des Plaines River. As a result, this approach generates calculated thermal criteria that are far more stringent than even the existing General Use thermal water quality standards applicable to the highest quality Illinois waters. This result shows that the Report's approach may not be appropriate for use in Illinois and needs to be modified to include consideration of the actual water body conditions. The MBI/CABB Report wrongly implies that every Illinois water body is currently not protected under the existing General Use thermal water quality standards, which is the primary use designation in the state. There is no evidence to suggest that this is the case and water quality monitoring data available to the IEPA shows such a conclusion is not true.

To correct the applicability problems in the approach taken by the MBI/CABB Report, and to establish sufficiently protective thermal water quality standards for the Lower Des Plaines River, the methodology used must take into account the actual habitat and aquatic life conditions that exist there and have been documented in numerous studies. Midwest Generation has presented the Agency with a methodology that does take into account these site-specific conditions. It is a far superior approach to establishing thermal standards for the Lower Des Plaines River. The Use Attainability Analysis ("UAA") process is itself a site-specific analysis of the subject waterway and thus is well-suited to the derivation of site-specific water quality standards. We urge the Agency to utilize a site-specific approach here to determining the applicable thermal water quality standards.

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We have set forth below our general comments on the MBI/CABB Report and have included detailed, additional comments on the technical aspects and data presented in the Report in Attachment A to this letter.

1. Site-Specific Considerations

We recognize that the MBI/CABB Report's use of generic, literature-based data to calculate numerical criteria may be necessary and useful in cases where no other sources are available. But this is clearly not the case here. The IEPA has actual biological and physical monitoring data from the Lower Des Plaines River covering a period of over twenty years. The Lower Des Plaines River is particularly ill-suited to the generic approach taken in the MBI/CABB Report. It is not comparable to any other waterway in the state. Its unique conditions require site-specific consideration that can be readily afforded in the context of the UAA process. The overall biological condition of this waterway is the result of many concurrent factors related to irretrievable habitat modifications, urbanization effects and commercial navigation, most of which are beyond IEPA's control. These relevant factors are not considered under the MBI/CABB approach. They should be if sufficiently protective thermal water quality standards are to be identified without causing significant and unnecessary economic harm.

There also is extensive biological data for the lower Des Plaines River which demonstrates that many of the fish species which the MBI/CABB Report finds should be limited or excluded by higher temperatures are indeed present and thriving. Where such data exists, as it does here, relying on the actual measurements in the stream and counting of fish in the waterway is a far superior method for characterizing the waterway. The use of site-specific data will provide far more scientifically rigorous conclusions than does the generic, literature-based search that forms the basis of the MBI/CABB Report. Reliance on actual stream data is quite simply sound science. Reference to and reliance upon the actual stream data should be incorporated into the Agency's decision-making process here.

Midwest Generation has provided actual stream data to the Agency and has made an extensive showing of how that data can properly be used to establish protective thermal water quality standards for the Lower Des Plaines River. The Midwest Generation/EA Engineering, Science and Technology, Inc. Report, "Appropriate Thermal Water Quality Standards for the Lower Des Plaines River" ("MWGen/EA Report"), October 13, 2003, presents actual field-collected data and discussion of the overall condition of the fish assemblage in the waterway, as well as the prevailing habitat limitations of the system. Review of the MWGen/EA Report demonstrates that many of the fish species identified by the MBI/CABB Report as having literature-based thermal tolerances well below the measured thermal values in the river are not only present but doing well. In the real world, the fish community can and does respond differently. The approach taken in the MBI/CABB Report does not take into account the specific history of species adaptation in the Lower Des Plaines River. Both acclimation and avoidance are necessary survival

mechanisms that ensure fish survival and growth in waterbodies which are subject to many concurrent stressors, like the waterbody here.

## 2. Use Designation Options

Turning to the use designations referenced in the Report, Midwest Generation understands that the Agency needed to provide some general guidance to the Report's authors concerning the potential use designations for which they were being asked to derive thermal criteria. There are certainly other potentially applicable use designations that could have been analyzed in the Report. We do commend the continuing attention given to the retention of the Secondary Contact use designation here based on the inherent limitations in the waterway. We also commend the Report's objective acknowledgement of the overwhelming evidence showing that the Lower Des Plaines River is habitat-modified and the authors' reference to the need to create a modified use designation based on "an assemblage that reflects the habitat modified conditions of the impounded portions of the Lower Des Plaines River." (Report at p. 7) As the Report highlights, "General Use is expected to support a diverse, warmwater fish assemblage that is expected to occur in the least disturbed, free-flowing habitats of the Lower Des Plaines main stem and similarly sized rivers in the region." (Report at p. 5) Obviously, neither the Brandon nor Dresden Pools are "least disturbed, free-flowing habitats." The Report is helpful in pointing out that the Modified Use option is intended to apply to "physically modified riverine habitats characteristic of the areas that are inundated by dams" and was developed primarily to address the "inundation of run and riffle habitats by resulting impoundment." (Report at p. 10) The dams at Dresden Island and Brandon Road inundate all "run and riffle habitat," except for a small tailwater area below the Brandon Lock. Based on the definitions provided by the authors, it is clear that neither pool should be classified as General Use.

While we appreciate the authors' insights into the use designation issues, we believe that the calculated thermal standards presented for the General Use option raise significant legal issues. The calculated criteria are more stringent than the existing General Use thermal water quality standards. We submit that were the Agency to propose such thermal standards under a General Use designation for any part of the Lower Des Plaines River, it would lack the legal authority to do so. We do not believe that the Agency has the legal authority to set a different Illinois General Use thermal water quality standard solely for a portion of the Lower Des Plaines River. Such a change to the General Use thermal water quality standard would have to be presented in a rule-making proceeding to modify the General Use thermal water quality standard on a state-wide basis. We do not believe that the subject Report provides a sufficient basis on which to pursue such a global Illinois thermal water quality standards change.

## 3. Summer and Non-Summer Months Proposed Standards

We also have concerns regarding the proposed approach to setting thermal water quality standards for both summer and non-summer months. The temperatures proposed by the

MBI/CABB report for all three use designation options are overly protective of the fish species which reside in the Lower Des Plaines River. We have presented extensive data which demonstrates that there are other permanent limitations in the system which effectively limit the degree of improvement that can be attained. Even in the absence of any power plant discharges, the existing, permanent habitat limitations, constant barge traffic, channelized/impounded nature of the waterway, as well as large wastewater treatment discharges, frequent CSOs and urban runoff, would dictate that the future fish assemblage would be dominated by the same types of species that are able to exist there today.

For the non-summer months, the authors “...recommend using the non-summer season values in Table 3 for all of the designated use options.” (Report at p. 12) There is little or no support given for this recommendation. These values were derived using the species information assembled for the General Use option only, but are recommended for all three use options presented. No explanation is provided for why the non-summer season limits for each use category should be identical when the summer season values for each use designation are not. If more than one use designation is developed for the Lower Des Plaines River, there should also be separate, seasonal temperature criteria developed for each use designation based on the expected species assemblage present for such use, as well as the inherent physical limitations described above. The suggested “one-size-fits-all” approach to setting non-summer thermal standards is not well-supported and will lead to overly restrictive water quality standards.

#### 4. Technical Data Reliability and Accuracy Concerns

The MBI/CABB Report presents an approach to deriving seasonal thermal water quality standards that is questionable on several other grounds. We have described many of these concerns in more detail in Attachment A to this letter. However, we present below the most significant weaknesses.

It is very difficult to identify the source and location in the waterway of the various temperature measurements reported in MBI/CABB Report Appendix Table 2 and relied upon for the proposed thermal standards. The Report refers to using “long term temperature monitoring data in the Lower Des Plaines R. and Chicago Area Waterway System (CAWS).” However, no reference or citation is provided to show the source of this data. This makes it impossible for anyone to evaluate the accuracy of the measurements so reported. A map or more detailed description of these locations is necessary in order to determine exactly where these temperature data are being measured. In this regard, we caution the Agency that it appears from the limited review of these measurements we were able to conduct without having the source and specific location information that the accuracy of the temperature data used is suspect. For example, in Appendix Table 2, the maximum August temperature for the Cicero Avenue location is listed as 122 °F. If the data are indeed from locations outside of the direct influence of other sources of heat (as stated in the MBI/CABB Report, page 8, Para. 2), then a value as high as 122 °F would be physically impossible. If this value is in error, it brings into question the accuracy of the remaining data used in the analysis.

From the limited temperature data provided, it is also not possible to determine whether these reported thermal readings are representative of average temperatures in the waterway. It is not clear whether the reported measurements were taken during the heat of the day or the cool of the evening, nor is it clear at what depth(s) they were taken.

Given these difficulties in evaluating the accuracy and significance of the temperature measurements set forth in the Report, our ability to understand the basis for the recommended seasonal criteria was very limited. However, the Report appears to be recommending non-summer seasonal temperature criteria that are actually more stringent than what are purportedly “ambient” thermal values. The actual temperatures listed in Table 3 of the Report for the selected Route 83-Cal-Sag “background” site appear to be substantially higher than the non-summer seasonal temperature criteria recommended in the Report. If the Route 83-Cal-Sag values are purportedly representative of the canal at non-thermally influenced “background” locations, then how can the proposed standards suggest numbers below these “ambient” values? How and why should the waterway be cooled down below allegedly ambient levels? Such recommended thermal water quality standards that are more stringent than the temperatures that would naturally occur in the waterway (e.g., without any thermal discharges) are neither consistent with nor required by the Clean Water Act and the Illinois water quality regulations.

The questionable conclusion that thermal standards should be stricter than naturally occurring conditions appears to be caused by the use of an inappropriate background location as the source of alleged “ambient values.” The authors state that they focused on the “determination of representative background conditions.” (Report at p. 13). Such a focus is not born out by the text of the Report. The Report instead primarily focused on the determination of the response of fish to various temperature regimes regardless of causative factors. Nevertheless, the Report offers the Route 83-Cal-Sag site as a “background” location that is representative of “ambient” conditions. (See Report at Table 3 and p. 12) However, the Cal-Sag receives inputs from three wastewater treatment plants. These inputs artificially lower in-stream temperatures in the summer and raise them in the winter. Thus, the Route 83-Cal-Sag location does not represent either ambient or background conditions for the Lower Des Plaines River. Similarly, in the Des Plaines River, the large input from the Stickney Wastewater Treatment Plant makes attainment of a winter average temperature in the low 40°C’s, as suggested in the Report, a physical impossibility.

Among the various thermal loading scenarios profiled in the referenced Holly and Bradley Report (1995) is a profile that includes no thermal loadings from power generation plants. (See Figure 2.3 of Holly and Bradley Report—LD 237, 1995). This “no power generation” loading profile shows a progressive warming of the water in the main channel as it moves downstream through the system, even in the absence of power plant discharges. This profile shows that for the Lower Des Plaines River, the large contribution of treated wastewater from the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), making up over 90% of the upstream flow during non-summer months, largely controls the temperature regime of the system. The effluent

temperature from the MWRDGC discharge effectively serves to keep the waterway at a temperature which is, in effect, elevated from that which would be found in a "natural" system during the non-summer period. (Conversely, this effluent flow also serves to cool the waterway somewhat during the summer months, since the effluent temperature remains relatively constant year-round).

Therefore, the water temperatures used as a basis for the seasonal analysis (*i.e.*, the Route 83 Cal-Sag site), are not representative of the conditions in the Chicago Sanitary and Ship Canal, nor the Lower Des Plaines River. The flow in the Cal-Sag does not receive the large volume of urban runoff and huge treatment plant effluent contribution that is characteristic of the Lower Des Plaines River. The Lower Des Plaines River follows a different thermal regime, albeit still elevated, from that proposed by the MBI/CABB for the non-summer months. The non-summer temperature limits proposed by the MBI/CABB report are both unrealistic and unachievable in this waterway, even absent the input of heat from power plant discharges.

In addition to using the "ambient" data from the Route 83 Cal-Sag site, the MBI/CABB report has adjusted the proposed non-summer temperatures to ensure successful spawning of the representative species that were chosen to represent the General Use condition. However, there has been no evidence presented on whether all of these species are actually present in the waterway and/or whether they in fact require such low temperatures to successfully reproduce. Species acclimation was not accounted for in the analysis. Habitat limitations in the system will effectively prevent certain species from successfully spawning, regardless of whether the water is in their preferred temperature range or not. Such habitat limitations were properly taken into account in the methodology presented in Midwest Generation's Report because it considered such relevant, site-specific conditions.

Finally, the maximum summer temperatures proposed for all three potential use designations are 2° C lower than those originally proposed in the November 7, 2003 draft MBI/CABB Report. This is a very significant change. It serves to make the maximum limits even more unduly restrictive and hence, more difficult to meet. It appears that both the Long and Short-term survival values listed in Table 2 have been consistently adjusted downward by 2° C. However, no explanation is given as to why this was done in the accompanying text. If the same methodology was used in both cases, we do not understand what caused the reduction in temperature values for the survival factors. We would appreciate receiving an explanation of the reason for this significant change.


The alternate thermal limits proposed by Midwest Generation are protective of the current and expected future fish assemblage in the lower Des Plaines River, given the permanent human-induced alterations made to the system and the continued influence of

upstream urban inputs. While targeting power plant thermal discharges appears to be an easy solution, requiring thermal reductions by these plants will not change the overriding fact that the Lower Des Plaines River is not, nor will it ever be, a natural waterway. As such, the potential economic ramifications of imposing the kind of stringent thermal

standards suggested in the MBI/CABB Report on our cooling water discharges are staggering. In fact, there may be no economically reasonable way to meet them, even with the installation of supplemental cooling and the implementation of significant unit deratings. Yet, even if these changes were possible, we do not foresee any tangible improvement in the river's fish assemblage from these reductions in temperature. We strongly object to the use of theoretical exercises to derive thermal water quality standards which take no substantive account of the actual physical and biological conditions in the Lower Des Plaines River.

We are willing to continue cooperating with the Agency towards producing objective and scientifically defensible findings for this UAA effort, in accordance with the realities of the waterway. Please let us know how we can best assist in this regard.

Sincerely,



Basil G. Constantelos  
Director, Environmental, Health and Safety

ATTACHMENT A  
MIDWEST GENERATION ADDITIONAL TECHNICAL COMMENTS  
ON THE 2004 MBI/CABB REPORT  
LOWER DES PLAINES RIVER UAA WORK GROUP  
July 28, 2004

The following comments by Midwest Generation address specific technical issues regarding the report entitled "Derivation of Temperature Criteria Options for the Lower Des Plaines River" prepared by the Midwest Biodiversity Institute (MBI) and Center for Applied Bioassessment and Biocriteria (CABB), dated June 11, 2004 (the "2004 MBI/CABB Report").

**1. The "Fish Temperature Model" is a "Ranking" and not a "Model."**

Throughout the 2004 MBI/CABB Report, the authors refer to the "Fish Temperature Model." This title is a misnomer. It incorrectly implies that the thermal data collected in a given category (e.g., short-term survival) were modeled or mathematically manipulated to discern the relationship between temperature and the endpoint being considered. No such modeling or mathematical manipulation occurred. The effort instead consisted of a ranking of species sensitivity data. The selected species were ranked from the most to the least sensitive (see App Tables 3-5). The upper lethal temperature for the most sensitive species listed became the short-term daily limit and that value less 2° C became the long-term survival limit. Under this approach, the criterion recommended is determined solely by the response of a single, sensitive species. Therefore, it is particularly important in this approach that both the correct (*i.e.*, representative) species are selected and that the thermal tolerance data for the most sensitive of the species selected be accurate because only that most sensitive species determines the numerical water quality standard recommended in the Report.

**2. The Thermal Database Used in the Report Should be Updated.**

When it was compiled approximately thirty years ago in the mid-1970's, the thermal database was one of the most complete thermal databases. However, it has now been approximately thirty years since the database was completed and it is in need of updating. The ORSANCO-sponsored update of this thermal database is not yet complete. As acknowledged in the MBI/CABB Report (at pages 3 and 4), "updated literature was available for only a few selected fish species." If the species ranking approach in the Report is to be used to develop Illinois thermal water quality standards, at the least then, the Illinois EPA should await the completion of the ORSANCO-sponsored update to the subject thermal database. Thermal water quality standards should not be based on data that are thirty years old and are in the process of being updated.

**3. More Ecologically Relevant Estimates of Upper Lethal Temperatures are Available to the IEPA.**

Upper lethal temperature estimates in the OEPA (1978) database used in the MBI/CABB Report were based entirely on UILT and CTM values. However, as noted by the Report's authors (at p. 3), a new, and, we believe better, method to determine the thermal tolerance of fish is now



available. This new and better method is called the "slow heating method." The standard UILT method involves transferring the fish from the acclimation temperature directly to a higher temperature. The CTM method involves rapidly increasing the exposure temperature at a rate of 0.5-1.0 C/hour. The UILT and CTM methods do not as closely approximate real-world conditions as does the slow heating method. In the slow heating method, the exposure temperature is raised 0.5-1.0 C/day, thereby allowing the fish to adjust to the higher temperatures (Hokanson and Koenst 1986, Reash et al 2000). We believe the slow heating method more closely approximates natural conditions. It yields higher, but more realistic, upper lethal estimates. Because the database utilized by Yoder et al. (2004) is populated by data collected using the old methodologies, it underestimates the actual tolerance of the fish species selected for the ranking approach. This under-estimation of fish tolerances is shown by the fact that many of the fish species which the MBI/CABB Report finds should be limited or excluded by higher temperatures are indeed present and thriving

#### **4. A Questionable Extrapolation Procedure was Used.**

The authors describe how they extrapolate from a known to an unknown endpoint (Report at p. 4). They indicate that the preferred procedure (Step 1) is based on relationships within that species' family. However, species within the same family can exhibit considerable differences in their tolerances to temperature. For example, common carp, which is a member of the minnow family, is highly resistant to high temperatures (survival temp of 41.0 ° C, App Table 1) but silver shiner, another minnow species, has an upper lethal temperature that is 12 ° C cooler (29.1 ° C). Within the sucker family, white sucker is fairly sensitive (UILT temp of 31.4 ° C, App. Table 1), but smallmouth buffalo is much less so (39.3 ° C) (App Table 1). Therefore, the extrapolations performed in this manner do not produce reliable or defensible values.

#### **5. The Criteria for Selecting RAS should be Better Defined.**

The Report lists seven criteria for choosing RAS and provides the list of the species so selected in Table 1. (Report at p. 5) Table 1 could be improved considerably if it had columns indicating the basis for each species' selection. For example, the authors indicate that 12 of the 30 General Use species are recreationally or commercially important, but do not disclose which species fall into either category. The table of RAS selected also does not reveal whether any of these species are potential nuisance species. Finally, of the selected RAS, there is no disclosure of whether any were chosen based on Criterion 7, *i.e.*, species not necessarily present but representative of those that are. In order to allow an evaluation of the accuracy and reliability of the RAS selection process, all of the above information should properly be disclosed in the Report. In the absence of such information, no peer review of the Report's ranking approach can be conducted. Without this information, it is extremely difficult to determine whether, and to what extent, the RAS selection process performed in the Report is appropriate for the Lower Des Plaines River.

#### **6. Comments on Table 1 Species Selection**

In general, the species selected in each use classification are not surprising, with certain exceptions as noted below.

Yellow perch is properly excluded from Table 1, but it erroneously appears in Appendix (“App”) Table 3, where it is ranked as the fourth most sensitive species based on its upper lethal temperature. Yellow perch should be deleted from App Table 3; it is not a RAS.

Conversely, common carp is listed in Table 1 under all three use designation categories, but has been erroneously omitted from App. Table 3. It should be added.

Pumpkinseed sunfish is predominantly a lake species and although it occasionally is found in rivers, it is not representative of large, Midwestern rivers. It should be excluded.

White sucker is a common to abundant inhabitant of warmwater to coolwater rivers in the Midwest. However, it is rare to uncommon in large rivers (Smith 1979, Becker 1983) and thus not representative of them. It can exist in impounded rivers, but only if it has access to suitable spawning areas (*i.e.*, fastwater areas with gravel to cobble substrates). Such areas are essentially absent in the Lower Des Plaines River, explaining the absence or greatly reduced abundance of not only white suckers but other species with similar spawning requirements (*e.g.*, redhorse, most darters). Based on the size of the Des Plaines and the lack of appropriate spawning habitat, the white sucker is not a RAS.

For similar reasons, silver redhorse is not an appropriate choice for the modified use designation RAS list. While it can survive under impounded conditions, it is capable of doing so only if suitable spawning habitat is available elsewhere. As discussed above, such habitat is rare to absent in the UAA study area. Thus, silver redhorse should not be included in the modified use RAS list. It appears that the authors of this report agree with this analysis in that they provide a modified RAS both with and without silver redhorse. It is only the “without” list that is appropriate here.

#### **7. 100% Protection Is Overly Conservative and Contrary to Both Federal and Illinois Precedent.**

The approach in the MBI/CABB Report includes the selection of values that are based on the protection of 100% of the species included in the RAS list. This is an overly conservative approach that generally has not been used by the IEPA in developing water quality standards in the past. Similarly, the U.S. EPA’s approach to most water quality parameters is to set the numerical limit no higher than at the 95<sup>th</sup> percentile value of the genera tested. This is a clear recognition that it is not appropriate to base water quality standards on an approach that requires protection of 100% of the species 100% of the time. The conservative approach recommended by Yoder and Rankin is even more misplaced here given the well known ability of fish to avoid elevated temperatures and the fact that many of the species considered in their analysis are thriving (MWGen/EA Report 2003) in the Lower Des Plaines River despite the predictions of their “model” that these species should not be able to do so in the prevailing water temperatures.

## **8. The Historical Ambient Temperature Record Is Largely Irrelevant.**

Except for determining whether a proposed temperature is reasonably achievable, the Des Plaines River historical temperature record is irrelevant to the current or expected thermal conditions in the Lower Des Plaines River. Originally, the Des Plaines River had no connection with Lake Michigan. Historically, it was shallow and certainly warmer than it is now. Creation of the Chicago Sanitary and Ship Canal, which connected the Chicago and the Des Plaines River systems, reversed the flow of the Chicago River and allowed cool water from Lake Michigan to flow into the Des Plaines River. The “ambient” temperature of the Des Plaines River is now dictated by the amount of water being diverted from Lake Michigan and the operation of the huge Stickney WWTP. However, the amount of water available from Lake Michigan for the discretionary diversion is decreasing, and is legally mandated to go to zero in the year 2019. Therefore, it is not unrealistic to project that the river’s water quality will at that time be based entirely on treated and untreated wastewater effluents and intermittent runoff.

## **9. There is no Disclosed Basis for the Criteria Used to Establish the Temperature Average.**

The MBI/CABB Report (at page 8) lists five criteria and indicates that average temperature values should be consistent with these criteria. There is no explanation provided of the basis that was used to establish these five criteria and the associated cutoffs. For example, Criterion 3 indicates that there should be growth of at least 50% of the non-game fishes. What is the basis for selecting a growth rate of 50%? Further, there is no disclosure of which of these five factors drives the criterion recommended for each Use category. Without this information, it is not possible to fully evaluate the approach presented in the MBI/CABB Report.

## **10. The Summer Upper Lethal Temperatures in Table 3 Are Overly Conservative and should be Revised.**

The average and maximum upper lethal temperatures (29 ° and 31 ° C, respectively) provided in Table 3 and discussed on page 10 are based on the purported thermal tolerances of shorthead and golden redhorse. However, the 31° C UILT for these two species shown in App. Tables 3 and 4 was not experimentally derived, rather it was based on anecdotal field observations made over thirty years ago (Gammon 1973). More recent lab studies have demonstrated that shorthead redhorse is indeed more thermally resistant than originally reported (Reash et al. 2000). Reash et al. (2000) attempted to derive a UILT for golden redhorse but the resultant value was found to be unreliable. However, nearly identical CTM values were derived for both redhorse species, strongly suggesting that both have similar UILT values. We believe that this interpretation of the Reash et al. (2000) golden redhorse data is more reliable than relying on anecdotal field observations that are over thirty years old.

Yoder and Rankin (p. 10) seem to agree that the golden redhorse UILT of 31 ° C should be revised but note that “extending this data (i.e., using a UILT of 33.5 ° C rather than 31° C) to include golden redhorse resulted in a 0.5 ° C increase in these values.” This increase was small because the next most sensitive species, the white sucker, has a UILT of 31.4 ° C. However, as

discussed elsewhere in these comments, white sucker is not a RAS. The habitats in Dresden and Brandon Pools are marginal at best for white sucker and, as a result, it should not be a RAS. Since Yoder and Rankin properly did not include yellow perch as a RAS (Table 1), the most sensitive species (i.e., black crappie, white crappie, and emerald shiner) in their General Use list have a UILT of 33 ° C. Thus, the short-term thermal standard for General Use using the Yoder and Rankin approach should be 33 ° C, not 31 ° C.

For the Modified Use option, Yoder and Rankin considered two scenarios, one that included silver redhorse and one that did not. Because of the near absence of suitable spawning habitat, silver redhorse is not an appropriate choice for a Modified Use RAS. Furthermore, for the reasons articulated above, white sucker also should be excluded. Thus, the short-term standard for this use should be 33 ° C based on the exclusion of both silver redhorse and white sucker.

Yoder and Rankin also considered a General Use scenario that included sauger because “some commenters felt this was a representative species for the large rivers of Illinois.” We agree that sauger is a RAS for large Illinois rivers but it is not a RAS for the Lower Des Plaines River, which is the only area germane to this report.