APPROPRIATE THERMAL WATER QUALITY STANDARDS
FOR THE LOWER DES PLAINES RIVER

Summary Report
Prepared by Midwest Generation and EA Engineering, Science and Technology, Inc.

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I. INTRODUCTION

Midwest Generation, with the assistance of EA Engineering, Science and Technology, Inc., has prepared this report for inclusion in the record of the current Use Attainability Analysis (UAA) for the Lower Des Plaines River. Under the federal Clean Water Act regulations, a UAA is required in order to determine if fishable and swimmable uses, reflecting the goals of the Clean Water Act, are not attainable for a particular water body or segment thereof. [See 40 C.F.R. § 131.10(j)].

This report evaluates and compares the present physical, chemical and biological characteristics of the Lower Des Plaines River to the current and proposed future thermal regime of the waterway. The results of this evaluation and comparison support the application of thermal water quality standards that are biologically appropriate and adequately protective of the existing and potential uses of this waterway, given the constraints on the system that are permanent or cannot be mitigated.

A. UAA Regulatory Overview

A use attainability analysis is defined as:

> ...a structured scientific assessment of the factors affecting the attainment of a use which may include physical, chemical, biological, and economic factors as described in Section 131.10(g). [40 CFR Section 131.3].

A "use attainability analysis" includes six factors that are to be considered in determining whether the fishable/swimmable goals of the Clean Water Act are attainable for a particular water body. [40 CFR § 131.10(g)]. These six UAA factors are discussed in this report and are summarized in Appendix 1. Under the UAA regulation, only one or more of these factors must be satisfied in order to determine that a water body is not capable of attaining the Clean Water Act's fishable/swimmable goals. Of particular relevance in this report are the following four UAA factors (the paragraph numbering is as found in 40 CFR 131.10(g)):

> 2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the

discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;

3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;

4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in attainment of the use;

5. Physical conditions related to the natural features of the water body, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses.

B. Application of the UAA Factors to Assess Chemical, Biological and Physical Characteristics of the Lower Des Plaines River

U.S. EPA has long advocated the concept of independent application when using the assessment tools available to make use designation decisions:

> *"Independent application means that any one of the three types of assessment information (i.e. chemistry, toxicity testing results, and ecological assessment) provides conclusive evidence of nonattainment of water quality standards regardless of the results from other types of assessment information. Each type of assessment is sensitive to different types of water quality impact. Although rare, apparent conflicts in the results from different approaches can occur. These apparent conflicts occur when one assessment approach detects a problem to which the other approaches are not sensitive. This policy establishes that a demonstration of water quality standards nonattainment using one assessment method does not require confirmation with a second method and that the failure of a second method to confirm impact does not negate the results of the initial assessment."* (See U.S.EPA, June 19, 1991 Transmittal of Final Policy on Biological Assessments and Criteria).

Therefore, to reliably determine whether or not fishable and swimmable uses are attainable for the Lower Des Plaines River, the UAA must include consideration of **physical** and **biological integrity**, not simply chemical water quality. In EPA's Water Quality Standards Handbook, Second Edition (1994), the use of biological criteria to support designated aquatic life use classifications is strongly encouraged.

Approximately 20 years later, the U.S.EPA continues to endorse the use of biological assessments and criteria as a very reliable tool in the development of appropriate water quality standards:

> *"Ecological integrity is a combination of these three components: chemical integrity, physical integrity and biological integrity. When one or more of these components is*

degraded, the health of the waterbody will be affected, and in most cases, the aquatic life there will reflect that degradation. Aquatic life integrates the cumulative effects of different stressors such as excess nutrients, toxic chemicals, increased temperature, and excessive sediment loading. Therefore, bioassessments allow one to measure the aggregate impact of the stressors. Because biological communities respond to stresses over time, they provide information that more rapidly-changing water chemistry measurements or toxicity tests do not always produce. As such, bioassessment provides a more reliable assessment of long-term biological changes in the condition of a waterbody. The central purpose of assessing biological condition of aquatic communities is to determine how well a water body supports aquatic life". (EPA 822-F-02-006, Summer, 2002)

The importance of basing use designations on biological integrity (as the overall integrator of waterbody conditions) was emphasized at the U.S.EPA sponsored "National Conference on Tools for Urban Water Resource Management and Protection" in 2000. In particular, the relationship between the Index of Biotic Integrity (IBI), an indicator of biological health, and a qualitative analysis of overlying stressors in six major metropolitan areas in Ohio were used by Yoder, Miltner and White, (2000) to suggest that there is a threshold of watershed urbanization (e.g.>60%) beyond which attainment of warmwater habitat (equivalent to Illinois' General Use) is unlikely. Similar reliance on biological assessment data and information were also recognized by an number of experts in the proceedings of the National Symposium on "Designating Attainable Uses for the Nation's Waters" held on June 3-4, 2002 in Washington, D.C. (GLEC, July 2002).

While Illinois does not have an established bioassessment program in place for large rivers, the draft bioassessment methodology that the Illinois EPA has developed, based on smaller order streams, can be successfully applied to the Lower Des Plaines River. Further, because of more than 20 years of biological and habitat monitoring data available on the UAA Reach, there is an extensive data base to which this draft bioassessment methodology can be applied to make decisions regarding the appropriate use designations for the Lower Des Plaines River.

Certainly, the chemical water quality of the Lower Des Plaines River has improved over the past 20 years. However, as the U.S. EPA and others have stated, chemical water quality alone does not dictate the potential of the waterway from an ecological perspective. Because the UAA analysis by Novotny/Hey & Associates focuses primarily on the chemical water quality of the Lower Des Plaines River, the information and supporting data presented in this report will address the other two key elements of a UAA--the physical and biological aspects of the Lower Des Plaines River and their overall potential for improvement, in the context of the 6 UAA factors. This extensive review of the physical and biological characteristics of the water body shows that focusing primarily on the chemical quality of the Lower Des Plaines River does not provide a reliable basis on which to determine its use potential. The UAA analysis presented in this report shows that the physical and biological constraints present in the Lower Des Plaines River make the full fishable/swimmable uses inherent to a General Use classification unattainable in this water body. Barring further refinements, such as the addition of subclassifications, to the existing Illinois Use Classification system, the Lower Des Plaines River is properly classified as a Secondary Contact Use water body.

II. BACKGROUND

Much of the background information and data contained in this report was drawn from the comprehensive ecosystem study of the entire Upper Illinois Waterway (UIW) performed by Commonwealth Edison ("ComEd") in the early to mid-1990's. Development and implementation of this study was done under the direction of an ad hoc task force consisting of representatives from Illinois EPA, U.S. EPA Region 5, Illinois Department of Natural Resources and the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), as well as other interested public, private and academic groups. (See UIW Summary at Appendix 2) Representatives of Illinois EPA, IDNR and U.S. EPA have recognized the UIW Study as the most comprehensive, multi-disciplinary effort ever performed on this waterway.

The overriding purpose of the comprehensive, multi-year UIW investigation was to better understand the effects that temperature increases caused by power plants have on aquatic biota and especially their potential to stimulate or hinder improvement of the waterway.

A majority of the information collected as part of the UIW Study is still valid today. The UIW Study data and findings need to be carefully considered in the UAA for the Lower Des Plaines River, including any assessment of appropriate thermal water quality criteria for the Lower Des Plaines River, to ensure that the most complete and reliable data available are used to determine what use(s) are attainable for this water body. Due to their comprehensive length, this report cannot extensively reference the studies performed as part of the UIW effort, but does provide a full executive summary in Appendix 2. All UIW documents are publicly available for review and can be provided upon request. (See listing of UIW Study individual reports and content summaries in Appendix 3).

III. HISTORY OF THE WATERWAY

The 53-mile section of the UIW originally studied by ComEd is a mix of artificial and greatly-modified natural waterways extending Southwest from Chicago to the Kankakee River. (Figure 1). Early in the history of Chicago, a plan was conceived to protect the area's primary water supply, Lake Michigan, by constructing three man-made waterways to permanently reverse the flows of the Chicago and Calumet River systems away from the lake, and divert the contaminated water downstream where it could be diluted in the Des Plaines and eventually the Illinois River. The man-made Chicago Sanitary and Ship Canal, completed in 1907, merges with the Des Plaines River about 40 miles downstream of Lake Michigan near Lockport, Illinois. Diversion water from Lake Michigan increased the navigation capabilities of the system and provided additional waste dilution. Construction of the Cal-Sag Channel was completed in 1922, connecting the Calumet and Little Calumet Rivers with the Chicago Sanitary and Ship Canal. Construction of these man-made waterways was a significant ecological event. It provided a direct link between the Great Lakes Drainage and the Mississippi Drainage.

Reconstruction of the UIW in its present form began in 1919. A new and larger channel was constructed in the Lower Des Plaines River and the upper Illinois River to form a continuous

navigational channel from Lake Michigan to the Mississippi River. This new channel was at least nine feet deep and 300 feet wide throughout and greatly increased the barge transport capabilities of the system. The project included construction of seven major locks and three dams, including a 40-foot dam just south of Lockport and a 34-foot dam just south of Joliet at Brandon Road. A third, 22-foot dam was constructed at Dresden Island, less than two miles downstream from the confluence of the Kankakee and Des Plaines Rivers.

In its UIW Study, ComEd covered the 53-mile reach between the diversion from Lake Michigan at Chicago and the Dresden Island Lock and Dam. The current UAA study reach area is a subset of the entire UIW. It extends from the Lockport Lock and Dam on the Chicago Sanitary and Ship Canal (RM 290) down to the I-55 Bridge on the Lower Des Plaines River (RM 278). This subset of the UIW is referred to herein as the "UAA Reach".

A. Power Plants in the UAA Reach

There are two open-cycle, coal-fired power plants that discharge either into or immediately above the UAA Reach. These plants, formerly owned and operated by ComEd, were sold to Midwest Generation in December, 1999. They include:

Will County Station is located in Romeoville, Illinois, near the intersection of the Chicago Sanitary and Ship Canal and 135th Street. (RM 295.5) The station has a total of 4 units, with a combined capability of 1154 gross megawatts of electricity. (For reference: 1 megawatt is enough power to service approximately 1000 homes). The first Will County unit began operations in 1955; the most recent unit came on-line in 1963.

Joliet Stations #9 (Unit 6) and #29 (Units 7&8) are capable of producing a total of approximately 1414 megawatts of electricity. The stations are located in Will County, approximately one mile southwest of the City of Joliet, Illinois. (RM 285) They are located on the Lower Des Plaines River just downstream of the Brandon Road Lock and Dam. The older Joliet unit began operating in 1959; the two newer units came on-line in 1966. Joliet Station #29 has 24 supplemental cooling towers to assist with heat dissipation. These towers were installed in 1999 and are used, as needed, to maintain near and far-field compliance with the existing thermal water quality standards.

Figure 1: Map of Upper Illinois Waterway, Including UAA Reach

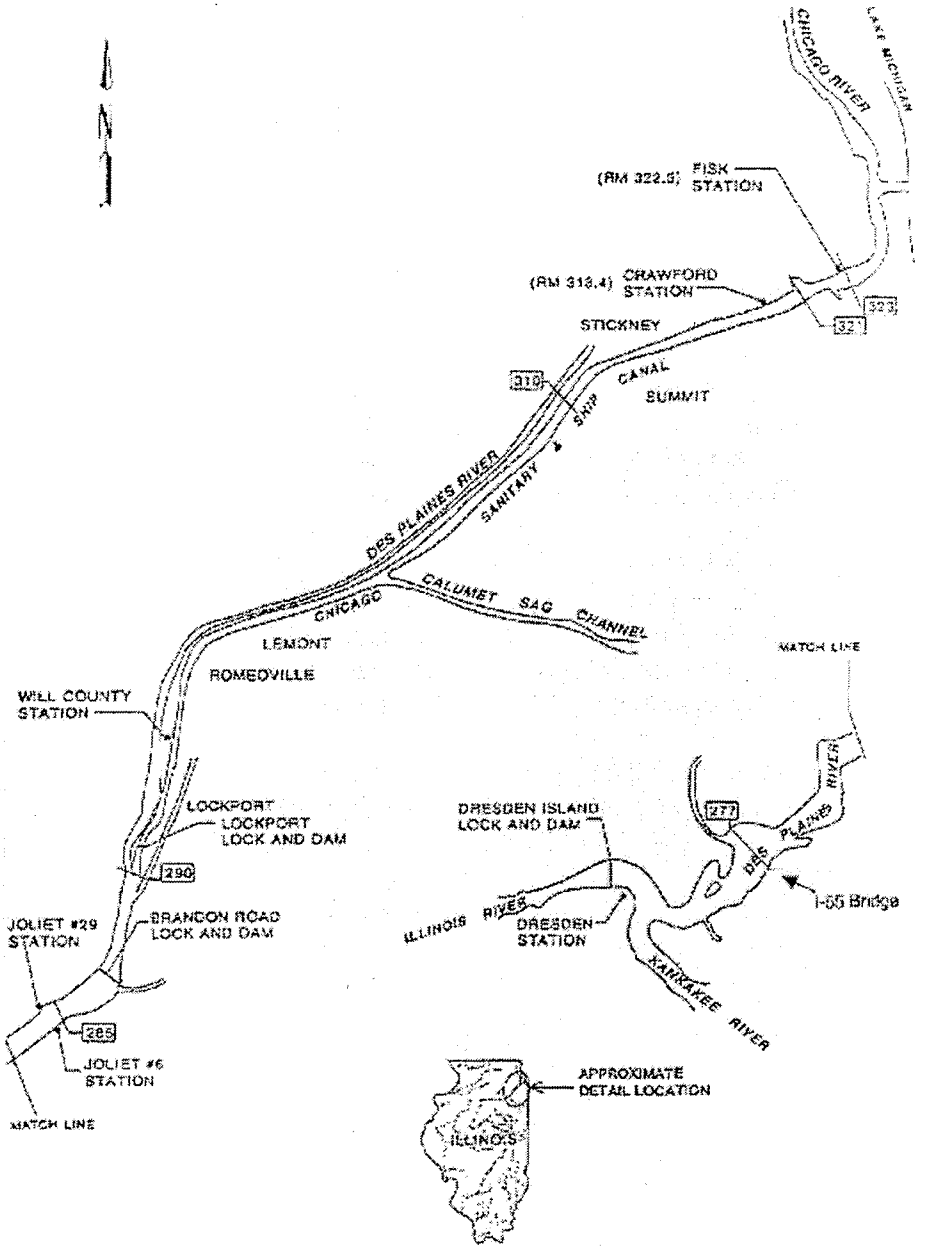


Table 1: Listing of Current Water Quality Limitations In Effect for the Lower Des Plaines River

PARAMETER	UNITS	GENERAL USE	SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE
pH	SU	6.5 minimum 9.0 maximum	6.0 minimum 9.5 maximum
Dissolved Oxygen	mg/L	5.0 minimum	4.0 minimum[2]
Arsenic	µg/L	(3)	1000
Barium	µg/L	5000	5000
Boron	µg/L	1000	1000
Cadmium	µg/L	(3)	150
Chloride	mg/L	500	---
Chromium (Total)	µg/L	---	---
Chromium (Trivalent)	µg/L	(3)	1000
Chromium (Hexavalent)	µg/L	(3)	500
Copper	µg/L	(3)	1000
Cyanide	mg/L	(3)	0.1
Fluoride	mg/L	1.4	15.0
Iron (Total)	µg/L	---	2000
Iron (Dissolved)	µg/L	1000	500
Lead	µg/L	(3)	100
Manganese	µg/L	1000	1000
Mercury	µg/L	(3)	0.5
Nickel	µg/L	1000	1000
Phenols	µg/L	100	300
Selenium	µg/L	1000	1000
Silver	µg/L	3.0	100
Sulfate	mg/L	500	---
Total Dissolved Solids	mg/L	1000	1500
Total Residual Chlorine	µg/L	(3)	---
Zinc	µg/L	1000	1000
Fecal Coliform Bacteria			
May-Oct.	#/100 ml	200[4]	---
Nov.-April	#/100 ml	---	

Table 1: Listing of Current Water Quality Limitations In Effect for the Lower Des Plaines River

PARAMETER	UNITS	GENERAL USE	SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE
Ammonia Nitrogen (total)	mg/L	15 [2]	---
Un-ionized Ammonia	mg/L	1.0	0.1
Nitrate Nitrogen	mg/L	---	---
Oil and Grease	mg/L	---	15.0
Total Phosphorus	mg/L	0.05 [3]	---
Aldrin	µg/L	---	---
Dieldrin	µg/L	---	---
Endrin	µg/L	---	---
Total DDT	µg/L	---	---
Total Chlordane	µg/L	---	---
Methoxychlor	µg/L	---	---
Toxaphene	µg/L	---	---
Heptachlor	µg/L	---	---
Heptachlor epoxide	µg/L	---	---
Lindane	µg/L	---	---
Parathion	µg/L	---	---
2,4-D	µg/L	---	---
Silver	µg/L	---	---

mg/L = milligrams per liter µg/L = micrograms per liter

1. 35 Ill. Adm. Code Part 302 (1999).
2. Excluding the Calumet-Sag Channel, which shall not be less than 3.0 mg/L at any time.
3. Acute and Chronic Standards (see Table 3-2).
4. (-) means no numeric standard specified; narrative standard applies.
5. Waterbody reaches physically unsuited for primary contact uses and not found in urban areas or parks may be designated as unprotected.
6. The allowable concentration varies in accordance with water temperature and pH values. 15 mg/L is the maximum total ammonia nitrogen value allowed. In general, as both temperature and pH decrease, the allowable value of total ammonia nitrogen increases as calculated from the un-ionized ammonia nitrogen standards.
7. Standard applies to certain lakes and reservoirs and at the point of entry of any stream to these lakes and reservoirs.

Table 1: Listing of Current Water Quality Limitations In Effect for the Lower Des Plaines River

Acute and Chronic Illinois General Use Water Quality Standards. [1]

Parameter	Units	Acute standard [2]	Chronic Standard [3]
Un-ionized ammonia			
April-October	mg/L	0.33	0.057 [4]
November-March	mg/L	0.14	0.025 [4]
Arsenic (total)	µg/L	340	150
Cadmium (total)	µg/L	exp[A+B ln(H)] A = -2.918 B = 1.128 but not to exceed 50 µg/L	exp[A+B ln(H)] A = -3.490 B = 0.7852
Chlorine (total residual)	µg/L	19	11
Chromium (total Hexavalent)	µg/L	16	11
Chromium (total trivalent)	µg/L	exp[A+B ln(H)] A = 3.688 B = 0.819	exp[A+B ln(H)] A = 1.561 B = 0.819
Copper (total)	µg/L	exp[A+B ln(H)] A = -1.464 B = 0.9422	exp[A+B ln(H)] A = -1.465 B = 0.8545
Cyanide (weak acid dissociable) [6]	µg/L	22	5.2
Lead (total)	µg/L	exp[A+B ln(H)] A = -1.301 B = 1.273	exp[A+B ln(H)] A = -2.863 B = 1.273
Mercury (total) [5]	µg/L	2.6	1.3

Where: Exp(x) = base of natural logarithms raised to x power

ln(H) = natural logarithm of hardness of the receiving water in mg/L.

1. 35 Ill. Adm. Code Part 302 (1999).
2. Not to be exceeded except where a zone of initial dilution is granted.
3. Not to be exceeded by the average of at least four consecutive samples collected over any period of at least four days.
4. American Public Health Association. 1998. Standard Methods for the Examination of Water and Wastewater. 20th edition. American Public Health Association, American Water Works Association, Water Environment Federation. 4500-CN I. STORET No. 718.
5. Human health standard is 0.012 mg/L.
6. Unless an effluent modified water is recognized in an NPDES permit.

IV. CURRENT UAA REACH USE DESIGNATION AND THERMAL WATER QUALITY STANDARDS

A "designated use" is the use specified in state water quality standards for each water body or segment. In setting use designations, a state is required to protect "existing uses." (40 CFR §131.10 and §131.12). "Existing uses" are defined as "those uses actually attained in the water body on or after November 18, 1975, whether or not they are included in the water quality standards." For the UIW, Illinois EPA is obligated to protect the uses actually attained as of November 18, 1975 or thereafter. In January, 1974, the Illinois Pollution Control Board (the "Board") designated the UIW as a "Secondary Contact and Indigenous Aquatic Life" use water body under the Illinois use classification system (hereinafter referred to as "Secondary Contact"). With little change since its adoption in 1974, the purpose of the Illinois Secondary Contact use classification is described in 35 Ill. Adm. Code §302.402 as follows:

> Secondary contact and indigenous aquatic life standards are intended for those waters not suited for general use activities but which will be appropriate for all secondary contact uses and which will be capable of supporting an indigenous aquatic life limited only by the physical configuration of the body of water, characteristics and origin of the water and the presence of contaminants in amounts that do not exceed the water quality standards listed in Subpart D.

The entire UIW from the South Branch of the Chicago River down to the I-55 Bridge has a designated use of Secondary Contact and Indigenous Aquatic Life. The narrative and chemical criteria associated with the Secondary Contact use designation are listed in Table 1. Other waters in the state (aside from Lake Michigan and Public and Food Processing Water Supply, which have their own specific limitations) are designated as General Use waters under the Illinois use classification system.

A. Thermal Water Quality Standards

With regard to thermal water quality limitations, there are significant differences between Secondary Use and General Use, as summarized below:

1. Secondary Contact

- Temperature shall not exceed 93 °F for more than 5% of the time, or 100 °F at any time (at the edge of the allowable mixing zone defined by Rule 302.102 of IAC, Title 35, Chapter 1, Subtitle C).
- Total of approx. 438 allowable excursion hours in any 12-month rolling period
- 100 °F maximum limitation, year-round

2. General Use (applicable downstream of the I-55 Bridge)

Narrative Criteria:

- There shall be no abnormal temperature changes that may adversely affect aquatic life unless caused by natural conditions.
- The normal daily and seasonal fluctuations which existed before the addition of heat due to other than natural causes shall be maintained.

Numeric Criteria:

- The water temperature at representative locations in the main river shall not exceed the maximum limits below during more than 1% of the hours in any 12-month period ending with any month. Moreover, at no time shall water temperature at such locations exceed the maximum limits by more than 3 °F:

  DECEMBER-MARCH: 60 °F

  APRIL-NOVEMBER: 90 °F

- Total of approx. 87 allowable excursion hours in any 12-month rolling period

- The maximum temperature rise above natural temperatures shall not exceed 5 °F.

The General Use thermal limitations are considerably more stringent than the Secondary Contact limits, both in numeric criteria and number of allowable excursion hours. Of equal concern here is that the General Use thermal standards by their express terms were intended to apply to "natural" waterways. The narrative General Use thermal standards assume that "natural" conditions existed in the waterway before the addition of point source discharges. Hence, the General Use thermal standards prohibit temperatures from rising more than 5 °F above "natural temperatures" and also require the maintenance of natural fluctuations in thermal levels in the waterway that existed before the addition of "other than natural" causes. The General Use thermal water quality standards were never intended to apply, and by their terms, cannot be applied to a waterway like the UAA Reach. The Lower Des Plaines River is not a "natural" waterway. It is a primarily man-made, artificial waterway with physical characteristics ill-suited to the application of General Use standards. It was constructed and/or altered for the purpose of protecting the water quality of Lake Michigan and maximizing commercial navigation, with the help of a lock and dam system that artificially creates and regulates water levels and flows. It does not have a "natural" temperature. It has temperatures that are dictated by the man-made uses for which it was constructed and/or altered.

3. Adjusted Thermal Standard for I-55

In addition to the two thermal limitations outlined above, there is an adjusted thermal limitation at the I-55 Bridge currently applicable only to Midwest Generation Power Plants. This adjusted limit was granted by the Illinois Pollution Control Board (IPCB) in Docket

Number AS96-10 , based on the results of the comprehensive UIW study performed by ComEd and overseen by the UIW Task Force. (See IPCB Order and Opinion, AS96-10, dated Oct. 3, 1996). The Adjusted I-55 Thermal Standard includes the following thermal limits and conditions:

Adjusted I-55 Thermal Standard

January:	60 °F
February:	60 °F
March:	65 °F
April 1-15:	73 °F
April 16-30:	80 °F
May 1-15:	85 °F
May 16-31:	90 °F
June 1-15:	90 °F
June 16-30:	91 °F
July:	91 °F
August:	91 °F
September:	90 ° F
October:	85 ° F
November:	75 ° F
December:	65 ° F

The Adjusted I-55 Thermal Standard may be exceeded by no more than 3 ° F during 2% of the hours in the 12-month period ending December 31, except that at no time shall Midwest Generation's plants cause the water temperature at the I-55 Bridge to exceed 93 ° F.

- A total of 175 excursion hours per calendar year are allowed.

The Adjusted I-55 Thermal Standard replaces the General Use Thermal Water Quality Standard for the Midwest Generation Plants. The Adjusted I-55 Thermal Standard recognizes the limitations and artificial influences on the thermal conditions of the UAA Reach while continuing to protect the existing uses of that waterbody.

V. THE RELATIONSHIP BETWEEN THE ADJUSTED THERMAL STANDARD AT I-55 AND THE UAA FOR THE LOWER DES PLAINES RIVER

In seeking the thermal adjusted standard from the IPCB in 1996, ComEd was required, in part, to show that the proposed adjusted standard would not adversely impact or prevent improvements to the aquatic community within the UAA Reach. In that proceeding before the IPCB, ComEd presented data for the entire UIW waterway, from Lake Michigan downstream to the Dresden Island Lock and Dam. The data presented demonstrated that thermal discharges from the power plants are not the main factor limiting further improvements in the aquatic community in the entire waterway, including the UAA Reach. There are other physical and biological constraints that prevent those improvements. These findings from the UIW Study, relied upon previously by

the IPCB in AS96-10 adjusted standard proceeding, are equally applicable here in the UAA of the Lower Des Plaines River.

According to Section 27(a) of the Illinois Environmental Protection Act (the "Act"), the IPCB was required to take into account the following factors in determining whether to grant the adjusted thermal standard requested by ComEd:

(a) the existing physical conditions;
(b) the character of the area involved, including surrounding land uses;
(c) zoning classifications;
(d) nature of the receiving water body, and
(e) the technical feasibility and economic reasonableness of measuring or reducing the particular type of pollution.

The Illinois EPA also addressed each of these factors in its recommendation filed with the Board to grant the adjusted standard in AS96-10. (AS96-10 Agency Recommendation, filed August 9, 1996) The IPCB summarized the Agency's recommendation as follows:

> While stating that it was "technically feasible" to reduce the effluent temperature from the plants to meet the General Use Thermal WQS (at I-55) by the use of cooling towers... the Agency provided the opinion that the costs of installing additional cooling "may not be economically reasonable when compared to the **likelihood of no improvement in the aquatic community of the UIW**". (AS96-10, Opinion and Order at p.7)--(emphasis added).

After a thorough review of the information presented in the AS96-10 proceeding, in October, 1996, the Board granted ComEd the requested I-55 adjusted thermal limitations applicable at the I-55 Bridge in the Des Plaines River. (General Use thermal water quality standards continue to apply to the waterway below the I-55 Bridge). In granting ComEd the thermal adjusted standard, the Board accepted, with the Illinois EPA's support, the findings of the UIW Study. The UIW Study found that the operation of these power plants does not interfere with maintaining a reasonably balanced indigenous community of aquatic organisms in the UIW consistent with the limited physical habitat and history of chemical contamination that remains in the sediment and the predominant uses of the waterway, namely barge transport and conveyance of non-point and treated point source discharges.

In 2000, with Illinois EPA support, the Board again found that the conditions in the UIW, including the lack of impact that the adjusted thermal standards would have on the ecosystem of the receiving waterway, supported the transfer of the adjusted thermal limits from ComEd to Midwest Generation. (AS96-10 Opinion and Order, March 16, 2000)

The Board concluded that conditions in the Lower Des Plaines River in 2000 had not changed appreciably from when the original thermal adjusted standard was granted, based on the 1991-1995 data presented in the UIW Study. Today, just a few years later, these significant limiting factors in the UAA Reach are still present and prevent it from attaining full General Use status.

There have been no significant changes in Midwest Generation's operation of its power plants since the AS96-10 adjusted thermal standard was granted. No adverse impacts have been observed on the indigenous fish community during the course of the plants' operation since Midwest Generation assumed ownership in late 1999. Annual fisheries monitoring has demonstrated that the fish community present is consistent with what one would expect for an impaired waterway. Midwest Generation continues to monitor the fish community in the system, as well as temperature and dissolved oxygen at the I-55 Bridge, on a regular basis. Results of these studies are submitted to Illinois EPA and other regulatory/environmental groups on an annual basis. The more recent monitoring results continue to show no appreciable changes from the 1991-1995 data on which the IPCB granted the thermal adjusted standard.

VI. CURRENT THERMAL COMPLIANCE STATUS

All thermal discharges from Midwest Generation's power plants continue to meet the near-field Secondary Contact standards at the edge of the allowed mixing zone, as well as the far-field adjusted thermal standard at the I-55 bridge. Compliance is maintained through continuous real-time monitoring, as well as the use of customized thermo-hydrodynamic modeling to adjust station operations, when warranted, to meet both near and far-field thermal limitations.

VII. PHYSICAL/HYDRAULIC/CHEMICAL NATURE OF THE SYSTEM

The upper two-thirds of the UIW can best be characterized as a slow-moving, relatively uniform canal with little or no natural shoreline. The bottom one third is, in essence, a series of impoundments separated by locks and dams. The hydrology of the entire system is complex, owing to the diverse mixture of water sources and their inherent flow variabilities. The flow rate in the system is unstable, especially in close proximity to the Locks and Dams, and is largely controlled by flows regulated by the locks and dams, in response to navigational needs, as well as upstream run-off events. (MWRD, 1992)

The inputs from all water sources vary seasonally, although the system is dominated by wastewater treatment plant discharges year-round (Dick Lanyon, MWRD, personal communication). Currently, summer discretionary diversions from Lake Michigan account for less than 50% of the overall flow. Moreover, as the discretionary diversion from Lake Michigan into the Ship Canal incrementally decreases as more lake water is used for domestic purposes, the system will eventually be dominated solely by wastewater treatment plant (WWTP) flows and non-point source run-off year-round, without the benefit of any dilution water from Lake Michigan.

A. Brief Description of the Pools Comprising the Upper Illinois Waterway

Lockport Pool (Not part of the UAA Reach): 34 mile reach. Narrow, dredged waterway with borders comprised of vertical rock, pilings or rip-rap. Depths vary from 16 to 26 feet.

Brandon Pool: 5 mile reach. Extends for five miles from the Lockport Lock and Dam to the Brandon Road Lock and Dam. The Des Plaines River enters the Brandon Pool just downstream

of the Lockport Lock and Dam (RM 290) at which point the waterway changes from a narrow man-made channel to a wider canal with an average depth of 20 feet and variable width.

Dresden Pool: 15 mile reach. Extends from the Brandon Road Lock and Dam down to the Dresden Island Lock and Dam. Main channel depths vary from 15 to 20 feet. The Dresden Pool has less artificial shoreline than the other two navigational pools. In addition, it has limited off-channel backwater and slough areas which are largely absent in the upstream reaches. Dresden Pool also has several minor tributaries, including the DuPage River, Hickory Creek, Jackson Creek and Grant Creek.

Both the Brandon Pool and upper portion of the Dresden Pool are being evaluated to determine if it is appropriate to change their current use designation. Lockport, Brandon and Upper Dresden Pool waters are currently designated as Secondary Contact waterways. (See Table 1)

B. Effects of Artificial Flow Control and Barge Traffic

From the information presented to the UAA Task Force, Hey and Associates' cursory review of selected data and conclusions regarding the lack of impact by barge traffic on the system is notably incomplete. The review was largely confined to the potential effects on main channel chemical water column quality. It did not take into consideration the significant impacts that frequent barge traffic in the UAA Reach has on the aquatic biota or their preferred habitats within the waterway as a whole.

The transportation of commodities along the UAA Reach continually affects the physical and biological quality of the system. The waterways are typically ice-free in the winter, allowing barges to navigate the UAA Reach year-round. Pool water levels are variably controlled to aid barge navigation, as well as to reduce flooding, thereby eliminating environmentally beneficial seasonal flushing events found in natural systems. The frequent manipulation of pool levels and flows to balance navigational requirements, along with the need to release the magnitude of excess water resulting from rainfall and snowmelt runoff, results in continuous disruptions to the biota that are not found in natural systems. Due to the relatively narrow breadth of the waterway, surge effects from the barges continually disrupt the channel border areas and carry fine-grained sediments into protected backwater and off-channel habitats. (Burton, 1995b)

The constant barge traffic through the UAA Reach may adversely affect aquatic organisms, particularly fishes, by:

(1) physically injuring or stranding fishes,
(2) disrupting or disturbing spawning habitat,
(3) uprooting aquatic vegetation,
(4) increasing turbidity via resuspension of bottom materials, and
(5) enhancing toxicity by resuspending and dispersing the fine-grained sediments shown to be associated with toxic compounds.

The net effect of barge traffic on the UAA reach is to make the main channel and border areas a less hospitable environment for most aquatic life and for recreational users alike.

As acknowledged by U.S. EPA and well-established in the literature, the presence of dams reduces the abundance and diversity of riverine species. This is a result of interrupting or eliminating migration, the pooling effect upstream of each dam, the sediment that builds up behind dams, etc. Species most effected are so-called fluvial specialists (e.g., most darters, many suckers, etc.), whereas habitat generalists (e.g., common carp, gizzard shad, channel catfish), and pelagic species (e.g. emerald shiner, freshwater drum) do quite well under impounded conditions. Similarly, simple lithophiles (e.g., redhorse and most darters), which require clean, hard substrates, do poorly in impounded situations because of increased siltation while those that are nest builders (e.g., centrarchids), or have modified spawning strategies (e.g., bluntnose minnow) do quite well under the same set of circumstances.

The studies that U.S. EPA conducted and/or sponsored on the Fox River clearly demonstrate these impacts as shown by declines in IBI scores upstream of each dam. The adverse impacts on aquatic communities caused by dams are recognized by other Region 5 States. For example, Wisconsin and Michigan are actively promoting dam removal. Ohio has a separate use classification that recognizes effects from dams, as reflected by the subcategory of their Modified Warmwater Habitat (MWH) designation noted as "impounded". In addition, Ohio also retains a MWH subcategory for "Channel-Modified" conditions. (See Table 7-15 of Ohio Administrative Code, Chapter 3745-1, effective July 7, 2003).

A recent study by United States Geological Survey (USGS) and the Illinois Natural History Survey (INHS) has documented direct mortality to aquatic life caused by towboats. Gutreuter et al (2003) found that various medium to large fish were killed as a result of propeller strikes in Pool 26 of the Mississippi River, as well as the lower portion of the Illinois River. They estimated that 790,000 gizzard shad were killed in just this area as a result of propeller strikes. The number of fish killed was a function of the number of fish killed per kilometer times the amount of barge traffic (kilometers traveled). On a large river such as the Mississippi, at least some fish will move away in response to oncoming barge traffic. (Lowery 1987, Todd et al 1989). In a smaller, narrower river like the Des Plaines, propeller avoidance would likely be more difficult, so it is reasonable to assume that the mortality rate estimated for the Mississippi River will at least be as high and may be higher in the Des Plaines River. So, in addition to detrimental effects due to re-suspension of sediment (contaminated and otherwise) and localized changes in water levels due to barge traffic and storm water control, direct mortality to the aquatic community due to barge traffic also has now been documented.

The system's hydraulic modifications are solely under the control of MWRDGC and the U.S. Army Corps of Engineers, and are in place exclusively to accommodate flood control and commercial navigation. There is no indication that navigational/flow control and ensuing barge traffic will ever be removed as a existing use for this waterway, as "navigation" is a protected use under the Clean Water Act. (See Clean Water Act, § 303(c)(2)(A)). As such, it constitutes a "permanent" modification which significantly precludes the attainment of full General Use in the UAA waterway under Factor #4 of the UAA criteria. (Appendix 1).

A considerable body of research has been collected during the past 20 years showing that significant adverse impacts are associated with the type of hydraulic modifications found in the

UAA Reach. For similar conditions, other states, such as Ohio, have refined their use classification systems to address the specific limitations posed by such modifications Here, even the IEPA Consultant's Draft UAA report acknowledged (See Draft UAA Report, p. 8-16) that expectations for the Upper Dresden Pool were lower because of hydraulic impacts and thus suggested the creation of a proposed use category called "General Use Impounded". Clearly, the reasonable biological expectations for areas like the UAA Reach are lower than those required for a General Use Classification System. The hydraulic modifications in the UAA Reach support either retention of the existing Secondary Contact use or creating a new use that could include modified water quality standards and associated criteria to reflect the aquatic community and recreational use limitations imposed by such adverse, persistent constraints.

C. Pollutant Loadings to the UAA Reach

A major component of the flow to the UAA Reach, 70% or more of the flow upstream of Brandon Road Lock and Dam is derived from treated wastewater discharges (Final Report, UIW Study, 1995. p. 10.4-2). These discharges,, by their nature and volume alone, remain a significant influence on conditions for aquatic life in the UAA Reach, and the UIW as a whole. A wide variety of industrial facilities line the shores of the UIW, particularly in the Lockport and Brandon Pools. (There are no power plants that discharge directly into the Brandon Pool). Discharges from these facilities are currently controlled by the NPDES permitting program, in accordance with the existing Secondary Contact Water Quality Standards.

Current monitoring data presented in the preliminary UAA reports indicate that water column quality may have improved over the years to the extent that most General Use chemical criteria are now being met within the waterway below Brandon Lock and Dam, and possibly upstream as well. (This subject is addressed in detail in the Hey and Associates' Draft Final UAA Report and will not be described here). However, there are still many non-point sources, as well as combined sewer overflows (CSO), that contribute to the overall pollutant loading to the system, including its sediment contamination, and are not readily controllable through current regulatory mechanisms. According to the U.S. EPA's review of the states' 2002 section 303(d) Lists, pathogens are the second most frequent cause of water quality impairments under the Clean Water Act. Excessive nutrients are also among the top four leading causes of water quality impairments. (U.S. EPA, August 2003). Hey and Associates found that the General Use fecal coliform standard cannot be met in the UAA Reach and that nutrient standards not yet developed but under consideration for Illinois General Use streams also may not be attainable in this waterway (Draft UAA Report, Chapter 7)

D. Extent and Physical Characteristics of Sediments in the UIW

From an aquatic ecological perspective, a significant stressor in the UAA Reach is the accumulation of fine-grained sediments and the presence of legacy contaminants from historic discharges. Next to structural habitat availability (discussed in the following section), the physical nature of the sediment in the UIW continues to be one of the most significant factors adversely influencing the present and future expected assemblage of aquatic biota present in the Lower Des Plaines River.

In the July 2002 U.S. EPA draft guidance on non-point source pollution, U. S. EPA identified many detrimental effects on aquatic life caused by excessive sedimentation from urban run-off. (U.S. EPA, July, 2002. p. 26-31) Sediment, whether contaminated or not, was found to be the leading cause of impairment accounting for 38% of the impaired waters in the nation. More recently, the U.S. EPA reported that "[s]edimentation and siltation problems account for more identified water quality impairments of U.S. waters than any other pollutant." (U.S. EPA, August, 2003). Excessive erosion, transport and deposition of sediment in surface waters is a significant form of pollution. Sediment imbalances impair many waters' designated uses. Excessive sediment can impair aquatic life by filling interstitial spaces of spawning gravels, impairing fish food sources, filling rearing pools, and reducing beneficial habitat structure in stream channels.

While the UIW Study did not quantify the amount of sediment present within the waterway, it did examine the types of sediment present, as well as its depositional pattern, particularly as it relates to the presence of contaminated sediment in the waterway.

The extensive studies performed by ComEd in the mid 90's (Burton, 1995a and 1995b, and 1998, 1999) found that contaminated sediments occur in all three navigational pools and are present primarily in side-channels and backwater areas. Sediment inputs from local drainages appear to have covered the historically contaminated sediments in some areas, especially along the lower reaches of the Dresden Pool. However, substantial deposits of fine-grained and potentially contaminated materials remain throughout the UIW, including in the limited habitat areas in the UAA Reach, posing a permanent impediment to significant improvement of overall ecological integrity of the system. In a recently completed (EA. May, 2003) habitat evaluation on the Dresden Pool, it was found that sedimentation was moderate to severe in many (23 out of 34, or 70%) of the areas where QHEI scores were calculated. Sedimentation appears to have gotten worse over the past 5-10 years (e.g., DuPage Delta). (Maps of QHEI locations are available upon request--large bmp files: 9.8MB).

A key limiting factor to improved biological conditions in the UAA Reach is the physical characteristics of the sediment itself (i.e., fine, silty, organic). The fine, silty and organic nature of the sediments are not suitable for many higher quality fish species which need a hard, clean substrate for spawning. Even if the stream could be remediated and the existing sediment (contaminated or not) removed, the nature of the waterway itself (e.g. impounded) would ensure that additional fine, silty sediment (whether clean or contaminated) would continue to be deposited, thereby preventing an improved habitat for better quality aquatic life. The unpreventable and irreversible accumulation and physical quality of the sediments that will always be present in the system is limiting further biological improvements in the UAA Reach, with existing, depositional area sediment contamination exacerbating the fundamental siltation problem.

As part of ComEd's UIW Study, conducted from 1991-1995, a thorough literature review (EA, 1992), followed by a detailed risk screening (LMS, 1995), defined historic patterns of sediment contamination in the Lower Des Plaines River and identified the following list of contaminants of special concern: **ammonia, arsenic, cadmium, chlordane, chromium, copper, DDT, dieldrin, lead, mercury, nickel, PCBs, PAHs and zinc.**

Intensive sediment and immediately overlying water column samples were subsequently taken and analyzed as part of the UIW study. (Burton, 1995a) Toxicity varied among pools and habitat types. Differences were correlated with sedimentation patterns. Fine-grained sediments from depositional areas were found to be the most toxic. Overlying waters also were found to be toxic. These fine-grained, contaminated sediments tend to occur at the tributary mouths and in backwater and protected areas of main channel border habitat---especially in the Lockport and Brandon Pools. These contaminated sediment depositional areas provide the primary source of potential habitat for the fish community. As such, the fish are likely exposed to whatever contamination currently exists within these specific areas. In contrast, sediments collected from main channel habitat and power plant intakes and discharges throughout the UIW generally had no or very little sediment toxicity. However, these areas do not provide suitable aquatic habitat for most aquatic organisms.

Monitoring by the Illinois Department of Natural Resources (IDNR) has shown significant body burdens of contaminants in adult, bottom-feeding fishes within the UAA Reach, as well as elsewhere in the UIW. These results are used by the Illinois Department of Public Health (IDPH) to establish annual human health risk advisories. (IDNR, 2002-2003 and IDPH, 2002-2003) There is an on-going consumption advisory for bottom-feeding fish species in effect for the Dresden Pool, as well as the upstream reaches and further downstream. This fish consumption advisory is clear and continuing evidence of the prevalence and persistence of sediment contamination in the UAA Reach.

The highest levels of toxicity were found in sediments collected between the junction of the Cal-Sag Channel and the Chicago Sanitary and Ship Canal and the Brandon Road Lock and Dam tailwaters. The Brandon tailwater area has been previously identified as the best quality aquatic habitat in the UAA Reach, based on its physical characteristics. (These are the same depositional areas AquaNova and Hey and Assoc. identify as potential "recreational use" waters (littoral zones)). Sediment toxicity in the Dresden Pool was more variable than in the two upper pools, with effects observed predominantly on growth. Toxicity was not restricted to the surface sediments, as much of the historic deposition has since been covered over by cleaner material.

More recent sediment sampling in the UAA Reach was performed by U.S. EPA Region 5 during the summer of 2001. Results of this investigation only have been released as part of the draft UAA Report, and have not undergone prior review by the UAA Biological Subcommittee or the UAA Workgroup. A thorough review of this data should be conducted as part of the overall evaluation of the future use potential of the waterway; however, these results must also be viewed with caution. Sediment is so heterogeneous and selectively dispersed in the system that unless a large quantity of samples are taken and analyzed, as was done in the previous UIW Study, the sampling may not be fully representative of the UAA Reach. Areas of significant contamination may be missed by a random sampling program. The draft UAA Report presents only average sediment sampling values from the U.S. EPA sediment sampling database. This partial disclosure of the U.S. EPA 2001 sediment sampling results does not allow for a meaningful, scientific assessment of the data. The average values do not reveal whether they reflect either a broad or narrow range of individual sediment sampling location results.

Grouping sediment data together to present only an "average" concentration of chemicals/metals/ toxics does not provide a true picture of where the specific areas of contamination are or the associated contamination levels. Averaging dampens out the heterogeneity of sediment quality and distribution, which is an extremely important factor in determining the adverse exposure levels sediment present to biological organisms. The data presented in the draft UAA Report does not disclose or differentiate between sediment sample type(s) or specific sampling site(s) at any given River Mile location. Thus, there is no way to determine if it reflects the results of main channel or side-channel/backwater areas. As explained above, sediment distribution (and any associated contamination) is extremely heterogeneous in nature within the UAA Reach. Depositional areas that would otherwise provide available fish habitat, such as those found just above or below lock and dams or backwaters/side channels, have large accumulations of sediment, while locations near the main channel may have sparse or no sediment accumulation, due to the scouring effects of barges and sporadic high river flows. Accordingly, sediment sampling results that average the values across various types of sediment areas will likely understate the levels of sediment toxicity present in the aquatic habitat areas in the UAA Reach.

In contrast, the sediment data obtained during the course of the UIW studies has been fully disclosed and peer reviewed. It represents the most comprehensive record available of current sediment quality and composition in the system, as well as how its presence in various locations relates to habitat quality and toxicity, within the UAA Reach and beyond. Since sediment characteristics do not change appreciably over a few year's time, the results of the UIW sediment characterization/toxicity work remain valid and applicable to this UAA process. A thorough and reliable assessment of sediment quality is critical to the overall use designation assessment of the Lower Des Plaines River. It affects the assessment of both biological habitat quality and the long-term potential for future recreational activity in the waterway. As noted earlier, the areas that are the most important biologically are also the areas that have been found to be the most contaminated.

The IEPA consultants assume that any contaminated sediments can be removed permanently and are not a limiting factor to the overall improvement of the waterway. However, this contamination is the result of historic deposition. It is not solely due to current point source discharges which could, theoretically, be controlled through tighter NPDES permit limits. No proposal, plan or funding has yet been identified by anyone that would remove the biological limitations these sediments (contaminated and otherwise) place on the UAA Reach and prevent them from reoccurring.

Even if remediation of any historically contaminated sediments was feasible, the impounded nature of the waterway will result in the continual deposition of fine, silty sediments, especially in the main-channel border, side-channels and backwaters where the majority of aquatic organisms reside. This type of sediment, as well as the continual barge traffic that affects its ultimate location in the waterway, is not conducive to the development of an improved biological community. The physical quality of the sediments in the system will continue to limit further biological improvements, with existing, depositional area sediment contamination exacerbating the siltation problem. The presence and persistence of fine-grained sediments in the UAA Reach constitutes a "lack of proper substrate..., unrelated to water quality," within the

meaning of the UAA regulations (UAA Factor #5), that preclude the attainment of aquatic life protection uses.

E. Effect of Temperature on Contaminated Sediments

Generalizing on the effects that elevated water temperatures may have on contaminants in the UIW is a difficult task. Elevated water temperatures may increase the rate of chemical or biological degradation of complex organics, strengthen or weaken the physical or electrostatic bonding of toxicants to inert substrates or to other chemical molecules, increase or decrease the rates at which organisms take up materials, increase physiological capabilities of the organism to eliminate or metabolize toxicants, thereby altering the level of concentration of the chemical at which toxic effects are expressed, and so on. Since it has been shown that the thermal discharges to the system are buoyant and do not generally affect the lower portion of the river, the sediments are not likely exposed to high water temperatures and should not be impacted by them, either positively or negatively. (Burton, 1995a) In any event, the overriding negative effects caused by the levels of contamination that remain present in the system, as well as the presence of fine-grained sediments themselves, regardless of whether they are contaminated or not, pose a continuing concern for the future potential of the waterway to meet a higher use.

F. Physical Habitats

1. Types and Availability of Physical Habitats

An obvious requirement for a diverse aquatic biota is a suitable variety of living spaces. As part of the original UIW study performed by ComEd, the entire UIW was surveyed to determine the types, distribution and relative amounts of physical habitats available in the three navigational pools. (Habitat definitions conventional for large rivers and reservoir systems were used in the survey). These habitat classifications are still valid today, as they are based on physical characteristics of the waterway, that have not changed appreciably since the UIW study. (EA, 1993)

Main Channel:	51.6%
Main Channel Border:	22.4%
Backwaters, Sloughs and Artificial Embayments:	10.4%
Tributary Deltas:	7.0%
Tailwaters:	4.6%
Tributary Mouths:	3.0%
Intake/Discharge Embayments:	1.0%

The preponderance of habitat available in the system is main channel (MC) and main channel border (MCB), areas where the effects of barge transport and industrial and municipal discharges are especially dominant. Main channel habitat, which accounts for more than 50% of the available area, is poor habitat for most fishes owing to excessive depths, scour and lack of food resources. Protected backwater areas and tributary mouths are almost non-existent in the Lockport Pool and uncommon in the Brandon Pool. These two upper pools are primarily artificial or dredged waterways with a uniform bottom and shear rock, piling or rip-rap borders.

A greater diversity of habitats is available downstream in the Dresden Pool, although these are still adversely affected by barge traffic and historical sediment deposition.

2. Physical Habitat Quality

Quantitative techniques for evaluating physical habitat in large river systems are generally lacking. Although it has shortcomings and limitations, the best quantitative system available for the UIW is the Qualitative Habitat Evaluation Index (QHEI) (Rankin, 1989). This numeric index ranks aquatic habitats as to selected attributes, availability and desirable quality characteristics. The outcome is a numeric score (ranging from 0-100) that allows comparison of habitats from other aquatic systems. The higher the numeric score, the better the quality of aquatic habitat in the waterway. The points allotted for the QHEI scores are divided as follows: Substrate (20 pts), Cover (20 pts), Channel Morphology (20 pts), Riparian Zone (10 pts), Pool/Riffle Quality (20 pts) and Gradient (20 pts).

The UIW studies found that average QHEI scores for the different habitat types ranged from 42 to 69, with the higher values attributed only to tributary mouths, a small riffle-run area in the Upper Des Plaines River, and the Brandon Road tailwater. The predominantly low scores reflect the artificial nature of the system and the limited variety of habitat. Channelization, inadequate in stream cover, lack of riffle-run habitat, excessive siltation, lack of clean, hard substrates, and poor quality riparian and floodplain areas all contribute to the low QHEI scores.

The UIW study also found that habitat conditions were poorest in the Lockport Pool (mean QHEI = 45.3), marginally better in the Brandon Pool (mean QHEI = 48.6) and better still in the Dresden Pool (mean QHEI = 54.8). However, even the best of these three QHEI scores is well below values typical of unaltered systems of comparable size. For example, Ohio EPA identifies a target minimum value of 60 as necessary to assume a potential for warmwater habitat use. All of the QHEI scores for the UAA Reach, except for the Brandon Road tailwater, were well below the target score of 60 that would be the Ohio equivalent to consider a General Use designation.

A more recent and more extensive habitat evaluation study was performed by EA Engineering, Science and Technology ("EA") in May 2003 on the entire Dresden Pool. QHEI scores were calculated along both banks of the river at 0.5 mile intervals throughout the pool. Field biologists from Illinois EPA accompanied EA during this investigation. Results are presented in Tables 1A and 1B. The results of this 2003 study show that habitat conditions today in the UAA Reach remain relatively unchanged from when first reviewed as part of the comprehensive UIW studies conducted in the early to mid-1990s. In fact, average scores now are even lower than they were in the mid-90's. The recent QHEI scores for the UAA waterway are all clearly well below what would be expected for a General Use stream under the Illinois use classification system. EA personnel reviewed the QHEI scores collected at all 34 locations and determined that poor habitat is pervasive throughout the Pool. IEPA biologists, present throughout the evaluation process, concurred that the entire area "looked the same" (Joe Vondruska, EA, personal communication).

Modifications to the QHEI factors which could improve overall habitat should be considered by Illinois EPA and its consultants as part of the UAA analysis. On the whole, however, the

individual QHEI metrics which are the major contributors to degraded habitat quality are those that cannot be feasibly or economically reasonably mitigated, including insufficient current speed, sediment quality (physical characteristics of the sediments), excessive siltation, lack of riffle areas, little or no sinuosity and poor riparian development (Table 1C).

Table 1A. Des Plaines River QHEI Scores, 21 May 2003.

Upstream I55			Downstream I55		
	QHEI Score			QHEI Score	
RM	Right Bank	Left Bank	**RM**	Right Bank	Left Bank
285.5	65.5 (TW)*	48 (MCB)	277.5 (408)	28 (MCB)	45.5 (MCB)
284.5	47.5 (MCB)	36.5 (MCB)	276.5	39 (MCB)	42 (MCB)
283.8 (403A)	43.5 (MCB)	39 (MCB)	275.5	49.5 (MCB)	57 (MCB)
282.5	35.5 (MCB)	36.5 (MCB)	274.4 (419A)	60 (MCB)	40 (MCB)
281.5	36 (MCB)	36 (MCB)	273.5 (501)	54.5 (MCB)	28 (MCB)
280.5	38 (MCB)	41 (MCB)	272.5	56 (MCB)	37 (MCB)
279.5	59 (MCB)	49 (MCB)	272.0 (510/507)	51 (MCB)	32.5 (MCB)
278.5	56 (MCB)	48 (MCB)			
	Overall Mean = 44.7 (Range = 35.5-65.5)			Overall Mean = 44.3 (Range = 28-60)	

* Habitat Type: TW = Tailwater MCB = Main Channel Border

Table 1B. QHEI Scores at Off-Channel Locations.

Location	Score
405--Treats Island (RM 279.7)	53
408--Mouth of Jackson Creek (RM 278.3)	54.7
414--Bear Island Slough (RM 275.9)	40.5
418--Mouth of Grant Creek (RM 274.8)	57.5

Provided below are the 10 major components of the QHEI that contributed to the low scores:

Table 1C--Dresden Pool Individual QHEI Factors--May 2003

Factor	No. of Locations Affected (out of 34)
Poor Development (of riffles)	ALL
No Riffles	32
Current Speed None or Slow	32
Recent Channelization or Lack or Recovery	30
No Sinuosity	23
Moderate to Heavy Silt	23
Extensive or Moderate/Extensive Embeddness	19
Only Substrate Silt or Detritus	10
Poor (≤ 6) Instream cover	8
Urban or Industrial Riparian Zone	6

Practically speaking, these factors either cannot be remediated (e.g. lack of sinuosity, substrate only silt) or the effort to remediate them, (e.g., the amount of instream cover) would be unprecedented for a stream of this size.

In addition, EA reviewed the habitat characteristics of the Brandon and Upper Dresden Pools and compared them to Ohio's use designations for Warm Water Habitat (WWH) and Modified Warm Water Habitat (MWH) to provide additional analysis, as requested by U.S. EPA. The results of this effort are presented in the following table (Table 1D), which was compiled based on the same criteria used by Ohio EPA to determine whether an area should be classified as WWH or MWH. As these data show, both the Brandon and Upstream Dresden Pool areas share many of the characteristics of modified warm water habitat streams, and except for depth, possess **none** of the characteristics associated with warm water habitat streams.

Table 1D. Comparison of warm water habitat (WWH) and modified warm water habitat (MWH) characteristics of the Des Plaines River.

	Brandon Pool	Upper Dresden Pool
WWH Characteristics		
No Channelization or Recovered		
Boulder, Cobble, Gravel Substrates		
Silt Free		
Good-Excellent Development		
Moderate-High Sinuosity		
Cover Moderate to Extensive		
Fast currents & Eddies		
Low/Normal Substrate Embeddness		
Max Depth > 40cm	X	X
Low/No Riffle embeddness		
Total WWH Characteristics	1	1
MWH Characteristics with High Influence		
Recent Channelization		
Silt/Muck Substrates	X	X
No Sinuosity	X	X
Sparse/No Cover	X	X
Total MWH (High)	3	3
MMH Characteristics With Moderate Influence		
Recovering Channelization	X	X
High or Moderate Silt Over Other Substrates		
Sand Substance (Boat)		
Fair/Poor Development	X	X
Low Sinuosity		
Only 1-2 Cover Types		
Intermittent or Interstitial		
Max Depth < 40cm		
High Embeddness of Riffle Substrates	X	X
Lack of Fast Current	X	X
Total MWH (Moderate	4	4
Total MWH (All)	7	7

With regard to the approach summarized in Table 1D, Yoder and Rankin (1996) stated that "as the predominance of modified habitat attributes increase to a modified warmwater ratio of greater than 1.0-1.5, the likelihood of having IBI scores consistent with the WWH use declines." In both Brandon Pool and Dresden Pool, the ratio is 7:1, far greater than 1.5:1 trigger point suggested by Yoder and Rankin. Thus, it is clear, based on this well established methodology, that neither of these areas is capable of attaining a Warmwater (i.e.General) Use, so some lower classification is clearly warranted.

These unalterable limitations in the physical conditions/habitat features of the waterbody, even without the presence of contamination, preclude the attainment of aquatic life protection uses consistent with General Use requirements. Therefore, these limitations meet the requirements of factor #5 of the UAA criteria for determining that General Use is not an attainable use designation for the UAA Reach. (Appendix 1).

Also, in the May 2003 EA study, no significant differences were found between habitat type or availability upstream or downstream of I-55. Similarly, the fish community downstream of I-55, where General use thermal water quality standards are in force, is not appreciably better than the fish community upstream of I-55, where Secondary Contact thermal limits are effective. This demonstrates that the maintenance of General Use thermal standards in the area downstream of I-55 does not allow attainment of a fish community commensurate with a General Use designation. The fish community is comparable upstream of I-55 where the less restrictive thermal Secondary Contact standards apply. If thermal levels made any appreciable difference, this would not be the case. Clearly, there are factors like the absence of adequate habitat in the Lower Des Plaines River, not thermal levels, that are limiting the assemblage of aquatic organisms present in the waterway.

The absence of adequate habitat limits the fish species that can inhabit the UAA Reach. Fish species whose natural history minimizes contact with the sediments or that are highly tolerant of degraded conditions, that preferentially attach to "clean or non-silty" substrates such as rocks or rip-rap around power plant intakes, are pelagic in nature or that prefer to live along rocky submerged cliffs, can be expected to inhabit the system. However, most aquatic species, especially fishes, require a sequence of varying habitat types as they proceed through the different life stages. The overall lack of habitat diversity in the UIW represents a serious impediment to the development of a more diverse resident aquatic biota consistent with a General Use designation. (Final Report, UIW Study, 1995. p. 2.6-1)

G. Limitations of the Illinois Use Classification System

Section 303(c) of the Clean Water Act provides that in setting water quality standards, States should consider the following factors: the use and value of State waters for public water supplies, propagation of fish and wildlife, recreation, agriculture and industrial purposes, and navigation. (See also 40 CFR §131.10(a)). Thus, the Act allows the States to consider the use and value of the particular water body in determining its appropriate use designation. Within these directives, a state has the flexibility to develop and adopt whatever use classification system, including subcategories of uses, it deems appropriate. For example, Section 303(c)(2)(A) of the Clean

Water Act includes "industry", "navigation", "marinas" and "agriculture", among the many suggested use designations for a water body.

However, Illinois has only two generic use designations for inland waterways: Secondary Contact and Indigenous Aquatic Life and General Use. The General Use classification is a broad aquatic life use that assumes a water body will support all aquatic life and all types of recreational uses. It does not differentiate among aquatic communities or the physical characteristics of a water body. Illinois also has not developed any use subcategories under its existing use classification system. As the U.S. EPA has noted, making a determination of non-attainment in waters with broad use categories may be difficult and open to alternative interpretations. (See *Water Quality Standards Handbook: Second Edition*, U.S. EPA, August 1994, Section 2.4, p. 2-5). Due to the lack of any refined delineation of use classifications in Illinois, there is a regulatory bias in favor of designating or "defaulting" waterways to the General Use classification.

In U.S.EPA's Water Quality Standards Handbook (Second edition. 1994--p.2.5), the Agency discusses the need for sub-categories of use in certain cases:

> *"Designated uses are described as being intentionally general. However, States may develop subcategories within use designations to refine and clarify the use class. Clarification of the use class is particularly helpful when a variety of surface waters within distinct characteristics fit within the same use class, or* ***do not fit well into any category****."* (emphasis added).

In the newly published "Strategy for Water Quality Standards and Criteria" document (U.S. EPA, August, 2003), it was stated that "assigning tiered designated uses is an essential step in setting water quality standards." EPA's Office of Science and Technology (OST) agrees that refined uses including biologically "tiered" uses can improve the effectiveness and credibility of state and tribal standards in many situations. "Many states are learning that refined uses offer advantages for waterways where information is available to develop them. For example, they can provide better operational definitions of desired outcomes, and can provide flexibility to describe locally-important variations that broad uses cannot." (EPA Strategy for Water Quality Standards and Criteria--August, 2003. EPA-823-R-03-010, p. 24).

Other Region 5 states either already have or are in the process of refining and expanding their use classifications. Ohio has four warmwater aquatic life use classifications. Their very best streams are classified as Exceptional Use. The majority of Ohio streams are classified as Warmwater Use; this use would be equivalent to Illinois' General Use. The next lower Ohio classification is Modified Use, which they further subdivide depending on the type of modification, e.g., Impounded (dams), Channelized, or Acid Mine Drainage. Thus, Ohio clearly recognizes that dams, due to their impounding effect, can necessitate a lower use classification. Lastly, Ohio has a category called Limited Resource Water, which is their lowest classification. In some cases, water quality criteria are adjusted to provide the level of protection necessary to protect each of Ohio's uses.

In comparison to Illinois' existing use designations, the state of Ohio's use classification system has a range of acceptable use designations based on measured physical, chemical and biological criteria. In Ohio's use designation guidance documents, the Ohio EPA has noted that sites with QHEI scores of less than 60 often do not support balanced, indigenous aquatic communities. (Ohio EPA, 1989a) Ohio EPA also notes that streams with gradients <5 ft/mile (as is the case in the UAA Reach) are very slow to recover or may not recover at all, resulting in an "irretrievable anthropogenic modification".

Wisconsin is in the process of developing new and more refined uses and has prepared (November 2002) a Draft document entitled "Guidelines for Designating Fish and Aquatic Life Uses for Wisconsin Surface Waters". For warmwater, Wisconsin is proposing the following categories: Diverse Fish and Aquatic Life (which they propose to further subdivide), Tolerant Fish and Aquatic Life, and Very Tolerant Aquatic Life. These categories would be quite similar to Ohio's Warmwater, Modified Warmwater, and Limited Resource Water uses, respectively. The draft Wisconsin guidance lists the factors which would allow one of their streams to be put into one of the two lower use categories. Three of the reasons they cite are particularly relevant to the UAA Reach:

1) "Dams, diversions or other types of hydrologic modifications preclude the attainment of a Diverse Fish and Aquatic Life community, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in the attainment of a Diverse Fish and Aquatic Life community."

   Thus, Wisconsin, like Ohio, recognizes the negative effect that dams can have on aquatic life.

2) "Human caused conditions or sources of pollution prevent the attainment of a Diverse Fish and Aquatic Life community and cannot be remedied or would cause more environmental damage to correct than to leave in place."

   They go on to note that "This condition can occur where years of poor land management have resulted in sediment and nutrient deposits in streams and other water bodies. These deposits can result in habitat destruction and degraded water quality. These conditions may not be attributable to one source and cannot be remediated through enforcement or reasonable management actions. Degraded habitat or water quality will likely continue to persist even with better land management in the watershed."

   The problem of legacy sediment contamination in the UAA Reach clearly would fall under this definition.

3) "Physical conditions related to the natural features of the water body, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of a Diverse Fish and Aquatic Life community."
   Wisconsin proposes to apply this to situations where the lack of these features is a result of the natural condition of the waterway. Nonetheless, it is a clear acknowledgement that

these factors, whether a result of natural conditions, or from the damming of a river, as in the UAA Reach, has severe consequences to the biota.

Given the precedents established by these other Region 5 states, Illinois should give strong consideration to developing one or more new and more appropriate use categories.

In its *Water Quality Standards Handbook*, the U.S. EPA offers some guidance in establishing subcategories of use designations. The U.S. EPA notes that subcategories of aquatic life uses may be based on: attainable habitat (*e.g.,* coldwater versus warmwater habitat); innate differences in community structure and function (*e.g.,* high versus low species richness or productivity); or fundamental differences in important community components (*e.g.,* warmwater fish communities dominated by bass versus catfish). (*Water Quality Standards Handbook: Second Edition*, U.S. EPA, August 1994, Section 2.4). The U.S. EPA also suggests using biological data as a basis for creating subcategories, such as using measurable biological attributes to create a use subcategory. *Id.*

In general, the U.S. EPA supports the use of greater specificity by states in defining use classification systems. It is considering revisions to the water quality regulations that would require more precise use designation systems by the states. In its 1998 Advanced Notice of Proposed Rulemaking on the Part 131 water quality regulations, the U.S. EPA said:

> [T]he Agency's current thinking is that there is a growing need to more precisely tailor use descriptions and criteria to match site-specific conditions, ensuring that uses and criteria provide an appropriate level of protection which, to the extent possible, is neither over nor under protective. 63 Fed.Reg. 36750 (July 7, 1998).

The discussions held during the recent U.S. EPA-sponsored national symposium entitled "Designating Attainable Uses for the Nation's Waters" (GLEC, July, 2002) also highlighted the current need for more refined designated uses with more differentiated criteria applicable to site-specific waterbodies.

For Illinois, the development of additional use classification designations to address those waters which fall between Secondary Contact and General Use may be an appropriate course of action to further evaluate the proper use classification of the UAA Reach[1].

The Lower Des Plaines River data reveals that in some ways it can attain uses that are higher than those included in the Secondary Contact Use designation. However, the application of the UAA regulatory factors shows that it cannot attain a General Use designation. The alternative of creating a new use designation or a subcategory that incorporates an appropriate hybrid of General and Secondary Use water quality standards is an option that would be consistent with U.S. EPA guidance and current thinking on use classification systems.

[1] The Clean Water Act regulations require an opportunity for public hearing before a State may establish a use subcategory. See 40 C.F.R. § 131.10(e).

An additional use category would allow the State to recognize and maintain the improvements that have been made in the Lower Des Plaines River chemical water quality over time, while also accurately concluding that certain fishable/swimmable uses are not attainable. Under such an additional use category, less stringent limitations are justified and warranted for those parameters which are not responsible for limiting the existing and potential indigenous aquatic community or preventing full recreational uses in a physically compromised system.

VIII. POWER PLANT EFFECTS ON THE WATERWAY

A. Effects of Power Plants on Physical Habitat

Power plants add to the availability of physical habitats in a localized but generally positive way. Intake and discharge embayments provide protected off-channel refuges. High velocities in the discharge areas tend to scour fine, contaminated sediments. Discharge water temperatures during mid-summer reach levels sufficient to exclude many of the more heat-sensitive fish species from the hottest portions of the plumes, but the areas affected are quite small. These same areas attract fish during the colder months of the year. Thermal plume observations conducted in connection with the UIW study in 1993-1994 revealed that in each instance at least 75% of the cross-section of the stream was in compliance with applicable thermal standards, providing a zone of passage for potentially affected organisms. (Final Report, UIW Study, 1995. Chapter 3). The data collected during the 2002 Joliet thermal plume studies conducted by EA for Midwest Generation, during typical summer operating conditions, showed that the two thermal plumes from the Joliet Stations are continuing to meet both the mixing zone and zone of passage requirements of 302.102 in the context of the existing Secondary Contact thermal water quality standards (EA, 2003, p. 13-15). Being surficial in nature, the thermal plumes from Midwest Generation's plants have no negative impacts on the existing physical habitats for aquatic life in the Lower Des Plaines River.

B. Water Temperature Regime

Generally, main channel water temperatures in the entire UIW tend to be warmer year round than would be expected for a river of comparable size in this geographic region. As an effluent-dominated waterway, the primary causes of the elevated thermal regime in the UIW are discharges from power plants and wastewater treatment plants (WWTP). WWTPs contribute a large component of the flow (100 % during low flow periods) and their discharges tend to have a relatively constant, moderate temperature which has the effect of dampening seasonal and diurnal changes. While power plants do not change the volume of flow, they add heat and raise the water temperatures not only near the plant, but progressively downstream. The increases in incremental temperature gradually diminish as heat is lost to the atmosphere, but overall water temperatures do increase from the Chicago Metropolitan area to the Joliet area, due to a combination of ambient solar heating, WWTP discharges, power plant contributions and non-point source sheet runoff from urbanized areas. (Final Report, UIW Study, 1995. Chapter 3).

The UIW study confirmed the cyclic nature of both temperatures and organism life stages in the waterway. Because nearly all temperate zone organisms normally live in temperatures that cycle annually, it is assumed that maintenance of a seasonal cycle is important. Thermal modeling

shows that water temperatures in the system are higher than they would be without the power plants in operation, but that the seasonal cycle is nonetheless preserved. The UIW studies observed actual conditions associated with power plant operations. It also confirmed that biological cycles are maintained in the waterway. The timing of biological cycles did not appear to be altered significantly, although some shifts probably do occur because the temperature cycle in the waterway cannot be considered "natural".

C. Longitudinal Temperature Distributions

The variability in temperatures inherent in the water source inputs to the UIW, atmospheric conditions (largely unpredictable), and operations of the power stations make concise, quantitative portrayal of longitudinal temperatures throughout the system extremely difficult. Midwest Generation uses predictive mathematical models to extrapolate hypothetical temperature distributions assuming fixed representative inputs and atmospheric conditions. The reliability of these models to depict realistic conditions has been confirmed for a wide range of seasonal and operational circumstances. (Holly, et. al, 1994-1995)

All of Midwest Generation's power plants in the UIW utilize once-through, open cycle cooling systems. Each plant takes relatively large volumes of water through its condensers and discharges it directly back into the waterway at an elevated temperature. Stations must meet the current Secondary Contact thermal limitations at the edge of the allowable mixing zone. Compliance is monitored by reporting end-of-pipe temperatures, per NPDES permit requirements. Compliance is verified internally by performing mass-balance calculations to determine the fully mixed waterway temperature. Field verification studies have been performed, including the field studies performed by ENSR as part of the UIW Study (ENSR, 1995) , as well as more recent studies (EA, 2003) that demonstrate compliance with the Secondary Contact thermal limits at the edge of the allowed mixing zone.

The UIW thermal modeling analysis shows that the overall thermal regime of the waterway downstream of the MWRDGC's Stickney Water Reclamation Plant (WRP) is influenced more by the temperature of the Stickney WRP treated effluent discharge than by any upstream temperatures: warmer in the winter, cooler in the summer. Therefore, any impacts on temperature from the operation of Midwest Generation's Fisk and Crawford Plants (located upstream of the Stickney WRP and approx. 33 River Miles upstream of the UAA Reach) on the Lower Des Plaines are negligible.

D. Non-Summer Water Temperatures in the Lower Des Plaines River:

While summer temperatures have been the primary focus in the draft UAA report, non-summer temperature limits also need to be adequately addressed in the course of the this UAA evaluation. There are periods during the Winter and Spring when ambient river temperatures currently exceed the corresponding General Use thermal water quality limit, largely due to the influences of the MWRDGC's Stickney Water Reclamation Plant (the "Stickney WRP"). The Stickney WRP provides up to 100 % of the flow to the waterway during the winter months. Its discharge elevates UIW temperatures above what would be found in a natural waterway during this time

of year. The result is an altered thermal regime, regardless of the input of heat from MWGen's plants.

This phenomenon is substantiated by MWGen's temperature monitoring data upstream of the UAA study reach that indicates ambient water temperatures often exceed the General Use thermal water quality criteria limit of 60 °F / 63 °F during the winter months. This is largely due, as indicated above, to the significant influence of MWRD's treated wastewater discharge on the waterway. Unless the temperature of this dominant discharge is controlled to ensure that downstream ambient temperatures meet the General Use criteria, the "natural" (in so far as anything can be considered natural in this waterway) background temperature of this waterway will remain elevated during the Winter and Spring months.

The Cal-Sag Channel enters the Chicago Sanitary and Ship Canal between the Stickney WRP discharge and Will County Station. Inflow temperatures from the Cal-Sag tend to be very similar to those at the Roosevelt Road Bridge (the most upstream influent point in the UIW system). Proceeding downstream, the next significant thermal input in the Lockport Pool (aside from the MWRD discharge during the winter months) is the discharge from Midwest Generation's Will County Station. Some of the heat from the Will County Station's discharge is gradually dissipated to the atmosphere along the approximately five mile reach from the Station to the Lockport Dam. This cooling continues for another mile and a half below the Lockport Dam, at which point it is further diluted by the discharge from the upper Des Plaines River. Inflows from the upper Des Plaines tend to have a cooling effect on the Lower Des Plaines River year-round, although the volume of total flow contributed is minimal.

Joliet Stations #9 and #29 are located in the Dresden Pool approximately a mile downstream of Brandon Road Lock and Dam. The waterway in this lower pool has a moderately large cross-sectional area (and surface area) and water movement downstream is relatively slow. A substantial portion of the heat input from the Joliet Stations is lost to the atmosphere before the flow reaches the I-55 Bridge located approximately seven miles downstream--the point at which General Use water quality standards begin.

Five miles downstream of I-55, the mixing of the Lower Des Plaines River with the cooler waters of the Kankakee River further reduces the water temperature. However, the inflow of the Kankakee tends to be compressed along the south bank of the channel such that full mixing (and reduction of the temperature by dilution) does not occur until downstream of the Dresden Island Lock and Dam. (Holly, et. al. 1995)

E. Lack of Thermal Effects on Phytoplankton and Zooplankton

The warmest areas in the UAA Reach occur in the near-field plumes immediately downstream of the points of discharge from Midwest Generation's power plants. Important questions associated with possible near-field impacts include whether these temperatures are sufficiently high to kill or injure planktonic organisms passing through the plants' cooling systems, whether mobile organisms will be excluded from areas in the immediate discharge vicinity, and whether the movements of mobile organisms up and down the waterway will be blocked by elevated temperatures that might completely occupy the cross-section near any particular station. The

UIW Study components were designed to respond to these questions. More recent information (EA, 2003) also confirms the limited extent of influence of the thermal plumes from MWGen's Joliet plants on the lower Des Plaines River under typical summertime operations.

The UIW Study showed that truly planktonic forms of algae (and presumably zooplankton) make up a very minor component of the flora and fauna in the UAA Reach. (Final Report, UIW Study, 1995. Chapter 5). For the most part, planktonic organisms are represented by species that attach to or are closely associated with the substrate--periphytic algae and grazing zooplankters. The UIW Study results indicate that phytoplankton densities generally increase with distance downstream. These increases are related to an expansion of available habitats in the lower pools, the input of plankton from tributaries in these pools, and to some extent, from increased growth rates due to elevated water temperatures.

Previously done studies documented in the UIW report, as well as the monitoring work done for the UIW study, confirm that algae in the UIW system have little susceptibility to entrainment and that similar community structure and abundances are found throughout the UIW. The community below Dresden Lock and Dam (RM 271.4) on the Illinois River was similar to that in the upper Des Plaines River and the Kankakee River. These results indicate that members of the phytoplankton communities in the system receiving warm-water effluents were similar to those removed from this influence. Although identified as a potential concern in the draft UAA report, the UIW studies of phytoplankton and periphyton clearly show that the system is not dominated by blue-green algae. It is, in fact, populated by the same species assemblage as other similar river-reservoir navigation channels. Phytoplankton density at Joliet was comparable to the density observed in Pool 19 of the Mississippi River, which is not thermally impacted. This shows that members of the phytoplankton and zooplankton communities are not impacted on a long-term basis by power generation.

F. No Adverse Thermal Effects on Macrophytes

Surveys showed that aquatic macrophytes occur throughout the UIW wherever suitable substrate occurs (Final Report, UIW Study, 1995. Chapter 6). Elevated water temperatures seem to be having no adverse effect on macrophyte stands, either in the general, system-wide context or in the immediate vicinity of power plant discharges. As the result of respiration, oxygen levels within the confines of the macrophyte beds may fall to low levels during the night, especially in the two upper pools. This may limit the value of such areas as habitat for sensitive fish species and life stages.

G. No Adverse Thermal Effects on Benthic Macroinvertebrates

The elevated water temperatures below power plant discharges or the generally warmer conditions that prevail in the UIW relative to nearby waterways are not adversely affecting macroinvertebrate composition or distributions. Habitat condition, as well as sediment quality, rather than temperature, appear to be the primary controllers of benthic invertebrate community composition within the UIW system. (Final Report, UIW Study, 1995. Chapter 7). The assemblages of near-field areas at each of the generating stations studied generally demonstrated an overall improvement in community quality relative to areas either upstream or further

downstream of the discharge, a result likely arising from improvements in flow regime within the discharge canals themselves. The UIW Study findings directly contradict the draft UAA report contention that the number and distribution of bottom organisms decreases as temperature increases. This might hold true where identical, suitable habitat conditions are present and not variable, as in the case of the Lower Des Plaines River, where macroinvertebrate habitat conditions are generally better within the discharge canals of the power plants than elsewhere in the waterway, despite the sometimes elevated temperature conditions. It is also important to understand that the warmest temperatures occur in the upper to middle portions of the water column, thus not affecting bottom-dwelling benthic macroinvertebrates. In the UIW study, any taxa that were found to be reduced or eliminated within the near-field areas typically demonstrated a rapid recovery to the composition and condition of those upstream of the discharges. This suggests that there was no observable cumulative impact of thermal effluents on the macroinvertebrate community.

H. Effect on Fisheries

The "Selection of the Temperature Standard" and "Critique of the Current Secondary Contact and Indigenous Aquatic Life Standard" sections of the draft UAA report have many inaccurate statements regarding temperature effects on riverine species and ecosystem processes. High and low temperatures may or may not be detrimental to aquatic life that resides in the UIW. There is not a simple relationship, as noted from many past studies (e.g., Cairns et al. 1973; Cairns et al. 1978; review by the Institute for Environmental Quality 1995). Both low and high temperatures can increase AND decrease toxicity due to exposures from other chemical stressors, such as found in the UIW, and is both species, toxicant type, toxicant concentration and species dependent. The overly simplistic statement that high temperatures increase toxicity is simply incorrect. Nitrification is also inhibited by cold temperatures and ammonia is not always consumed in the upper sediment layers. Nitrification is very sensitive to toxicants, which abound in the depositional sediments. The UAA consultants AquaNova and Hey and Associates incorrectly imply that high temperatures are always detrimental by focusing only on negative thermal impacts and over-generalizing. Both ammonia and ammonium can be toxic but this is both species and concentration dependent. For example, the amphipod *Hyalella azteca* is more sensitive to total ammonia than the un-ionized form. Blue green algae are not a concern in the UIW due to its high flow. Toxic cyanobacterial blooms have only been noted in pond, lake and reservoir ecosystems. So, many of the "negative" examples used in the draft UAA Report do not apply to the UIW, yet their presentation implies that they do.

The UIW study data, as well as the results of MWGen's on-going monitoring, show that the magnitude, duration and extent of excess temperature in the Lower Des Plaines River is within the tolerance range for most of the species expected to reside in this waterway, given the existing physical constraints. Contrary to the implication in the draft UAA Report (October, 2003 revised temperature section, p. 2-93), "[d]irect deaths from excessive temperature beyond the thermal lethal point" have never been documented in the Lower Des Plaines River. MWGen's monitoring work (EA, 1997-2002) continues to show that dissolved oxygen levels in the Lower Des Plaines remain at or above that needed to support the indigenous aquatic community. MWGen's long-term fisheries monitoring program (EA, 2002) assessments of fish condition show that there are no obvious food availability problems in the system. Synergisms between

heat and toxic substances have been shown by Burton's studies (1995, 1998, 1999), however, these studies were conducted under controlled laboratory or in-situ conditions which represented worst-case exposure conditions. In reality, the heat from MWGen's power plants does not reach the areas where most of the sediment-bound contaminants are found.

Exclusion areas--small areas of elevated temperature avoided by sensitive mobile organisms--will occur in the immediate discharge vicinities for all of the Midwest Generation stations during the warmer months. The three-dimensional mapping of the thermal plumes (ENSR, 1994, EA, 2003), shows that buoyancy of warm water limits these exclusion areas to upper water column layers and that a zone of passage at cooler temperatures (of at least 75% of the cross-section of the waterway) remains beneath the surface thermal plume at any time. As part of the UIW Study, fly-over, infra-red imagery was taken of the waterway. (Brady, 1993-1994) These data also confirm the surficial nature of the thermal plumes in both the summer and winter periods.

These findings, together with the fact that no fish kills have been reported in or around any of Midwest Generation's stations, support the premise that resident fish species can and do move temporarily out of thermally enhanced areas and into portions of the river that are more suited to their preferred temperature range. Thermal refuges (e.g. tributary mouths) exist throughout the expanse of the Lower Des Plaines River downstream of Brandon Road Lock and Dam, and are also found upstream, although are more limited there due to the physical structure of the canal in this area.

The fishery of the UIW is basically a "warm-water" assemblage consistent with the physical circumstances of the system. Common carp dominate the biomass throughout the system. Improvements in the diversity of species occur as one moves downstream through the three navigational pools. The assemblage inhabiting the Dresden Pool, though improved over those of the Lockport and Brandon Pools, is still well below expectations. Brandon Road Lock and Dam is clearly a transition point for the fishery, based primarily on improvements in habitat availability relative to the upstream reaches. While it may not be possible to separate the various stressors to the system to determine which ones are most responsible for the limitations on the biological potential of the waterway, thermal discharges are not sufficient to account for the lack of a balanced indigenous fish community in the Lower Des Plaines River. Given the lack of balance in the Lower Dresden Pool, even if thermal discharges were to required to comply with General Use Thermal Standards, there still would not be a balanced indigenous fish community in the UAA Reach.

The warmer overall conditions of the waterway may also play a beneficial role in protecting the aquatic ecosystem as a whole, especially in light of the recent efforts of state and federal natural resources agencies to deter the threat of invasive species to our waterways. The water temperatures currently encountered in the UAA reach may actually serve to preclude the migration of non-native invasive alien species of fish, such as the Asian carp, to more sensitive waterbodies, such as the Great Lakes, which, if unchecked, could have a devastating effect on Lake Michigan's indigenous aquatic community/sport fishing industry. Midwest Generation has been working cooperatively with state and federal natural resources agencies to assist in the development of plans to control the migration of invasive species in the UAA waterway, using whatever means are technically and legally available.

I. Temperature Effects on Dissolved Oxygen Levels

For purposes of analyzing dissolved oxygen (D.O.) levels, the waterway can be divided into two segments: the area above and the area below the Brandon Lock and Dam. Dissolved oxygen levels vary seasonally in both areas in accordance with the prevailing water temperature regime, the changing solubilities of oxygen and with oxygen levels in tributaries and other source waters. Oxygen concentrations in the Lockport and Brandon Pools are typically below saturation, periodically dropping below the Illinois Secondary Contact standard of 4.0 ppm. Generally, higher oxygen levels are observed downstream of the Brandon tailwaters and in the Dresden Pool. In part, this is the result of the reaeration that occurs at the Brandon Road Dam and transport through the tailwater area. Dissolved oxygen levels in the Dresden Pool main channel are generally improved over those in the two upper pools, and are generally in compliance with applicable limits. (EA, 1997-2002 Temp/D.O. Study Reports).

It has also been speculated that power plant discharges, by adding an increment of heat to the overall waterway, are accelerating the bacterial and chemical decomposition of organic matter and the respiration of aquatic plants, thereby reducing dissolved oxygen levels. While this may be conceptually correct, the actual reduction is very small, and more importantly, accelerating decomposition has the overall positive effect of reducing levels of organic materials in the system. It is likely that occasional decreases in dissolved oxygen levels in the system are primarily caused by heavy rainfall events, nutrient introduction and primary productivity cycling and/or increased boat traffic, rather than the input of heat from power plants. (EA 2001 Temp./D.O. Study Report, p. 8-11). Illinois EPA's UAA consultant also has suggested that the cause of sporadically low D.O. cycles in the system may be more the result of nutrient enrichment and photosynthesis, rather than strictly thermal inputs. (Vladimir Novotny --personal communication. December 13, 2001).

At times power plants can also contribute to increasing the level of dissolved oxygen in a waterway. In the UAA Reach, the intermittent use of Joliet Station #29's supplemental cooling towers during warm weather periods contributes additional dissolved oxygen to the waterway. The total contribution has not been quantified but may more than offset any incremental decreases in dissolved oxygen perceived to be the result of power plant operations under high temperature conditions.

Significantly, the water temperature/dissolved oxygen studies at the I-55 Bridge performed annually by ComEd/Midwest Generation since 1997 have not shown consistent correlations between high water temperatures and prolonged adverse levels of dissolved oxygen. Supplemental physicochemical monitoring done as part of Midwest Generation's long-term fisheries monitoring system also show that dissolved oxygen levels are variable throughout the waterway during the course of the monitoring period. Typically, D.O. levels are at or above minimum limits in the various habitats sampled over the course of the summer period. (EA Upper Illinois Waterway Fisheries Investigation Reports, 2000, 2001, 2002) The observation that lower D.O. levels in the system are generally limited to a few locations for short periods of time indicates that low D.O. is not a widespread problem in the waterway.

Short-term, localized "low" D.O. levels, whatever the cause, should not have any measurable adverse impacts on the aquatic community. The U.S. EPA Green Book (FWPCA, 1968) recommends a warm water fisheries one-day acceptable minimum dissolved oxygen concentration of 3.0 mg/l, with a 7-day minimum of 4.0 mg/l. Dissolved oxygen levels in the Lower Des Plaines River are generally well above these minimums. The data analysis presented as part of the current UAA Study, as well as the UIW Study results and current monitoring data, all indicate that dissolved oxygen levels in the Lower Des Plaines River are more than sufficient to support the indigenous aquatic community.

Overall, the average D.O. in the waterway is well above that needed to sustain the indigenous biological community, as evidenced by both continuous I-55 monitoring, as well as measurements taken as part of MWGen's long-term fisheries monitoring program. These data continue to show more than adequate levels of D.O. at all of the sampling locations in the Lower Des Plaines River, including the immediate generating station discharge canals, where water temperatures are the highest.

IX. UNIQUENESS OF THE WATERWAY

The Lower Des Plaines River, along with the Chicago Sanitary and Ship Canal, Cal-Sag Canal and portions of the Chicago River are the only major waterbodies in the State currently designated as Secondary Contact and Indigenous Aquatic Life waters. They have held this designation since its inception in 1974. This is due to the unusual and unique character of this waterway. Its uniqueness creates additional challenges in trying to determine what its overall potential as a valued State aquatic resource could be in the future.

The unique character of the UAA Reach makes it difficult to identify a biological reference site for this portion of the UIW. The UAA Biological Subcommittee had several discussions regarding the availability, or lack of availability, of a biological reference site for the Lower Des Plaines River UAA Reach. A reference site is needed in order to be able to compare biological measurements from the Lower Des Plaines River with other physically similar streams in the State to determine the overall potential of the system. Several rivers in the same ecoregion have been proposed for consideration as a reference site by various Subcommittee members and the IEPA consultants, but none has received the consensus support of the UAA Biological Subcommittee upon further review. This is because there are no other waterways in the State that have the same artificially-controlled flow/level regime, the man-made "shorelines" or the significant commercial navigational/storm water control uses of the UAA Reach. All of these characteristics must be considered for a proper assessment and comparison of biological potential, because they are <u>permanent</u> features of the UAA Reach.

Without an appropriate representative reference stream, a prediction that the UAA Reach can attain the General Use classification is highly speculative. In other words, there is no actual real-life stream that mirrors the UAA Reach to show with a reasonable degree of certainty that General Use can be attained. We lack this reasonable basis on which to determine what the UAA Reach is capable of regarding the type of aquatic life it can support with more stringent water quality limitations in place. For this reason, the suggestion that a separate use designation

for this particular portion of the waterway should be developed based on what it actually has attained, or what it might reasonably attain in the future, warrants further review.

X. CURRENT MONITORING STUDIES OF THE UAA REACH

Midwest Generation continues to perform physical monitoring in the UAA Reach, including temperature monitoring (done year round at each generating station and at the I-55 Bridge), as well as seasonal temperature/dissolved oxygen monitoring at I-55. Midwest Generation, working with the Iowa Institute of Hydraulic Research, also continues to perform thermo-hydrodynamic modeling of the waterway as part of its on-going compliance commitment. These models are, by necessity, very customized in nature, due to the unique circumstances present in the river system.

The studies conducted on the UIW show the waterway to be populated with aquatic biota capable of carrying out their life functions under the constraints of available physical habitat. The studies also show that some species (e.g. walleye) and organism groups (e.g. redhorses) that might be expected in a slow-moving river-reservoir system in the Midwest at this latitude, though present, are found in reduced numbers.

The important questions here are:

(1) Is the heat contribution of Midwest Generation's plants sufficient to raise temperatures to a range that would exclude expected species, or are the reduced numbers of such species a result of other factors, such as poor habitat?; and

(2) What temperature limits are reasonable for the protection of organisms one would reasonably expect to inhabit the waterway?

Although temperature is but one factor among many that the study has shown affects aquatic life, it is useful to examine the temperature requirements of the biota in relation to existing and expected future waterway temperatures. The best information on temperatures requirements for biota is available for fish. The fish community of the Lower Des Plaines River has been monitored on an ongoing basis for the past twenty-plus years, sponsored by ComEd/Midwest Generation. The monitoring results continue to show general improvements and/or status quo in the biological community over time under the existing Secondary Contact thermal water quality limits. These results indicate that the existing thermal levels in the UAA Reach are not a significantly limiting factor to the present or future expected biological community.

XI. ESTABLISHING PROTECTIVE THERMAL LIMITS FOR THE BRANDON POOL AND THE UPPER DRESDEN POOL

A. Temperature is a Unique Constituent

Temperature has several unique characteristics that need to be considered when determining appropriate and protective thermal limits. Temperature is non-conservative; excess temperature dissipates very rapidly to the atmosphere. It does not bioaccumulate and under most conditions it stratifies vertically in the water column, thus allowing for a zone of passage even when surface temperatures might be excessive. Because temperature "behaves" in a very predictable manner, thermal models can accurately predict the general spatial distribution of thermal plumes based on a few fairly simple input parameters. However, the sudden and unpredictable flow fluctuations that occur in the Des Plaines River as a result of artificially controlled flow management make predictions much more difficult than in natural systems.

In addition to unique physical properties, fish have a well established ability to avoid excessively warm or cool temperatures (EPRI 1981). Assuming thermal refugia are available, fish will simply avoid areas that are too hot and return quickly when temperatures are more favorable. Thus, many species avoid thermal discharges during the middle of the summer, but seek out these areas during cooler periods. This is why many discharge areas are favored "fishing holes" over much of the year. Avoidance of excessive temperatures is why fish kills are rare during the summer...the more sensitive species simply leave the area. Thus, from a behavioral perspective, thermal avoidance is protective. It allows fishes to move away from conditions that otherwise may become lethal.

A distinction needs to be made between short term and long term avoidance (Ohio EPA 1978). Short-term avoidance is "the temporary avoidance by a species population caused by the onset of limiting or unfavorable environmental conditions" (Ohio EPA 1978). Short-term avoidance, though not rigorously defined, is typically considered to be on the order of hours or days, whereas long-term avoidance has been defined as the permanent or prolonged avoidance of an area (Ohio EPA 1978). Thus, long-term avoidance would be on the order of weeks or months. Long-term avoidance is an indicator of appreciable harm (assuming the area avoided is not trivial in size), whereas, short-term avoidance is not (Ohio EPA 1978). Fisheries studies performed by EA for over the past 20 years demonstrate that there is short term avoidance of the power plant discharge canals during the hotter periods of the summer, but that fish move back into the discharge areas once more preferable temperatures resume. There is no evidence that fish permanently move from the area and do not return.(EA Fisheries Monitoring Studies, various years).

The AquaNova/Hey Report states (p. 2-99) that "only adult fish are known to escape the impacts of high temperatures" and that the effect on juvenile fish is "uncertain". This is simply untrue. U.S. EPA has long acknowledged that juvenile fish can avoid high temperatures. For example, in their "Gold Book" (U.S. EPA 1986), the Agency states that "(J)uvenile and adult fish usually thremoregulate behaviorally by moving to water having the temperature closest to their thermal preference" (emphasis added). The EPA report goes on to note that "this response (avoidance) precludes problems of heat stress by juvenile and adult fish during the summer." (U.S. EPA

1986). Another interesting aspect of temperature is that the temperatures fish prefer during the summer are quite close (often within 2-4 °C) to those that are lethal (EPRI 1981).

B. Brandon Pool Current Conditions

As evidenced by the final meeting minutes of the UAA Biological Subcommittee (April 3, 2002), there was a general consensus reached by the biological experts assembled that a General Use classification is not appropriate for Brandon Pool. This determination was based on existing limitations (principally poor habitat quality, urbanization, sediment quality and barge traffic) which either cannot be changed (i.e., the habitat limitations and urbanization) or will not be changed in the foreseeable future, if at all (i.e., sediment quality and barge traffic). Because of these present and continuing limitations, the aquatic biota in the Brandon Pool will continue to be dominated by tolerant fishes and macroinvertebrates.

Given the existing and potential biotic community in the Brandon Pool, the present Secondary Contact thermal water quality standards (WQS) will be protective, whether the area remains Secondary Contact or is upgraded to a new "modified" use that also accounts for the limitations inherent in this segment of the UAA Reach.

C. Dresden Pool

If the use classification for the Upper Dresden Pool (i.e., the area upstream of I-55) remains as Secondary Contact, then the Secondary Contact thermal standards are and would remain appropriate to protect that use designation. However, as part of the UAA, a potential upgrade of the use designation to General Use or some other intermediate "modified" use is under review. Although Midwest Generation submits that a complete analysis of the UAA factors shows that General Use is not attainable for the UAA Reach, we have included in our review of the thermal standards whether more restrictive thermal standards would be needed to support any proposed upgrade in the use designation of the Upper Dresden Pool. As explained further below, this review concludes that more restrictive thermal standards would not result in any significant improvement to the aquatic communities in the Upper Dresden Pool.

To evaluate Upper Dresden Pool thermal alternatives, we applied some of the protocols typically used as part of a 316(a) demonstration under the Clean Water Act[1]. As with a UAA, a 316(a) analysis evaluates the physical, chemical and biological conditions of the waterway and characterizes potential stressors and their impacts. In a 316(a) demonstration, the main focus is on thermal discharges. The 316(a) process considers what thermal limits are necessary to support balanced, indigenous aquatic communities.

U.S. EPA has long recognized that it is not practical or necessary to evaluate the thermal tolerance of every aquatic species. It recommends that a group of Representative Important Species (RIS) be assessed.

[1]. A 316(a) demonstration is prepared to support the position that applicable thermal limits are more stringent than necessary to assure the protection and propagation of a balanced indigenous community of shellfish, fish, and wildlife in or on the water to which the discharge is made. The applicant attempts to demonstrate that alternative, less stringent thermal limits, will allow the protection of existing balanced indigenous communities, or alternatively, will allow the development of such a community if one is not present currently. This is the showing that ComEd successfully made before the Board in the AS96-10 proceeding.

According to U.S. EPA's Technical Guidance Document (U.S. EPA 1977), RIS are those that are:

1. Commercially or recreationally valuable;
2. Threatened or endangered;
3. Critical to the structure and function of the ecological system[1];
4. Potentially capable of becoming localized nuisance species;
5. Necessary in the food chain for the well-being of species determined in 1-4; or
6. Representative of the thermal requirements of important species but which themselves may not be important.

Recognizing that it is not possible or even necessary to study every species at a site in great detail due to time and resource limitations, U.S. EPA (1977) suggests that 5 to 15 species be designated as RIS because this range of RIS species allows for a representative assessment of the biotic community. Except for threatened and endangered (T&E) species, investigators generally pick species that are (or are expected to be) fairly common because it is difficult to assess the status of, or impacts to, species that occur in low abundance. Also, all other things being equal, species chosen as RIS should be ones for which thermal tolerance data are available.
Based on existing site-specific information, we compiled thermal tolerance data on the following Representative Important Species (RIS) consistent with the U.S. EPA suggestion:

Gamefish	Panfish	Forage Species	Benthic Species	Miscellaneous Species
Smallmouth bass	Green sunfish	Gizzard shad	Smallmouth buffalo	Freshwater drum
Largemouth bass	Bluegill	Emerald shiner	Channel catfish	Common carp
		Bluntnose minnow	Redhorse	

D. Justification for the Selection of RIS:

The selection of Representative Important Species (RIS) for the Lower Des Plaines River is consistent with accepted methods and guidance. MWGen also considered the inclusion of a number of cool water species, such as walleye, other percids and esocids, as suggested by U.S. EPA.

However, such cool water species are not appropriate representatives of the potential fish community in the Lower Des Plaines River. Not only is the Upper Dresden Pool near the edge of their natural ranges, but there is little or no habitat in the Brandon and Upper Dresden Pools to support them. For cool water species such as northern pike and yellow perch, which are examples of the percid species found in some Illinois waters, clear, well-vegetated lakes, pools, or backwaters are required for them to thrive and particularly to reproduce. Such areas are rare to nonexistent in these UIW pools. Therefore, these species will be limited naturally by the lack of suitable habitat.

[1]. To evaluate this factor, most investigators include at least one species at each trophic level (e.g. a herbivore, an insectivore, an omnivore and a top predator).

Even assuming the General Use Thermal Standards applied to the Upper Dresden Pool, neither good northern pike nor yellow perch populations would become established. Since, as shown during EA's recent habitat survey of the entire Dresden Pool (EA. May, 2003), habitats upstream and downstream of I-55 are similar, it follows that these species should have been able to establish viable populations in the lower Dresden Pool, which is already subject to the General Use thermal standard. However, data collected over the past nine years (See Table 1E), show that only one yellow perch and one northern pike have been collected from the General Use portion of the pool. Since populations of these two species in lower Dresden Pool are already protected by the General Use thermal standard, the only logical reason for their extreme rarity in lower Dresden Pool is lack of proper habitat or other non-thermal causes. Both species are also rare in the Upper Marseilles Pool , which is subject to the General Use thermal water quality standard, for the same reason (i.e. lack of habitat). (See Table 1F).

These cool water species are habitat limited in the UAA Reach and should not be designated as RIS. U.S. EPA (1977) guidance supports this approach for species at the edge of their range. The U.S. EPA report stated (p. 36) that "[w]ide-ranging species at the extremes of their ranges would generally not be considered acceptable as 'particularly vulnerable' or 'sensitive' representative species" though they still could be considered important." Here, based not only on their peripheral nature but also the obvious habitat limitations, the U.S. EPA guidance does not support their inclusion in the RIS designation.

Walleye are more thermally tolerant than yellow perch or northern pike and, as a result, are more widely distributed in Illinois (Smith 1979). Thus, they were not excluded from the MWGen RIS list based on being peripheral. However, like the two species just discussed, they clearly are habitat limited. Most walleye populations spawn over clear cobble or rubble areas, but some populations can spawn in flooded, well-vegetated backwaters. However, except for a small portion of the Brandon tailwaters, both habitat types are rare in Dresden Pool. Examination of data from Lower Dresden Pool and Upper Marseilles Pool supports our contention that walleye are habitat limited. Nine years of collecting fish has yielded only one walleye from the Lower Dresden Pool and only one from the Upper Marseilles Pool (See Tables 1E and 1F) despite the fact that General Use thermal standards prevail in both areas. Thus, there is no reason to believe that walleye would be any more successful in the Upper Dresden Pool than the Lower Dresden Pool.

If we compare catches of walleye with those of smallmouth bass, a species considered to have similar thermal tolerance, or to redhorse, which are likely more thermally sensitive (Reash et al 2000), it is equally clear that walleye numbers in these areas are constrained by something other than temperature. For example, Lower Dresden Pool, which yielded only one walleye, produced 477 smallmouth bass and 571 redhorse (all redhorse species combined) during the same period (See Tables 1E and 1F), and upper Marseilles Pool, which also yielded only one walleye, yielded 172 smallmouth bass and 348 redhorse. The only possible interpretation of this data is that walleye are habitat limited while the other two species, which have roughly similar thermal requirements, are not. Given that it is habitat limited, walleye is clearly not an appropriate RIS for the UAA Reach.

E. Temperature Tolerance of RIS

In considering the temperature tolerance of fish, it is important to recognize that their upper lethal temperature varies directly with acclimation temperature until that species can no longer be acclimated to any higher temperature (usually referred to as the ultimate upper incipient lethal temperature). Thus, fish exposed to summertime ambient conditions should be able to withstand water temperature at or near the upper end of the tolerance range reported for that species. All the Des Plaines River RIS except for redhorse, have upper temperature tolerances in the mid to high 30s °C (95 – 100 °F) (Table 2). This indicates that occasional exposure to temperatures in the mid to high 90s °F should have little effect on these species. The fact that populations of several RIS are good in the Upper Dresden Pool (EA 2001, 2002) supports this interpretation.

If Secondary Contact thermal standards are adversely affecting RIS, then one would expect that RIS catch rates would be lower in the Dresden Pool upstream of I-55, where the Secondary Contact thermal limits apply. Conversely, similar catch rates upstream and downstream of I-55 would suggest that the Secondary Contact thermal standards in the Upper Dresden Pool have little or no influence on the abundance of RIS. In Table 3, catch rates for all native RIS in the Dresden Pool (divided into the upstream and downstream of I-55 segments) are compared for the period 1999-2001. Thirty-three upstream vs. downstream comparisons can be made (11 taxa x 3 years). In 14 of the 33 comparisons, there is no appreciable difference between upstream and downstream of I-55 CPE's. In ten of 33 comparisons, CPE's are noticeably higher downstream of I-55. In nine of 33 comparisons, CPE's are noticeably higher upstream of I-55, where the Secondary Contact thermal limits apply. Thus, overall there is no clear pattern favoring the Dresden Pool segment upstream or downstream of I-55. On a species-specific basis, there are some differences. Emerald shiner, green sunfish, channel catfish, and freshwater drum are generally higher upstream of the I-55 Bridge. Catches of smallmouth bass, gizzard shad, bluntnose minnow, and smallmouth buffalo show no clear-cut upstream/downstream pattern. Redhorse, largemouth bass and especially bluegill CPE's are higher downstream of I-55. In sum, eight of the 11 RIS taxa show either no upstream/downstream preference or have slightly higher catch rates in the warmer upstream portion of the study area.

Largemouth bass, redhorse, and especially bluegill CPE's were generally higher in the cooler waters downstream of I-55. However, of these three species, only bluegill showed a large difference in catch rates. Both bluegill and largemouth bass are very thermally tolerant so their higher catches downstream of I-55 are likely not a result of avoiding the area upstream of I-55. Given that the abundance of most RIS is not lower upstream of I-55 and, even when catch rates are higher downstream of I-55, the difference is slight (bluegill being the only exception), it appears that changing the thermal standard upstream of I-55 from Secondary Contact to General Use may result in only a marginal improvement to the fish community.

The only species (group) that would likely be limited by the Secondary Contact thermal water quality standards are the redhorses. Little quantitative thermal data are available for redhorse but the limited data available indicate that its upper lethal limit is about 92 °F and they likely avoid temperatures in the mid to high 80s °F (Reash et al 2000). Although the thermal limits associated with the Secondary Contact use designation would likely be limiting to redhorse, it

appears that other, more important factors, already limit redhorse abundance in the Lower Des Plaines River.

The Des Plaines River downstream of I-55 is already designated as General Use. If water temperature was the principal factor affecting redhorse abundance in the Des Plaines River, then one would expect that redhorse abundance would be much higher downstream of I-55, which is already subject to the General Use thermal standards, than upstream of I-55, where the Secondary Contact thermal limits apply. Furthermore, in the absence of other limiting factors, redhorse abundance in the Des Plaines River downstream of I-55 would be comparable to that seen in other similar sized rivers. Redhorse catch rates are higher in the Des Plaines River downstream of I-55 as compared to upstream of I-55 (Table 4). However, the difference is slight (about 2 fish/km downstream of I-55 compared to about 0.5 fish/ km upstream of I-55) and probably not biologically significant. Further, redhorse catches per unit of effort (CPEs) downstream of I-55 are much lower than they are in the Kankakee River (Table 4). This indicates that other factors (likely either poor habitat or sediment quality) limit redhorse abundance in the Dresden Pool. This being the case, imposing more restrictive thermal limitations on the river upstream of I-55 would likely result in only marginal improvement in redhorse abundance and little or no improvement in the other RIS.

F. Is a Balanced, Indigenous Aquatic Community Present?

Another way to determine whether existing or proposed thermal limits are protective is to determine whether a balanced, indigenous community (BIC) is present; or, if such a community is not present, are current thermal WQS precluding development of a BIC. Based on low Index of Biotic Integrity (IBI) scores (calculated using scoring procedures developed in Ohio, (Ohio EPA 1987), we conclude that a BIC is not present in the Des Plaines River below the Brandon Road Lock and Dam (i.e., Upper Dresden Pool). In both 2000 and 2001, mean IBI scores gradually improved from the mid-teens in Lockport and Brandon Pools to the low 20s in the Dresden Pool (Figures 2 & 3). A BIC should have IBI scores in the low 40s (Ohio EPA 1987). Thus, even in the "best" areas (i.e., those downstream of I-55), the Des Plaines River fish community is poor, with IBI scores not even approaching those that would be expected from a BIC.

G. Are the Secondary Thermal Limits the Cause of the Lack of Balance?

Given that a BIC is not present, it is appropriate to consider whether the lack of a BIC is due to thermal effects or other causes. Several lines of evidence suggest that the lack of a BIC is due primarily to factors other than thermal impacts.

First, IBI scores upstream of I-55, where the Secondary Contact thermal WQS apply, are only marginally lower than in the area downstream of I-55 where the more restrictive General Use thermal WQS apply (Figures 4-6). This indicates that even if the observed IBI differences are due to differences in thermal standards, the net environmental benefit associated with the more restrictive General Use standards is minor.

Second, the mean IBI score in the Joliet Station discharge was comparable to or higher than the mean score at the location just upstream of the station in two of the past three years (Figures 4-6). If the thermal discharge was causing a significant impact, then one would expect that the impact would be most severe in the discharge canal (where water temperatures are highest), but such is not the case.

Third, when slightly better IBI scores do occur in the Dresden Pool, they occur in off-channel areas (e.g., tributary mouth and slough locations) suggesting that, in general, habitat is more important than temperature in determining the quality of the aquatic biota. This assertion is supported by the fact that IBI scores in the Joliet discharge canal (DIS) are comparable to those at main channel border (MCB) locations both upstream and downstream of I-55. Also, temperature measurements in these off-channel areas can be as high or higher than those in the main channel, further indicating that temperature is not the driver in this system (EA 2002).

Fourth, within the upstream I-55 Segment, IBI scores in the Joliet Station discharge are comparable to (i.e., within 4 IBI units, Ohio EPA 1987) to those in other habitats, including Main Channel Border (MCB), Tributary Mouth (TM), and even Dam Tailwater, a habitat with a considerably higher QHEI score.

Fifth, if temperature was the driving factor with regard to the quality of the aquatic biota, then one would expect that IBI scores downstream of the discharge to be noticeably lower than those upstream of it. IBI scores at the first MCB location downstream of the discharge were slightly lower than at the MCB location upstream of the discharge in two of three years, however, the decline is minor (on average about 3 to 4 IBI units, Figures 4 & 6). Even if this small decline is real, the spatial extent of the decline is small. In 2001, IBI scores immediately upstream and downstream of the discharge were comparable (Figure 5). Further, the fact that IBI scores in the discharge itself, where water temperatures are highest, were higher than in areas downstream of it suggests that the slightly lower scores at the next location downstream (where temperatures would be lower) may not even be related to the thermal discharge.

In any case, it is reasonable to conclude that whatever thermal impacts there might be are minor, limited to a small area, and of minor consequence compared to other, more limiting factors.

If thermal is not the principal factor accounting for the lack of a BIC and causing a poor biota throughout the Dresden Pool, then it is reasonable to ask what factor(s) are limiting the biota. As discussed in greater detail elsewhere in this report, there are several factors that clearly limit the quality of the biota. The two most severe limiting factors are poor habitat quality and sediment quality/contamination. Constant barge traffic and urbanization are two likely additional factors, and, based on QHEI metric scores, siltation is also a likely contributing factor (Note: this refers to the general negative effects of siltation in general [e.g., burying of habitats], not the toxic component of sediment). It is also important to note that of possible contributing factors, only water temperature can be addressed in part by point source controls. Thus, even if General Use thermal standards were adopted for the Des Plaines River upstream of I-55, the relevant data shows that the aquatic biota would not significantly improve because the factors that do significantly limit the quality of the biota cannot and will not be controlled.

H. Would the Upper Dresden Pool Aquatic Biota Improve Significantly if General Use WQS Were Applied and Would a BIC be Achieved?

Theoretically, the numbers of only a few species would increase in the Upper Dresden Pool, with redhorse being the group most likely to improve. In reality, however, any improvement is likely to be negligible because other, more influential, factors limit the quality of the biota. With regard specifically to redhorse, this is clearly the case as the abundance of redhorse in Dresden Pool downstream of I-55, where General Use thermal WQS already exist, is only marginally higher than that in the Dresden Pool upstream of I-55. (Table 3). Some of the other reasons why meaningful improvement in the Upper Dresden Pool aquatic community is unlikely include the following:

(1) No thermally sensitive cold- or cool-water species are present
(2) Other factors, some of which are irreversible, limit the community
(3) The community in the Des Plaines River downstream of the I-55 Bridge is not balanced despite General Use WQS (and thermal limits) being in place
(4) The amount of clean spawning substrate is limited for certain fish species due to excessive siltation.

Therefore, except for a possible small increase in redhorse abundance, the fish and benthic communities of Dresden Pool upstream of I-55 are not likely to improve significantly even if General Use thermal standards are imposed. For these same reasons, it is highly unlikely that a BIC would develop in this area.

The biological community data collected on the Lower Des Plaines River for the past 20+ years is more reliable and ecologically meaningful. It warrants a higher level of credence than laboratory-derived endpoints that attempt to predict how the biological community would respond. Good populations will be maintained only if there is adequate early life history survival, successful spawning, etc. An examination of the long term data sets shows that those species tolerant of the extensive limiting conditions that exist in the study area (*e.g.,* gizzard shad, most centrarchids, various minnows, etc.) are doing quite well, whereas those that are more sensitive to these limitations (e.g., redhorse and darters) are not. Thus, it is factors other than temperature (*e.g.,* sedimentation, poor habitat, silty and/or contaminated sediments, etc.) that determine and limit the Upper Dresden and Brandon fish communities. Temperature plays an insignificant role. In other words, there would be no significant change in these fish populations even if General Use thermal standards were applied to the Upper Dresden and Brandon Pools.

Indeed, the results of the recent pool-wide habitat assessment (EA. May, 2003), coupled with the poor IBI scores throughout Dresden Pool suggest that, if anything, it is Lower Dresden pool that is misclassified. Because of poor habit conditions due to impounding and the other factors discussed previously, the biological data supports a lowering of the use classification of Lower Dresden Pool and does not support upgrading the use designation of the upper Dresden Pool.

TABLE 1E. NUMBER, CPE (No./km), AND RELATIVE ABUNDANCE OF ALL FISH TAXA COLLECTED ELECTROFISHING FROM LOWER DRESDEN POOL (between the I-55 bridge and Dresden Lock and Dam) FOR THE PERIOD OF 1994-2002.

SPECIES	LOWER DRESDEN POOL		
	#	CPE	%
LONGNOSE GAR	32	0.16	0.079
SHORTNOSE GAR	1	0.01	0.002
UNID GAR	3	0.02	0.007
SKIPJACK HERRING	35	0.18	0.087
GIZZARD SHAD	12,070	62.00	29.881
THREADFIN SHAD	391	2.01	0.968
GRASS PICKEREL	4	0.02	0.010
NORTHERN PIKE	1	0.01	0.002
CENTRAL STONEROLLER	5	0.03	0.012
GOLDFISH	9	0.05	0.022
GRASS CARP	1	0.01	0.002
COMMON CARP	1,022	5.25	2.530
CARP X GOLDFISH HYBRID	134	0.69	0.332
BIGHEAD CARP	2	0.01	0.005
GOLDEN SHINER	21	0.11	0.052
PALLID SHINER	3	0.02	0.007
EMERALD SHINER	3,781	19.42	9.360
GHOST SHINER	12	0.06	0.030
STRIPED SHINER	20	0.10	0.050
SPOTTAIL SHINER	347	1.78	0.859
RED SHINER	2	0.01	0.005
SPOTFIN SHINER	400	2.05	0.990
SAND SHINER	3	0.02	0.007
REDFIN SHINER	1	0.01	0.002
MIMIC SHINER	3	0.02	0.007
CHANNEL SHINER	1	0.01	0.002
BLUNTNOSE MINNOW	2,602	13.37	6.442
FATHEAD MINNOW	1	0.01	0.002
BULLHEAD MINNOW	1,141	5.86	2.825
RIVER CARPSUCKER	141	0.72	0.349
QUILLBACK	90	0.46	0.223
UNID CARPIODES	1	0.01	0.002
WHITE SUCKER	11	0.06	0.027
SMALLMOUTH BUFFALO	363	1.86	0.899
BIGMOUTH BUFFALO	21	0.11	0.052
BLACK BUFFALO	9	0.05	0.022
SPOTTED SUCKER	4	0.02	0.010
SILVER REDHORSE	28	0.14	0.069
RIVER REDHORSE	6	0.03	0.015
BLACK REDHORSE	1	0.01	0.002
GOLDEN REDHORSE	358	1.84	0.886
SHORTHEAD REDHORSE	177	0.91	0.438
UNID MOXOSTOMA	1	0.01	0.002
BLACK BULLHEAD	3	0.02	0.007
YELLOW BULLHEAD	47	0.24	0.116
CHANNEL CATFISH	376	1.93	0.931
UNID AMEIURUS	1	0.01	0.002
TADPOLE MADTOM	4	0.02	0.010
FLATHEAD CATFISH	17	0.09	0.042
TROUT-PERCH	1	0.01	0.002
BLACKSTRIPE TOPMINNOW	16	0.08	0.040
BROOK SILVERSIDE	98	0.50	0.243
WHITE PERCH	4	0.02	0.010
WHITE BASS	9	0.05	0.022
YELLOW BASS	8	0.04	0.020
HYBRID MORONE	2	0.01	0.005
UNID MORONE	5	0.03	0.012
ROCK BASS	11	0.06	0.027

TABLE 1E (cont.)

SPECIES (cont.)	LOWER DRESDEN POOL		
	#	CPE	%
GREEN SUNFISH	3,146	16.16	7.788
PUMPKINSEED	26	0.13	0.064
WARMOUTH	5	0.03	0.012
ORANGESPOTTED SUNFISH	3,040	15.62	7.526
BLUEGILL	7,271	37.35	18.000
LONGEAR SUNFISH	67	0.34	0.166
REDEAR SUNFISH	1	0.01	0.002
HYBRID SUNFISH	108	0.55	0.267
UNID LEPOMIS	110	0.57	0.272
SMALLMOUTH BASS	477	2.45	1.181
LARGEMOUTH BASS	1,659	8.52	4.107
UNID MICROPTERUS	1	0.01	0.002
WHITE CRAPPIE	15	0.08	0.037
BLACK CRAPPIE	35	0.18	0.087
BANDED DARTER	1	0.01	0.002
YELLOW PERCH	1	0.01	0.002
LOGPERCH	126	0.65	0.312
BLACKSIDE DARTER	1	0.01	0.002
SLENDERHEAD DARTER	3	0.02	0.007
WALLEYE	1	0.01	0.002
FRESHWATER DRUM	439	2.26	1.087
TOTAL FISH	40,394	207.50	100.000

TABLE 1F. NUMBER, CPE (No./km), AND RELATIVE ABUNDANCE OF ALL FISH TAXA COLLECTED ELECTROFISHING DOWNSTREAM OF DRESDEN LOCK AND DAM FOR THE PERIOD OF 1994, 1995, AND 1999-2002.

SPECIES	D/S DRESDEN L&D		
	#	CPE	%
LONGNOSE GAR	18	0.41	0.239
SHORTNOSE GAR	1	0.02	0.013
UNID GAR	2	0.05	0.027
SKIPJACK HERRING	23	0.52	0.305
GIZZARD SHAD	1,003	22.80	13.301
THREADFIN SHAD	55	1.25	0.729
GOLDEYE	1	0.02	0.013
GRASS PICKEREL	1	0.02	0.013
NORTHERN PIKE	3	0.07	0.040
GRASS CARP	1	0.02	0.013
COMMON CARP	178	4.05	2.360
CARP X GOLDFISH HYBRID	2	0.05	0.027
GOLDEN SHINER	2	0.05	0.027
EMERALD SHINER	2,565	58.30	34.014
GHOST SHINER	7	0.16	0.093
STRIPED SHINER	7	0.16	0.093
SPOTTAIL SHINER	50	1.14	0.663
RED SHINER	5	0.11	0.066
SPOTFIN SHINER	422	9.59	5.596
SAND SHINER	36	0.82	0.477
MIMIC SHINER	9	0.20	0.119
SUCKERMOUTH MINNOW	8	0.18	0.106
BLUNTNOSE MINNOW	265	6.02	3.514
BULLHEAD MINNOW	257	5.84	3.408
RIVER CARPSUCKER	91	2.07	1.207
QUILLBACK	69	1.57	0.915
HIGHFIN CARPSUCKER	1	0.02	0.013
UNID CARPIODES	2	0.05	0.027
NORTHERN HOG SUCKER	7	0.16	0.093
SMALLMOUTH BUFFALO	180	4.09	2.387
BIGMOUTH BUFFALO	1	0.02	0.013
BLACK BUFFALO	1	0.02	0.013
SILVER REDHORSE	50	1.14	0.663
RIVER REDHORSE	3	0.07	0.040
BLACK REDHORSE	2	0.05	0.027
GOLDEN REDHORSE	236	5.36	3.130
SHORTHEAD REDHORSE	56	1.27	0.743
GREATER REDHORSE	1	0.02	0.013
BLACK BULLHEAD	1	0.02	0.013
CHANNEL CATFISH	126	2.86	1.671
FLATHEAD CATFISH	4	0.09	0.053
TROUT-PERCH	1	0.02	0.013
MOSQUITOFISH	2	0.05	0.027
BROOK SILVERSIDE	24	0.55	0.318
WHITE PERCH	3	0.07	0.040
WHITE BASS	50	1.14	0.663
YELLOW BASS	7	0.16	0.093
HYBRID MORONE	3	0.07	0.040
UNID MORONE	50	1.14	0.663
ROCK BASS	2	0.05	0.027
GREEN SUNFISH	466	10.59	6.180
PUMPKINSEED	1	0.02	0.013
ORANGESPOTTED SUNFISH	11	0.25	0.146
BLUEGILL	559	12.70	7.413
LONGEAR SUNFISH	7	0.16	0.093
HYBRID SUNFISH	2	0.05	0.027
SMALLMOUTH BASS	172	3.91	2.281
LARGEMOUTH BASS	174	3.95	2.307

TABLE 1F (cont.)

SPECIES	D/S DRESDEN L&D		
	#	CPE	%
WHITE CRAPPIE	2	0.05	0.027
BLACK CRAPPIE	8	0.18	0.106
LOGPERCH	36	0.82	0.477
SLENDERHEAD DARTER	1	0.02	0.013
WALLEYE	1	0.02	0.013
FRESHWATER DRUM	207	4.70	2.745
TOTAL FISH	7,541	171.39	100.000

Table 2. Upper Thermal Temperatures of Various Des Plaines River RIS

Species	Location	Lifestage (size)	Upper Lethal Temp. (°C)	Reference
C. carp*	Poland	Juvi	40.6	Horoszewicz 1973
	Lake Erie	YOY	39.0	Reutter and Herdendorf 1975, Reutter and Herdendorf 1976
	Canada	YOY& Juvi	35.7	Black, E.C. 1953
Channel CF	Lake Erie	165	38.0	Reutter and Herdendorf 1975 Reutter and Herdendorf 1976
	AK hatchery	44-57	37.8	Allen and Strawn 1967
	Lower Susquehanna R, PA	158	36.5	Peterson, Sutterlin, and Metcalf 1979
	SC hatchery	50	36	Cheetham, et al. 1976
Bluegill	SC cooling ponds	Juvi (27-58 mm)	41.9-42.8	Holland, W.E., et al. 1974
	SC cooling ponds	40-82 mm	38.5-41.4	Holland, W.E., et al. 1974
	Wabash R, IN	49 mm	39.0	WAPORA, Inc. 1976
	TN	73, 140	37.4-39.2	Cox, D.K. 1974
	Lake Erie	168	38.3	Reutter and Herdendorf 1975, Reutter and Herdendorf 1976
	Mississippi River	Juvi	37.3	Banner and Van Arman 1973
	VA hatchery	50-100	36.0	Cherry, D.S., et al. 1977
	Lower Susquehanna R, PA	52-159	36.0	Peterson, Sutterlin, and Metcalf 1979; Peterson and Schutsky 1979
	Lower Susquehanna R, PA	52-159	35.8	Peterson, Sutterlin, and Metcalf 1979; Peterson and Schutsky 1979
	Lake Erie		35.5	Hickman and Dewey 1973
	Mississippi River	YOY	35.0	Cvancara, V.A. 1975
	Galveston Bay, TX		35.0	Chung, K. 1977
	Mississippi River	Juvi, adults	34, 33	Hart 1947
	Mississippi River	Eggs	33.8	Banner and Van Arman 1973
	Mississippi River	YOY	28.5	Cvancara, V.A. 1975, Cvancara, et al. 1977

* All data (except redhorse data) from Talmage, S. and D. Opresko. 1981. Literature Review: Response of Fish to Thermal Discharges. EPRI Publication EA-1840. Redhorse data from Reash, R., G. Seegert, and W. Goodfellow. 2000. Experimentally-derived upper thermal tolerances for redhorse suckers: revised 316(a) variance conditions at two generating facilities in Ohio. Env. Sci. & Policy Vol 3:S191-S196.

Table 2. Upper Thermal Temperatures of Various Des Plaines River RIS

Species	Location	Lifestage (size)	Upper Lethal Temp. (°C)	Reference
LM bass	Parpond, SC	Immature	40.0	Smith, M.H. and Scott 1975
	Galveston Bay, TX		37.2	Courtenay, et al. 1973
	Mississippi River	YOY	36.2	Cvancara, V.A. 1975
	Galveston Bay, TX		36	Chung, K. 1977
	Mississippi River	YOY	35.6	Cvancara, V.A. 1975 Cvancara, V.A. et al. 1977
	Canada Lake	52 g	28.9	Black, E.C. 1953
SM bass	Alabama	YOY	37.0	Wrenn 1980
	Lake Erie	151	36.3	Reutter and Herdendorf 1975, Reutter and Herdendorf 1976
	New & East R., VA	50-100	35.0	Cherry, D.S. et al. 1977
	Alabama	Adults	35.0	Wrenn 1980
Green SF			35	Whitford 1970
FW Drum	Mississippi River	YOY	36.0	Cvancara 1975
	Lake Erie	180-212	34.0	Reutter and Herdendorf 1975, Reutter and Herdendorf 1976
	Mississippi River	YOY	32.8	Cvancara, V.A. 1975 Cvancara, V.A. et al. 1977
E. shiner	S. Canadian R, OK	Adults	37.7	Matthews and Maness 1979
	Lake Superior	Juvi	35.2	McCormick and Kleiner 1976
	Canada	Juvi	30.7	Hart 1947
Gizzard shad	Lake Erie	?	36.5	Hart 1952
	Lake Erie	152-167	31.7	Reutter and Herdendorf 1975, Reutter and Herdendorf 1976
	Mississippi	YOY	31.0	Cvancara, V.A. 1975
	Mississippi	YOY	28.5	Cvancara, V.A. 1975, Cvancara, et al. 1977
BN minnow	Wabash R, IN		38	WAPORA, Inc. 1971
	New & East Rivers, VA	50-100	32	Cherry, et al. 1977
	New York streams		31.9	Kowalski, et al. 1978
Shorthead RH	Muskingum R, OH	Juvi	33.3	Reash et al 2000
SM buffalo	Wabash R, IN		31-34 (preferred)	Gammon 1973
	Ohio River		22-23 (preferred)	Yoder & Gammon 1976

Table 3. Comparison of RIS Catch Rates (No/km) Upstream and Downstream of I55.

Species	1999		2000		2001	
	US I55	DS I55	US I55	DS I55	US I55	DS I55
Smallmouth bass	1.2	0.6	0.4	1.1	1.0	0.9
Largemouth bass	7.9	14.0	7.2	13.7	5.4	6.4
Green sunfish	29.7	12.6	24.5	28.9	16.9	7.0
Bluegill	10.6	50.9	19.0	86.4	18.2	33.9
Gizzard shad	32.1	51.0	27.0	62.3	65.1	84.9
Emerald shiner	10.1	3.2	7.7	1.8	11.4	9.2
Bluntnose minnow	8.3	12.1	6.2	26.7	20.9	19.1
Smallmouth buffalo	3.4	3.7	2.4	2.4	2.5	3.2
Channel catfish	3.2	1.9	3.6	2.0	3.5	1.9
Freshwater drum	3.0	2.6	4.6	1.6	3.0	2.4
Redhorse spp.	0.6	1.1	0.9	0.8	0.2	0.7

Table 4. Kankakee, Illinois and Des Plaines River Redhorse (all species combined) Catch Rates

Kankakee River near Braidwood (11 locations)

YEAR	CPE (No./km)
1999	27.3
1998	17.5
1996	18.1
1993	25.2
1992	11.4
1991	15.6
1990	20.8
1989	21.5

Kankakee River (IDNR data, timed effort converted to effort per 1 km)

Wilmington Dam		I-55		Confluence	
YEAR	CPE	YEAR	CPE	YEAR	CPE
2000	88.0	2000	104.0	2000	4.0

Illinois River Downstream of Dresden Lock and Dam (upper Marseilles pool)

YEAR	CPE
1999	8.7
1995	15.3
1994	4.3

Illinois River Lower Dresden Pool (several locations)

YEAR	CPE
1999	0.9
1998	8.6
1997	5.6
1995	13.1
1994	3.3

Des Plaines River: Lower Dresden Pool Downstream I-55

YEAR	CPE
1999	1.1
1998	2.4
1997	2.5
1995	2.3
1994	2.5

Des Plaines River: Upper Dresden Pool Upstream I-55

YEAR	CPE
1999	0.6
1998	0.7
1997	0.8
1995	0.0
1994	0.3

Figure 2. Upper Illinois Waterway Mean IBI Scores, 2001.

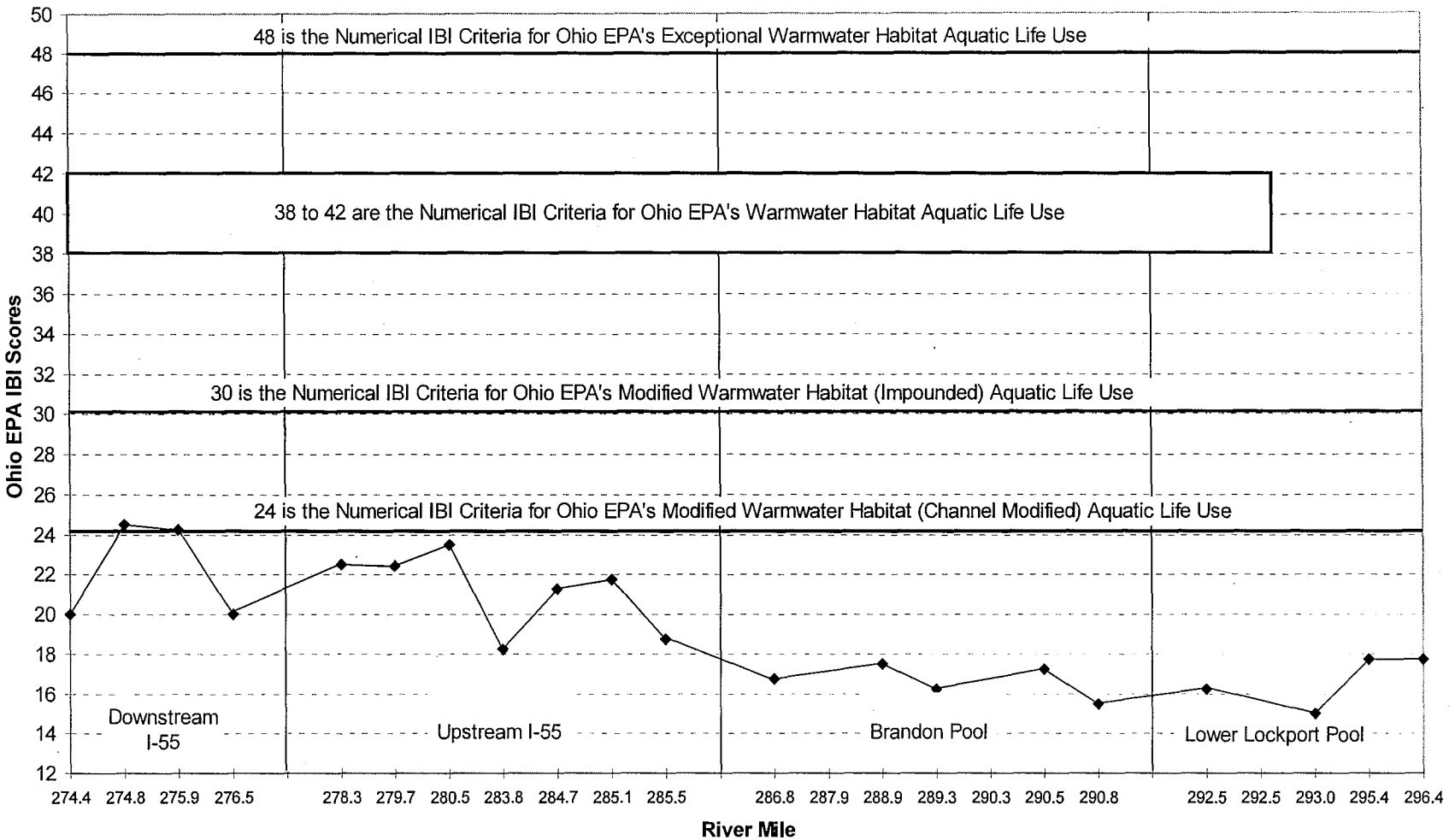


Figure 3. Upper Illinois Waterway Mean IBI Scores, 2000.

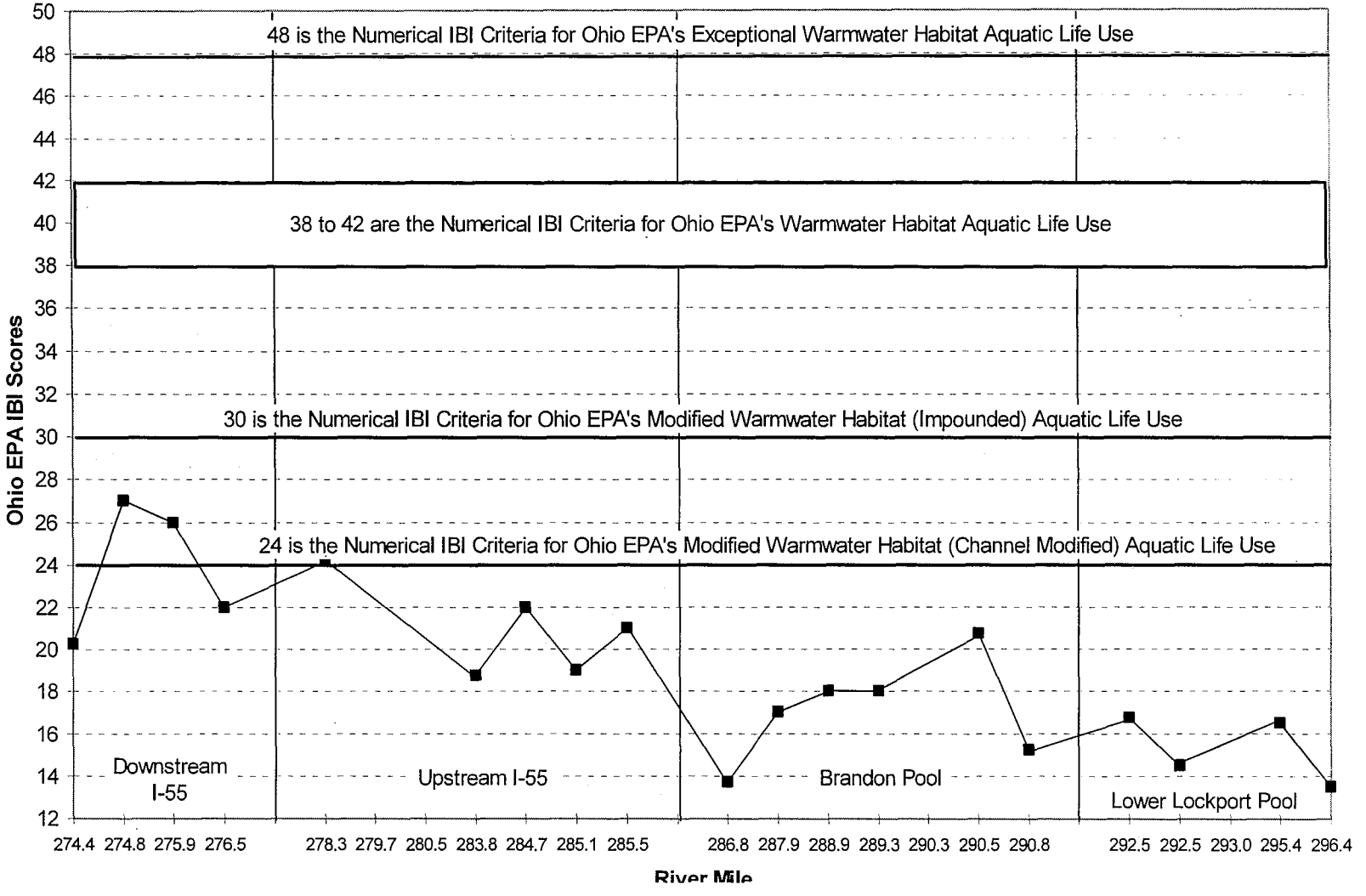


Figure 4. Mean IBI Scores Within the Upstream and Downstream I-55 Segments, 1999.

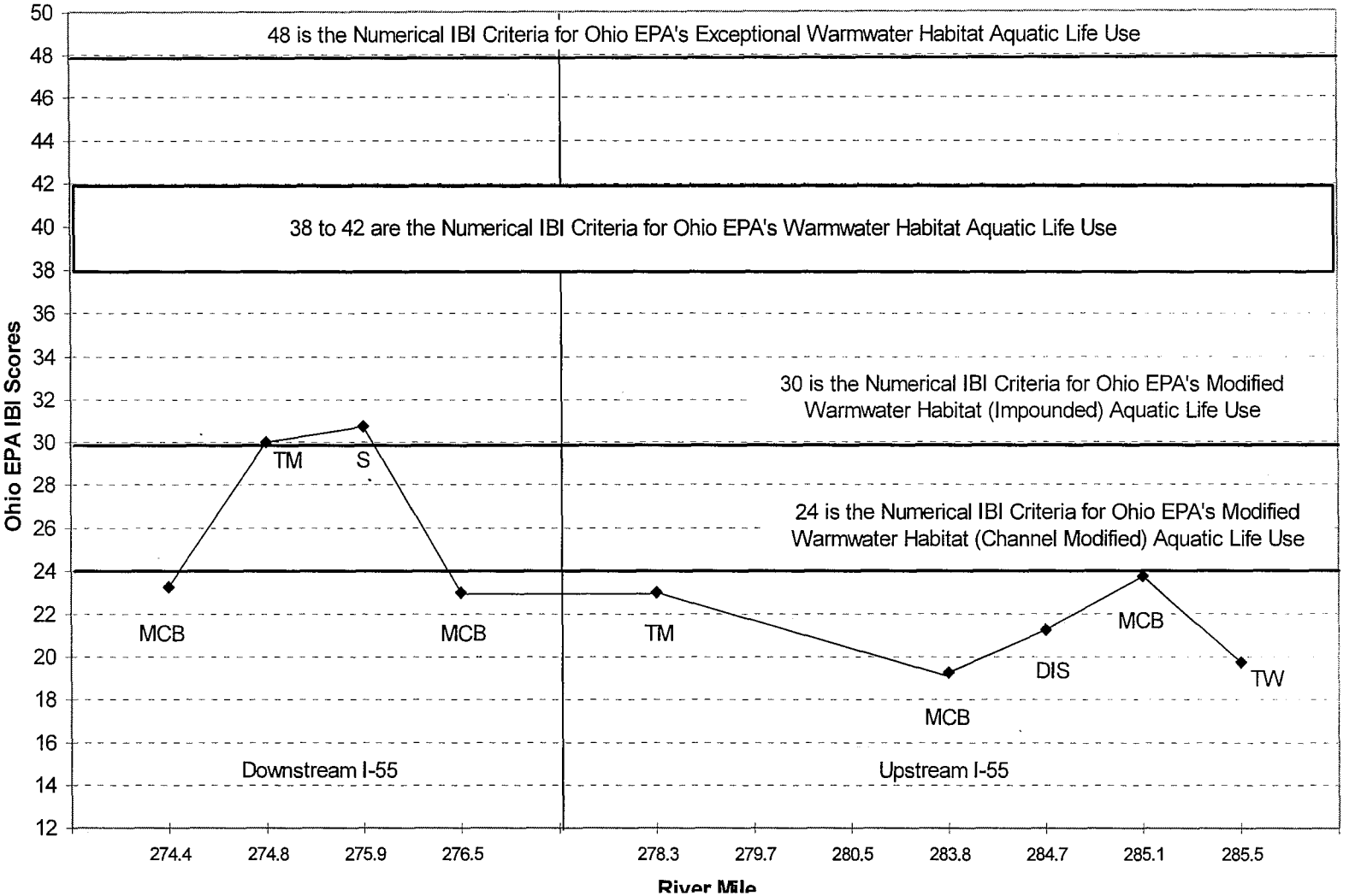


Figure 5. Mean IBI Scores Within the Upstream and Downstream I-55 Segments, 2000.

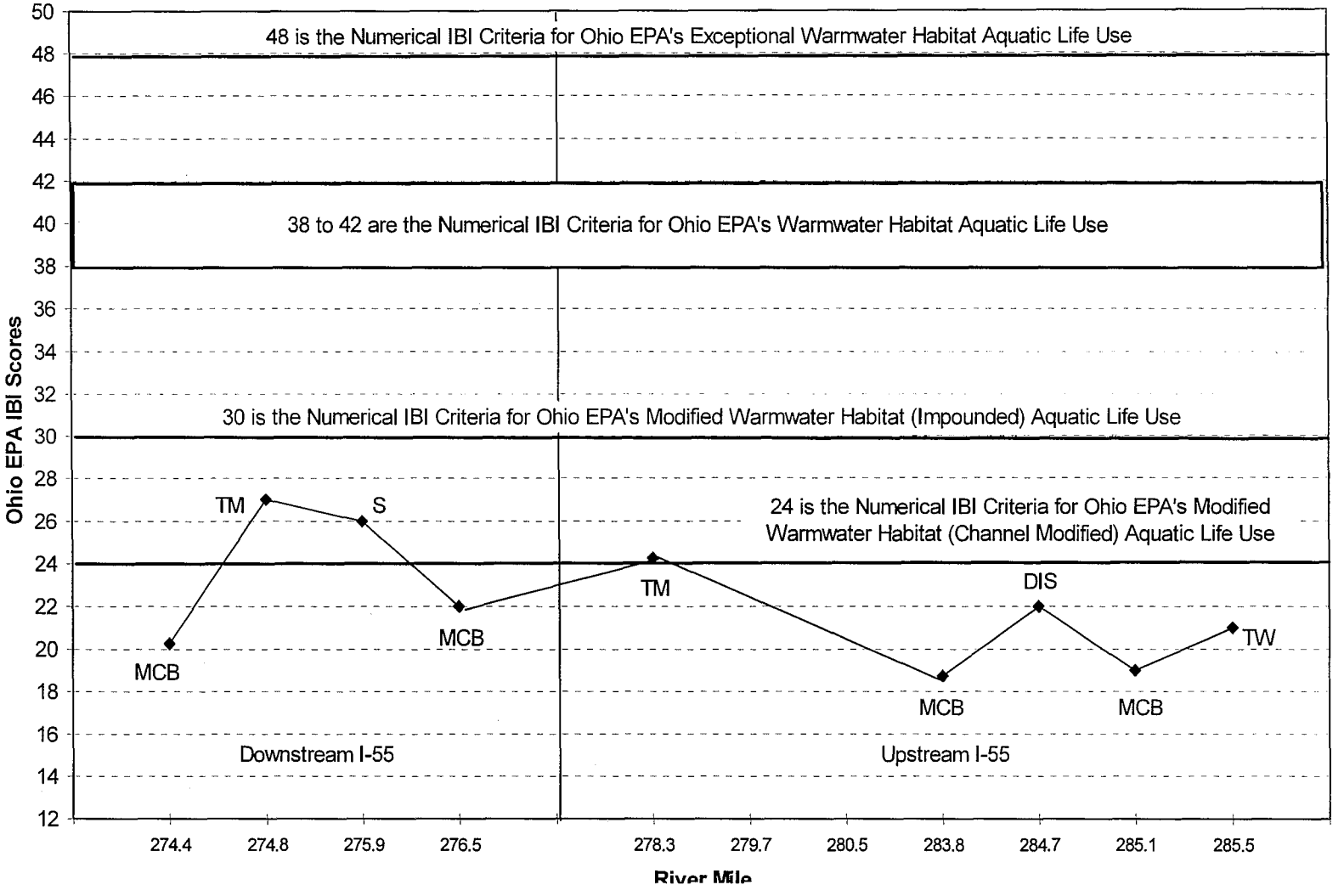
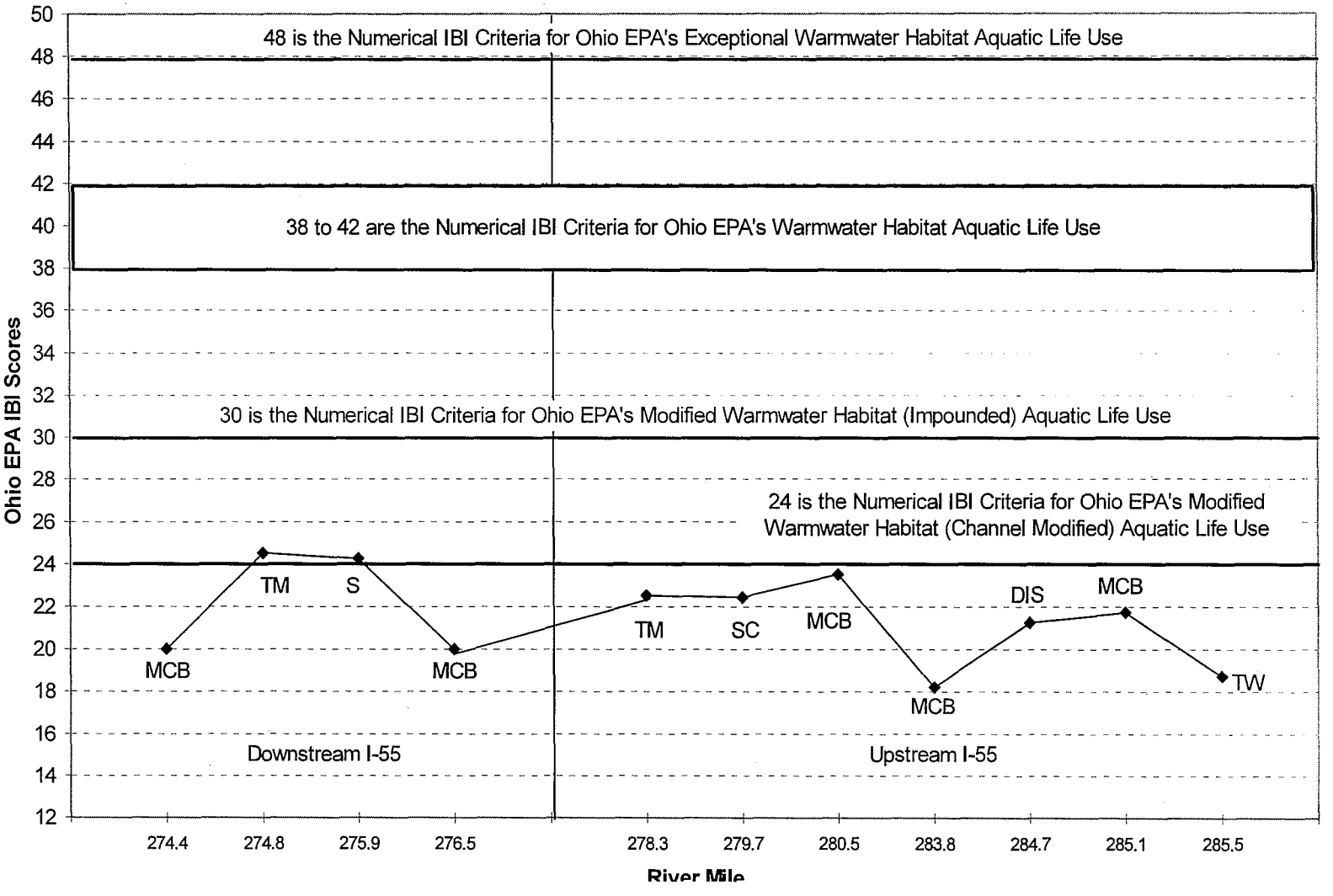


Figure 6. Mean IBI Scores Within the Upstream and Downstream I-55 Segments, 2001.



XII. COST/BENEFIT ISSUES

A significant question to be answered in the context of the current UAA process is: What is the cost/benefit of applying tighter limits and/or technological controls to further limit the amount of heat introduced to the system? The previous section has documented that the environmental benefit of lower temperatures in the Lower Des Plaines River would be negligible in the context of the existing and/or permanent physical limitations of this waterway. This section serves to provide general information for the Agency's consideration in determining appropriate thermal water quality limits for the UAA Reach which adequately serve both biological and industrial uses while not causing unjustified, adverse economic impacts. We have not attempted here to assess all of the other economic impacts that would be caused generally if the UAA Reach were upgraded to General Use. That inquiry is beyond the scope of this report.

A. Compliance with General Use Thermal Water Quality Limits

Based on modeling studies done as part of the UIW Study, it is unlikely the Lower Des Plaines River could meet the General Use thermal criteria even in the absence of power plant thermal discharges. (Final Report, UIW Study, 1995. Chapter 3). Applicability of these limitations to a system which is so heavily influenced by artificially controlled conditions and the effects of heavily urbanized surrounding areas is not likely to improve the biological community and is also not economically reasonable to achieve.

B. Costs Associated with Technological Controls and/or Operating Restrictions to Meet More Stringent Thermal Water Quality Standards

Review of the other UAA factors included in this report demonstrates that General Use is not attainable in the UAA waterway based on one or more of them Having shown that tone of more of the UAA factors is satisfied here, the proper legal conclusion is that the UAA Reach should not be designated as a General Use waterway. Therefore, MWGen believes that a full socio-economic impact study under the remaining sixth UAA regulatory factor is not warranted. However, at the Agency's request, a preliminary engineering cost estimate on the operational/technological considerations of meeting a stricter near-field water quality temperature limit will be provided by MWGen as part of this UAA effort. If the opportunity is provided, details regarding this cost estimate can be presented at a future UAA Workgroup meeting.

XIII. CURRENT AND FUTURE OPERATIONAL CONSIDERATIONS

A. SEASONALITY OF PEAK POWER PRODUCTION

The highest demand for Midwest Generation's product ("electricity") comes concurrently with the highest ambient air and water temperatures and lowest river flows. The critical summer period is when the need for electricity is the greatest. Air conditioning all of the commercial businesses and residential buildings in northern Illinois requires a tremendous amount of power. This is in addition to the normal demands on the system: lighting, computer systems, health care equipment, routine conveniences, etc. During the hottest times of the year, the ambient river temperatures are also increased, due to higher air temperatures and solar inputs. The discharges from our power plants also contribute to this temperature rise. This creates a situation in which thermal stress is exerted on the waterway from both natural and man-made sources, in response to ambient weather conditions.

Despite this reality, and yet in fact, because of it, Midwest Generation plants must remain available to provide needed power to the citizens and businesses of Northern Illinois (and beyond) during these periods. Production levels cannot be adjusted/moved to a less sensitive time of year, as an industrial manufacturing facility may be able to do. (i.e. Midwest Generation cannot "store" electricity made during off-peak seasons to provide for customer demand during critical summer periods).

Midwest Generation is very sensitive to potential impacts on the environment. We have a continuing commitment to remain in compliance with our permit limitations. We have continued to take significant steps to reduce effluent temperature levels during critical periods, including the use of cooling towers and unit deratings, in order to maintain compliance with all applicable thermal water quality standards while optimizing the ability of our stations to continue to produce needed power. Midwest Generation's goal is to strike an equitable and protective balance between the energy needs of the citizens of Illinois and the environmental concerns associated with our operations.

B. USE OF EXISTING COOLING TOWERS

The 24 mechanical draft, once-through cooling towers at Joliet Station #29 were installed on a completely voluntary basis by ComEd in 1999. (This installation took place after the current alternate thermal limits for I-55 were granted, not as a means to obtain them). Use of the towers serves to mitigate any potential adverse thermal impacts that station operations could have on either a near-or far-field basis. The towers are designed to operate on an intermittent basis only, and do not receive any type of treatment for biofouling control, other than drying. Operation of the towers results in an effective discharge temperature considerably less than the end-of-pipe value. Based on design criteria, the use of the towers is projected to result in a temperature decrease of at least 14 °F in the volume of discharge passed through them (approx. 33% of the total design flow of the station, or over 50% of the typical condenser flow rate). Based on actual temperature monitoring data, a comparison of the pre-cooling tower effluent and the post-cooling tower effluent shows a more typical temperature decrease is approximately 20 °F, and can be higher under elevated tower influent temperature conditions. This results in an overall effective

discharge temperature at least 5 °F cooler, and more typically 10 °F cooler, than the corresponding condenser discharge temperature.

Station management remains committed to using the cooling towers on an as-needed basis, to ensure that all applicable thermal limitations continue to be met. In 2001, the towers were used for approximately 40 days during the year to maintain thermal compliance. In 2002, the towers were used for approximately 55 days. In 2003 (to-date), the towers were used for a total of approximately 37 days, primarily to control near-field compliance with the Secondary Contact thermal limits. While increased use of the cooling towers could possibly reduce the magnitude of potential temperature limit exceedances that occur within the allowable excursion hours provided in the Secondary Contact thermal standard, the cooling towers are not capable of providing the cooling needed to prevent the frequency of such elevated temperatures and hence, the requirement for significant unit deratings remains the same, raising the possibility of complete unit shutdowns, to meet more stringent thermal limits under General Use water quality standards.

C. CURRENT PLANT DERATINGS

Use of the existing Joliet Station cooling towers alone is often not sufficient to control the thermal discharge from the plant to meet the current Secondary Contact thermal limits under adverse weather/river flow conditions. Under these situations, units have been and will continue to be derated (i.e. megawatt load restricted) when compliance conditions warrant. Unfortunately, this forced loss of power occurs when it is most needed by the citizens and businesses of Northern Illinois. The cost of unplanned, emergency unit deratings to Midwest Generation is extremely high, in terms of lost revenue, and can adversely impact system reliability.

Derating is also not necessarily confined to the summer period. There have been several occasions in the recent past when the Joliet units have needed to reduce load to meet the applicable thermal limits during December and March/April, when upstream river temperatures were elevated and/or when abnormally warm weather conditions persisted over several days.

D. FUTURE COMPLIANCE ALTERNATIVES

Compliance costs are one of the factors to be considered under the UAA to evaluate the economic impact of any proposed use upgrade. Among the potential economic impacts caused by upgrading the UAA Reach to General Use are the costs for additional controls/deratings that would be required to meet these more stringent General Use thermal standards on a near-field basis for the Joliet and Will County Stations.

In the AS96-10 adjusted standard proceeding, ComEd presented evidence showing that the cost estimate to derate generating units to comply with the General Use thermal limits at I-55 (seven miles downstream of the Joliet Station discharge) was in the range of $3.5M to $16M annually (in 1995 dollars). As further shown below, complying with General Use thermal limits near-field, even with an allowed mixing zone, would be significantly more costly, and likely is not possible given the physical and technological constraints to doing so.

Based on a review of historical river temperature and station operating schedules, and confirmed by thermal modeling results, neither Will County nor Joliet Station can consistently meet the General Use thermal water quality standards under their current operational mode. This would be true for Joliet Station #29 even with all available supplemental cooling towers in operation.

Further, significant unit deratings would be required during non-summer periods should warmer weather conditions prevail during the period from December through March, when the General Use limit is 60/63 °F. Ambient, upstream temperatures of this magnitude have been observed during a number of years at both our Will County and Joliet Stations.

Installation of additional cooling towers would appear to be the solution of first choice. However, there are several, serious obstacles that surface upon further analysis.

The installation of additional supplemental cooling towers for either Joliet or Will County presents significant technological obstacles. Aside from the significant costs associated with the equipment, installation and operation/maintenance of additional cooling towers, there is not enough physical space at either station to accommodate the number of towers that would be needed to ensure uninterrupted unit operations during critical demand periods. It simply is not feasible to do. The number of towers that were installed at Joliet #29 in 1999 was chosen based not simply on historical derating information, but on the physical space available to accommodate them on-site. The 24 towers installed filled all of the available physical space along the Joliet Station discharge canal. These towers enable the Joliet Station to maintain compliance with the applicable thermal limits. They are not sufficient to achieve compliance with General Use thermal standards without drastically limiting the operating capability of the Joliet generating units.

To achieve compliance with more stringent thermal standards, significant unit deratings, and most probably total unit shut-downs, would be required under the critical load demand conditions typically encountered during hot, dry summers. The potential loss of electrical power totals approximately 2500 megawatts of normally available generation to the citizens of Northern Illinois, or the amount required to service approximately 2.5 million homes. These users would need to find an alternate source of power. Since Midwest Generation's sole business is to generate power for sale to the open market, the loss of this capability, due to a station's inability to consistently meet tighter thermal limits at normal operating loads, would likely result in the decision to shut down units unable to supply required power during peak demand times. While there are other sources of power in the area, these may not be available during critical demand conditions, due to prior sale commitments or operational problems. The potential result of the loss of this amount of power from the grid could, under extreme circumstances, lead to instability and ultimately rolling brown or black-outs under adverse weather conditions.

XIV. TEMPERATURE LIMIT PROPOSAL FOR THE BRANDON POOL

Based on the biological information and supporting data presented and/or referenced in this report, as well as the determination of the UAA Biological Subcommittee (See meeting notes dated April 3, 2002), the Brandon Pool cannot support a General Use designation. Dissolved oxygen, bacteria, copper and temperature limits are not currently meeting General Use standards in this segment of the waterway, largely due to unregulated and/or non-point source contributions. Moreover, the physical characteristics of the Brandon Pool will continue to limit its future potential to support a higher quality aquatic community, as well as any form of full body contact recreation. **For the above reasons, Midwest Generation submits that the existing Secondary Contact thermal water quality standards upstream of the Brandon Road Lock and Dam should be retained.** These standards remain adequately protective of the current and expected assemblage of aquatic organisms that inhabit the Brandon Pool, given the existing physical and chemical constraints of the system and the existing navigational uses.

XV. TEMPERATURE LIMIT PROPOSAL FOR THE UPPER DRESDEN POOL (From Brandon Road Lock and Dam to the I-55 Bridge)

Midwest Generation's operations are governed by the variable weather conditions and the artificially controlled UIW river flow, neither of which is reliably predictable in either the short or long-term. Midwest Generation has taken actions to ensure that its stations can continue to operate during high electrical demand periods, while still meeting all currently applicable thermal limitations. This compliance strategy involves using actual monitoring data to track actual UIW flow and thermal conditions and also employs thermal modeling to try to anticipate when river conditions will change and require more stringent control of thermal discharges. Midwest Generation remains on diligent and constant watch of the UIW in-stream conditions to adjust as necessary its unit loads so that compliance with existing thermal standards is maintained.

The biological and physical monitoring data from the ongoing collection efforts of Midwest Generation persuasively demonstrate that generally, existing thermal conditions in the UAA Reach have no significant adverse effects to the types of indigenous aquatic organisms existing in or expected to inhabit this waterway, given the existence of other permanent limitations and human-induced disturbances. In fact, under the prevailing ambient temperatures, there have been gradual improvements in the fish community over time, as predicted by this same type of evidence that was presented to support the IPCB's decision to grant the alternate thermal standards in the AS96-10 proceeding. All of this has been achieved because the continual input of heat to the system at Secondary Contact and AS96-10 levels does not cause significant adverse effects to the UAA Reach.

As such, **Midwest Generation submits that continuing compliance with the existing Secondary Contact limits near-field, and the alternate I-55 thermal limits far-field, as set forth in the AS 96-10 Board Opinion and Order, has and will continue to adequately protect the indigenous aquatic community in the entire UAA Reach. Actual river monitoring data for a period of over twenty years and reliable scientific evaluations of that**

data, supports the conclusion that additional or more stringent thermal restrictions are not likely to result in any substantial improvement in the biological community of the system.

Modified Thermal Limits for Upper Dresden Pool:

Under either the existing Secondary Contact or a new use designation, thermal water quality standards may be modified in order to provide further protection the current and expected assemblage of aquatic life that would reside in the Upper Dresden Pool, given appropriate consideration of the permanent constraints on the system under the UAA Factors 3, 4 and/or 5.

In an effort to make the thermal water quality standards more reflective of the existing seasonal variability in the Upper Dresden Pool, Midwest Generation proposes that a maximum thermal standard of 93 °F should apply during the summer months of June through September, with step-wise monthly or semi-monthly limits applied during the remainder of the year. Temperature in the main body of the river, as determined by the Midwest Generation's Near-Field Thermal Compliance Model, shall not exceed the maximum limits by more than 5 °F for more than 5% of the hours in the 12-month period ending December 31st. This proposal is also conditioned upon the allowance of a mixing zone consistent with Illinois regulations. This seasonal approach is consistent with the standards set in several other Region 5 states, including Ohio, and is also reflective of how the adjusted I-55 thermal standards were developed.

Table 5 shows the proposed maximum thermal limits for the Upper Dresden Pool. The numeric limits are based on the general seasonal temperature cycle of the waterway and incorporate an increased margin of safety, beyond that already currently afforded by the Secondary Contact thermal limits. Compliance with these proposed main river temperature standards can be documented through the use of the proposed Midwest Generation Near-Field Compliance Model, previously submitted to Illinois EPA and U.S. EPA Region 5 for review in 2001. (A copy this submittal is attached as Appendix 4.)

Midwest Generation has proposed this alternate temperature limitation for the Upper Dresden Pool in an effort to assist the Agency in the development of appropriate water quality limitations for this transitional waterway that are reflective of both the improvements and limitations inherent to the Lower Des Plaines River.

Under this proposal, water temperature limits would be gradually lowered over the Fall and Winter periods, and increased in the Spring period, in correspondence with the current modified thermal regime of the waterway. The seasonal cycle to be approximated by the step-wise progression of monthly or semi-monthly temperature limitations would be more reflective of the ambient conditions encountered and would also be complementary to the existing adjusted thermal standards at the I-55 Bridge. This approach is appropriate because the Upper Dresden Pool is basically a "transition zone" from Secondary Contact to General Use designated waters.

These proposed modifications to the Upper Dresden Pool thermal limits could be implemented as part of an overall sub-classification of the use designation for the Upper Dresden Pool. Alternatively, it may be accomplished by a site-specific classification for the Upper Dresden Pool with water quality standards that reflect the existing conditions in that segment of the UAA

Reach. More stringent thermal water quality limitations than those proposed above will only create significantly more burdensome and costly compliance requirements for Midwest Generation stations that are not economically sound or environmentally beneficial for this particular waterway. Such unnecessary restrictions also threaten to impose additional hardships on the general public due to the potential loss of existing levels of electrical power at competitive prices when it is most needed.

Table 5: Proposed Modified Thermal Limits for the Upper Dresden Pool
(Brandon Road Lock and Dam down to the I-55 Bridge):

Jan 1-31	Feb 1-29	Mar 1-15	Mar 16-31	Apr 1-15	Apr 16-30	May 1-15	May 16-31	Jun 1-30	Jul 1-31	Aug 1-31	Sept 1-30	Oct 1-31	Nov 1-30	Dec 1-31
72	77	82	82	90	90	92	93	93	93	93	93	92	90	82

Maximum temperature in the main body of the river, as determined by the Midwest Generation's Near-Field Thermal Compliance Model, shall not exceed the maximum limits listed above by more than 5 ^{o}F for more than 5% of the hours in the 12 month period ending December 31st. This temperature limits proposal is also conditioned upon the allowance of a mixing zone consistent with Illinois regulations.

XVI. SUMMARY AND CONCLUSIONS

There is an abundance of data demonstrating that conditions in the UAA Reach are, and will remain, strongly limiting for aquatic life. The UIW Study results show that the lack of diversity and quality of physical habitats in the UAA Reach are the primary reasons why a full aquatic life use is not attainable. The existence of fine, silty sediments in the limited habitat areas that do exist in the UAA Reach, along with chemical contamination present in certain sediments, are also important, contributing factors that prevent the attainment of the "fishable/swimmable" uses represented by the General Use classification. Even if the physical habitat conditions could be improved significantly, the predominant uses of the waterway, namely barge transport and conveyance of treated effluents and storm water away from the Metropolitan Chicago area, would still have significant adverse effects on the biological community. Artificially controlled, variable flows and pool levels to accommodate navigational needs present a condition which is considerably altered from what would be found in a natural waterway. As such, these constraints are irreversible and cannot practically be mitigated. Similarly, there is no cost-effective or practical solution to the residual chemical sediment contamination that exists throughout the system, or the fact that the system will continue to be dominated by fine-grained sediment in the future, limiting its ability to support a more diverse biological community. In addition to continuing siltation, the impounding effect caused by the Brandon and Dresden Lock and Dams has permanently degraded the riverine habitat by the elimination of riffles and fast water areas. And finally, there is no legal authority to require the reduction of the non-point source run-off that enters the UAA Reach in significant amounts and aggravates further the chemical sediment contamination.

Ambient water temperatures (main channel temperatures without power plant contributions) approximate the regional norm for warm-water streams in spring, summer, and fall. Winter ambient water temperatures tend to be elevated slightly above regional expectations due to the large inputs of water from POTWs. The maximum summer temperature rise above background when the five Midwest Generation stations (Fisk, Crawford, Will County, Joliet #9, and Joliet #29) are operating at normal load schedules (all sources considered) is about 8 °F at I-55, while compared to the General Use standard's prohibition of no more than a 5 °F rise above "natural" conditions. However, under winter conditions, the maximum temperature rise through the system is about 12 °F above background (assuming all plants are operating at normal load schedules, which is often not the case during the winter period when unit maintenance outages occur). Small areas around the discharges from the individual power stations may be warmer.

There is substantial temperature variability outside the main channel in the UAA Reach that is unrelated to power plant operations. Side channel, slough, and backwater habitats are often warmer than mid-channel areas in mid-summer (due to solar heating) and colder in winter. Complex physical and chemical interactions occur between the elevated temperatures and the dissolved oxygen cycle and the system dynamics of organic and inorganic toxicants. However, in no case is temperature the primary factory that constrains the establishment of more favorable physical and/or chemical conditions for aquatic life. In other words, even if the thermal standards were upgraded to General Use, the "fishable, swimmable" standards of the Clean Water Act would not be attained.

The extensive biological studies done to date continue to support the conclusion that, due to both physical and chemical limitations, the UIW as a whole, and the UAA Reach specifically, remains incapable of sustaining a high quality aquatic biota representative of the region and of true General Use waterbodies. At the same time, the studies provide no indication that water temperature is, in any way, significantly constraining the establishment of a unique biota suited to the physical and chemical limitations of the system. Species that find physical circumstances that suit their natural history appear to flourish within the limits set by sediment chemical contamination and physical constraints and navigational use of the UAA Reach. Species tolerant of the physical and chemical limitations that define the system are typically tolerant of the elevated temperature regime as well. The discharge temperatures allowed by the applicable Secondary Contact standards, including the AS96-10 limits, clearly do not further limit the representative fish species and other aquatic life present in the UAA Reach.

Moreover, conditions for aquatic life in the UAA reach are not expected to substantially improve in the foreseeable future, even if point source dischargers are required to reduce current loadings to the water body. The "recovery" of a degraded system generally depends on a sequence of improvements. Of primary importance is a substantive improvement in the physical, as well as the chemical condition of the waters. Suitable water clarity, dissolved oxygen content, and nutrient loadings associated with an absence or low levels of chemical contaminants such as trace metals, ammonia, herbicides, pesticides, petroleum products and other materials associated with agriculture, industrial processes, or urbanization are paramount. A diversity of uncontaminated physical habitats suitable to the native regional assemblage of aquatic life is also a necessary component of overall ecological integrity. Given a physical and chemical environment that meets minimal requirements for life, there must be a diversity of seed organisms available to recolonize a formerly degraded area. Finally, the physical/chemical environment must be sufficiently favorable to permit the recolonization process to proceed.

In the UAA Reach, the water quality has greatly improved since the adoption and application of the Secondary Contact water quality standards. These improvements stem from additional treatment and control implemented by public and private waste treatment facilities that discharge to the UAA Reach. Moreover, similar improvements have realized in the tributary drainages. There also is a suitably diverse assemblage of seed organisms available to colonize the UAA Reach. Nonetheless, irreversible obstacles still remain to the establishment of a higher quality biota. These obstacles include: (i) the general lack of habitat diversity and lack of balance among habitat types in the UAA Reach (*e.g.* except for the Brandon tailwaters, riffles are absent in the UAA study area); (ii), physical characteristics of the sediments; and (iii) contaminated sediments and physical habitat disturbances associated with barge traffic and water level fluctuations.

The resurgence of macrophyte beds, proliferation of more tolerant forms and continuous input of immigrants of more sensitive species from the tributaries to the UAA Reach serve to mask the prevailing level of physical and sediment-based chemical degradation that still exits. Colonization by more highly tolerant species and the ability of more sensitive immigrant organisms to survive in the system may provide some optimism which would lead to the misassumption that these species would be capable of carrying out their full life histories in the

UAA reach. However, there is little prospect of establishing a true resident biota of more sensitive native species similar to those inhabiting the higher quality tributaries that feed the system, such as the Kankakee River. Sufficient physical habitat to make this possible is simply not present in the UAA Reach. Moreover, the limited habitat that does exist is further constrained by the navigational traffic and the constant flow manipulations and alterations required to maintain this protected use in the UAA Reach.

The limiting factors in the UAA Reach are clearly and consistently the physical habitat and sediment quality limitations that characterize this system. These factors will remain unchanged for the foreseeable future. Each of these factors alone satisfy the requirements of the UAA analysis under the Clean Water Act regulations for maintaining the current use designation of the UAA Reach, or developing an alternate use designation that reflects the constraints present in the waterway. Clearly, the weight of the biological and physical evidence here supports the conclusion that General Use is not attainable for the UAA Reach, within the meaning of 40 CFR 131.10(g).

This report also has provided actual monitoring data and pertinent reference information to demonstrate that the thermal levels in the UAA Reach have not and cannot improve to those required under the General Use standards without a significant technical and financial burden to MWGen. To propose such a use upgrade, and the corresponding thermal water quality standards required by General Use, would likely result in a serious loss of electrical capacity to service the needs of Illinois industrial and residential users while not reaping any significant environmental benefits to the UAA Reach. Twenty-plus years of actual river monitoring data show that the present thermal regime of the Lower Des Plaines River has not negatively impacted the biological community that resides in the system. Other more important factors, such as habitat limitations, sediment quality and flow alterations/commercial navigation have far more influence on the overall assemblage of species capable of residing in the waterway both now and in the future. In addition, there is still a consumption advisory in effect for certain species of fish present in the UAA Reach--this alone should preclude the area from being designated as full General Use.

All of the above unalterable conditions and conditions that cannot be modified sufficiently satisfy one or more of the UAA six regulatory factors to allow for an alternate use designation for this industrialized urban waterway which would be commensurate with its permanently altered character. Accordingly, the Illinois EPA may elect to preserve the improvements in chemical water quality that have been realized in the UAA Reach by creating a new use classification or sub-classification that incorporates the chemical levels that are being attained by the UAA Reach. Ohio's more specific and refined use classification system is one approach that can serve as guidance to the Illinois EPA in crafting an alternative use designation. Better and more refined use designations, with correspondingly differentiated water quality standards, may help recognize the water quality improvements in the UAA Reach. As it currently stands, the Illinois use classification system is not differentiated sufficiently to acknowledge any use levels that fall between Secondary Contact and General Use. . The UAA study reach, as a whole, will not meet the criteria for a full General Use waterway. Further, as U.S. EPA's UAA guidance states, primary contact recreation, one of the requirements of a General Use classification, is also a significant concern for the UAA Reach. Navigational traffic, as well as widespread

bacteriological concerns, threaten the safety of public recreation in the waters of the Lower Des Plaines River. Several deaths and near-misses have occurred in recent years, even with the current Secondary Contact designation in place. Further mishaps and/or potential tragedies are more likely to occur if the State deems the UAA Reach suitable for full body contact recreation. Absent some further refinement of the Illinois use classification system, the current Secondary Contact designated use is the only use designation attainable, as shown by the physical, sediment chemistry/character and biological data relating to the UAA Reach.

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APPENDIX 1

Use Attainability Analysis (UAA) Factors

A Use Attainability Analysis (UAA) consists of six factors that are to be considered in determining whether the fishable/swimmable goals of the Clean Water Act (CWA) may be attainable for a particular water body. (Ref: 40 CFR Section 131.10(g). These factors must be looked at holistically for the waterway, and not segmented for each particular aspect of the system, as the draft UAA report has done. Ecological integrity is the summation of all factors which influence the ability of organisms to carry out their full life cycles in a given waterway.

Based on the chemical, physical and biological data available for the waterway, the six factors are outlined below, along with a determination of their applicability to the Lower Des Plaines River UAA:

1. Naturally occurring pollutant concentration prevent the attainment of the use;

>>>Potentially applicable if ammonia is considered a naturally occurring pollutant.

2. Natural, ephemeral, intermittent or low flow conditions or water levels prevent the attainment of the use, unless these conditions may be compensated for by the discharge of sufficient volume of effluent discharges without violating State water conservation requirements to enable uses to be met;

>>>Applicable to UAA Reach. See discussion in Paragraph 4 below regarding effect of low flow conditions and water levels.

3. Human-caused conditions or sources of pollution prevent the attainment of the use and cannot be remedied or would cause more environmental damage to correct than to leave in place;

>>>Applicable to UAA Reach.

Widespread, historic sediment contamination (the result of human activities), as well as artificially-controlled flow manipulations and barge traffic disturbances affect the entire length of the UAA reach, and beyond. Barge traffic has been shown to be lethal to fish. Also, there has been no proposal made to remediate the existing sediment contamination problem and a means to prevent future sediment contamination from non-point sources is unknown. The impounded nature of the waterway will continue to result in the deposition of fine-grained, silty sediments (contaminated or not), which are not conducive to the development of higher quality fish and macroinvertebrate habitat. As water-borne commerce, transportation and industrial uses are protected uses under the CWA, it is unlikely that these activities will cease in the foreseeable future. As such, the waterway will continue to be dominated by upstream POTW and industrial effluents, artificial flow control, channelization and barge traffic effects.

Use Attainability Analysis (UAA) Factors

4. Dams, diversions, or other types of hydrologic modifications preclude the attainment of use, and it is not feasible to restore the water body to its original condition or to operate such modification in a way that would result in attainment of the use;

>>>Applicable to the UAA Reach.

The entire Upper Illinois Waterway (UIW), including the UAA reach, is basically a series of pools separated by locks and dams. Flow in the system is controlled entirely by diversions from Lake Michigan, effluents from large POTWs, and level manipulation to accommodate barge traffic. Besides their hydraulic influence, these dams greatly affect habitat quality by eliminating riffles, causing silty sediment deposition and reducing current speed, etc.

Flow rates are sporadic in nature and vary widely in magnitude on any given day. Flow patterns do not follow any natural, seasonal cycle and cannot be forecast with any measure of accuracy due to their completely artificial nature.

5. Physical conditions related to the natural features of the water body, such as the lack of proper substrate, cover, flow, depth, pools, riffles, and the like, unrelated to water quality, preclude attainment of aquatic life protection uses; or

>>>Applicable to the UAA Reach.

Limitations on available, suitable habitat in the system is the primary constraint which prevents further substantive improvements in the indigenous aquatic community. What habitats do exist are also continually disturbed by barge traffic and artificially controlled river flows and levels. There is little or no shoreline cover, fast water areas, riffles or other physical features needed for more desirable fish species to establish viable populations in this portion of the Lower Des Plaines River. The species that do exist and actually thrive in this system are those whose life history characteristics are better suited to the physical characteristics and conditions of the waterway.

6. Controls more stringent than those required by Section 301(b)(1)(A) and (B) and 306 of the CWA would result in substantial and widespread economic and social impact.

>>Applicable to the UAA Reach.

The cost to install and operate supplemental cooling for the three Midwest Generation Stations situated along this waterway to meet General Use thermal limitations would constitute a significant economic hardship on the company (assuming that installation is

even feasible, due to physical space constraints at the sites). These costs would not be offset by any comparable significant environmental benefit, and would, conversely, create a serious and potentially dangerous situation in which the power supply of northern Illinois citizens could be severely jeopardized in times of greatest demand, because the Joliet #9, Joliet #29 and Will County Stations would be forced to shut down to meet the tighter General Use thermal water quality limits. The citizens of Illinois would suffer, and the aquatic community of the Lower Des Plaines would likely see no measurable or meaningful improvement.

APPENDIX 2

Executive Summary of UIW Study, Results and Conclusions

The UIW Investigation was initiated in late 1991 with an invitation to Illinois and Federal regulatory and water management agencies, certain public interest groups, and other water-users to participate. In response to this solicitation, a multi-institutional group - the Upper Illinois Waterway Task Force - was formed and charged with the design and oversight of studies that would clarify the current status of the waterway and aid in predicting future conditions. ComEd, in turn, committed to conduct the requisite studies deemed necessary by the Task Force and utilize this technical information base to develop recommendations for alternative thermal standards applicable to its power plants.

The investigation included a broad base of ecological studies of the waterway relevant to evaluating the aquatic ecosystem. It included studies of available habitats, biota that would be expected to be present in these habitats, levels of water and sediment contamination, chemical risk screening, surface thermal imagery of the entire waterway as well as in the immediate vicinities of the power stations, 3-dimensional reconstructions of the thermal plumes for each power station to evaluate zones of passage around the warmest parts, mathematical thermal modeling of the entire geographic reach considering all other relevant features affecting water temperature (including calibration using actual field measurements), and a 40+ year climatological reconstruction to estimate water temperatures under all historically known combinations of ambient weather and plant operating conditions. It included a thorough literature review of previous UIW studies, including contaminants in fish tissues. It also included literature reviews on effects of temperature on fish, interactions of temperature and chemicals of freshwater biota, and effects of turbidity and barge traffic on aquatic ecosystems. **These studies, in combination with the biological monitoring of phytoplankton/periphyton, macrophytes, benthic invertebrates, ichthyoplankton, fish, and fish diseases comprise the most thorough study of this portion of the UIW ever conducted.**

The studies and surveys performed clearly demonstrate that conditions in the waterway remain limiting for aquatic life. Lack of diversity and stability of physical habitats clearly are limiting factors, as are the pervasive chemical contamination in sediments and occasional depressed dissolved oxygen levels. The limitations are mostly severe in the upper pools. Prospects for improving physical habitat conditions are limited and tend to conflict with the predominant uses of the waterway, namely barge transport and conveyance of treated point and non-point source discharges. Similarly, there are no obvious practical and economical short-term solutions to the residual chemical contamination in sediments that persist throughout the system.

The biological studies conducted under the UIW Task Force's direction support the conclusion that, due to physical and chemical limitations, the UIW remains incapable of sustaining a high quality aquatic biota representative of the region. At the same time, **the studies provide no indication that the contribution to higher water temperature caused by power plant operation is constraining the establishment of aquatic biota suited to the physical and chemical limitations of the system.** Species that find physical circumstances that suit their natural history appear to flourish within the limits set by both chemical contamination

and limited habitat. Species tolerant of the physical and chemical limitations that define the system are typically tolerant of the elevated temperature regime as well.

In short, operation of ComEd's (now Midwest Generation's) power plants does not interfere with maintaining a reasonably balanced indigenous community of aquatic organisms in the UIW consistent with its limited physical habitat, abnormal thermal pattern even in the absence of power stations, and history of chemical contamination that remains in sediments.

Based on the results of these studies, alternative thermal limitations for the I-55 Bridge were developed and submitted to the Illinois Pollution Control Board in the spring of 1996. The Board approved the proposed standards on October 3, 1996. The NPDES permits were modified to include the standards by February, 1997. **It is important to note that while alternate thermal limitations were approved for I-55 based on the study results, the supporting information contained in the UIW study reports also confirms that the Secondary Contact thermal limits remain generally supportive of the existing indigenous aquatic community in the upstream reaches, especially given the other permanent limitations in the system.** Midwest Generation continues to obtain information about the waterway by conducting focused studies on particular areas of concern, including potential effects on the fisheries community and temperature/dissolved oxygen interactions. All recent data suggest that temperature is not a significant contributor to the current biological integrity of the system. A reassessment of the conditions in the waterway will be made as conditions warrant.

APPENDIX 2

Executive Summaries from All Individual
Upper Illinois Waterway Studies

(included with original January 24, 2003 report--electronic copies not available)

APPENDIX 3

List of Individual Biological, Chemical and Physical Study Reports Associated with the Upper Illinois Waterway, 1990 to present

LITERATURE REVIEW

- EA Compilation/Annotation of Physical, Chemical & Biological Data Pertaining to CSSC, Lower Des Plaines & UIW 1980 - 1991
  - Main Report & Appendices - (July 1992)
- Reviews of Literature Concerning:
  - Effects of Temp. on fish
  - Effects of Freshwater Biota from Interactions of Temperature and Chemicals
  - Effects of Turbidity and Barge Traffic on Aquatic Ecosystems (Dec. 18, 1995)

PHYSICAL/CHEMICAL

- ENSR Physical-Chemical Study of UIW - Summer '93 - Spring '94
- ENSR D.O./Temp. Monitoring @ I-55 (1995)
- EA D.O./Temp. Monitoring @ I-55 (1997)
- EA D.O./Temp. Monitoring @ I-55 (1998)
- EA D.O./Temp. Monitoring @ I-55 (1999)
- EA D.O./Temp. Monitoring @ I-55 (2000)
- EA D.O./Temp. Monitoring @ I-55 (2001)
- EA D.O./Temp. Monitoring @ I-55 (2002)
- EA D.O./Temp. Monitoring @ I-55 (2003)--In progress

- Appendix A - Summary of Physico-chemical Measurements Collected by Municipal & Industrial Dischargers within ComEd's Area of Concern (1993)
  (reference copy only)
- Aerial Imagery of Surface Temps using Infrared (IR) Imagery
  - Summer 1993
  - Winter 1994
- Thermo-Hydrodynamic Model of the Chicago Sanitary & Ship Canal and the Lower Des Plaines River (Dec. 1994)
  (volumes 1 & 2)
- Fly-Over Photos (Natural & IR) (multiple years throughout study period)
- UIW Report on Estimation of Water Temperature Exceedance Probabilities in the UIW using Thermo-Hydrodynamic Modeling (Jan. 1996)
- LMS UIW Chemical Risk Screening (Jan. 1996)
  (Main Report & Appendices A - P)
- UIW 1994 - 1995 Sediment Contamination Assessment, G. Allen Burton Dec. 18, 1995

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List of Individual Biological, Chemical and Physical Study Reports Associated with the Upper Illinois Waterway, 1990 to present

PHYSICAL/CHEMICAL (cont).

- Continuous In-Situ Monitoring and Thermal Effect Characterization Tasks - Final Report June 18, 1998 (July 1997 - March 1998)
- Continuous In-Situ Monitoring and Thermal Effect Characterization Tasks - Final Report March 11, 1999 (July 1998 - October 1998)
- Habitat Evaluation of the Dresden Pool (May, 2003--unpublished), performed by EA Engineering, Science and Technology for Midwest Generation.

BIOLOGICAL

- Des Plaines River Long-Term Monitoring Program: Aquatic Biology Section Technical Report Phase I 1986 (6)
- Des Plaines River Long-Term Monitoring Program: Aquatic Biology Section Technical Report Phase II (87/04)

- Des Plaines River Long-Term Monitoring Program: Vegetation Analyses and Habitat Characterization (88/5)
- Des Plaines River Long-Term Monitoring Program -- Vegetation Analyses and Habitat Characterization (July 1992)

- 1993 Phytoplankton Survey (March 1994)

- Aquatic Macroinvertebrates within the Upper Illinois Waterway 1992-1993 Report (Feb. 2, 1994)

- 1993 Benthic Macroinvertebrate Investigation and Habitat Assessment (RM. 272-323) (Feb. 2, 1994)
- UIW 1994 Benthic Macroinvertebrate Investigation and Habitat Assessment (March 2, 1995)

- 1994 Aquatic Macrophyte Investigation and Habitat Assessment (Feb. 21, 1995)
- 1995 Aquatic Macrophyte Investigation and Habitat Assessment (Jan. 5, 1996)

- Winter Fisheries Survey on the Des Plaines River 1992 (May 1992)
- Lower Des Plaines River Aquatic Monitoring - Final Report 1992 (Jun 1993)
- Winter Fisheries Studies in the UIW 1993 (Oct. 1993)
- Spring Spawning Survey in the UIW 1993 (Oct. 1993)

APPENDIX 3

List of Individual Biological, Chemical and Physical Study Reports Associated with the Upper Illinois Waterway, 1990 to present

BIOLOGICAL (cont).

- 1994 Winter Fisheries Survey (July 1994)
- 1994 Ichthyoplankton Investigation (UIW) (April 1995)

- UIW 1993 Fisheries Investigation (March, 1994) (Report & Appendix)
- UIW 1994 Fisheries Investigation (March, 1995) (Report & Appendix)
- UIW 1995 Fisheries Investigation (Dec., 1996) (Report & Appendix)
- UIW 1997 Fisheries Investigation (Feb. 1998)
- UIW 1998 Fisheries Investigation (April 1999)
- UIW 1999 Fisheries Investigation (May, 2000)
- UIW 2000 Fisheries Investigation (March, 2001)
- UIW 2001 Fisheries Investigation (April, 2002)
- UIW 2002 Fisheries Investigation (May, 2003)
- UIW 2003 Fisheries Investigation (In Progress)

uiwstudies.doc

APPENDIX 4

Joliet 29 Near-Field Thermal Compliance Model

1.0 Introduction

This model calculates a "fully-mixed" receiving water temperature immediately downstream of the Joliet 29 condenser cooling water discharge. Compliance with the Secondary Contact temperature standards specified in the Joliet Station 29 NPDES permit is determined based on the output of this model. (Note: A similar model has also been developed for Joliet 9, but does not include operation of the supplemental cooling towers in its calculations).

The model determines the fully-mixed receiving water temperature by calculating a weighted average temperature of the receiving stream, after mixing with the station's condenser cooling water discharge, based on the effective temperature and flow of the condenser cooling water discharge and the temperature and flow of the receiving stream. This approach is patterned after the general mass balance procedure for conservative substances outlined in IEPA's *Illinois Strategy for Point Source Wasteload Allocation*, January 17, 1991.

2.0 Thermal Balance Procedure for Determination of Effective Discharge Temperature

The effective discharge temperature input for the model is determined by consideration of condenser cooling water flow, condenser cooling water discharge temperature, cooling tower flow, and cooling tower discharge temperature. When the cooling towers are not in operation, the effective discharge temperature is equal to the condenser cooling water discharge temperature. The basic thermal balance equation for determination of the effective discharge temperature is:

$$T_{EF} = \frac{T_{CW}(Q_{CW} - Q_T) + T_T Q_T}{Q_{CW}}$$

Term	Description
T_{EF}	Calculated effective condenser cooling water discharge temperature after mixing with cooling tower discharge, in degrees F.
T_{CW}	Actual condenser cooling water discharge temperature in degrees F. Temperature is continuously monitored by Bailey and Endeco systems at head of discharge canal.
Q_{CW}	Condenser cooling water flow in cubic feet per second (cfs). Flow is based on the number of circulating water pumps on at the time in question. Each of the four circulating water pumps is rated at 230,000 gpm (512.5 cfs).
Q_T	Flow of condenser cooling water routed through the cooling towers in cfs. Flow is based on the number of cooling tower pumps on at the time in question. Each of the 48 cooling tower pumps is rated at 7500 gpm (16.7 cfs).

T_T Cooling tower discharge temperature in degrees F. Temperature is continuously monitored by three thermocouples in the cooling tower discharge flume. Input for the model is the average of the three readings.

3.0 Thermal Balance Procedure for Determination of Fully-Mixed Receiving Water Temperature

Fully mixed receiving water temperatures are determined using a thermal balance model that considers condenser cooling water flow, effective condenser cooling water discharge temperature, upstream river flow, and upstream river temperature. The basic thermal balance equation for determination of the fully-mixed receiving water temperature is:

$$T_{FM} = \frac{T_{EF}Q_{CW} + T_{US}(0.5*Q_{AV})}{Q_{CW} + (0.5*Q_{AV})}$$

Term	Description
T_{FM}	Calculated fully-mixed receiving water temperature in degrees F.
T_{EF}	Calculated effective condenser cooling water discharge temperature after mixing with cooling tower discharge, in degrees F. Determined using thermal balance procedure outlined in step 2.0.
Q_{CW}	Condenser cooling water flow in cubic feet per second. Flow is based on the number of circulating water pumps on at the time in question. Each of the four circulating water pumps is rated at 230,000 gpm (512.5 cfs).
Q_{AV}	Available receiving stream dilution flow in cfs. Available dilution flow is determined by subtracting condenser cooling water flow from the upstream river flow. If the upstream river flow is equal to or less than the condenser cooling water flow, the available receiving stream dilution flow is zero. Upstream river flow is the average value of flow recorded during the 24-hour period preceding the time in question. The primary source of flow data is the gauging station operated by the Army Corps of Engineers at the Brandon Road Lock and Dam. Secondary sources for flow data are the gaging station on the Chicago Sanitary and Ship Canal at Romeoville operated by the United States Geological Survey, and the Des Plaines River gaging station at Riverside, operated by the Army Corps of Engineers.
T_{US}	Upstream river temperature in degrees F. Temperature is continuously monitored by Bailey and Endeco systems in the station intake canal.

4.0 Near-Field Thermal Compliance Matrix

The excel-based Near-Field Thermal Compliance Matrix can be used by station personnel on an as-needed basis to insure that compliance with the Secondary Contact thermal standards is maintained under current receiving stream conditions. Input the condenser cooling water discharge temperature and flow and the cooling tower discharge temperature and flow; the matrix displays fully-mixed receiving water temperatures at various upstream river flows and temperatures. A sample output of the matrix is attached.

Example of Joliet 29 Near-Field Compliance Matrix:

APPENDIX 4

Enter Cooling Tower Pump Rating in gpm and number of pumps on:

Cooling Tower Pump Rate:	7,500 gpm	**Number of Pumps On:**	36
Calculated Tower Flow:	602 cfs		

Enter Cooling Tower Discharge Temp: 84 degrees F

Enter Circ Water Pump Rating in gpm and number of pumps on:

Circ Water Pump Rate:	230,000 gpm	**Number of Pumps On:**	3
Calculated Circ Water flow:	1537 cfs		

Enter Circ Water Temp: 100 degrees F

Calculated effective discharge temp: 93.74 degrees F

Upstream River Flow, cfs	Available Dilution Flow*, cfs	River Temperature													
		75	76	77	78	79	80	81	82	83	84	85	86	87	88
2050	513	92.30	92.37	92.45	92.53	92.60	92.68	92.76	92.84	92.91	92.99	93.07	93.14	93.22	93.30
2250	713	91.79	91.90	92.00	92.10	92.21	92.31	92.42	92.52	92.62	92.73	92.83	92.94	93.04	93.14
2450	913	91.32	91.45	91.58	91.71	91.83	91.96	92.09	92.22	92.35	92.48	92.61	92.74	92.87	93.00
2650	1113	90.87	91.02	91.17	91.33	91.48	91.63	91.79	91.94	92.09	92.25	92.40	92.55	92.71	92.86
2850	1313	90.44	90.62	90.79	90.97	91.15	91.32	91.50	91.67	91.85	92.03	92.20	92.38	92.55	92.73
3050	1513	90.04	90.24	90.43	90.63	90.83	91.03	91.22	91.42	91.62	91.82	92.01	92.21	92.41	92.61
3250	1713	89.66	89.87	90.09	90.31	90.53	90.75	90.96	91.18	91.40	91.62	91.84	92.05	92.27	92.49
3450	1913	89.29	89.53	89.77	90.01	90.24	90.48	90.72	90.95	91.19	91.43	91.67	91.90	92.14	92.38
3650	2113	88.95	89.20	89.46	89.71	89.97	90.23	90.48	90.74	90.99	91.25	91.50	91.76	92.02	92.27
3850	2313	88.62	88.89	89.16	89.44	89.71	89.98	90.26	90.53	90.80	91.08	91.35	91.62	91.90	92.17
4050	2513	88.30	88.59	88.88	89.17	89.46	89.75	90.04	90.33	90.62	90.91	91.20	91.49	91.78	92.07
4250	2713	88.00	88.31	88.62	88.92	89.23	89.53	89.84	90.15	90.45	90.76	91.06	91.37	91.68	91.98
4450	2913	87.72	88.04	88.36	88.68	89.00	89.32	89.64	89.97	90.29	90.61	90.93	91.25	91.57	91.89
4650	3113	87.44	87.78	88.11	88.45	88.79	89.12	89.46	89.79	90.13	90.47	90.80	91.14	91.47	91.81
4850	3313	87.18	87.53	87.88	88.23	88.58	88.93	89.28	89.63	89.98	90.33	90.68	91.03	91.38	91.73
5050	3513	86.93	87.29	87.65	88.02	88.38	88.74	89.11	89.47	89.83	90.20	90.56	90.93	91.29	91.65
5250	3713	86.68	87.06	87.44	87.81	88.19	88.57	88.94	89.32	89.70	90.07	90.45	90.83	91.20	91.58
5450	3913	86.45	86.84	87.23	87.62	88.01	88.40	88.79	89.17	89.56	89.95	90.34	90.73	91.12	91.51
5650	4113	86.23	86.63	87.03	87.43	87.83	88.23	88.63	89.03	89.44	89.84	90.24	90.64	91.04	91.44
5850	4313	86.01	86.43	86.84	87.25	87.66	88.08	88.49	88.90	89.31	89.72	90.14	90.55	90.96	91.37
6050	4513	85.81	86.23	86.65	87.08	87.50	87.92	88.35	88.77	89.19	89.62	90.04	90.46	90.89	91.31

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INTRODUCTION-- COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
1-8, bottom	303(d) listing incomplete/abbreviated	Should also specifically include: PCBs, and flow alternation. It should also be noted that heat is NOT listed as a parameter of concern for any of the UAA segments in the most recent 305(b)/303(d) reports
	Plant design data (in Table 1.2 on page 1-11) is INAPPROPRIATELY APPLIED to determine that MWGEN plants consistently use entire river for cooling--This is NOT TRUE	Design data should only be considered as "worst-case" and should not be applied to any analysis without consultation with MWGEN on actual station operating conditions, which are adjusted to ensure compliance with all thermal limits, including mixing zone and zone of passage provisions required by Section 302.102 . In addition, consultant assumes "low flow" conditions to come to flawed conclusions, when actual flow data is readily available and would show that condenser flow rates are normally less than the flow in the river system. Consultant fails to compare actual temperature data to actual flow data for the same time periods.
	Table is incomplete and values in last column of table are either taken out of context or not properly cited. Insufficient information is given in order to look up referenced data.	It is uncertain what the values in the last column represent, since there were several different scenarios run in the thermal modeling work done as part of the UIW Study. Poor citations and lacking references make fact checking extremely difficult for this report.
	Cooling towers referenced as being used to control far-field compliance only; no information is provided on effect (i.e. efficiency) of cooling tower operation in lowering discharge temperature of Joliet 29	Towers are used to control both near and far-field thermal compliance. This information was provided in MWGEN presentation to Biological subcommittee. (Ref: June 4, 2002 presentation)
1-22 footnote	Consultant refers to cooling towers being "commonly used" and "mandatory" with references that are not cited	Recent DOE EIA 767 data for rivers in IL and WI show that only 3 out of 13 and 5 out of 17 power plants (respectively) have closed cycle cooling, with the rest being open-cycle.
1-23, #3	Report refers to "improved sediment quality", but values presented still indicate that contamination is still prevalent in the waterway. Need to differentiate results between main channel and depositional areas. as well as core versus grab sample results.	Biological subcommittee was never been given the opportunity to review the USEPA sediment sampling methods/results; Sediment contamination is very heterogeneous in nature; a few samples and averaged results shouldn't be relied upon to establish that overall quality has improved.

WATERBODY ASSESSMENT: Chemical Parameters
CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-66--figure 2.30	MWRD and MWGen described as being "side by side" comparisons--inaccurately described	Data is NOT from the same location in the waterway
2-66-figure 2.31	MWGEN data "re-plotted" from hard copy; accuracy questioned (This is only one example of "re-plotting" or reorganizing our data to meet consultant's needs)	Data provided by MWGEN should not be taken out of context; we would have provided the electronic files, with accurately documented data, if a request had been made to us.
2-71	Complete misrepresentation of data provided by MWGEN; Statement attributed to Wozniak, 2002 that maximum temperature in the upper part of Dresden Pool was 100 °F or more for an extensive period of time in 1999 is absolutely FALSE. Consultant fails to acknowledge the Secondary Contact thermal limits also include 26 acre thermal plume, zone of passage and excursion hour provisions.	Data on intake and discharge temperatures at Joliet Stations, provided by MWGEN during June 4, 2002 subcommittee meeting, showed maximum month condenser outlet temperatures, which were explained to the group as NOT being representative of the discharge to the river due to the impact of cooling tower operations. Towers are capable of cooling the station discharge down by a minimum of 5 °F before it enters the lower Des Plaines River and receives further mixing with ambient river water. In addition, the condenser outlet temperatures presented represent the highest 15 minute value recorded in any given month, and CANNOT be assumed to have been in effect for the ENTIRE MONTH, as the consultant did. The Consultant then proceeds to apply his inaccurate assumption on main river temperature to the remainder of the UAA Report, to the extent that he alleges that MWGEN was in violation of the Secondary Contact thermal limits for months at a time.
2-72, top	Consultant implies that misrepresented high river temperatures are responsible for low D.O. in the river (i.e. temperature is driving D.O. out of the waterway) 2nd to last para: ..."no single cause of the low DO can be pinpointed." Compare this statement to the one at the right>>>>>>>>>	No actual data or information is presented to support this position. Temp/DO studies done for MWGEN do not show any strong correlations. p. 2-79, 2nd para: states the causes of instantaneous DO excursions in the Dresden Pool as being definitively caused by nutrient enrichment and cloudy days. (No citation of supporting data) <u>Example of inconsistencies in report statements/conclusions.</u>

WATERBODY ASSESSMENT: Chemical Parameters
CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-74	Reference to QUAL2E model as applicable to UAA	QUAL2E assumes steady state flows, complete vertical/horizontal mixing, one-way flow---all of which are not applicable to the lower Des Plaines River.
2-81, third bullet	Misrepresented high temperature is again cited as the cause of low D.O. Consultant misuses MWGEN data to show that temperatures exceeding 100 °F (falsely assumed to be in the entire river) have occurred.	Complete misrepresentation and misuse of MWGEN data, resulting in false assumptions and conclusions which target thermal discharges as being in noncompliance with existing standards. MWGEN has actual data, as well as recent river study results, to demonstrate that this is NOT TRUE.

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-82, para. 2	Reference to Table 1.2 (p. 1-11)-- power plant capacities and heat rejection information	This information represents design or worst-case values , and are NOT representative of current plant operations.
2-82, para. 2	Reference to Table 1.2 (p 1-11)--summer delta T in the river at low flow	This information was NOT presented in either the Holly (1994) or Wozniak (2002) references--Where did it come from and what is the intent of presenting it? Holly and Bradley (1994) report reference is also absent from review of literature listing.
2-82, para. 2	Reference to Joliet Cooling Towers (in footnote to Table 1.2, p. 1-11)	No mention is made anywhere in the report of the benefit of cooling tower use on the condenser outlet temperatures, nor the fact that towers were in use during all of the periods when the consultant erroneously claims that main river temperatures were in excess of 100 °F
2-82, para. 3	Consultant misuses/manipulates information provided by MWGen and deliberately omits discussion on use of unit deratings to maintain compliance when cooling towers alone are not sufficient (even through this information was clearly presented by MWGEN at the Biological Subcommittee meeting).	MWGen uses the 24 cooling towers at Joliet 29 to the full extent possible to control our thermal discharges to comply with both near and far-field thermal limits. When towers alone cannot reduce temperatures to an acceptable level, significant unit deratings (i.e. decreases in megawatt load) are taken to control temperatures in the waterway. MWGen has consistently had to derate during critical summer periods, when the demand for electricity is highest. MWGen has incurred costs in $M's to remain in compliance with the existing thermal limitations.
2-85, mid	Report cites history of thermal limits in the waterway, with particular emphasis on the role that ComEd has played--but fails to mention that all prior proceedings were supported by biological data. Consultant also does not recount the most recent Board order, which states that conditions in the river have not changed appreciably since the I-55 adjusted thermal standards were first granted.	Consultant omits the fact that the I-55 adjusted thermal standards were subsequently transferred to MWGEN by the IPCB in March, 2000, at which time IEPA concurred with their original conclusion, based on the supporting data previously submitted by ComEd, that the adjusted limits remain fully supportive of the indigenous aquatic community at I-55.

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104-original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-86 para. 1	Consultant relies on design or worst-case parameters, combined with simplistic, unsupported assumptions and suppositions, to imply that the Joliet Stations are not in compliance with the Secondary Contact thermal limits.	MWGen operates Joliet Station in order to consistently comply with both near and far-field thermal limitations, utilizing cooling towers and significant unit deratings, when necessary to ensure compliance. Since 1999, cooling towers have been in use and condenser flow rates have been adjusted downward to optimize station operations, as well as cooling tower efficiency. Supporting data confirming continuing compliance during the 1999 summer period, as well as more recent periods, has been presented to both IEPA and USEPA (June, 2002).
	Consultant also assumes that Joliet Station discharges combine with each other and leave no mixing zone in the river. Actual data shows that this is NOT TRUE.	Recent thermal plume studies performed by MWGen (EA. 2003), along with temperature analyses previously presented to IEPA and USEPA (June, 2002) clearly demonstrate Joliet Stations' continuing compliance with all applicable thermal standards and there is no interaction of thermal plumes from Joliet 9 and 29 until temperatures are already within the specified Secondary Contact limits. In addition, the data provided by MWGEN DOES NOT show main river temperature, so there is no actual data to support the consultant's simplistic and inaccurate assumptions.

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-86 para. 3	Consultant assumes that station condenser discharge temperatures are equivalent to main body river temperatures, even though they acknowledge the existence and use of cooling towers. This implies that the cooling towers have no effect---This is NOT TRUE.	The erroneous assumptions made regarding the required power plant flow versus the river flow are not supported by any actual data and allege that Midwest Generation has been in chronic violation of the Secondary Contact thermal limits. The assumption that there is no mixing zone in the river is based on the gross misinterpretation of station operating parameters, river flow dynamics and appalling disregard for the need of substantive support for such statements. Data from recent thermal plume studies conducted by Midwest Generation clearly refute these allegations. Condenser discharge temperature (as reported in Joliet Station #29 DMRs and in the presentations given by Wozniak in 2001 and 2002) is NOT equivalent to the temperature entering the lower Des Plaines River. Use of the cooling towers, which actually treat almost 50% of the condenser flow (due to lower than design condenser flow rates), decrease discharge canal temperatures by a minimum of 5 °F . This "effective discharge" then enters the river and mixes with cooler upstream water to effect addition reductions in overall plume temperature.
	Consultant claims that I-55 temperature in 1999 was above the General Use limit of 32 °C (90 °F)	The maximum General Use limit is 33.9 °F (93 °F)--which is identical to the I-55 adjusted thermal limit during the summer months. I-55 temperatures have remained at or below 93 °F since continuous monitoring began in 1988.

WATER BODY ASSESSMENT FOR TEMPERATURE --
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-88, para. 1	Consultant again erroneously concludes, using simplistic and biased assumptions, that the temperature of Joliet's condenser discharges is equivalent to the temperature of the entire river downstream of the plants. This is NOT TRUE and is not supported by recent field measurements and confirmatory studies submitted to IEPA and USEPA.	Mass-balance calculations, as well as actual field data, demonstrate that this is NOT TRUE. The Joliet Stations are operated to ensure continuing compliance with all existing near and far-field thermal limitations. MWGen has presented a proposed near-field thermal compliance model to IEPA and USEPA for use in monitoring and assessing near-field compliance on an on-going basis. This model is based on IEPA's guidance on Point Source Wasteload Allocation (1991).
	Again, MWGEN is cited as the source of this information, which has been misinterpreted, misused and manipulated by the consultant to support wholly inaccurate assumptions.	If the condenser discharge temperature were equivalent to the fully mixed temperature in the river, the I-55 thermal limits would consistently be exceeded during the hot summer months, which continuous monitoring data has shown is not the case. Compliance with the I-55 adjusted thermal standards has been maintained since the limits became effective in Nov. 1996.

WATER BODY ASSESSMENT FOR TEMPERATURE --
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-89	Consultant wrongly assumes constant low flow conditions dominate river system, without checking real data to confirm validity of assumptions, and then misuses MWGEN provided information to determine how our plants impact the waterway. This is extremely biased, as well as unrealistic. In fact, elsewhere in the report, the flow of the waterway is characterized as greatly fluctuating, as the graph on this page shows. It should be noted that this graph is "replotted" from the US Army Corps of Engineers website, which depicts 6 am values only, so this graph is NOT representative of continuous flow data for the entire time period and only represents one hour each day. In addition, it was acknowledged that the flow is supplemented by diversion flow during the summer period---Both these factors would indicate that there is no "constant" low flow which would result in the kinds of situations that the consultant presumes to occur in the lower Des Plaines river.	MWGEN maintains continuous records of intake, discharge and I-55 temperatures, as well as circulating water flow rates, cooling tower flow rates and cooling efficiency and river flow rates. MWGen also retains a complete record of 2-hour Corps of Engineers flow data for Brandon Road. All of this REAL DATA was offered to the IEPA consultants, but it was never requested. Another example of inconsistency within the report and/or disregard for information or data that weakens consultant's arguments.
	Cooling towers are again mentioned, but discounted as not having any beneficial impact on the station discharge.	Information presented to the workgroup discussed the use of the towers and their efficiency in reducing the temperature of the station discharge a minimum of 5 °F before it enters the river. (p. 60 of 6/4/2002 presentation). This data was not included in the draft UAA Report.
	The statement "*Most* current power plants located on rivers such as the Des Plaines River used closed cycle cooling with natural draft or mechanical cooling towers (for example, the WE power plants near Portage and Kenosha, Wisconsin) or lakes (plants near Dresden or Springfield, IL).: is incorrect and misleading.	There are many open cycle power plants in the Midwest, including several on the Ohio River in Ohio and Wabash River in Indiana. Closed cycle cooling was a requirement for all plants built after 1970, which is the type of plant the consultant may be referring to. The Joliet and Will County plants were built before this requirement was in place, and were built to utilize cooling water from an industrialized, Secondary Contact waterway, not comparable to any river in Portage or Kenosha, Wisconsin. (Ref. DOE EIA Data from 2000)

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-89, bottom	EXTREME MISREPRESENTATION SELECTIVE USE OF DATA: Consultant cites MWGEN as stating that "...the use of the existing cooling towers alone is often not sufficient to control the magnitude of the thermal discharge to meet current near and far-field limits." but FAILS to include the immediately following statement (on the same page), which was provided in the both the 6/4/2002 MWGEN PowerPoint presentation and hand-outs which stated : "•Under these situations, units have been and will continue to be derated when compliance conditions warrant (both at Joliet and Will County). •Forced loss of power occurs when it is most needed by the citizens and businesses of Northern Illinois."	Data recently presented to IEPA and USEPA confirm that even under critical summer conditions, Joliet Station continues to remain in compliance with all near and far-field thermal limits, through the adjustments in station circulating flow rate, use of cooling towers and unit deratings.
2-90	Example of poor report preparation: Where are the first three items regarding temperature effects? #4-#11 discuss impacts of "excessive" temperature but does not quantify the magnitude at which adverse effects would be expected to occur.	These points appear to be taken from a basic textbook on water pollution. How do these points relate to specific information provided for lower Des Plaines River? How does the real in-stream data compare? Are these effects documented in the Lower Des Plaines River?

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-91 top	#11 implies that there is a proliferation of blue-green algae in the waterway	Data provided by the UIW study on periphyton and phytoplankton was not referenced, although the information was readily available to the consultant. Contrary to the consultant's statements, the UIW studies of phytoplankton and periphyton clearly show that the system is NOT dominated by blue-green algae. It is, in fact, populated by the same species assemblage as other similar river-reservoir navigation channels. Phytoplankton density at Joliet was comparable to the density observed in Pool 19 of the Mississippi River, which is not thermally impacted.
	Figure 2.43 inaccurately depicts the "Range of summer temperatures in the Upper Dresden Island Pool" as being between 95 and 100 °F (still going along with the completely invalid and erroneously derived assumption that a single monthly maximum condenser outlet temperature equates to a fully mixed river temperature for an entire month).	The premise that water temperatures in the main body of the river are equivalent to Joliet Station discharge temperatures is prevalent throughout the report and is ENTIRELY INCORRECT (as explained previously).
2-91, bottom	The statement made in the last sentence of paragraph 1: "... the standards should not be developed to protect the ***inferior*** biotic composition. The standards should also contain some margin of safety." (emphasis added) implies that the Secondary Contact thermal limits are not adequately protective of the types of aquatic species expected to be found in this waterway. What criteria does the consultant use to determine that the current biotic composition is "inferior" for the lower Des Plaines River, or is this just another opinion, without evidence or support?	Midwest Generation's recently submitted report (dated January 24, 2003, as well as the more recently issued revision) discusses this matter in great detail and relies on a comprehensive data base of field-collected data to come to the conclusion that the existing limits do adequately support the current and potential aquatic populations in the waterway, based on other permanent limiting factors in the waterway.
	Define "inferior" in the context of the UAA reach. Years of monitoring data show significant improvements in the fish community over time, despite continued input of heat.	The so-called "inferior" species are those that are best suited to the available habitat/flow regime present in the waterway.

2-91 bottom	The last statement on the page implies that the current Secondary Contact thermal limits are already above the lethal limit for indigenous fish species, and charges IEPA with supporting a "lethal standard". To the contrary, the in-stream biological data demonstrates that there has been no lethality observed with the current Secondary Contact thermal standards in place.	The only way a statement like this could be made is by believing the simplistic and erroneous assumption that water temperatures in the main body of the river are allowed to remain at 100 °F (the Secondary Contact maximum limit) for an unspecified amount of time, thereby eliminating any species whose lethal thermal limit is below this value. If one reads all of the requirements related to the Secondary Contact thermal limits, it can be seen that any water temperatures in the main body of the river are strictly limited between 93 °F and 100 °F to only 5% of the hours in any 12-month period. In addition, the general water quality provisions at Il.Adm. Code 302.102 specifically state the mixing zone and zone of passage requirements be maintained for all thermal discharges to the waterway, be it General Use or Secondary Contact. The purpose of these combined regulations is to ensure that there continues to be an adequate margin of safety to ensure the health and well-being of the indigenous aquatic community.
2.92 mid	Is there truly a belief that the river "*can reach its ecological optimum that would be commensurate with the goals of the Clean Water Act.*", that is supported by actual data, or is this solely the opinion of the consultant?	Our understanding of the UAA process was that is it was the consultant's task was to take all available data on the waterway and provide a summary which could then be used the IEPA to determine which water quality limitations would be adequately protective of the existing and potential indigenous aquatic community. The statements made within the draft report go well beyond this, with little, if any, supporting information and data. At no point during the UAA workgroup discussions was there any preconceived idea that the entire lower Des Plaines River would become full General Use, other that that professed by the consultant, at the outset of the study. This bias has carried through since the first workgroup meeting, and is apparent the draft report.

WATER BODY ASSESSMENT FOR TEMPERATURE --
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-92	Consultant surmises, by selectively pulling information from previous Board rulings, that the Secondary Contact standards were implemented and accepted ..."to avoid the cost of cooling on the Lower Des Plaines River that was perceived as hopelessly polluted."	This statement seriously misrepresents the basis upon which the determination of the appropriateness of the Secondary contact standards, as well as previous thermal variances, was based. Significant amounts of actual field data, biological, chemical and physical, were presented to determine the ecological and biological integrity of the waterway (not dissimilar to what the current UAA study should be doing). Based on the data presented, the determination was made, by both Agency and supporting consultants, that the lower Des Plaines River could not support a full complement of aquatic life due to permanent limitations unrelated to heat.
2-93 bottom	Data for Figure 2.44 was provided within the context of several different MWGEN documents, but is SELECTIVELY MISUSED in the figure to FALSELY imply that Secondary Contact limits were routinely exceeded by MWGEN discharges, as well as to try to demonstrate that the existing Secondary Contact limits are lethal, by MISUSING provided thermal limit data (Table 2 of 2003 MWGEN/EA Report) without regard for the qualifying information in the text (p. 28 of MWGEN/EA Report)	As stated previously, consultant continues to mis-use MWGEN-provided discharge temperature data to try to demonstrate lethality of the temperatures encountered in the main body of the river. If temperatures at or above 100 °F were prevalent in the river, there would be massive fish kills observed, or the marked absence of fish during the hottest times of the year. MWGEN's continuing fisheries monitoring program has not documented either of these occurrences. To the contrary, the program continues to document a varied assemblage of warm water species thriving within close proximity to our thermal discharges. IDNR also has supporting data on fisheries in the waterway and can confirm that no fish kills have been documented in the lower Des Plaines River (even in 1999).

WATER BODY ASSESSMENT FOR TEMPERATURE --
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-93		All of the species listed in Figure 2.44 can and do live in the lower Des Plaines River. The most recent EA fisheries study (2001), which was submitted to the UAA workgroup as well as IEPA's consultants, shows that the species assemblage in the upper and lower Dresden pools are dominated by gizzard shad, bluntnose minnow, bluegill, emerald shiner, green sunfish, common carp, spot tail shiner and bull head minnow. In addition, the populations of freshwater drum, smallmouth bass, largemouth bass and channel catfish have all either increased or stayed relatively constant between the years 1994-1995 and 2000-2001. All of the fisheries monitoring work is done during the period from May through September, during the height of the warm-weather period of the year. If the consultant is correct and the entire Dresden pool's temperature has exceeded the lethal limit for these species, then one would not expect to find them thriving in the system.
	Maximum temperature of the waterway is again MISREPRESENTED/WRONGLY EXTRAPOLATED from MWGEN data. In addition, monthly maximum condenser discharge values are WRONGLY extrapolated to have lasted for entire months at a time--implying noncompliance.	Estimated maximum temperature in the Upper Dresden Pool is not equal to the pre-cooling tower, condenser outlet temps. provided by MWGEN! Alleging noncompliance with the existing thermal limits, without proof or justification, is not within the scope of the UAA work.
	Another example of poor report preparation: *Temperature* is misspelled in both graphs on pages 2-92 and 2-93.	Typographical, as well as significant grammatical errors are found throughout the report. Missing pages/sections, etc. Spell-check was not done prior to submittal of report to IEPA.
2-93/2-94	Figures 2.44 and 2.45--The consultant is completely off-base in estimating the maximum temperature of the lower Dresden pool by using maximum Joliet Station discharge canal temperature data.	The discharge temperatures are measured at the condenser outlet and do not reflect the impact of the cooling towers on decreasing this temperature before it is discharged to the main body of the river.
	MWGEN's data has been misused, misinterpreted and misrepresented throughout	Under even the most critical weather and flow conditions, the use of Joliet's cooling

	this report.	towers, along with significant unit deratings, ensures that compliance with all applicable thermal limits continues to be maintained.
2-94 bottom	Perseverating on the original misinterpretation/misuse of MWGEN data, the consultant implies, through "speculation" and "deduction", that the power plants were in non-compliance with the applicable thermal limits.	Careful review of the existing data would show that the values that the consultant purports are representing the temperatures in the main body of the river are actually maximum recorded condenser outlet temperatures, and do not account for the cooling provided by the towers that were in operation at the time, nor is the actual river flow during this time considered. The consultant also assumes that the design data provided by the UIW report and Midwest Generation are representative of the actual operating conditions at the plant. Our facilities could not physically operate at maximum loading if river flow conditions were consistently below our circulating water flow rates. Back pressure would necessitate significant unit deratings. However, this seldom occurs for two reasons: (1) river flow is constantly fluctuating by orders of magnitude, and therefore, extremely low river flows are only sporadic (i.e. on the order of hours), rather than chronic, and (2) Midwest Generation maintains vigilant watch over river and station operating temperatures and use the available cooling towers, as well as unit deratings, to ensure that all thermal limits are met in the main body of the river (i.e. where the Secondary Contact limits are in effect). Trying to equate a condenser outlet temperature with a main river temperature, using a worst case estimate of condenser and river flow is NOT appropriate, especially when actual data for all time periods in question is available. Thermal plume monitoring studies done during 2002 by Midwest Generation conclusively show that the thermal plumes from the two Joliet stations well within the current Secondary Contact limits and their discharge temperatures are not equivalent to the temperature in the main body of the river under typically encountered summer weather flow and operating conditions.

WATER BODY ASSESSMENT FOR TEMPERATURE --
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-95 mid	The statement that the I-55 temperature during the 1999 period did not meet the maximum General Use thermal limit of 93 °F is WRONG. The consultant states that the maximum allowable General Use temperature is 91.7 °F Figure 2.46--"Replots" and again misinterprets/misrepresents MWGEN's condenser discharge temps, as well as I-55 temps, by assuming that a monthly maximum value (based on 15 minute readings) is equivalent to entire month of data.	In reality, the maximum General Use thermal limit is 93 °F--which is identical to the maximum adjusted I-55 standard that is applicable to Midwest Generation's discharges. Errors of this nature should not occur in a carefully prepared technical report. The reader should not be forced to make these significant editorial corrections. The discharge canal temperatures plotted in Figure 2.46 represent condenser outlet temperatures, and do not reflect the beneficial impact of the cooling towers at Joliet 29, which significantly decrease the overall temperature of the discharge before it enters the lower Des Plaines River.

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-96	The consultant takes it upon himself to account for the total number of hours during which the temperature exceeded 90 °F, even though he does not clarify WHERE this temperature is measured, and whether the main river standard is even applicable to an end-of-pipe value. Further, there is no way that any number of hours can be determined from the data provided, since it represents monthly maximum values only (based on 15 minute readings). Therefore, the maximum for any given month may have only lasted for 15 minutes, and yet the consultant has wrongly extrapolated this to mean that a monthly maximum value lasted for the **entire** month.	There is no current regulatory requirement to maintain any specific condenser discharge temperature, as long as the main body of the river is within the specified Secondary Contact thermal limits at the edge of the allowable mixing zone and the zone of passage considerations are met. Midwest Generation continues to operate the two Joliet Stations to consistently comply with these limitations.
	The first sentence in para. 2 states that "...the Secondary Contact Indigenous Aquatic Life standard is above the lethal temperature of several warmwater fish species." The consultant goes on to say that adult fish would vacate the river during the hotter months of the year to escape the "lethal" temperatures allowed in the waterway.	If this were truly the case, Midwest Generation's routine fisheries monitoring program, as well as the programs run by the Illinois Department of Natural Resources, would pick up such a drastic change. In reality, there has been, and continues to be a healthy assemblage of resident warmwater fish species in the waterway, despite the continued operations of the Joliet units. Avoidance of the immediate discharge canal has been documented during the hottest times of the year, but fish continue to be found both upstream and downstream of these areas. There is no data to suggest a "mass migration" of fish to the Kankakee River during the summer period. Nor is there any evidence to support the consultant's supposition that younger fish are killed by higher temperatures. To the contrary, the Midwest Generation fisheries monitoring program continues to collect both adult and young fish throughout the expanse of the Dresden Pool.

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-96 bottom	The lower Des Plaines River is not currently classified as "marginal" or "nuisance", as incorrectly stated by the consultant in the seventh line of the third paragraph.	The exact definition of Secondary Contact is as follows: (Il.Adm. Code Title 35, Subtitle C, Chapter I, Section 302.402) ***Secondary contact and indigenous aquatic life standards are intended for those waters not suited for general use activities but which will be appropriate for all secondary contact uses and which will be capable of supporting an indigenous aquatic life limited only by the physical configuration of the body of water, characteristics and origin of the water and the presence of contaminants in amounts that do not exceed the water quality standards listed in Subpart D.*** Based on this definition, the current Secondary contact standards continue to be appropriate for the lower Des Plaines River. There is no inference in the language above that such waters are considered "nuisance" or "marginal", only that they are influenced by factors which may prevent them from becoming full-body contact recreational or supporting a balanced indigenous aquatic community.

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-97	The consultant again attacks the Secondary Contact thermal limit as being "lethal".	As stated earlier, the assumption made by the consultant that the limit allows 100 °F temperatures in the main body of the river is WRONG. The additional safeguards provided by excursion hour allowance between 93 °F and 100 °F, along with the mixing zone and zone of passage provisions, adequately ensures that aquatic organisms in the system are adequately protected. The field monitoring data collected by both Midwest Generation and MWRDGC demonstrate this, in that there have been consistent populations of indigenous aquatic organisms throughout the lower Des Plaines River, even with the addition of heat.
	The consultant readily "deduces", again misusing both UIW study and well as Midwest Generation-provided information, that the 5 °F delta T above natural temperature General Use limitation is violated in the waterway.	How can the consultant base this conclusion on "reasonable scientific confidence" when the data needed to draw this conclusion is not available, by the consultant's own admission? Also, since the General Use thermal limits do not currently apply to the upper Dresden Pool, there is no reason why the 5 °F delta T limit should be expected to be met.
	Although the consultant states that they were directed by IEPA to defer on a recommendation regarding future temperature limitations for the lower Des Plaines River, they have done exactly that. In line 10, they state that a socio-economic study is "... the only reason a departure from the Illinois General Use standard can be justified. This study has concluded that the first five reasons for downgrading the thermal standard form that specified by the Illinois General Use standards cannot be applied."	The correct legal interpretation is that if any one or more of the 6 UAA regulatory factors is met, a less than fully fishable/swimmable use can be justified. We submit that the actual field data show that UAA Factors 3, 4 and/or 5 are met in the Lower Des Plaines River. Therefore, a socio-economic impact study (Factor #6) is NOT the sole reason for a departure from the Illinois General Use standards.

	The two issues which IEPA requested the consultant address related to temperature were: (1) determination of whether current thermal conditions are detrimentally impacting the aquatic community that inhabits the study reach, and (2) determination of whether *the* currently applicable state standard (Secondary Contact and Indigenous Aquatic Life standards <u>modified</u> *(what does this mean?)* for the Dresden Pool) ~~is~~ *are* adequate to protect the aquatic community otherwise capable of inhabiting the study reach. bottom of page: example of poor grammar "issues addressed to be addressed..."	The Midwest Generation report (January, 2003 and October, 2003 revision) specifically addresses these two issues and should be carefully reviewed by both the Agency and the Biological Subcommittee. Our preference was to use actual field-collected data, as opposed to unsupported allegations and statistics, to develop biologically supportable thermal limits for the lower Des Plaines River. Our intention is to work with the Agency and other stakeholders to propose a new thermal standard that would be both biologically protective and financially and technically attainable. MWGen submits, based on the available data, that Factors 3, 4 and/or 5 are met for both the Brandon and Dresden Pools.
2-98	Consultant's conclusions are not based on the actual data presented for consideration by MWGEN and others.	(1) Ammonia toxicity is known to be influenced by temperature, but the source of ammonia itself has not been fully dealt with. Ammonia is sometimes considered a natural pollutant, in which case it would fall under UAA factor #1. (2) The system is <u>not</u> dominated by blue-green algae (as documented by the UIW report, Chapter 5). The system also does not support swimming, therefore, this point is not applicable to the lower Des Plaines River in any way. (3) Here, the consultant alleges that temperature is the sole reason why some values below the General Use dissolved oxygen limit have been encountered at certain locations, although other causes of low D.O. are discussed elsewhere in the report. (4) The thermal limits are again attacked as being lethal (using the same false assumption on discharge vs. main river temperature), and it is implied that temperature is the only limiting factor to a better fish assemblage in the system. The consultant completely ignores habitat constraints, flow alterations, barge traffic and sediment contamination and/or quality as having any effect on the current or future fish assemblages in the lower Des Plaines River.

		(5) Comparison of the Secondary Contact thermal limits with those found in other states is not valid, since the lower Des Plaines is a unique waterway, whose combined characteristics are not equaled elsewhere.
2-98 bottom	There is inconsistency with the conclusions drawn in this section, compared to other sections of the report, especially with regard to meeting and of the six factors. In some instances, the consultant's response does not answer the question posed by the factor.	(1) The consultant states that the elevated temperatures in the Dresden pool are not natural, but does not provide any data to support this statement or provide a definition of "elevated". The UIW modeling studies have shown that, even without power plant inputs, this waterway would have warmer temperatures year round than a waterway of similar size in a non-urbanized area. Therefore, "elevated" temperature may be an intrinsic characteristic of this river. MWRD's discharge ensures warmer temps. during the winter months. (2) The consultant discounts the sporadic low flow conditions in the waterway as being limiting to the aquatic community. A statement is made that river flow is increased by diversions, but this only occurs during the summer months, and the diversion amount is not always great enough to provide a flow rate comparable to a "natural" waterway. Flow fluctuations may not negatively impact water quality, but they do impact fish habitat, esp. in the Brandon tailwater, one of the best physical habitats in the system. (3) The consultant's response to the issue of whether human caused conditions or sources of pollution prevent the attainment of use and cannot be remedied or would cause more environmental damage to correct than to leave in place is : "Reducing temperature would improve biotic integrity of the Lower Des Plaines River." This response ignores all of the other human-induced limiting factors in the system which limit the aquatic life in the system much more than temperature may. Just because temperature is perceived to be a parameter that is "easily controllable", it does not mean that it should be singled out as the only potentially adverse variable in this complex system. The UAA workgroup and subcommittee meetings have gone through lengthy

		discussions regarding the variety of limiting factors in the waterway, but these discussions have apparently been ignored by the consultants, in deference to the unsupported premise that temperature in the waterway is severely limiting its recovery. All of the data and information presented in both the 1995 UIW Study, as well as the more recent Midwest Generation January, 2003 report and October 2003 revision demonstrate that thermal inputs are not a significant limiting factor preventing the waterway from attaining a higher status--physical characteristics and human-caused conditions are the primary factors. (4) The consultant, and without basis or support, dismisses the premise that dams, diversions or other types of hydrologic modifications preclude the attainment of use. The above factors are the primary basis for the system <u>not</u> being able to attain full General Use (Factor 4). The waterway is significantly impacted by frequent barge traffic, unnatural hydrologic modifications and flow alterations caused by lock and dam operations and summer lake diversions that are not matched during the winter months, when the waterway becomes completely dominated by POTW effluents and runoff. (5) The consultant summarily dismisses the concept that physical habitat limitations in the system preclude the attainment of aquatic life protection uses. The current Secondary Contact limits are adequately protective of the resident aquatic community, which is most limited by the lack of available habitat, proper substrate, flow, cover and depth. The channelized lower Des Plaines does not provide the variety and/or quality of habitat necessary to support a higher quality fishery, regardless of the existing water quality or thermal conditions. This is supported by the data presented in both the UIW Study and the Midwest Generation 2003 report. Improvements to habitat of the nature described in the report would not result in QHEI values even approaching a General Use stream.

WATER BODY ASSESSMENT FOR TEMPERATURE--
CHAPTER COMMENTS:
(Pages 2-82 through 2-104--original draft references)

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
2-99	The consultant flatly states : " While the General Use thermal standard is ***necessary*** and ***appropriate*** to protect the aquatic community otherwise attainable within the Upper Dresden Island pool,..." (emphasis added). IEPA did not charge the consultant with the task of determining what the appropriate thermal limits should be for the waterway, but they take it upon themselves to do so, without a sound basis of actual supporting data to justify this position. They have also provided "guidance" for the Agency and Midwest Generation on how to develop a standard that would "provide adequate protection to the potentially indigenous aquatic species that would reside in the Dresden Island pool.." and suggest that the General Use limits provide the baseline for limit development, based on the lethality data in Figures 2.44 and 2.45, which were previously noted as being misrepresented and inconsistent.	Midwest Generation submits that UAA Factors 3, 4 and/or 5 do apply to the entire lower Des Plaines River. Therefore, the waterbody cannot meet the definition of General Use and should have specific standards set which are appropriate for the unique conditions in the lower Des Plaines River. Midwest Generation has proposed a set of appropriate thermal standards, and have offered to continue to work with IEPA and the stakeholders to present these site-specific standards to the Board for review and approval.
2-102	The MWGEN/EA 2003 Report is referenced, but is not used in any way other than to misinterpret the fish lethality data found in Section XI	IEPA has subsequently distributed the MWGen report for review by the full workgroup. We have obtained comments from IEPA, USEPA and MWRD, which we have incorporated into our revised report (issued October, 2003). The information and data referenced in the MWGen report should be fully reviewed and considered by the Agency for use in the UAA decision-making process

WATER BODY ASSESSMENT: Sediment--
CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
3-5 footnote	Uses same FALSE assumption on main river temperature to negate conclusions reached by UIW toxicity testing, by stating that a temperature of 100 °F might have been maintained or exceeded in 1999 in the Upper Dresden Island Pool for a period of two months. Consultant independently concluded, based on qualified, in-vitro laboratory results by Burton, , that "the only reason for 100% mortality was temperature."	Directly below the information presented in the Burton report is a qualifying statement *"It should be noted that the acclimation period for these experiments was approximately 2 hours. This relatively short period may have induced stress in the test organisms and influenced their response."* As discussed in the MWGEN/EA 2003 report, acclimation time is important, and organisms residing in the river have substantially more acclimation time as the temperature of the water slowly changes in accordance with a seasonal cycle. In addition, an in-situ or in-vitro test does not afford the test organism the opportunity to move away from any potential stressors, unlike the real-world situation, where there are always refuge areas available. Dr. Burton's studies were <u>not</u> designed to establish what the appropriate temperature limits should be in the waterway.
3-19 bottom	Consultant wrongly compares sediment sampling results from different locations and different gear types to come to the conclusion that sediment quality has improved since the UIW studies were conducted. Comparing sediment from the navigational channel and depositional areas is not valid. Sediment is known to be heterogeneously distributed, so many samples in the same location are needed to make a valid, scientific evaluation of overall sediment contamination.	The navigational channel provides no habitat for aquatic organisms, while the depositional areas, side channels, etc. provide the only habitat available in the waterway. This is the reason why the Burton studies used sediment from these areas. The consultant's reasoning that the Brandon Road tail water presents a "worst-case" condition is in direct conflict with other statements made in the report that indicate this area is an "exceptional" habitat. Characteristics which define biological habitat quality include both physical and chemical criteria.
3-21	Consultant uses USEPA's 2001 sediment study results to determine that conditions have improved since the Burton studies were	Why has this data only been revealed in the context of the consultant's draft UAA Report? It is not fully referenced, so it is

	conducted, but again is INVALIDLY comparing locations, gear-types and level of effort.	impossible to go back to the data source to review methodology, sampling protocol, etc. This is true of many of the consultant's data sources--they are poorly referenced, or not referenced at all. As part of the UAA process, all data, reports and documentation used in the analysis should be made available to reviewers in the form of appendices. Will this be done to allow for independent confirmation of results/conclusions?

WATER BODY ASSESSMENT: Physical Assessment--
CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
4-32--4-34	*"The physical habitat formed by the navigation system fall under reasons 4 and 5 for a change of the designated use outlined in Box 1.1."*	If any of the 6 reasons is invoked, this should allow for a lesser use to be applied. This is not the final conclusion of the report, even though individual chapters (Chapters 4, 5, 6) indicate this to be appropriate.
	Habitat assessment confirms that poor habitat in the lower Des Plaines River is the result of a lack of riffle/run habitat, limited hard substrates, channelization, poor riparian habitat, lack of stream cover and impounded water. This system does meet the optimum for warmwater use. These factors fall under Reasons 4 and 5 of the UAA. However, the consultant feels that improvements can result in QHEI scores above 60 in the Dresden Pool and 50 in the Brandon Pool.	Why is final conclusion not consistent with information provided within the body of the draft UAA report?

Additional Comments on Chapter 4 (Habitat)

4-16 (2nd para) QHEI measures both the "emergent" properties and the factors that shape them (3rd para) – Some changes can occur over a 9-10 year period . . . e.g. amount of macrophyte development, degree of sedimentation, etc.

4-17 The QHEI form shown is outdated 4-33 & 4-34 (Conclusions) – The authors acknowledge that habitat quality presently is poor within Upper Dresden Pool but suggest that it could be improved enough to meet the target score of 60. These improvements would come as the result of "placement of artificial in-stream . . . habitat" and expansion of the riparian corridor. Although such habitat manipulations are feasible for small streams, they are not feasible for a river the size of the Des Plaines. To our knowledge, habitat manipulation of this scale has never been attempted in the United States.

The costs of such efforts would almost certainly be in the 10's of millions of dollars. There is no regulatory basis by which IEPA or USEPA could force such an effort and neither agency has this kind of money to devote to such a project. The only realistic conclusion is that habitat, which is acknowledged to be limiting in Upper Dresden Pool, will continue to be so.

In tables 4.3 and 4.4, single QHEI scores are presented at each river mile. While some of these indeed are single values, others are based on the authors taking the mean of two or three QHEIs. For example, in Table 4.4, QHEI scores for RM 284.8 were calculated by three groups of investigations (EA, ESE, and LMS); who reported QHEIs of 42, 44, and 50.5 at RM 284.8. In the current report, the mean of these values was reported. Depending on how these multiple QHEIs are handled, the grand average at the bottom of the table may change and the standard deviation certainly will change.

EXISTING AND POTENTIAL MACROINVERTEBRATE COMMUNITY--
CHAPTER COMMENTS:

Page Reference	Report Citation	General Comment
5-18	*"The results of the macroinvertebrate sampling were heavily influenced by lack of habitat and barge traffic. Results of the macroinverteberate analysis need to be viewed as only one component of the "weight of evidence" needed to draw conclusions about the current biological use of the Lower Des Plaines River."*	This chapter presents probably the most balanced and accurate assessment of the data provided for analysis. It does not take limited data and come to any broad, sweeping conclusions, and it rightly acknowledges that there are many different factors that need to be considered before determining the appropriate use of a waterway.

EXISTING AND POTENTIAL FISHERY COMMUNITY-- CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
6-25	Conclusion of the Fisheries assessment chapter indicate that *"part of the reason for the poor IBI values throughout the Lower Des Plaines River is the lack of adequate habitat".*	If any of the 6 reasons is invoked, this should allow for a lesser use to be applied.
	Based on reason No. 4, it is recommended the entire Lower Des Plaines River, including the Brandon and Dresden Island Pools be considered for a modified stream classification that would reflect the currently altered habitat of the waterway.	This is not the final conclusion of the report, even though individual chapters indicate this to be appropriate.

Additional Comments on Chapter 6: Existing and Potential Fishery Community:

P 6-17 – last para

According to the authors "the large and significant difference in IBI between the impounded and free-flowing stations of the Fox River make a strong case that the habitat modifications resulting from pooling of water behind dams results in major declines in biotic integrity, independent of other interacting watershed factors."

Later in the chapter (p. 6-24) when discussing the results from the Fox River, the authors state that "the presence of and proximity to dams has significant effects on the fish biotic integrity."

And in the chapter summary of p. 6-25, they recommend "that the entire Lower Des Plaines River, including the Brandon Road and Dresden Island Pools be considered for a modified stream classification that would reflect the currently altered habitat of the waterway."

Given the acknowledgement of the deleterious effects caused by impounding rivers and their own recommendation as quoted above, the report's recommendation in Chapter 8 that Upper Dresden Pool be upgraded to General Use is totally unsupported by their own assessments and recommendations contained in Chapter 6. As such, the conclusion in Chapter 8 is not supported by the data and information in the body of the UAA report.

p. 6-20. The percentages shown for top carnivores in the Fox River (lower right graph) seem far too high. We request that the authors verify these percentages.

p. 6-22. The authors state "Mean IBI scores for Upper and Lower Dresden were not significantly different from each other following the removal of the effects of Habitat Type and Month, but both were still significantly higher than Brandon Pool."

Given the fact that scores are virtually indistinguishable (see Figure 6.12) after habitat effects are removed, there is no basis to conclude that the Secondary Use thermal standards are impacting Upper Dresden Pool. This also indicates that imposing General Use thermal limits on Upper Dresden Pool will not result in any measurable improvement to the fish community.

In summary, the analyses and conclusions in Chapter 6 fail to support the overall conclusions of the report. Instead, they support our contention that fish communities in the UAA Reach are limited by factors other than temperature.

PATHOGENS AND RECREATION-- CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
7-9---7-11	Consultant appears to be selectively interpreting published USEPA guidance regarding primary vs. secondary contact	Many of the factors which would prevent primary contact in the lower Des Plaines are present, and not able to be controlled by point source discharges. Safety concerns are significant, due to heavy barge traffic, channelization and lock and dam operations. MWGen's perspective, based on the Agency guidance, is that there is sufficient justification to retain the entire lower Des Plaines River as Secondary contact for recreational purposes.
7-19/20	Consultant acknowledges that even with effluent chlorination, the Illinois General Use Std. for primary contact recreation would not be met, yet goes on to suggest that primary contact use would be attainable.	This suggestion, without scientific support, would result in an unnecessary risk to the general population than maintaining the current Secondary Contact use designation Reference waterbodies also do not meet the criteria for primary contact.
7-22	Evidence presented suggests that the ambient ("natural") least impacted waterways in the state cannot meet the std. for primary contact recreation.	This factor alone should be sufficient to determine that the UAA waterway should retain its Secondary Contact use designation. Physical factors and safety concerns would further support the need to limit full body contact recreation.
7-24--7-27	Figures presented inaccurately depict the true nature of the waterway; there are no barges in any of the photographs, which leaves the reader with the impression that the waterway is not heavily used for navigational traffic and industrial activity	Another example of bias.
7-27	The channel cross-section figure implies that the "littoral zone" in the upper Dresden pool would be conducive to swimming and wading	In reality, these areas are those most heavily impacted by siltation. The bottom sediments are often several feet thick and would be a hazard for anyone attempting to walk on them. In addition, most of the shoreline property in the Dresden pool, especially along the shallower shoreline areas, is privately owned, which would prevent access by the general public.
7-34	Consultant acknowledges that the waterway is effluent dominated and there are other than point sources contributing to the bacterial load in the system	By suggesting further control of point sources, there is no guarantee that the ambient water quality will improve by requiring POTW chlorination/dechlor. In addition, chlorination itself and the by-products created imposes greater risks to the aquatic community. Additional safety would be afforded only if the primary source of bacterial

		contamination is from point sources; this report, as well as data from IEPA, suggest that this is not the case.
7-37	Report states that "Navigation may not be impeding the recreational opportunities in the Dresden Island Pool and limited recreation is feasible in most sections."	Limited recreation can and does occur in the Dresden Pool, but primary contact recreation is incidental, at best. Recreational opportunities and uses are of a secondary contact nature, and should remain so for public safety reasons.
7-39 bottom	Swimming in the Dresden Island Pool is infrequent and occurs mostly in the section downstream of the I-55 Bridge. This type of use cannot be characterized as existing primary contact recreational use.	If this is the case, why has the consultant suggested that chlorination be required of point source dischargers? If primary contact is not an existing use, it does not need to be protected. There needs to be some minimum accepted threshold of individuals that take part in primary contact activities in order to for such a use to be acknowledged.
7-44	Report states that the lower Dresden Pool (downstream of I-55) does not have a General Use thermal standard	MWGen maintains an adjusted thermal standard only at the I-55 Bridge--General Use thermal water quality standards are in effect directly downstream of I-55. (There is no longer a "Five Mile Stretch" variance, which existed in the early to mid-1980's).
7-44, #2	Report states that "the biological character of the Brandon Pool was found as marginal, below the threshold for the general use, but not much different from the section of the Dresden Pool downstream of I-55. **These concerns doe not prevent designating the entire reach as General Use."** (emphasis added) (Reference to Chapter 7 puzzling, since this statement is found in Chapter 7)	According to USEPA guidance, a UAA must consider physical, chemical and biological factors when determining appropriate use designations. Biological integrity/potential cannot be ignored. Upgrading a waterway based solely on chemical integrity is not appropriate.
7-45 #5	"Downstream of RM 283 the river is surrounded by forests and natural lands valued by the citizens."	Where is the documentation and support for this statement? What citizens? Most "natural lands" in this area are privately owned and not open for public access.
7-45 #6	Report minimizes safety concerns brought about by barge traffic	There are several deaths each year on this waterway, due to barge-related accidents, and these are related to secondary contact uses only. Primary contact would likely increase the number of incidents/fatalities.
7-45	"Logically, the entire Dresden Island Pool should have the same standards and will have for most other parameters (see Chapter 7)".	It is the consultant's own opinion that General Use should be extended throughout the Dresden Pool. Careful consideration of the actual fisheries and habitat data would show that indeed, the whole Dresden Pool should have the same designation, BUT none of it is commensurate with full General Use criteria.

		Also, this is in chapter 7, so the reference is incorrect.
7-47	Consultant offers Options I and II for classifying the waterway regarding recreation; Option I is recommended--extending primary contact to the entire Dresden Pool, even with the acknowledged safety concerns and uncertainties associated with being able to meet the required bacteriological standards.	Why doesn't the consultant mention the possibility of defining a new use designation for this reach (with restricted primary contact use), which would not need to be re-visited every 3 years and would take on full standing as a state WQ standard? This is allowed by the UAA regs, as long as at least one of the 6 factors is met.
Chapter 7 General		No where in this section is it mentioned that higher temperatures actually limit the amount of time that bacterial contamination is present within the waterway. Higher temperature water also increases the effectiveness of chlorination.

MODIFIED WATER USE DESIGNATION FOR BRANDON ROAD D POOL AND CORRESPONDING STANDARDS--
CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
8-2	**Indiana**-Michigan Canal	Should be Illinois-Michigan Canal
8-7/8	The modified impounded use designation criteria described for Brandon Pool would also be applicable to the upper Dresden Pool.	Ohio's modified warmwater habitat (impounded) would be appropriate for the UAA Waterway.
8-8, bottom	"Ideally, the goal for a water body in this category (modified impounded) is supporting a balanced aquatic biota and limited contact recreation."	The data presented in the report indicates that there is not a balanced aquatic community in either the Brandon or Dresden Pools, as the result of Factors 4 and 5, therefore, this use should be appropriate for the entire UAA waterway.
8-13, Fig. 8.10	Figure description notes "good habitat conditions"	"good" habitat is not merely a function of the presence of shallow, main channel border areas. The substrate characteristics, current, amount of cover, etc (all QHEI criteria) must be taken in to account to determine the overall quality of a given habitat for target organisms.
8-14 figure	MWGEN (ComEd) data inappropriately used; comparison of data which groups different gear types, different locations and different levels of effort is NOT SCIENTIFICALLY DEFENSIBLE! Consultant also makes unsupported statements regarding the existence of early life stages in the Brandon Pool.	The data presented on early life stages from the UIW study (1993-1994) was not intended to quantify the extent or success of spawning activity. The graph is also incorrectly annotated, as this was data from a ComEd, not MWGen, study
8-15, top	The data presented do not acknowledge the fact that the physical features of the Brandon Road pool **prevent** development of early life.	Unsupported statement.
8-15/16	Report compares the Fox River to the lower Des Plaines and claims that this was the consensus of the biological subcommittee	Inappropriate comparison. Also, this was NOT agreed upon by the Biological Subcommittee.
8-16	Dresden ~~Dam~~-Pool paragraph; while the subcommittee did agree that Brandon Pool could not be considered General Use, it did not do so based on the absence of early life forms alone. Next Paragraph: Consultant puts forth reasoning why Dresden pool cannot be considered as "modified impounded" using flawed logic, versus relying on the data and analyses provided within the body of the report.	Both Brandon and Dresden Pools share many of the same characteristics which prevent the attainment of full aquatic life use and primary contact recreation.

8-16	The consultant's suggest an IBI criterion of 30 for the modified category and 40 for the general use, impounded category.	First, the authors do not have nearly a large enough data set to allow development of biocriterion. Furthermore, the IBIs they calculated from the "reference" stream data sets appear to have been calculated using improperly scored metrics. You can not use metric scoring guidelines based on one set of classifications and then use a different set of classifications for assigning "proportional" scores and resultant use designations.
8-23	Data from MWGEN again misrepresented to try to demonstrate that summer temperatures in the Upper Dresden Pool typically exceed 100 °F , and ultimately affect D.O.	Data on lower Des Plaines temps. was misinterpreted by consultant. End of pipe temperatures are NOT equivalent to the temps. in the main body of the river, where the temp. standards are met.
8-32 bottom /8-33 top	Consultant recommends that the entire Dresden Pool be designated as General Use and that none of the 6 factors (save for #6) is applicable.	No substantive support is provided to negate either Factors 3, 4 and/or 5 from being applicable to the Dresden Pool. Consultant chooses to ignore analyses and conclusions present in other sections of the report to promote preconceived notion of full use attainment for the Dresden Pool. MWGen has provided real data and information to demonstrate that Factors 3, 4 and/or 5 are applicable, which allows for a more appropriate, modified use to be applied to this portion of the waterway.
8-33	Consultant asserts that a socio-economic impact study is the only means to obtain a less stringent thermal limit than General Use. Consultant states that the installation of closed cycle cooling is "common" and will not cause widespread socio-economic impact.	USEPA regulations state that if ANY of the 6 factors is met, a lesser use can be pursued, which would allow for a different set of chemical/physical limitations which are appropriate for the waterbody under consideration. EIA 767 data demonstrate that closed cycle cooling on large river systems in the Midwest is NOT common. Again, the bias which the consultant showed at the outset of the UAA process has prevailed in the conclusions, without the support of actual data or factual information.
8-34 / 8-35	Consultant recommends that socio-economic impact study be performed by MWGen and other thermal dischargers to waterway and states that if the burden of proof is not met, General Use standards should be applied.	UAA regs. allow for different limitations if any one of the 6 factors are met. MWGen asserts that Factors 3, 4 and/or 5 are met for the entire UAA waterway, therefore, a socio-economic impact study is NOT required.

SUGGESTED ACTION PLAN--CHAPTER COMMENTS:

Page Reference	Incorrect/Incomplete/Misleading Information in Draft UAA Report	Response/Rebuttal/Revisions Indicated
9-2	Consultant states that General Use thermal limits are met in the Brandon Pool	Monitoring data show that General Use thermal limits are NOT met in the Brandon Pool; ambient, upstream temperatures, especially during the winter months, are often higher than the allowable General use limits, due to the dominance of the MWRD discharge in establishing the "ambient" conditions in the waterway.
9-2 bottom	"...an excellent but impaired by pollution habitat zone at the confluence of the river and Hickory Creek." Consultant assumes that the habitat conditions in the Dresden pool may *someday* be able to meet the Ohio WWH criteria.	grammatical improvements to this report are necessary throughout No scientific support is given for this statement, as it is purely opinion. Since the river will remain impounded and affected by barge traffic and artificial flow modifications, it will not ever meet the higher criteria assigned as WWH by Ohio.
9-3	Secondary Contact thermal limits again referred to as lethal to the indigenous community	MWGen fisheries monitoring shows that indigenous community is doing well under existing thermal regime.
9-6	#7--top: Secondary contact alleged as not being protective of the existing or proposed use and should be changed to the General Use standard	No basis for this statement, other than the false assumption that the fully mixed river temp. is at the limit for extended periods of time (MWGen demonstrated, with data, that this is not true and that fish community is not negatively impacted by existing thermal limits)
9-8 top	Consultant refers to "problem" with temperature in the Upper Dresden Pool	Based on mis-used/misinterpreted information from MWGen; river is NOT at 100 deg. F for any period of time. Current thermal limits are consistently met.
9-8 Middle	Consultant overrides the results of Burton's studies and assumes that USEPA proves that there is less contamination present in the waterway	USEPA data is not presented in a manner conducive to comparison with Burrton's results. Locations, sampling protocol etc. are not summarized in the report. Also, since sediment contamination is extremely heterogeneous, it is possible that one sample taken directly adjacent to another may have significantly different results. As such, it is not appropriate to state that contamination has lessen as there is insufficient data on which to base this conclusion. Contaminated or not, the quality/physical nature of the sediment is the most limiting factor preventing the establishment of a more diverse assemblage of fish in the waterway.

Midwest Generation Comments on Draft UAA Report

General Comments:

The chapters of the draft UAA report that were submitted to the Biological Subcommittee and Workgroup for prior review have changed little, if at all, from the original drafts. Significant comments had been prepared and submitted by the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC), Illinois EPA's biologists, the Three Rivers Manufacturing Association (TRMA), as well as Midwest Generation, but have apparently been ignored or dismissed in the preparation of the draft UAA report.

In addition, the draft report contains several chapters, as well as associated conclusions, which were not discussed among the Biological Subcommittee members prior to publication. This especially true for the assessment made for the Dresden Pool. It appears, based on review of the actual data presented during the course of the UAA process, that many of the report's conclusions are unsupported by genuine, field-collected data and are, rather, the opinion of IEPA's consultants.

Misspellings and poor grammar are common throughout the report, with little effort made in corrections which would have been caught if a spell-checker had been employed. Statements scattered through the report, such as "scientific judgment", "one may speculate", "reasonable to assume", "by a great margin", etc. have no place in a technical report.

In addition, the IEPA consultants appear to selectively use the U.S. EPA guidance provided regarding both UAAs and water quality criteria in general.

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago
100 EAST ERIE STREET CHICAGO, ILLINOIS 60611-3154 312•751•5600

Richard Lanyon
Director of Research & Development
312·751·5190

October 14, 2003

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

Dear Toby:

Subject: Lower Des Plaines River UAA Study Report, Changes in Chapters 2 and 8

We have reviewed the revised Chapters 2 and 8 of the Lower Des Plaines River UAA Study Report forwarded to us by Mr. Scott Twait on October 7 and 10, 2003. The Metropolitan Water Reclamation District of Greater Chicago (District) has the following comments.

Page 2-82, second paragraph

The authors state that "The lower Des Plaines River receives and carries a significant thermal load." The authors should define or explain what is a "significant" thermal load and include water temperature data to demonstrate that the thermal load is significant. The CSSC is also a warmwater stream consisting mostly of treated effluent. The Lake Michigan flow is only about 10 to 15 percent of the total CSSC at Lockport. The wording "... the flow reversal of the Chicago River ...." has no practical value and should be stricken from the last sentence.

Page 2-83

The first line wherein temperatures are given, 60 degrees C should be degrees F.

Page 2-93, second paragraph

The authors state that "In current water quality standards guidelines and regulations, ..." The authors should provide an example showing how current standards are developed in order to protect potentially indigenous fauna in the water body.

Subject: Lower Des Plaines River UAA Study Report, Changes in Chapters 2 and 8

Page 2-94, Figure 2.43

In the figure, the authors provide an arrow that illustrates the summer water temperature range in the Upper Dresden Island Pool. The authors should provide a table of actual summer temperatures and a reference for the data used to show the actual temperature range.

Page 8-20, first paragraph

The text states that pathogen standards "... are now mandatory even for the Secondary Use." This is incorrect. There are no IPCB pathogen standards for Secondary Use waters. The text must be corrected.

Page 8-20, second paragraph

The first sentence should be revised as follows: "The second reason why the Secondary Contact standard cannot be retained is the fact, proven in this UAA, that the values for a number of chemical constituents measured during 2000-2001 in the Lower Des Plaines River are equal to or less than the current General Use water quality standards." The second sentence should be stricken because reference to backsliding is not appropriate.

Page 8-20, third paragraph

Change 1.e. and 1.f. to 1.a. and 1.b. The last two sentences referring to the differences between coldwater and warmwater should be stricken since the Lower Des Plaines River only supports warmwater fish species.

If you have any questions, please contact Mr. Richard Lanyon, Director of Research and Development, at (312) 751-5190.

Very truly yours,

R Lanyon

Richard Lanyon
Director of Research and Development

RL:js

Protecting Our Water Environment

Metropolitan Water Reclamation District of Greater Chicago

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September 30, 2003

Mr. Toby Frevert
Illinois Environmental
Protection Agency
Bureau of Water
1001 North Grand Avenue, East
P. O. Box 19276
Springfield, Illinois 62794-9276

Dear Mr. Frevert:

Subject: Comments on Draft Report of Lower Des Plaines River Use Attainability Analysis

In March 2003, Hey and Associates, Inc. issued for Stakeholder comment a draft report entitled, "Lower Des Plaines River Use Attainability Analysis." The Metropolitan Water Reclamation District of Greater Chicago (District) has reviewed the subject report and offers the following comments for your consideration.

General Comments

The report recommends a new water use designation for the Brandon Road pool. Please clarify if the new use is called "Modified Impounded" or "Modified Warmwater Impounded." The phrase describing the proposed new use should be consistent throughout the report. The report also uses the phrase "General Use Impounded" at times when referring to the Dresden Island Pool. It should be clarified if this meant to be a proposed new use designation.

In Chapter 3, the report discusses sediment toxicity from many perspectives. However, until comprehensive laboratory and in situ sediment toxicity testing is conducted, conclusions regarding the toxicity of sediments in the Lower Des Plaines River are questionable.

Subject: Comments on Draft Report of Lower Des Plaines River Use Attainability Analysis

In Chapter 5, the numeric results from the 2000 benthic surveys are not included in the subject report. Spatial trends for fish are shown in the report. It is recommended that the benthic invertebrate data be directly included in the report rather than referenced in the Appendix.

There is considerable discussion of biological criteria in the report. If it is the intent of the report to recommend that some sort of biological criteria be linked to each use classification, this should be clearly stated.

It is suggested that high levels of sediment contamination and elevated temperatures are preventing full attainment of the biological integrity in the Dresden Island pool. Rather than using empirical calculations for determining sediment impairment, it is recommended that a more rigorous field and laboratory assessment including toxicity testing be conducted. In addition to the two stressors previously identified, the report should also consider the effects of commercial navigation, lack of riffles, and other habitat modifications on the biological health of the Lower Des Plaines River.

Specific Comments

Title Page: Include the USACE river miles for the study area in the Lower Des Plaines River.

Pages 3-5 through 3-8: Comments concerning the effects of water temperature on biological organisms should be included in Chapter 2, Temperature.

Page 3-9: It is stated that "They (tubificid worms) are very sensitive to toxic contamination, especially in pore water of the sediments." Provide a reference for the statement.

Page 3-16: It is stated that sediments are continuously being resuspended and moving downstream. The authors conclude that this condition resulted in an improvement of the chemical quality of the sediment. It should be noted that additional sediment loading is constantly being transported through the waterways from

upstream sources. Therefore, the sediment quality may not be improving in all locations.

Page 3-30: The discussion of the toxic effects of dieldrin, heptachlor, and heptachlor epoxide in the Lower Des Plaines River sediments on benthic invertebrates is not clearly written. Clearly state what conclusions are being drawn regarding pesticide toxicity.

Page 3-41: Define "higher temperatures."

Page 3-41: It is stated that toxic metals in sediment do not appear to be a toxicity problem. The sentence should read, "Metals do not appear to be a toxicity problem." It must be clarified if the statement is intended to refer to both the Brandon Road and the Dresden Island navigational pools.

Page 3-41: It is stated that individual PAHs in sediments from the lower Des Plaines River are generally not toxic. It must be clarified if the statement is intended to refer to both the Brandon Road and the Dresden Island navigational pools.

Page 3-41: It is stated that the oligochaete *Tubifex tubifex* is widespread and a very sensitive organism. Results from the 2000 benthic invertebrate survey conducted by the District did not include species identification of oligochaete worms. The authors must explain how they reached the conclusion that *T. tubifex* is widespread. *T. tubifex* is very tolerant of organic contamination in sediments. These aquatic worms are not considered as sensitive benthic organisms.

Page 4-16: It is stated that no changes in the physical stream habitat have occurred since 1993-94. Since no habitat surveys have been conducted since 1994, it is highly speculative to conclude that there have been no changes in habitat.

Page 5-7: It is stated that the taxa richness for artificial samplers increased between the Lockport and

Subject: Comments on Draft Report of Lower Des Plaines River Use Attainability Analysis

Brandon Road navigational pools. Include in the report numeric data showing the change in taxa richness.

Page 5-7: It must be explained how the taxa richness for benthic invertebrates relates to the ecological integrity or stream impairment in the Brandon Road and Dresden Island navigational pools.

Page 5-8: It is stated that the number of EPT taxa was low. Include in the report numeric data showing the low values and indicate how many EPT taxa should be present in a healthy, deep-water river.

Page 5-11: It is stated that aquatic worms were high in number in the Lockport and Brandon Road pools. Include in the report numeric data showing the abundance of aquatic worms.

Page 5-14: The lower Des Plaines River below the I-55 Bridge was used as a biological reference/comparison condition for the Lockport, Brandon Road, and Dresden Island pools. The Chicago Sanitary and Ship Canal in the Lockport pool and the Des Plaines River in the Brandon Road pool are channelized waterways. The Des Plaines River in the lower Dresden Island pool is a natural river. Because of the difference in physical habitats, it is not appropriate to use the Lower Des Plaines River as a reference/comparison condition.

Page 5-14: It is stated that some metrics indicate a restricted benthic community in the Lockport and Brandon Road pools. Define "restricted" and identify the metrics that show a restricted fauna.

Page 5-15: The Illinois Macroinvertebrate Biotic Index (MBI) does not include the effects of metals or habitat. Additionally, the MBI was developed for wadeable streams, not man-made impoundments or large river systems. The MBI may not be the appropriate index to use for this waterway.

Page 5-17: Describe the benthic community that would be indicative of a General Use classification.

Subject: Comments on Draft Report of Lower Des Plaines River Use Attainability Analysis

Page 5-18: It is stated that "The results of the macroinvertebrate sampling were heavily influenced by lack of habitat and barge traffic." It is recommended that the previous sentence be revised to read, "The lack of instream and riparian habitat and barge traffic limit the biological integrity in the lower Des Plaines River."

Page 6-24: A numeric biological criterion for Ohio's boatable waters is presented in the report. Please verify that it has been quoted correctly.

Page 6-24: It is stated that the "Warmwater Habitat" stream classification used in Ohio corresponds to the General Use designation in Illinois. The IBI data for the lower Des Plaines River does not meet the Ohio IBI values for a Warmwater Habitat. The IBI data indicates that the lower Des Plaines River can not attain the Warmwater Habitat use, and therefore, should not be classified as General Use.

Page 8-1: Please clarify in the title of Chapter 8, if the lower Des Plaines River also includes the reach from the I-55 Bridge to the Kankakee River.

Page 8-28: The report recommends that the DO standard for the Dresden Island pool be 5.0 mg/L measured as a daily mean. The proposed standard should include a daily minimum DO value if daily variations are significant.

Page 8-32: The report recommends that the entire reach of the Dresden Island navigational pool be designated as General Use. This is not supported by earlier statements in the report such as on Pages 6-24 and 6-25. Please clarify.

Page 8-33: The authors recommend that the existing General Use water temperature standard be used as a base. Explain the words "as a base."

Page 8-34: Please clarify if the proposed standards for water temperature and copper in the Brandon Road

pool are different than the current General Use standards.

Page 8-35: A daily minimum DO standard of 3.0 mg/L is recommended by the authors for the Brandon Road pool when daily fluctuations are significant. Define "significant." Also clarify if the daily minimum value will apply when the daily DO fluctuations are not significant.

Page 9-3: It is stated that the Illinois biotic General Use criteria is not attainable in the Dresden Island pool. The Illinois Pollution Control Board (IPCB) has not established biological criteria for General Use waters.

Page 9-3: The report recommends a reduced biotic integrity for the Lower Des Plaines River in the Dresden Island pool. Furthermore, it is suggested that the biological conditions be similar to other impounded streams in Illinois (for example, Fox River). Commercial navigation frequently occurs in the lower Des Plaines River. There is no commercial navigation in the Fox River. Since the water uses are not similar, it cannot be justified to use the biological integrity of the Fox River as a potential ecological goal for the lower Des Plaines River.

Page 9-4: The categories "highly elevated" and "elevated" that are used to describe chemicals in sediment do not consider toxicity or impairment to benthic invertebrates. A sediment triad approach is highly recommended for evaluating the condition of the contaminated sediments in the lower Des Plaines River. Site specific sediment guidelines from the province of Ontario or the State of Minnesota should be used for further evaluation of the sediments.

Page 9-5: The report recommends that the IEPA continue using the IBI to assess the biological integrity of the Lower Des Plaines River. The District also recommends monitoring the benthic invertebrate community.

Subject: Comments on Draft Report of Lower Des Plaines River Use Attainability Analysis

Page 9-5: Seven recommendations are suggested in the report for modifying the current General Use water quality standards. Three of the recommendations (#4, #5, and #6) are not related to amending IPCB General Use water quality standards.

Page 9-6: The authors propose an interagency study of sediment contamination in the Lower Des Plaines River. The study should also include a comprehensive assessment of the distribution of contaminants and toxicity of the sediments throughout the study area.

Page 9-6: It is stated that turbine aeration and aeration over the spillways at the Lockport Powerhouse are effective measures for improving the DO in the Brandon Road pool. District monitoring data indicates that there is no increase in dissolved oxygen as water moves through the turbines in the powerhouse. Also, there is no spillway at Lockport. All turbulence is caused by discharge through the turbines or sluice gates.

The report should note that the Chicago Area Waterways UAA study which is currently in progress will address DO issues upstream of Lockport.

If you should have any further questions regarding our comments, please contact me at 312-751-5190.

Very truly yours,

R Lanyon

Richard Lanyon
Director
Research and Development

RL:IP:dm
cc: Farnan/O'Connor
Rosenberg/Zurad
Kollias/Sawyer
Dennison/Zmuda

Polls (Consultant)
O'Reilly (Hey and Assoc.)

REPLY TO COMMENTS

SUBMITTED BY JULIA WOZNIAK ON BEHALF OF MIDWEST GENERATION

by AquaNova/Hey Associates

The typographical errors comments were considered but for the most part they did not appear in the original report (i.e., they occurred when the report was downloaded from the internet, possibly due to a flaw in the download software). For example, 32EC is not in the original report, 32• C is.

Specific substance comments:

1. *The Use of the probabilistic statistic method* is very common in hydrology and water quality analyses. These methods are indispensable and pertinent as the US EPA's water quality criteria are expressed in probabilistic terms, i.e., they have a dimension of magnitude, duration and frequency. Multiplication of duration and frequency equals probability. Thus, a magnitude of being exceeded one day in three years represents a probability of 0.1 percent, as explained in the body of the report.

The question as to whether there is a precedent we would like to refer to a prominebnt US EPA TMDL study for toxic metals in the NY-NJ harbor (US EPA Region 2, July 26, 1994) that used almost identical statistical methodology for assessing compliance with the standards. Both TMDLs and UAAs deal with attainment of standards and should use the same methodology. Many past UAAs dealt with physical impairment and deficiencies of the water body (e.g., no flow in summer) for which statistical water quality standard evaluation is irrelevant. Only one UAA similar in scope to the Des Plains River UAA was performed in California (Santa Ana) and to our knowledge also used similar statistical evaluations.

Furthermore, the US EPA now recommends and distributes the analytical program DYNTOX that contains almost exactly the same procedures and Monte Carlo evaluations as those performed in the Des Plaines River UAA.

2. *The probabilistic symbols* are very common and we tried to explain them by a text, e.g., "*The probability of not being exceeded* $X = p(C \leq C(max))$ ", the text and the formula have the same meaning. We will go through the report and explain more complex probabilistic formulations.

3. *"Scientific judgement"* was used only for chloride and a part of the ammonium evaluation. Chloride is not a priority pollutant. Many states do not have a chloride standard and its effects are more associated with the taste of drinking water and its association with sodium that may cause hypertension than with acute or chronic toxicity. The 1986 US EPA criteria document lists toxic chloride concentrations that are much greater that the Illinois General Use Standard and the effects are related to long term exposure. Therefore, the team accepted the 97 percent probability of compliance as satisfactory.

Chronic ammonium toxicity requires 30 days averaging of daily concentrations. The standard is related to pH and temperature. Because no measured concentrations exceeded the chronic standard, even under the worst case scenario of measured pH and temperature, a "scientific" but very obvious judgement was made that the likelihood of exceeding the chronic standard is very low, certainly less than 0.1 percent.

3. *Priority organics.* Limited water quality data are available for priority organics. The subpart F of Section 302 of the Illinois Water Quality Standards deals with the development of the criteria for these pollutants. The US EPA criteria documents for priority pollutants list criteria for this category of pollutants only for human consumption based on life long drinking of water and extensive eating of fish. Water supply is not a designated use of the Lower Des Plaines River. Development of criteria for aquatic life protection for toxic organic chemicals based on the EPA procedures is not a part of this UAA. It would involve numerous costly toxicity bioassays and analyses. No federal aquatic life protection criteria have been issued for organic chemicals with exception of pesticides.

4. *Temperature standards.* This first report was a screening report. The next reports will deal with the temperature problem.

5. *Higher use.* We removed the term "higher use" from the text. It is implied that the use that would be consistent with Section 101(a) of the CWA and meeting or approaching the Illinois General Use Standards will be "higher" than the current use. We are substituting different wording.

Also, the philosophy of the use attainability in the CWA is not the same as stated in the comments. The goal of the CWA is to achieve full aquatic life protection and primary recreation for all navigable water bodies unless an UAA proves that the use is not attainable. The fact that the current (existing) use does not fully meet the goals of the CWA does not call for a UAA to justify the current use. The UAA must begin with the statutory (CWA Section 101(a)) use and ascertain and prove to IEPA and USEPA whether such use attainable, using the six reasons, and if it is not attainable then what would be the best optimal use.

Also reasons such as some other source or cause of pollution (e.g., operation of the locks) prevents the attainment of the use may not be used to justify the downgrade of the use. As long as these causes are correctable and the cost of correction would not cause a wide spread adverse socio-economic impact the statutory general use and primary recreation is attainable.

6. In the original document, the box containing the six reasons of UAA has the reasons properly numbered.

7. The binding standards are the Illinois Section 302 standards; however, the UAA may suggest a modification of the Illinois Standards that would reflect the site specific conditions.

8. *Page 7 statement on TMDL* is now followed by the sentence "The modified TMDL will be preceded by an assessment of the impact of other possible causes of impairment listed as reasons 1 to 5 in Box 1."

8. *Page 9 comment on an alternative to 99.4 percentile for chronic toxicity.* The only other methodology we know of is the use of Monte Carlo simulation that will generate from the monitored data a series of calculated concentrations that would have the same statistical characteristics (mean, standard deviation) as the monitored series. From this long term (5 to 20 years) calculated series the four or thirty days moving averages of concentrations could be calculated and compared with the CCC standard. This methodology does not necessarily provide better results. 99.4 probability was suggested by Charles Delos of the US EPA Office of Standards.

9. *Typos such as :g/l* are correct (e.g., • g/L) in the original document. Apparently, the downloading software or a different version of WORD did not correctly print the special symbols.

10. The biological subcommittee discussed the reference water bodies for the biological evaluation. The Kankakee River is an appropriate reference for chemical parameters. We are adding two additional references, the Green and Mackinaw Rivers. We cannot use the lower Illinois River as a chemical reference because the water contains effluents from a population of about 10 million. A reference body, by definition, is a water body minimally impacted by human activities.

11. *Ammonia standard* . As it is common in some states (e.g., Wisconsin), and as it has happened with other parameters (e.g., metals) the State of Illinois may adjust the ammonium standard to correspond to the federal criterion. The scientific knowledge presented in the recent federal document on criteria for ammonium seems to be overwhelming and it would be a better standard. For example, the new criteria document finds no relationship of the acute toxicity to temperature.

Consequently, using a more stringent old Illinois standard may lead to an overprotective situation. It is not the task of an UAA to justify an existing (overprotective) standard if it can not be done based on the scientific evidence. There may be other situations (e.g., with some metals) where the current reports from EPA call for a standard that is more stringent than the current Illinois standard. However, we will compare the ammonium concentrations also to the current Illinois standard. If the Illinois standard is not met and the federal criterion is, we will suggest IEPA to adopt the federal criteria.

12. We substituted "visual fitting" for "eye ball estimate".

13. *The average temperature* of 15• C is derived from the temperature plot at G11 (Lockport) (Appendix, p.A26). It is expected that Brandon Pool is more critical for ammonium considerations.

14. *Removal of toxic metals from the 303(d) list.* Our interpretation of the water quality regulations is that if a parameter meets a standard, the designated use is met for this particular parameter. Then the antidegradation rule applies for this particular parameter, irrespective of whether or not the use for another parameter is met or the existing use for the other parameter is not the use complying with the CWA Section 101(a). However, in a cooperation with IEPA we will make sure that our report not present wording and recommendations that would be a responsibility of the Illinois EPA.

15. *Comments on p. 31.* We are interpreting the water quality regulations that the General Use must be considered for all navigable water bodies unless the UAA proves otherwise. No UAA has been previously prepared for the Lower Des Plaines River. The AquaNova - Hey team is not blindly assuming that the General Use is attainable for all parameters, but we have to find reasons why it would not be attainable. The UAA may propose site specific or alternate standards that are not presently included in Section 302, yet, these standards may be commensurate with the CWA Section 101(a). We are now in the process of investigation all possible avenues, including addressing the magnitude and frequency of the standard. Only after these issues are resolved will we consider a TMDL step.

The Preliminary Water Body Assessment is a screening report that did not go into a detailed analysis of those parameters that either failed the preliminary screening or were considered as threatening.

16. *Page 31.* For nonpriority pollutants we assumed that the adverse impact on biota might require longer exposure, longer than one day over three years. For example, tests on fish showed that after 13 months of exposure to pH of 4.5 the test fish were affected but not dead (1986 US EPA criteria document - the yellow book).

17.*Page 36.* The sentence was rephrased to read *"Dissolved oxygen is an important water quality parameter. If DO is not present in sufficient concentrations, lethal and chronic effects will ensue. The Illinois General Use Standard for DO has not been met by a great margin."*

Fourth bullet: "The team intends to investigate concurrent effects of high temperature and deoxygenation of residual BOD on the dissolved oxygen concentrations in the Des Plaines River by the (QUAL-2E) model".

18. *Page 37. Fecal coliforms.* Most of the wording was taken from the US EPA documents on this issue, namely the 1994 Water Quality Standards Handbook. The text detailing the three options and the statement "**Failure to support the swimmable goals for a stream is a major deficiency**..." are verbatim quotations from the Standards Handbook (p2-3) and we included them to point out the problems with defining the recreational use. We included them to document US EPA positions. We have provided the citation in the report by a superscript reference pointing to the 1994 Water Quality Standards Handbook (possibly this superscript was lost in downloading the document). The AquaNova- Hey associates team has not completed the detailed analysis of regulations and options available to derive a proper recreational use. We are now collecting and analyzing data from reference streams and trying to identify the source of bacterial contamination that, as correctly pointed out by Ms. Wozniak in her comments, might be of an uncontrollable nonpoint origin.

As pointed out in our last paragraph, the USEPA has modified its position and now allows more flexibility and other recreation classifications. The January 2000 *Draft Implementation Guidance for Ambient Water Quality Criteria for Bacteria-1986* list the other options. This document does emphasize that all six reasons should be considered. One option was quoted as *"designating a secondary contact recreation may be appropriate where primary use is not an existing use and high levels of natural and uncontrollable fecal pollution exist* (p.30)". Physical restriction of the Brandon pool and intensive navigation that may not ber correctable as well as the fact that the reference streams also have high bacterial counts, will be considered along with reason six of UAA.

Finding an optimum use designation for recreation will not be simple and at this point we do not have any preconceived positions or fixed solutions. Ms. Wozniak's excellent analysis will certainly be considered.

19. *Change of flows.* At this time we do not have information on any substantial intended changes of flow by increasing withdrawals from Lake Michigan. We hope that such information will be provided to us and we are requesting it.

AquaNova International, Ltd.
Hey & Associates, Inc

Water Body Assessment - Methodology for Ascertaining the Chemical Integrity of the Lower Des Plaines River

REPLY TO COMMENTS
from
Metropolitan Water Reclamation District of Greater Chicago

Dr. Irvin Polls submitted comments on behalf of the MWRDGC to the document entitled *Water Body Assessment - Methodology for Ascertaining the Chemical Integrity of the Lower Des Plaines River* prepared by the AquaNova International/Hey and Associates team. The methodology was submitted to the Illinois EPA for review and to the stakeholder workgroup for comments.

GENERAL COMMENTS

1. *The introduction section should include a brief discussion of the current water uses for the lower Des Plaines River and possible future water use scenarios.*

The current designated water use for the Lower Des Plaines River has been defined as *Secondary Contact and Indigenous Aquatic Life.* According to Section 302 of the Illinois Water Quality Standards Guidelines this use and corresponding standards are intended for those waters that are not suited for general use activities (defined by the General Water Quality). The water quality standards defining this lower use are appropriate for all secondary contact activities and should be capable of supporting indigenous aquatic life limited only by the physical configuration of the body of water, characteristics and origin of the water and the presence of limited amounts of contaminants. Other beneficial uses of the river include navigation (existing) and water supply (non-existent). Obviously, waste disposal and conveyance are also river uses.

The study reach for the proposed UAA is the lower segment of the Des Plaines River from its confluence with the Chicago Ship and Sanitary Canal at the E.J.& E railroad bridge (River Mile 290.1 near Lockport) downstream to the Interstate 55 highway bridge (RM 277.8). This 12+ mile reach has two distinctly different segments, the Brandon Road Pool above the Brandon Road Lock and Dam (River Mile 286) and the portion of the Dresden Pool above the I-55 Bridge.

It will be the task of this UAA to develop conditions for the higher uses and test them against 6 reasons of the UAA allowing to changes to the use and standards. The starting point will be the statutory use for full aquatic life protection and primary contact recreation as defined by the federal water quality criteria and Illinois general use water quality standards. Development of the scenarios will begin immediately after the quantitative water body assessment that will be presented to the Illinois EPA and stakeholder workgroup in the June-July period of this year.

2. *An appendix should be included with definitions of important terms and all acronyms.*

We will prepare such an appendix and include it with the reports. Our first report will be the historical assessment of water quality and standards that is planned for the June - July presentation to the I EPA and subsequent release. In the meantime the team will be submitting and presenting for discussion shorter memoranda and methodologies that do not have all components of a report.

3. *The assessment should not include water or sediment data that is more than 5 years old.*

We will use older water quality data primarily for historical purposes. We have already recognized that there is a distinct improvement trend for some water quality parameters (e.g., ammonium). We will present these trend analyses. If changes are statistically significant we will focus primarily on the last five years. Ms Wozniak from Midwest Generation also pointed out that their sediment analysis from the 1993 -1995 period is probably the best sediment toxicity study that has been done on this segment of the river. This sediment study will be analyzed and considered because of its thoroughness and comprehensiveness.

SPECIFIC COMMENTS

4. Clarify what is meant by a modified TMDL

A full TMDL contains ten mandatory components such as determination of loading capacity, margin of safety, load and waste load allocation to individual sources and background/natural loads, and an implementation plan.

This UAA study will focus on the causes of the water quality impairment by categories, e.g., urban wet weather diffuse sources, point sources from waste reclamation plants, industrial sources, and will perform allocations by categories for those pollutants that cause an impairment of water quality. Also, because the UAA is an iterative process in which water quality standards will be evolving (in contrast to a TMDL where water quality standards are fixed) the allocation cannot be as detailed. The implementation plan will be developed only approximately if Reason 6 (a wide spread socio -economic impact of the standards are implemented) is an issue.

5. Provide scientific references for probabilistic fitting/analysis

The best references are:

Mc Cuen, R.H. (1998) *Hydrologic Analysis and Design (2nd ed.)* Prentice Hall, Upper Saddle River, NJ

E.P. Smith, K. Ye, C. Hughes, and L. Shabman (2001) Statistical assessment of violations of water quality under section 303(d) of the Clean Water Act. *Environ. Sci. Technol.* **35** (606-612)

Chow, V.T., S. R. Maidment and L.W. Mays (1988) *Applied Hydrology.* McGraw-Hill, New York, NY

Also the statistic was explained in

Novotny, V. and H. Olem (1994) *WATER QUALITY: Prevention, Identification and Management of Diffuse Pollution*, VanNostrand Reinhold Publ. (Distributed by J. Wiley and sons), New York

6. Selection of the 99.4% compliance for chronic toxicity is arbitrary. If daily or weekly water quality data is not available a statistical analysis (for chronic toxicity) should not be performed.

The conflict between the water quality standards data requirements and actual data availability is quite obvious and very common. However, the Illinois EPA may be required in the petitioning process to provide such an evaluation to the US EPA for the new standards. It is up to an agreement between the US and Illinois EPAs whether a CCC analysis, in view of incomplete data, can be dropped out.

7. *The federal human health protection criteria are unreasonable and should not be used. The criteria are based on assumption of 70 year fish eating and water use for drinking of an average person.*

We have pointed out this fact in the methodology document. Furthermore, the issue of this UAA is primarily aquatic life protection and contact recreation. The human health criteria apply to water supply use that was included as a consideration in the RFP. The UAA document may have to address the issue whether these criteria are attainable.

8. The recently proposed US EPA nutrient criteria for Ecoregion VI should be included and considered when establishing future water quality standards.

Presently, the Illinois water quality standard for nutrients in the General Use category is

Waters of the state shall be free from sludge or bottom deposits, floating debris, visible oil, odor, plant or ***algal growth****, color or* ***turbidity*** *of other than natural origin (Section 302.203 Offensive Conditions).*

A similar wording is for Secondary Use and Indigenous Life..

This narrative criterion is difficult to implement in the UAA and impossible without a numeric *translator*. Typically, a good surrogate is the dissolved oxygen limitation, especially in impounded waters, such as Brandon and Dresden reservoirs. At this point, the federal criteria for nutrients are not mandatory and they are not even intended to be a requirement, based on the criteria document wording. The criteria are based on an arbitrary 25 percentile of concentration of water bodies in the ecoregion. The state of Illinois should have a close look at these criteria and their scientific soundness. We have sent our opinion to Illinois EPA and this issue will be addressed later.

9. The recently proposed IEPA metals standards in General Use Waters for nickel and zinc should be included.

We have included these standards in the documents and will consider them in the evaluation. Also we will consider (March 20, 2001) draft standards for metals and other constituents.

10. If the water effect ratio is used for establishing site-specific water quality standards for metals, the standards should be based on acute and chronic testing (total and soluble metals) using water collected from the subject study area.

The soluble metal concentrations are available for the study segment and will be used. If the quantity of the soluble data is not sufficient, a relation between soluble and total metal concentrations will be established as pointed out in the methodology. Additional testing and sampling by the AquaNova/Hey Assoc. team is not planned and is not a part of this UAA. *As pointed out in the preceding paragraph, draft Illinois EPA standards consider dissolved metals and proposed a conversion factor (similar to WER) to convert total metals to their dissolved fraction.*

11. The numeric water quality standards for cyanide shown in Table 1 should be revised to indicate that General Use Waters refers to WAD (weak acid dissociable test) cyanide limit and the limit in Secondary Contact Waters (and federal criteria) is for total cyanide. Units for cyanide, TRC, oil and grease, and water temperature should be provided.

Corrections and inclusions of Table 1 have been made (see Attachment).

12. The recommended value for water effect ratio for metals shown in Table 2 are very high. Rather than using these surrogate values that are based on laboratory toxicity studies, the concentrations of total and soluble metals should be measured in the lower Des Plaines River, and a site specific ratio for each metal should be established.

That was our original plan. The new draft Illinois EPA criteria considers dissolved metals and, in absence of measured dissolved data, a conversion factor for total metals is included in the draft criteria.

13. If the metal toxicity (of sediments) is greater than one, a metal is considered to be bioavailable, not that the sediment is contaminated. Bioavailability for metals does not always mean toxic or indicate contaminated conditions.

The draft document for sediment toxicity considers excess metal in pore water as an indication of suspect or unacceptable conditions. The term *criteria* is used, i.e., a criterion represents a scientific judgment but not a binding standard. The sediment toxicity unit will be used as guidance to assess the legacy contamination of sediments and possible cause of bulk water quality problems.

14. Rather than calculating or estimating a sediment toxicity unit or metal toxicity for determining the sediment quality in the study area, it is recommended that the consultant compile existing recent sediment quality data from the Lower Des Plaines River and compare the information with fresh water sediment guidelines.

The sediment guidelines we have available (e.g., DiToro et al. reports) recommend sediment pore water pollutant calculations. DiToro=s presentation at the recent TMDL conference in St. Louis documented that simple comparisons and correlations of sediments with different composition (e.g., organic content) may fail. Nevertheless, we will prepare a compilation of sediment data, the best one being the sediment work that covered 1993-1995 studies by Commonwealth Edison Company and will attempt to make comparison to the standing sediment guidelines.

15. Ten percent allowable water quality excursions translates into 109 excursions during a three-year period. Does 109 excursions mean daily excursions? Please clarify?

This number was used to point out the scientific unsoundness of the EPA=s 305(b) guidelines. It simply means that if someone sampled a water quality parameter *daily* and during a three-year period 108 samples were in violation of the magnitude of a standard, the 305(b) assessment would still consider these excursions as acceptable. There are 1095 days in a three-year period.

16. There is too much uncertainty with the Monte Carlo Statistical Analysis. It should not be used for addressing the issue of incomplete water quality monitoring. When developing a chronic water quality criteria, water quality data should be used that was collected in the field and analyzed, not mathematically simulated or derived. There is no replacement for field collected monitoring data.

We respectfully have a different opinion. In order to assess chronic toxicity all parameters would have to be sampled daily which no-one does.

The current deliberation of the National Academy of Sciences Committee on the Scientific Fundamentals of the TMDL process (Dr. Novotny is a member of this committee that will report to Congress in June) has discussed the problem of incomplete data series. It concurred that use of statistic models is legitimate and recommended their use. Otherwise the chronic toxicity could not be assessed. See also comment 6.

TABLE 1
COMPARISON OF NUMERIC ILLINOIS STATE STANDARDS (draft) WITH FEDERAL AQUATIC LIFE PROTECTION AND WATER CONTACT CRITERIA

Parameter	Illinois General Use Standards		Federal Aquatic Life Protection Criteria		Illinois Secondary Contact and Indigenous Aquatic Use Standards Title 35:Env. Protection, C:Wat.Pollution, CH1
	Title 35:Env. Protection, C:Wat.Pollution, CH. 1		40 CFR 131		
pH (units =- log $[H^+]$)	6 - 9		6.5 - 9		6 - 9
Phosphorus (mg/l)	0.05 (streams and shallow pools excluded)		Draft criteria are site specific		NA
Dissolved Oxygen (mg/l)	5.0 (minimum), 6.0 (for 16 hours on any day) (Permissible excursion at flows less than Q_{7-10})		Early life stages: 7 day mean - 6.0 1 day minimum - 5.0 Other life 7 day minimum - 4.0 1 day minimum - 3.0		4.0 3.0 (Calumet Canal) (Permissible excursion at flows less than Q_{7-10})
Toxic compounds	Acute (draft)	Chronic (draft)	Acute	Chronic	
Arsenic (• g/l) trivalent-dissolved	360*1.0	190*1.0	360	190	1000
Cadmium (dissolved)[1)] (• g/l)	exp[A+Bln(H)]x {1.38672-[(lnH)(0.041838]}* a=-2.918.918 B=1.128	exp[A+Bln(H)]x {1.101672-[(lnH)(0.041838]}* A=--3.490 B= 0.7852	A= -3.828 B=1.128	A=-3.490 B=0.7852	150 (total)
Chromium (total hexavalent)(• g/l)	16	11	16	11	300
Chromium (trivalent-dissolved)[1)] (• g/l)	exp[A+Bln(H)]x 0.316* A= 3.688 B=0.819	exp[A+Bln(H)]x 0.860* A=1.561 B=0.819	A=3.688 B=0.819	A=1.561 B=0.819	1000 (total)
Copper (dissolved)[1)] (• g/l)	exp[A+Bln(H)]x 0.96* A=-1.464 B=0.9422	exp[A+Bln(H)]x 0.96* A=-1.465 B=0.8545	A= -1.464 B=0.9422	A=-1.465 B=0.8545	1000(total

Parameter	Illinois General Use Standards Acute (draft)	Illinois General Use Standards Chronic (draft)	Federal acute	Federal Chronic	Illinois Secondary Contact and Indigenous Aquatic Use
Cyanide (• g/l)	49 (Weak Acid Dissociable)	9.9(WAD)	22(Total)	5.2(Total)	100(total)
Lead (dissolvedl)[1)] (• g/l)	exp[A+Bln(H)]x {1.46203-ln(H)(0.1457120]}* A= -1.301 B=1.273	exp[A+Bln(H)]x {1.46203-[(lnH)(0.14512)]}* A=-2.863 B=1.273	A=-1.46 B=1.273	A=-4.705 B=1.273	100(total)
Mercury (dissolved) (• g/l)	2.6x0.85*-2.2	1.3x+0.85-1.1*	2.4	0.12	
Nickel (dissolved)[1)] (• g/l)	exp[A+Bln(H)]x 0.998* A=0.5173 B=0.8460	exp[A+Bln(H)]x 0.997* A=-2.286 B=0.8460	A=3.3612 B=0.846	A=1.1645 B=0.846	1000(total)
TRC (• g/l)	19	11			
Zinc (dissolved) (• g/l)	exp[A+Bln(H)]x 0.978* A=0.8875 B=0.8473	exp[A+Bln(H)]x 0.986* A=-2.286 B=0.8473	A=-0.8604 B=0.8473	A=0.7614 B=0.8473	1000(total)
Benzene (• g/l)	4200	860			
Ethylbenzene (• g/l)	150	14			
Toluene (• g/l)	2000	600			
Xylene (• g/l)	920	360			

Footnotes (March 2001 Draft)

ln[H] is a natural logarithm of hardness

*Conversion factor or dissolved metals

Conversion factor means the percent total recoverable metal found as dissolved metal in the toxicity tests to derive water quality standards of this part. These values are listed as components of the dissolved metals water quality standards to serve to convert total metals water quality to dissolved standards and were obtained from USEPA water quality criteria. In the federal criteria this parameter is represented by Water Effect Ratio.
Metals translator mans the fraction of total metal in the effluent or downstream water that is dissolved. The reasons for using metals translator is to allow calculation of total metal permit limit from a dissolved metal water quality standard. In the absence of site-specific data for the effluent or receiving water body, the metals translator is the reciprocal of the conversion factor.

If dissolved metal concentrations are use the underlined conversion factor parameter is not used.

Table 1 - Continuing

Parameter	Illinois General Use Standards	Federal Aquatic life and Human Health Protection Criteria	Illinois Secondary Contact and Indigenous Aquatic Use Standards
Barium (total) (mg/l)	5.0		5.0
Boron (total) (mg/l)	1.0		
Chloride (mg/l)	500		
Fluoride (mg/l)	1.4		
Iron (dissolved) (mg/l)	1.0	1.0	2.0 (total) , 0.5 (dissolv.)
Manganese (total)(mg/l)	1.0		1.0
Oil, fats and grease (mg/l)			15.0
Phenols (mg/l)	0.1		0.3
Selenium (total) (mg/l)	1.0		1.0
Silver (total)[1] (• g/l)	5.0	A=-6.52 B=1.72	1100
Sulfate (mg/l)	500		
Total Dissolved Solids (mg/l)	1000		1500
Fecal Coliform[2] (No/100ml)	200 (May - October) 400 (any 30 day period)	126 (geometric mean of 5 samples over a 30 day period)	Repealed
Temperature	32°C (Apr.-Nov.) 16°C (Dec. - March) max 2.8°C over natural	Local and site specific	> 34°C 5% of time • 37.8 at all time
Total ammonium as N (mg/l)	15	calculated[4]	
Un-ionized ammonia as N (mg/l)[3]	Acute 0.33 (April-Oct.) 0.14 (Nov.-March) Chronic 0.057 (April-Oct.) 0.025 (Nov.-March)	Superceded by the 1999 federal criteria[4] for total ammonium	0.1
Radioactivity Gross beta (pCi/l) Radium 226 (pCi/l) Strontium 90 (pCi/l)	 100 1 2		

TABLE 2
COMPARISON OF NARRATIVE ILLINOIS STATE GENERAL USE AND SECONDARY CONTACT AND INDIGENOUS AQUATIC LIFE USE STANDARDS WITH FEDERAL AQUATIC LIFE PROTECTION AND WATER CONTACT USE CRITERIA

Parameter	Illinois General Use Standards	Illinois Secondary Contact and Indigenous Aquatic Use Standards	Federal Aquatic life and Human Health Protection Criteria
Narrative Objectionable floatables Algae Odor, color and turbidity	Waters of the state shall be free from sludge or bottom deposits, floating debris, visible oil, odor, plant or algal growth, color or turbidity of other than natural origin.	Waters subject to this subpart shall be free from unnatural sludge or bottom deposits, floating debris, visible oil, odor, unnatural plant or algal growth, or unnatural color or turbidity.	All waters free from substances attributable to wastewater or other discharges that: (1) settle to form objectionable deposits; (2) float as debris, scum, oil, or other matter to form nuisances; (3) produce objectionable color, odor, taste, or turbidity; (4) produce undesirable or nuisance aquatic life

Footnotes:

[1)] The limiting concentration for metals is calculated from

$$C = \exp[A + B \ln(H)]$$

where ln[H] is a natural logarithm of hardness

[2)] The standard of 200 No/100 ml is applied to a geometric mean of a minimum of five samples taken over a 30 day period, the standard of 400 No/100 ml can be exceeded by no more than 10% of samples during any 30 day period.

[3)] *Illinois Standard for Ammonium* (Title 35:Env. Protection, C:Wat.Pollution, CH. 1)
The limiting total ammonium concentration (subjected to the 15 mg/l maximum) is a site specific standard that is calculated from pH and temperature from

$$N = U[0.94412(1+10^{X})+0.0559] \qquad X = 0.09018 + [2729.92/(T + 2732.16) - pH .$$

where U = limiting concentration of un-ionized ammonia as N (mg/l), N= total ammonium standard (mg/l), T=temperature in °C

[4)] *Federal Criteria for Ammonium* (US EPA: *1999 Update of Ambient Water Quality Criteria for Ammonia.* EPA-822-R-99-014, Office of Water, Washington, DC

Acute criterion
The one hour average concentration of total ammonia nitrogen ($NH_4^+ + NH_3$ in mg N/L) does not exceed, more than once in three years on average, the CMC calculated by the following equation

Salmonid fish are present

$$CMC = \frac{0.275}{1+10^{7.204-pH}} + \frac{39.0}{1+10^{pH-7.204}}$$

Salmonid fish are absent

$$CMC = \frac{0.411}{1+10^{7.204-pH}} + \frac{58.4}{1+10^{pH-7.204}}$$

In this UAA study it is assumed that the criterion for salmonid fish absent is applicable.

Chronic criterion

The thirty-day average concentration of total ammonia nitrogen (in mg N/L) does not exceed, more than once every three years on average, the CCC calculated using the following equation

Early life stages are present

$$CCC = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}} \right) x\, MIN\left[2.85, 1.45 \times 10^{0.028(25-T)} \right]$$

Early life stages are absent

$$CCC = \left(\frac{0.0577}{1+10^{7.688-pH}} + \frac{2.487}{1+10^{pH-7.688}} \right) x \left[1.45 \times 10^{0.028(25-MAX(T,7))} \right]$$

In this UAA study it will be assumed that early life forms are present. This is because the goal of the study is to provide conditions for a balanced aquatic life that obviously necessitates support of early life forms.

The 1999 update also included consideration of the 4 day average (similar to the priority pollutant criteria):

The highest four day average within the 30-day period should not exceed 2.5 times the CCC.

A comparison of federal criteria for total ammonium/ammonia with Illinois calculated standards for total ammonium derived from the unionized ammonia standard is shown on Figure 2. **It is shown that at pH of 7.0 (typical for the investigated segment of the Des Plaines River) the federal acute ammonia toxicity criterion (CMC) is 36.1 mg N/L while the Illinois standard is 15 mg N/L, which is a significant difference and should be considered by the state and preparers of this UAA.** The Illinois chronic toxicity standard is similar to the CCC federal criterion for early life present criterion based on consecutive 4-day averaging.

End of footnotes for Table 1 ----------

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trma
Three Rivers Manufacturers' Association

June 11, 2002

Mr. Toby Frevert
Great Lakes Coordinator
Illinois Environmental Protection Agency
1021 North Grand Ave. East
Springfield, IL 62794

RE: Lower Des Plaines River Use Attainability Analysis (UAA)

Dear Mr. Frevert:

Three Rivers Manufacturers' Association, established in 1933, serves the needs of local manufacturers in Grundy and Will counties. Our mission is to promote manufacturing excellence amongst our members and improve the general manufacturing climate within the communities we serve. Several of our members (Midwest Generation, Caterpillar, BP Chemicals, Stepan Company and ExxonMobil Joliet Refinery) are located on a portion of the Des Plaines River that is being considered for re-designation from Secondary Contact use to General Use.

To date, several of our members have been active in attending and providing comments to both the Lower Des Plaines River UAA workgroup and its biological subcommittee. From their perspective, all parties involved have done much work to date and they should be commended for their efforts. However, our members report that the discussions within both workgroups have not been as useful and effective as they could be, for reasons to be discussed later.

Reclassification of the lower segment of the Des Plaines River from Secondary Contact use to General Use, or any comparable type of "Warm Water Modified Use" which would include primary contact recreation, will have an immediate impact upon the daily operations of all those facilities that are located on the waterway. Unless the final recommendation is based upon best available data and scientifically sound interpretation, and properly classified within the boundaries of what is realistically and practically attainable, the overall result will be a negative outcome for all the impacted facilities and municipalities. These limitations could be felt either across the board or individually, but all would have some level of negative economic impact as a result of operational limitations, permit restrictions, capital expenditures and safety/security considerations.

Today, we would like to identify and generally discuss those issues that we believe will have specific impact to our members. Our goal is to provide more specific arguments on those issues over the next 6-8 weeks.

- A major concern is the lack of thoroughness and overall validity of the IEPA's consultants' (AquaNova and Hey & Associates) work to date. Our participating members have constantly argued during the meetings that their work products lack the combination of sound science, accurate data interpretations and sufficient opportunity for review by the workgroup members. Additional confusion is added as their roles are not clear and there is disagreement between the consultants at the meetings. Many of the recommendations which have been set forth by the IEPA consultants have not met with the full approval of the workgroup, but this factor has been largely ignored to date. Furthermore, the consultants have failed to provide appropriate responses and follow-up to relevant concerns raised by industry regarding their biological and chemical assessments. It is our position that unless all proposed and related concerns are fully investigated and evenly presented, their final recommendations will not properly address the sum of all environmental, economic and social impacts which will occur as the result of reclassifying the use designation of this segment of the Lower Des Plaines River.

  It should be noted that the confusion we have described above is not solely an industry concern. In Albert Ettinger's February 15th letter to you, his initial concern with the UAA workgroups was the lack of quality and direction by the IEPA consultants.

- Based upon the data presented to date, it is apparent that the Dresden Pool area meets more of the necessary criteria than the Brandon Pool for meeting a "General Use" standard. While we generally support the findings made, which are based on actual, reputable data, we do not agree with all the verbal and written recommendations the consultants have provided. As an example, we have reviewed the consultants' presentations and discussions regarding "recreational use attainability" at the May 16th general workgroup meeting and have found fault with several of the conclusions drawn.

  From our vantage point, it is clear that the consultants did not provide a thorough and unbiased interpretation on the current status of the upper Dresden Pool as it relates to the "recreational use" attainability.

  As pointed out at the meeting, their data collection efforts regarding barge operations and public access, as well as the results and photographic documentation, were severely biased when compared to the actual day-to-day activities on this segment of the lower Des Plaines River. Furthermore, without any prior discussion or agreement, in their report and presentation they have combined the river segment downstream of the I-55 bridge, known as the "lower Dresden Pool area" and currently classified as "General Use", with the "upper" segment and presented recreational use data largely representative of the lower Dresden Pool and applied it to the upstream reach. We feel this is a gross misrepresentation and another example of their biased approach to recommend the Dresden pool area of the lower Des Plaines River be designated "General Use".

  In their presentation and report, the consultants appeared to concentrate most of their data on showing and recommending how the more restricted Brandon Pool area could not meet the recreational use standards, due to strictly physical constraints. However, when

discussing the Upper Dresden Pool area, the consultant has recommended "recreational use" despite incomplete data and speculative information / interpretation noted earlier.

- During the May 16th full workgroup meeting, we found the consultants' presentation on fecal coliform to be both incomplete and confusing. We are particularly concerned about the consultants' specific inferences that the fecal coliform standard can be met for the lower Des Plaines River segment below the Brandon Road, as recommended at the May 16th meeting. The data indicates that the current fecal coliform limits for primary contact recreation are not being met anywhere in the system, but this fact is ignored due to the anticipated treatment improvements which the consultants anticipate in the near future. It is their perception that CSO's are the primary source of fecal coliform contamination and that various municipality projects due for completion in 2003 would all but eliminate the discharge, especially if chlorination was added to the process. While not fully acknowledged during the discussion, any chlorination would also result in the need for de-chlorination equipment, not only for the municipalities, but also for facility discharges, in order to meet the extremely stringent General Use chlorine (TRC) limits. Economically, this could be extremely difficult for all impacted sites, especially for little is any environmental impact.

  We also strongly disagree with the consultant's supposition that the only source of fecal coliform in this waterway is the upstream POTW's. As stated by the IEPA, there are many General Use waters in the state that do not currently meet the required fecal coliform limits for primary contact recreation. Many of these are in areas without any POTW discharges. As such, any additional treatment provided to the POTW discharges to meet a tighter fecal coliform limitation, (as well as the more stringent chlorine discharge limits), would only serve to make the discharges of better quality than the ambient river conditions. This is not an economically sound or environmentally beneficial proposition.

  The consultants' consistent use of statistics to "dampen" out the reality of the continuing water quality problems that may prevent the attainment of full "General Use" is a matter of great concern to our members. Furthermore, the consultants did not make a clear distinction on how fecal coliform findings were to be compared with the E. coli standard that the USEPA has endorsed. Nor have they made it clear how standards and guidance for designated bathing waters could be compared with the current and future situation regarding primary contact recreation in the lower Des Plaines River.

  The fecal coliform issue is a typical example of how the consultant ignores industry's input and provides no follow-up to their verbal or written concerns. During the discussion on thermal issues at the June 4th biological subcommittee meeting, AquaNova commented that the fecal coliform issues had primarily been resolved at the May 16th meeting and that they would meet the necessary standards for recreational use issues as recommended. It is our members' recollections that the fecal discussions were well diversified and no conclusions were reached at the May 16th meeting. However, if it had not been for comments by our members and others that the issue had not been resolved

and needed more discussion, the consultants would have continued on with the perception it was a closed issue.

- Another area directly related to the proposal for a primary contact recreation designation is navigation and related safety concerns. As pointed out at the May 16th meeting and investigated further by our members, the navigational data collection for the lower Des Plaines River segment was minimal and the public survey responses vague at best, yet the consultant recommended recreational use. We agree with the consultant that the amount of barge traffic as provided by the U.S. Army Corps of Engineers for the Dresden and Brandon Road Locks and Dams, is significant. However, in reviewing this information with the barge tug operators in our area, the lock numbers need to be multiplied 2-3 times in order to get an accurate barge movement count within this area of the lower Des Plaines River. Normal operation is to move a single incoming barge 3 times before returning it. Initially, it is moored at a "fleet" holding area until the facility is ready for it, then it is moved to the appropriate dock. Upon being loaded or unloaded, it is moved a third time back to the holding area and then shipped out of the Brandon and/or Dresden pool areas.

  In addition to the barge movement, the average barge width is not 33 feet as identified by the consultant, but rather 40-50% of the barges are chemical or liquid barges which average 50 feet. The data presented by the consultant for the upper Dresden Pool segment, where the greater concentration of barge movement takes place, is understated in both the amount of barge traffic movement as well as the greater overall dimensions of the individual barge tows. This makes the available waterway for recreational craft considerably smaller than depicted by the consultant, and certainly less safe.

  Barge tug operators contribute the current good safety record for the lower Des Plaines River segment Pool area because of the limited recreational use accessibility and industry facility concentration in both the Upper Dresden and Brandon pools. Their concern is that with any greater recreational use, safety concerns for all crafts would increase greatly. The potential for primary contact recreation in these areas will undoubtedly add to the safety concerns of barge tug operators, industry and the public that border or use this waterway

We support the previously sent letters from industry, the MWRDGC and the environmental community that question the direction that the IEPA consultants are taking the UAA process, as well as the quality and thoroughness of their work. Furthermore, we are concerned about their lack of response to all concerns raised at both the general and biological workgroup meetings. While there has been a lot of work done to date, it has not been presented in a format or forum that most everyone can agree has fully met the Illinois EPA's objective to seek an appropriate use designation for the Lower Des Plaines River.

As stated earlier, and as you have encouraged us to do, we will be providing additional follow-up correspondence and information to you on the issues of concern to our members that would be directly impacted by any change in the current "use" classification for the Lower Des Plaines River.

We look forward to working with you on the UAA process in the future. Should you have any questions, please do not hesitate to contact me.

Sincerely,

Gerald Caamano
Vice President

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Three Rivers Manufacturers' Association

June 6, 2003

RECEIVED
JUN 11 2003
DIVISION OF
Water Pollution Control

Mr. Toby Frevert
Great Lakes Coordinator
Illinois Environmental Protection Agency
1021 North Grand Ave. East
Springfield, IL 62794

RE: Lower Des Plaines River Use Attainability Analysis (UAA)

Dear Mr. Frevert:

The Three Rivers Manufacturers' Association is writing this letter on behalf of its members who are located on the Des Plaines River and will be impacted by any change in use designation of this waterway. Our impacted members have completed an initial review of Hey and Associates, Inc/AquaNova International, Ltd. draft UAA report and have identified several issues of concern which we need to bring to your attention.

As stated in our previous letters of concern dated, June 11th and July 8th, 2002 (attached for your reference), several of our members have been active in attending and providing comments to both the Lower Des Plaines UAA workgroup, as well as its Biological Subcommittee. With receipt of the widely controversial and largely uncorroborated draft UAA proposal, it is our intention to apprise the Illinois EPA of our concerns in order to ensure that the final proposed UAA report is a scientifically defensible and factually accurate document that can be used to make important regulatory decisions which will adequately protect the environment under obligations prescribed in the Clean Water Act, following the UAA criteria outlined in 40 CFR Part 131.

Moving forward a reclassification upgrade from the current Secondary Contact water quality standards without taking into sufficient account specific technical and safety-related concerns provided by our members will result in a scientifically unsound and unsupportable position by the Agency. Implementation of such a change, without adequate biological, physical or chemical supporting data, will result in an immediate adverse impact upon the daily operations of those facilities located on the waterway. Based upon our initial review of the proposed UAA, we have serious concerns as to how the consultants reached their final recommendations and would like to identify and summarize those issues in this letter. At this time, it is our goal to highlight these issues now, and discuss them more thoroughly at the yet to be determined biological subcommittee and workgroup meetings. In addition, because of the importance of these issues, we are also open to a direct meeting with Agency personnel to go over our concerns in detail.

The organization of our comments will follow the chapters as organized in the draft UAA report.

Chapter 1 Introduction

Contrary to the consultant's opinion, and according to the language in 40 CFR Part 131, meeting the test for **any** of the 6 reasons described in the UAA guidance is grounds to make the

justification that a lesser use is warranted for a particular waterbody. The consultant seems to be selectively interpreting the regulations in order to promote a General Use classification for a waterway which, according to the actual data on habitat, flow regime, existing use and biological/bacterial characteristics, meets several of the 6 UAA criteria allowing for a lesser use. This is not to say that the Lower Des Plaines River needs to retain all the Secondary Contact chemical limits, since it is apparent that water quality has improved substantially over the past 10 years. The appropriate approach in this case would be to develop a site-specific use designation to reflect this improvement, while still acknowledging that the waterway will continue to be impacted by permanent physical alterations to prevent full General Use. Pushing the waterway into a General Use designation without sufficient supporting evidence will bring strong opposition from our members.

Also, the consultant's listing of Illinois' 303(d) parameters of concern for the UAA reach is incomplete, as it omits one of the most important influences of this waterway: flow alterations. The flow in the Lower Des Plaines is entirely artificially controlled and largely influenced by treated municipal discharges, and runoff from upstream storm events, and as such, must be included in any analysis of the future potential of this waterway.

This is just one instance of the disregard for accuracy and/or completeness found throughout the report.

Chapter 2 Water Body Assessment

The UAA recommendation that the Dissolved Oxygen (DO) concentrations in the Dresden Pool can meet the General Use standard is inconsistent with the consultants' own findings and Midwest Generation's findings. In their conclusion, the consultants use the terms "most of the time" and "few excursions" of the 5 mg/l general use standard for the Dresden Pool area. In addition, it is stated that the summer time minimum 16 hours level is difficult to obtain. Furthermore, the Dresden Pool area exhibits large diurnal DO variations during the summer and, on occasion, drops below the 5mg/L standard. Finally, the consultant infers that the federal DO criterion of 5 mg/l for the Dresden pool area "*may be attainable, provided that the criterion frequency component of allowable excursions is considered and included into the Illinois General use standard.*" The consultant's use of statistical manipulations, rather than the true assessment of real monitoring data, is problematic. It appears to serve as a means to obscure the reasoning behind many of the conclusions made in the report, thereby making it difficult to do a thorough review of the subject matter.

In the consultants' conclusion regarding temperature impact, they state it is one of the more significant parameters being addressed in the study. We believe this is rightfully so due to the possible adverse socio-economic impact to dischargers and population from the potential application of more stringent limitations. Midwest Generation has previously submitted a report to the Agency detailing temperature and its impact on the present and expected future biotic integrity of the Lower Des Plaines River. As Midwest Generation has extensive experience with temperature-related issues, as well as considerable biological, physical and chemical monitoring data for the waterway, we will defer to them to provide the Agency with additional information regarding how temperature has been addressed in the consultant's draft UAA report.

We do note that while the recommendation of appropriate thermal limits was specifically stated as not part of the consultant's work, they did advocate that General Use thermal limits be applied to the entire UAA waterway, above and below Brandon Lock and Dam. This was done, from our

perspective, without clear support or regard for the other inherent limitations in the system documented in other portions of the report, and concurred with by members of the Biological Subcommittee. Contrary to the consultant's assertion, a socio-economic impact study is NOT the only factor by which alternative thermal limits can be derived for the lower Des Plaines River. As stated earlier, the correct interpretation of 40 CFR Part 131 would allow for the consideration of a lesser use when any of the 6 UAA factors are met. While we are in agreement that IEPA should work with the stakeholders group to devise and propose a new thermal standard that would be both environmentally protective, as well as financially and technically attainable, this does not need to be done in the context of a full-blown socio-economic impact study. It is our understanding that Midwest Generation has already put forth a draft proposal for the Agency's review.

Chapter 3 Sediment Quality

Despite the consultant's attempt to negate the impacts of sediments on water column quality, the accumulation of sediments from historical discharges do have a significant effect upon the aquatic community within the Dresden pool area. In USEPA 's July 2002 published draft on non-point source pollution, it stated that high levels of sedimentation from various types of urban runoff have been found to be a leading cause of impairment. While the UAA recommendation assessed most of its conclusions based on the recent 2001 USEPA sediment sampling data, these results have never been released nor reviewed by the workgroup or Biological Subcommittee. (There is not even a reference to this study cited anywhere in the report). In light of numerous examples where the consultants misinterpreted data and study findings elsewhere in the draft UAA report, it is essential that this data, as well as the sampling protocol, locations and analytical methodology, be provided to the workgroup and subcommittee. This would allow for a thorough review period and subsequent discussion to provide a well-based interpretation of the USEPA results prior to any formal action to revise the current use designation based on as-yet unseen data.

Chapter 4 Physical Habitat of the Lower Des Plaines River

The UAA's overall findings indicate that the Lower Des Plaines segment does not have the necessary types of physical habitat and/or flow regime (as indicated by QHEI scores and associated data on habitat quality) necessary for the maintenance of a General Use biological population. This is supported by the conclusion statement in this chapter "that the poor habitat in the Lower Des Plaines River is a result of a lack of riffle/run habitat, limited hard substrates, channelization, poor riparian habitat, lack of in stream cover and impounded water." This finding is consistent with numbers 3, 4 and 5 of the UAA factors, thus justifying a less than General Use designation.

An additional major impact is the result of the current usage of the waterway which the UAA states as "heavily used for commercial barge traffic and a major cause of degraded habitat and considered irreversible." The consultant's statement that "At the current time, the river is heavily used.....", seems to imply that barge traffic will be reduced in the future. This is highly unlikely, due to the number of local industries, as well as those in the Chicago metropolitan area, which rely on this waterway for transport of commodities. Current traffic counts show consistent heavy use by barge traffic over the past few years.

Furthermore, Figures 4.7 and 4.12 do not provide a true representation of the actual barge traffic on the river. Especially in Figure 4.12, which appears to be taken from a selected frame of reference in such a way that the river actually appears much wider than it is. This is but one example of how the consultants have misrepresented the true character of the river, especially at the I-55 Bridge. Another example is a picture previously presented to the workgroup of the area at the I-55 Bridge, which appeared to be pristine with no barge traffic, when in reality, it is probably the most used tow and barge area of the Lower Des Plaines segment. Evidence of a predetermined goal by the consultant to fit this waterway into the General Use designation is found throughout this report. We urge Illinois EPA to let the years of biological, chemical and physical data speak for the quality of the waterway as a whole, and not the unsupported conclusions reached by the consultants in many parts of this report.

Interestingly, the habitat chapter does not discuss application of the six UAA factors at its conclusion, even though the data and discussion indicates that reason numbers 3, 4 and/or 5 would be met, justifying a less than full General Use designation.

Chapter 5 Existing and Potential Macroinvertebrate Community

The conclusions reached in this chapter were based upon a limited set of data and should be viewed as such. The sample comparisons with other Illinois rivers are inconclusive, as most were small non-large river impoundments and did not have heavy barge traffic. As a result, when drawing a conclusion about the current biological use of the Lower Des Plaines River, an appropriate review should be given. In comparing this chapter with the rest of the report, we note that the conclusions drawn are honest and reflect the uncertainties associated with the data. Other sections, unfortunately, do not necessarily let limited data stand in the way of drawing often unsupported conclusions.

Chapter 6 Evaluation of Existing and Potential Fishery Community

We agree with the UAA's findings that an Ohio IBI value of 48 for warmwater habitat is unreasonable for the entire Lower Des Plaines River area. Furthermore, the analysis shows that the waterway meets reason 4 of the federal regulations 40 CFR 131 required for a change of the designated use /or water quality standards for a water body. Therefore, the consideration of a modified stream classification is appropriate, and should be considered, in conjunction with the detailed analysis and impact by the other evaluations in the designation process.

Chapter 7 Pathogens and Recreation

It appears that the draft UAA report takes our navigational concerns lightly without thorough investigation. The consultant's conclusion regarding the impact of navigational constraints is not consistent, nor is it adequately represented or properly investigated. While the recommendation states that there is heavy barge traffic, which needs to be addressed, other language in the report suggests that it could be reduced. Even in these economic times, barge traffic along the Des Plaines River has remained steady. It is the major thoroughfare for inbound and outbound materials and products from the Gulf of Mexico and Mississippi River to the greater Metropolitan Area of Chicago. This segment and further upstream segments allow industry to transport their raw materials and finished products at the lowest cost available, and cannot economically be changed as suggested to more expensive alternatives such as truck and rail.

Furthermore, readers are led to believe that there are few if any barges along the segment, as none appear in the chapter pictures. Our members will provide more accurate pictures taken last summer of typical barge traffic on the waterway. In these photos, one will note the narrow passageway, rather than the "sufficiently wide enough" passage presented in the report. The "littoral zone" referenced in the report is hardly the place for primary contact recreation in this system. Safety is the major concern.

In the consultants' summary, they discuss "potential." They state that downstream of RM 283, the river is surrounded by forests and natural lands valued by the public, however, they do not mention the important fact that most or all the shore land and access is owned by multiple industries and therefore not open for development of public recreational use, as proposed. Nor does the report state that many of these areas are used to dock barges waiting to be loaded/unloaded or waiting for a tow for passage. In addition to the bacterial water quality concerns for primary contact recreational use, additional recreational usage would create a safety concern for all the impacted facilities. An example is the unfortunate drowning last year of the three boaters fishing in the Lower Des Plaines River upstream of the I-55 Bridge. We have attached a copy of the newspaper article describing the incident.

While security has always been a concern of our members, it has become of heightened importance in light of current world events. Relaxed recreational standards, as the UAA recommends will encourage increased recreation in an industrial area and put an added burden on the members' facilities to secure them from trespassing and/or possible vandalism.

Chapter 8 Modified Water Use Designation for Brandon Road Pool and Corresponding Standards

While this chapter primarily discusses the Brandon Pool designation, on a much smaller and less detailed scale, it also evaluates the Lower Des Plaines River segment. Again this is an example of inconsistency within the UAA report leading to an unsupported uniform standard for pathogens for the Lower Des Plaines River segment. The consultant fails to fully support their "General Use" designation, and does not fully take into account all of the navigational concerns and the City of Joliet's requirements. The consultants make broad unsupportable statements such as "However this stretch of the river also has a relatively high concentration of industrial activities and most recreation will still occur downstream of the I-55 Bridge". If the segment is re-designated, how do they know that the expected frequency of swimming will still be low, and how do they know it will only occur south of the I-55 Bridge? These are key factors that need to be carefully reviewed in any re-designation of this waterbody that is heavily navigated by barge and tow. Human health and safety will continue to remain primary concerns.

Furthermore, the consultants did not elaborate on the "industrial activity." This area does, in reality, experience a high concentration of barge traffic. While this segment of the river does meet some of the General Use chemical water quality parameters, it does not for major parameters such as copper, dissolved oxygen, Escherichia coli and temperature, and will not, unless major technological improvements are made by the City of Joliet and other facilities. For bacterial standards, in particular, it is doubtful whether the e. coli or fecal coliform General Use limits can be attained in the waterway, even if costly chlorination/declorination is instituted by the City of Joliet. By Illinois EPA's own admission, many of the waterbodies in the state cannot meet the existing General Use limits for bacteria, largely due to unregulated agricultural and other non-point source runoff.

Chapter 9 Conclusion

As in our previous letters, we support the issues and concerns raised by several parties within the IEPA workgroup and Biological Subcommittee that questioned the direction that the AquaNova International, LTD and Hey and Associates, Inc have taken with the UAA process, as well as the quality and thoroughness of their work.

As you have encouraged the workgroup members to do, we are voicing these concerns and issues to the Agency, as any change in the current "use" classification for the Lower Des Plaines River will have varying economic impact to our members located within the prescribed segment. While we agree that some of the more recent data appear to support some aspects of a "General Use" designation, other studies reveal that the Lower Des Plaines River segment remains incapable of sustaining the biotic integrity necessary for an overall "General Use" designation.

As a result, we would support a "modified warm water" designation of the entire UAA reach if there is agreement to a modified standard for thermal, DO, copper, and Escherichia coli which recognizes the inherent limitations of the waterway to meet full General Use. In this scenario, the use designation of the Lower Des Plaines River could still be improved, while recognizing that the system retains certain unalterable characteristics that meet one or more of the six UAA factors which allow for alternate uses to be considered. Once the UAA is complete and approved by the Agency and workgroup, the potential impact of any revised water quality standards will have to be taken into consideration by all affected facilities on the waterway. We feel this could best be accomplished in the context of individual NPDES permit negotiations, if necessary.

We look forward to continuing to work with you on the UAA recommendation process. Should you have any questions, please do not hesitate to contact me.

Sincerely,

Gerald Caamano
Vice President

Attachments: June 11, 2002 TRMA letter
July 18, 2002 TRMA letter
August 19, 2002 News Article

cc: Ms. Marcia T. Willhite - Chief, IEPA Bureau of Water

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July 18, 2002

Mr. Toby Frevert
Great Lakes Coordinator
Illinois Environmental Protection Agency
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RE: Lower Des Plaines River Use Attainability Analysis (UAA)

Dear Mr. Frevert:

As encouraged by you and mentioned in our June 11, 2002, correspondence, TRMA is following-up on additional issues of concern to our members who would be directly impacted by any changes in the current "secondary use" classification for the Lower Des Plaines River. These issues have been previously identified in either general / biological workgroup meetings.

Bacterial Contamination / Recreational Use Issues:

AquaNova and Hey & Associate's omission of the discussion regarding fecal coliform limits and standards in the May 16th General Workgroup minutes, is another example of incomplete notetaking. This omission may lead some workgroup members to think that the fecal coliform and/or E. coli findings and their relationship to the UAA outcome are not of major concern. To our members, this matter has always been very important. The bacterial quality of the lower Des Plaines River has become an even greater issue at this time, as the Illinois Environmental Protection Agency (IEPA) is considering an upgrade of the existing use classification to include some level of primary contact recreational use.

At the May 16th general workgroup meeting, much discussion surrounded the inadequate presentation by AquaNova and Hey & Associates of the fecal coliform levels in the Lower Des Plaines River. Their presentation on analytical results, the impact to any classification re-designation, proposed methods to reduce current levels, the correlation between fecal and the US EPA's emphasis for states to use E. coli, as well as the method for determining the appropriate bacterial standard for the waterway, was confusing and inconsistent.

Since May 16th, the US EPA has published their latest draft for "Implementation Guidance for Ambient Water Quality Criteria for Bacteria." It was written to provide guidance to state, territory and authorized tribal water quality programs on the adoption and implementation of bacteriological water quality criteria for the protection of waters designated for recreation. As a result of comments on the previous February 2000 draft, the scope and detail of the 2002 guidance increased significantly. As identified in the executive summary and Section Four - "Appropriate Approaches for Managing Risk in Recreational Waters", the guidance is rather specific on steps that need to be taken relating to bacteria and prior to classifying for any level of recreational use. Some of the more important recommendations are:

- encourage states to use E. coli or enterococci as the basis of their water quality criteria for bacteria to protect fresh recreational waters.
- acknowledge there are different types of recreational uses and different management choices available in managing those water resources.
- states should conduct sanitary surveys to identify sources of fecal pollution when high levels of bacteria are observed
- states may want to adopt seasonal, secondary, intermittent, primary contact recreation
- suggests that states approach the recreational use issue by looking at several factors such as whether the waterbody is actually being used for primary contact recreation, existing water quality, water quality potential, access, recreational facilities, location, safety considerations, and physical conditions of the waterbody in making any use attainability decision.

To fully realize the possible impact of the guidance, the IEPA needs to allow time for all parties within the UAA workgroup to thoroughly review, discuss and comprehend the options and related impacts. We propose that this subject be a major discussion item at both the upcoming biological subcommittee and full workgroup meetings.

Thermal Water Quality Limit Issues:

Midwest Generation provided a detailed overview of the current thermal limits in the lower Des Plaines River and their relationship to the indigenous aquatic community as part of their presentation to the Biological Subcommittee on June 4, 2002. This letter does not intend to reiterate all of the information discussed, but it does serve to reinforce the position that thermal inputs are not causing a significant negative impact on this waterway. According to the extensive physical and biological data collected throughout the system over the past 20+ years by Midwest Generation (including the comprehensive study of the entire Upper Illinois Waterway performed by ComEd), the current

Secondary Contact Water Quality limits remain protective of the indigenous biological community in the entire waterway for which the current UAA is being conducted. Although the biological subcommittee has not yet come to consensus on what the "potential" of the waterway is for the future, there remain significant limiting factors in the lower Des Plaines River that should prevent it from being considered a full General Use waterway. This is especially true for the reach above Brandon Road Lock and Dam, but also apparent in the waterway from Brandon downstream to I-55 (and even further downstream, according to the comments made by Chris Yoder at the last Biological Subcommittee meeting). Prospects for improving physical habitat conditions are limited and tend to conflict with the predominant uses of the waterway, namely barge transport and conveyance of treated point and non-point source discharges. Control of thermal discharges to meet more stringent limitations, in the absence of other measures to improve the overall habitat/sediment/physical quality of the waterway, would be a significant economic hardship for our members that discharge heat into the lower Des Plaines River, and would likely not result in any significant environmental improvements to the system.

Contaminated Sediment Issues:

Next to habitat availability (which has been addressed by the IEPA consultants to some extent), the level and complexity of chemical contamination is the most significant factor influencing the assemblage of aquatic biota present in the lower Des Plaines River. As part of ComEd's Upper Illinois Waterway (UIW) Study, conducted 1991-1995, a thorough literature review, followed by a detailed risk screening, defined historic patterns of sediment contamination in the lower Des Plaines River and identified the following list of contaminants of special concern: ammonia, arsenic, cadmium, chlordane, chromium, copper, DDT, dieldrin, lead, mercury, nickel, PCBs, PAHs and zinc.

Intensive sediment and overlying water column samples were subsequently taken and analyzed. Toxicity varied between pools and habitat types. Differences were correlated with sedimentation patterns. Fine-grained sediments from depositional areas (the "better" physical habitats) were found to be the most toxic. Overlying waters were also found to be toxic. Acutely toxic sediments were also found in the Brandon tailwater area, which has been identified as the best quality aquatic habitat in the UAA study area. (Also note that these depositional areas are also those areas identified by AquaNova and Hey & Associates as potential "recreational use" waters (littoral zones). Sediment quality does not change rapidly over time, so the results of the UIW work should be considered as valid for use in the UAA effort.

Monitoring by the Illinois Department of Natural Resources (IDNR) has shown significant body burdens of contaminants in adult, bottom-feeding fishes. There is a continuing consumption advisory in effect for the Dresden Pool, as well as the upstream reaches, which is another indication of the prevalence and persistence of sediment contamination in the waterway.

We are also continuing to wait for the results of the more recent sediment survey work that was allegedly performed by US EPA last summer. This data will confirm the validity of previous monitoring efforts, as well as provide an indication of the current extent of sediment contamination in the waterway. Involved industries and POTWs have been consistently providing information, study data and reference resources to assist in the UAA effort, but we have yet to see a similar contribution from USEPA, even though they should have data that would be useful for the overall analysis.

Resolution of the contaminated sediment issue is critical to the overall use designation assessment of the lower Des Plaines River, as it affects not only biological habitat quality, but also the long-term potential for recreational activity in the waterway. All current analyses by the IEPA consultants seem to assume that these contaminated sediments can be removed and therefore should not be considered as a limiting factor to the overall improvement of the waterway. However, since this contamination is the result of historic deposition, and not due to current point source discharges (which could, theoretically be controlled through tighter NPDES permit limits), no proposal has yet been made by either USEPA or IEPA on how to adequately deal with and/or mitigate these contaminated sediments. In fact, the entire subject of contaminated sediments has yet to be fully discussed within the context of either the Biological Subcommittee or the full workgroup. We feel that this is a very critical issue for the UAA, and should be given the attention that it deserves in an upcoming meeting.

Comments on Meeting Minutes:

As our members have received and had time to review the minutes from both the recent May 16th biological sub-committee and the June 4th full workgroup meetings, we would like to comment on several issues. As in the past, in what seems to be a recurring theme in previous meeting minute drafts, as well as during the actual meetings, AquaNova and Hey & Associates use broad assumptions, leave out pertinent items contrary to their chosen direction and discuss key issues without resolution or discussion of necessary next steps. Comprehensive comments within the meeting minutes are imperative during this regulatory process as they are the foundation upon which parties can continue to have their arguments documented, pro or con.

As mentioned above, the exclusion of comments and discussion regarding the fecal coliform issue in the draft of the May 16th minutes is a major concern. As identified in our June 11th letter to you and in the recent US EPA Guidance bacteria document, this is an important issue and needs to be documented as such in the meeting minutes.

An additional omission is the potential recreational use discussion on swimming and watercraft usage in the Lower Dresden pool area. While item 25 states that "no consensus was reached", there are no specific details included as there are in item # 's 10 and 11 for the Brandon Pool.

Barge Traffic / Safety Issue:

Another issue we would like to address in our next correspondence is the impact of barge traffic to any recreational use classification designation. We are still compiling information from the US Corps of Engineers, the US Coast Guard, barge tow companies and local on-river facilities with an anticipated completion and follow-up letter to you by August 15th.

We continue to support the IEPA's efforts to seek out and include all appropriate information, as well as provide an open discussion arena in which to voice our opinions in order to obtain a scientifically-based, well founded outcome to the UAA effort for the lower Des Plaines River that will acknowledge the overall improvements in the aquatic community and water quality that have been made over time, while acknowledging the overall character and predominant, continuing use of the waterway for commerce, industry and the conveyance of treated point and non-point source discharges.

Sincerely,

Gerald J. Caamano
Vice President

MIDWEST GENERATION COMMENTS ON TEMPERATURE SECTION OF DRAFT UAA REPORT

Temperature Section (page 2-82):

Para. 2:

"...upstream of Lockport is a warmwater ~~body~~ stream." corrected

Para. 3:

The information presented in Table 1.2, and as described in this paragraph, is not accurately annotated and has missing information. The station values presented are maximum design ratings, and are not reflective of current actual station operations. These design values should be identified as such in the table. In addition, the information obtained from the Holly and Bradley 1994 report (last column in table) is taken out of context and therefore, is misleading. (Holly is also misspelled several times in the text). If this reference is retained, a full explanation of the context needs to be included that reveals the information represents modeling values based on specific hypothetical scenarios rather than actual measured station operational data. Alternatively, it would also be appropriate to delete the Holly and Bradley 1994 report information from the last column of the table so that you are not mixing actual design data with modeled values. In addition, none of the information in the table is attributable to Wozniak, 2001. The footnote regarding the cooling towers did come from Wozniak, but it does not relate to the table information from Holly and Bradley, 1994, since the cooling towers were not constructed until 1999.

Corrected as suggested above

Para. 4:

This statement is misleading. The MWRDGC treatment system discharges completely dominate the lower Des Plaines River system year-round and ultimately dictate the "ambient" temperature of the waterway. The statement as written is only correct for the summer months. To be accurate, the text should include the important fact that the MWRDGC discharges are warmer than a natural waterbody would be during the winter months. The text also should be revised to include the fact that the MWRDGC discharges control the "background" temperature of the lower Des Plaines River and should acknowledge that this is part of how the thermal regime of this waterway is influenced by human-induced conditions.

Statement on the dominance of MWRDGC flows was added

Page 2-83:

Para. 1

The use of the word "excessive" is a vague and subjective term. It should be clarified to convey it means temperatures exceeding the applicable thermal water quality standards for a given stream.

Wording accepted

Para. 2 under "General Use" Heading

The I-55 Alternate Thermal Standards granted by the Illinois Pollution Control Board are not correctly described as a "variance" but rather an "adjusted standard." The Illinois Pollution Control Board's decision in AS96-10 granted an adjusted thermal standard specifically for the I-55 Bridge location. This standard is not applicable to the waterway downstream of I-55, where General Use thermal water quality standards remain in effect. (Commonwealth Edison once held a thermal variance which covered the entire waterway from the I-55 Bridge down to the confluence of the Des Plaines River with the Kankakee River. This variance was commonly known as the "Five Mile Stretch Variance." However, it has not been in effect since the mid to late 1980's.)

"Variance" corrected to "adjusted standard"

Also, the (Tarson, 2001) reference is not listed in the References section at the end of the chapter.

Tarson (2001) is a memorandum provided by IEPA that is included in the Appendix (on the CD). The reference was corrected.

In the discussion of the General Use standards, the Illinois mixing zone or zone of passage requirements, which are applicable to thermal dischargers to both Secondary Contact and General Use waters, should be described. The regulatory limitations on the scope of the mixing zone have been applied to the Midwest Generation discharges through the NPDES permits issued to the stations located in the UAA Study area and prevent the entire river from becoming heated to the maximum thermal water quality standards.

A statement on mixing zone was included in the report.

Page 2-84:

Para. 3

Commonwealth Edison's efforts in prior proceedings before the Illinois Pollution Control Board more than 25 years ago seeking the Five Mile Stretch Variance, which has not been in effect for over ten years, is irrelevant to the UAA issues here. In other portions of the report, information that is more than five years old and is not reflective of current conditions in the river has not been included. It also should be deleted from the report to eliminate the confusion it apparently caused the report's authors, as they mistakenly concluded that this variance still remains in effect and covers the entire five-mile stretch from the I55 Bridge to the confluence with the Kankakee River. If this discussion instead is to be retained, then it must be explained that this variance expired long ago and some explanation should be provided to clarify why this information is relevant to the UAA

analysis. As currently written, it appears relevant only for the purpose of expressing the view that Commonwealth Edison was given relief from the thermal standards in this five-mile stretch for an extended period of time over the "opposing views by the USEPA, Illinois environmental agencies and private citizens." (Page 2-84). While the authors may be critical of the Illinois Pollution Control Board's decision to grant the Commonwealth Edison variance, such beliefs are not appropriate or necessary in the UAA report. Again, to present a more balanced description of the variance proceeding, if this text is retained, a description of the biological data on which Commonwealth Edison relied successfully to obtain the variance should be included so that the reader has some basis on which to evaluate the merits of the Board's prior decision in the face of the referenced opposing views. If there is some relevance to this section of the report, the biological data that was presented to the Board is certainly relevant to understanding why the variance was granted, which would seem to be the only helpful purpose for including this outdated information in the report.

Midwest Generation suggests that the description of the 1996 adjusted standard granted to Commonwealth Edison (page 2-85) should replace the description of the former variance. The results of this proceeding reflect the standards that have applied to the Joliet stations for the past 7 years. This is what needs to be conveyed and emphasized to the reader. As presently written, because it is relegated to the end of the discussion, it simply appears to be an extension of the old variance proceeding and it may not be clear that it does reflect a different scope of relief than did the variance and that it provides the currently applicable thermal discharge standards with which the Joliet station discharges must comply. In addition, so that the explanation of the administrative record is complete, this portion of the report should be expanded to include the fact that on March 16, 2000, the Pollution Control Board granted the transfer of the Alternate I-55 Thermal Limitations to Midwest Generation in AS 96-10, with the concurrence of IEPA and with no opposing views by U.S. EPA or private parties presented.

Wording corrected. Unlike the chemical water quality data that were restricted to the period from 1995 to 2000, the IEPA contract required that we prepare a brief history of the development of the standards.

Page 2-85:

Para. 4, first line: "report provides ~~an~~ excellent..." corrected

Para. 5, 4th line: "...that would enable ***one*** to directly assess..." corrected

Page 2-86:

The erroneous assumptions made regarding the power plant flow requirements versus the low river flows are not supported by any data and allege that Midwest Generation has been in chronic violation of the Secondary Contact thermal limits. The assumption that there is no mixing zone in the river is based on the misinterpretation of station operating

parameters, river flow dynamics and the lack of substantive support for the statements made in the report. The assertion of Midwest Generation's alleged noncompliance with thermal standards is false and unsubstantiated. It should properly be deleted from the report. Data from the recent 2002 thermal plume studies conducted by Mid west Generation clearly refute these allegations (as do previously done studies by ENSR for the UIW Study work) and such data should be referenced in this section of the report. The data collected during the 2002 thermal plume studies, during typical summer operating conditions, show that the two thermal plumes from the Joliet Stations do not mix with each other until the temperatures of both discharges are fully compliant with the Secondary Contact thermal limits.

Page 2-86 has no assertion of Midwest generation violation of thermal standards. The discussion on flow effects is a valid scientific judgment, considering a situation wherein the combined condensers flows equal or exceed the upstream flow of the river. Such situation may occur during flows approaching 7Q10 (see the subsequent discussion on the duration of 7Q10 flow). A mixing zone requires an availability of sufficient colder flow to mix with the discharge which is not the case during the 7Q10 conditions.

Further, the following statement in the second sentence on page 2-86 is incorrect: "...the discharge temperature is very close to the river temperature immediately downstream of the plants." The condenser discharge temperature does not equal the temperature in the main body of the river, where the thermal standards are applicable. This is due to the operation of the Joliet #29 cooling towers, as well as mixing with the ambient river flow.

Statement on the impact of operation of cooling towers was added and the statement was deleted.

River flows, as shown in the draft UAA report in Figure 2.42, fluctuate constantly, often by orders of magnitude, year-round. Thus, a 7Q10 value is rarely reached, and if it is, it only lasts for a short period (on the order of hours). There is no persistent low flow condition in the waterway, due to the frequent manipulation of flows by the upstream locks and dams. These facts need to be included in the report to present a complete and accurate description of river flows and conditions.

The paragraph on river flows and 7Q10 is correct. 7Q10 has two definitions that do not differ much. In the hydrologic definition, the magnitude of the 7Q10 is not exceeded during a consecutive 7 days low flow period that has a recurrence interval of once in ten years. In the ecological definition introduced by the US EPA in water quality criteria regulation, 7Q10 is a smallest mean flow of a consecutive seven days low flow with the recurrence interval of once in ten years. The value of 7Q10 have been established by government agencies (USGS) from past measereuments that included operation of locks. Assertion that 7Q10 last "only hours" is erroneous. By definition, the low flows at or below 7Q10 during the once in ten years design period last in days (7 days) not hours.

The report makes frequent use of the phrases "reasonable to assume", "under these assumptions", "as a matter of fact", etc. Such assumptions and speculation are both unnecessary to and detract from merits of what should be a reliable, scientific report, especially when there is actual river data available that can and should be presented in lieu of such assumptions and speculation.

We have tried to edit out such statements wherever possible.

Para. 2:

The graphs of temperature "probabilities" in Figures 2-37 through 2-39 are meaningless, because temperature is a parameter that does behave in the same manner as conservative pollutants. It dissipates quickly and does not result in a "concentration" in the waterway that may be amenable to statistical analysis. The statistical temperature probabilities presented in these graphs are not meaningful and should either be excluded from this report or explained to demonstrate their alleged relevance.

Statistical probability plotting is a legitimate and well established simple method of presenting data and has been routinely used in past assessments of the Des Plaines River (e.g., MWRDGC reports by Butts quoted in the report).

In addition, the x-axes on several of the plots appear to be mislabeled.

X-axes of Figures 2-37 to 2-41 are correct.

The fact that none of the temperature measurements taken by MWRD or IEPA have exceeded 93 °F is significant. It is a subjective, and we submit inaccurate, characterization to try to diminish the significance of this in-stream temperature monitoring data by characterizing these measurements as "infrequent". While the data may not constitute a continuous record, it does provide a snapshot of the waterway during various times of the year and, due to the reliable sources of this information, it is direct and persuasive evidence of what is occurring in the waterway with regard to temperature.

The term "infrequent" was deleted. The frequency of data collection was described in the introductory sections of Chapter 2

Why does the water temperature in the Kankakee River at Momence have any bearing on the lower Des Plaines River? (Fig. 2.41) The UAA Biological Subcommittee did not agree that the Kankakee River was a "reference waterbody" for the lower Des Plaines River. There was significant opposition to any suggestion that it was. The Kankakee River bears no resemblance to the lower Des Plaines River in any aspect, other than perhaps its general geographic location, but that is a woefully insufficient basis to qualify the Kankakee River as a "reference waterbody." The Kankakee is shallow, does not have barge traffic or flow controlling locks and dams, and does not receive significant municipal or industrial inputs. If the authors insist on doing so, then the Biological Subcommittee's opposition should at least be expressly referenced to disclose that this finding did not have its support.

We have used the Kankakee River to document, as close as possible, the natural temperatures the Des Plains River would have had without human effects. We have explained to the members of the biological subcommittee that the use of such data is legitimate and required by the UAA guidelines. It is necessary to address the

Reason 1 of the UAA. For example, if the natural temperatures represented by the Kankakee River measuments were higher than the General Use standard, Reason 1 would allow to increase the standard. Most of the discussion in the biological subcommittee concerned the applicability of biotic integrity criteria and ecologic potential and not the magnitude of temperature and chemical standards.

Page 2-88:

The following facts should be included to provide an accurate description of the discharges from the Joliet power plants. Joliet Station #29 uses 24 mechanical draft cooling towers to dissipate the heat in the discharge canal prior to its entry into the lower Des Plaines River. The towers are designed to cool from 1/3 to 1/2 of the total condenser flow of Joliet Station #29. The design delta T on the towers is 14 deg. F, and monitoring over the past several summers shows much higher values, and therefore, greater efficiencies in dissipating heat. When all 24 cooling towers are operating, the condenser discharge temperatures in the discharge canal are then cooled by an additional 5 deg. F or more before combining with the main body of the river.

The above paragraph was added to the report.

Page 2-89:

On page 2-89, continuing assertions of low flow operations and subsequent recirculation are not founded on any actual data and instead only seem to further the consultant's position advocating the use of open cycle cooling at power plants. The purpose of the UAA report should not be to advocate one means of cooling over another. The beneficial use of the Joliet #29 cooling towers is essentially dismissed by the report. (e.g. "They simply, partially cool down water in the discharge canal.") In reality, Midwest Generation has presented monitoring data to the IEPA, USEPA and UAA Workgroup members showing the effectiveness of their use in maintaining compliance with the thermal water quality standards. This available data is omitted from the draft report, perhaps because it would detract from the author's opinion that closed cycle cooling systems should be required in the UAA Study area. The relevance of this perspective to the UAA factors is, however, not disclosed. It perhaps might have some relevance to the socio-economic costs factor under the UAA regulation in terms of what it would cost to convert each of the power plants to a closed recycle system, but the report expressly notes that this factor is not included in the scope of the report.

We agree that an extensive discussion on cooling towers and where they are installed may not be appropriate in this UAA, considering the report does not address the Reason 6. The discussion was limited to one sentence pointing out that the closed loop cooling system is another alternative that saves water.

Para. 2:

The first sentence provides as follows: "Most current power plants located on rivers such as the Des Plaines River used closed cycle cooling with natural draft or mechanical

cooling towers (for example, the WE power plants near Portage and Kenosha, Wisconsin) or lakes (plants near Dresden or Springfield, IL)." (emphasis added) This statement is incorrect and misleading. DOE 2001 EIA 767 data, which is the federal government's national listing of power plants, including a description of the type of cooling systems they use, reveals that only 5 out of 17 power plants located on rivers in Illinois have closed cycle cooling and that only 3 out of 13 similar plants in Wisconsin are closed cycle---the remainder are open cycle like the Joliet plants. Certainly, the DOE data shows the opposite is true. Most of the power plants in Illinois and Wisconsin do not use close cycle cooling systems. If any comparison to closed recycle systems is retained in the revised report, then the DOE data should replace the current inaccurate, comparative statements citing Illinois and Wisconsin power plants.

See the note above on the limits of the discussion of cooling systems.

The Joliet cooling towers are briefly mentioned to stress they "do not allow recycle," apparently to characterize the towers as somehow inferior to closed recycle systems, which is not true. Efficiency data presented at the UAA Biological Subcommittee meetings, as well as in Midwest Generation's UAA Thermal Report to the Illinois EPA, show that the Joliet #29 cooling towers are very effective in lowering the station's discharge temperature prior to its entry to the lower Des Plaines River by approximately 5 deg. F or more.

Information on the efficiency of the existing system specified above was added.

Para. 3:

The data provided by Midwest Generation continues to be mischaracterized here. While it is true that the use of the cooling towers alone is often not sufficient to control the magnitude of the thermal discharge to meet the current near or far-field limits, the fact that Midwest Generation has taken significant unit deratings (i.e. forced decreases in generating capacity) in order to remain in compliance with all applicable thermal limits is not included. Hence, because the reader is only told that the cooling towers are insufficient to achieve compliance, it leaves the false impression that the Joliet Station's thermal discharges are sometimes not in compliance with the applicable thermal standards. Data recently presented to IEPA and USEPA confirm that even under critical summer conditions, Joliet Station No. 29 continues to remain in compliance with all near and far-field thermal limits.

A sentence on unit derating was added.

Page 2-90:

No reference source is provided for the numbered paragraphs in this section . The text may have been excerpted in part from a textbook on the general effects of thermal levels in a waterway, although no citation is provided for much of this section. One of IEPA's consultants, who has claimed to have limited knowledge of biology, is cited as the source of certain of the information (i.e., see numbered paragraph 10). As more fully explained below, the information needs to be revised because it is unrepresentative of the UAA

Study area and not sufficiently specific to the conditions in the Lower Des Plaines River to be useful or otherwise relevant in this UAA analysis. While all of the statements about potential thermal effects are generally true, they are not placed in the context of the UAA Study area to reveal whether or not they are occurring here. Without greater specificity and context, the statements create misleading impressions concerning their applicability here.

The reference by Krenkel and Novotny has most of the original references in the pertinent chapters. References were added into the report. The consultant has forty years experience in water quality and water body integrity assessments, courses and other experience in biology and worked closely with biologists on numerous problems throughout his career. Professor Krenkel is a leading and recognized specialist on thermal pollution who published several books and numerous articles on this subject.

The numbering starts with paragraph number 4. Have paragraphs been mis-numbered or have paragraphs 1 through 3 been omitted inadvertently?

Numbering of paragraphs was corrected to start with #1 (a word processing glitch) .

#5: It also should be stated that temperature may also play a beneficial role in breaking down chemical and biological pollutants more quickly, resulting in improved water quality and sediment conditions.

Statement on beneficial effects of temperature were also added. Acceleration of biochemical reactions at higher temperatures is well known for break down of organic compounds in water and sediments (e.g., BOD and Volatile Suspended solids). However, high temperatures (above 22°C) slow down nitrification that at 34°C (93°F) is reduced to about 50% of its rate at 22°C. This may explain the ammonium release from sediments and sediment toxicity at high temperatures observed by Commowealth Edison expert Dr. Burton (references added to the report) that would otherwise be balanced by nitrification in the upper aerobic layer of sediment.

#6: Temperature is one of many factors, not the only factor, which may influence dissolved oxygen levels in the waterway. The report does not mention the saturation level of the water. The water 's saturation level is an over-riding factor which will directly affect to what extent a temperature increase will release oxygen from water. The report should reference the interaction between temperature and saturation levels because one without the other is an incomplete and misleading description.

In the section on DO in Chapter 2 we have provided the link between the DO saturation and temperature. Temperature decreases the oxygen saturation which, in turn, may result in upstream oxygen release from water.

#7: The positive impacts of temperature on biological processes, including the breakdown of contaminants and bacteria, again has been omitted.

See the note for #5.

#8: This statement implies that ammonia is a problem in the waterway. However, the rest of the report does not contain any information showing that ammonia toxicity is occurring in the UAA Study area or that ammonia levels in the waterway are not attaining General Use standards. Temperature may affect ammonia toxicity, but only if the ammonia levels are sufficiently high, which would indicate a problem unassociated with power plant operations. If the discussion of ammonia toxicity is retained, it should be expanded to include the fact that the available data on ammonia in the UAA Study area shows that ammonia toxicity is not generally a problem.

Ammonium is not a problem in the water column and we believe that also in sediments not affected by high temperatures. In the section on Ammonium (p.2-41) we have pointed out that the attainment of the chronic(thermally dependent) ammounium standard at I-55 (MWRDGC 95) is marginal with a small MOS, which was attributed to a combined effect of temperature and higher pH. Ammonium was identified by Burton as a problem in sediments at high temperatures and we added a short discussion on the problem.

#9: Swimming is prohibited in the Secondary Contact waters, and therefore, this statement is not applicable to the lower Des Plaines River.

This UAA in Chapter 7 has documented that the new Limited Contact Recreation use and standards for pathogens based on Escherichia Coli is attainable in the Upper Dresden pool and the use in this pool must be reclassified to a limited contact recreation.

#10: This statement is biased in that it does not quantify the magnitude of temperature which would result in the listed effects, and implies that temperature is the primary cause of adverse effects on the aquatic community. In addition, it does not acknowledge any of the beneficial effects of increased water temperatures on aquatic organisms, including more rapid growth, increases in food availability, etc. Specifically, in paragraph 10(2-1)--how does temperature disrupt the food supply (other than to possibly make it more abundant)? In paragraph 10(2-3)-- how does increased temperature result in increased predation? In paragraph 10(5)--aren't all of the listed alleged effects "sub-lethal", other than the effect in paragraph 10(1)?

References were added. Most of this information is taken from USEPA (1986) criteria document.

With regard to paragraph No.#11--The UIW studies of phytoplankton and periphyton clearly show that the system is not dominated by blue-green algae. It is, in fact, populated by the same species assemblage as other similar river-reservoir navigation channels. Phytoplankton density at Joliet was comparable to the density observed in Pool 19 of the Mississippi River, which is not thermally impacted. The comments about the toxins released by blue-green algae being harmful to swimmers and preventing contact recreation are inflammatory and inaccurate when applied to the UAA Study area.

In Figure 2.43, the range of summer temperatures in the Upper Dresden Island Pool is in error and should be removed from this graph. (The erroneous assumptions in this figure

regarding the Joliet Station's discharge temperatures versus the temperatures in the main body of the waterway were discussed in detail at the June 6, 2003 meeting).

The arrow denoting the temperature range has been adjusted to represent documented observed temperatures. The figure presents general knowledge about the problem and the fact that the river today may not conform may be coincidental. We believe that, in the context of possible modification of the standard or retaining the existing standard, we should reveal a possibility of this problem which has been reported by a well known scientist and known from literature and is also included in the USEPA (1986) criteria document.

Page 2-91:

The following statement is made in the last sentence of paragraph 1: "... the standards should not be developed to protect the *inferior* biotic composition. The standards should also contain some margin of safety." The incorrect implication is that the current Secondary Contact thermal limits are only protective of inferior biota and are not adequately protective of the types of aquatic species expected to be found in this waterway, assuming there are no other *controllable* anthropogenic influences. The use of the term "inferior" is subjective and unsupported. It would be accurate to state that the UAA Study should determine what standards are necessary to protect the existing and potential biotic composition of the waterway.

This UAA cannot be limited to develop standards that would be protective of the existing biological population but rather address the issue of what would be the ecologic potential of the water body if the current stresses, including temperature, are remedied. We have qualified what is meant by the term "inferior".

Para. 3:

The last statement on page 2-91 creates the implication that the current Secondary Contact thermal limits are already above the lethal limit for indigenous fish species. If not, why does the Agency need to be cautioned that the proposed standard should not be above the lethal limit? No one has suggested that the existing thermal standards should be made more lenient, which might provide an objective basis for this statement. There is no information offered to support, nor could there be, the assertion that the current standards are lethal to indigenous fish species.

Based on the literature data, some provided by the Mid west Generation, and the experiments by Dr. Burton we found that the existing Secondary Use and Indigenous Aquatic Life Use standard upper limit is in the lethal zone.

Page 2-92:

Para. 1:

The UAA consultant's task was to take all available data on the waterway and provide a summary of the relevant data which could then be used by the IEPA to determine the appropriate use classification of the waterway and to develop water quality limitations that would be adequately protective of the existing and potential indigenous aquatic community. The statement made in the last two sentences goes well beyond this scope: ***"In subsequent years, water quality of the river has improved dramatically, both chemically and biologically, and the sense of hopelessness has now been replaced by a belief that the river can reach its ecological optimum that would be commensurate with the goals of the Clean Water Act."*** Whose "belief" is this? At no point during the UAA workgroup discussions was there any commonly held belief that the entire lower Des Plaines River could attain full General Use. The discussions actually indicated much skepticism of such a "belief." The "ecological optimum" for this system must be determined based on the actual data from the waterway, not someone's ill-defined speculation. The report should focus on presenting all of the relevant physical and biological data so that the Illinois EPA can draw well-supported findings as to the appropriate use classification for the UAA Study area.

> The consultants provided enough documentation in subsequent Chapters (4-6) that the river in the Dresden Pool, after the stresses are removed, could reach a level of biotic integrity commensurate with other impounded rivers in Illinois that are classified as General Use water bodies (e.g., Fox River). Significant water quality improvements have been achieved in the river due to massive investments in pollution abatement upstream of the Upper Dresden Pool. The work is not finished and the current UAA on Chicago waterways should address most of the remaining issues.

Page 2-93:

(Carry-over of duplicate sentences at top of page)

Para. 1:

All of the species listed in Figure 2.44 can and do live in the lower Des Plaines River. The most recent EA fisheries study (2001), which was submitted to the UAA Workgroup as well as to the IEPA's consultants, shows that the species assemblage in the upper and lower Dresden pools are dominated by gizzard shad, bluntnose minnow, bluegill, emerald shiner, green sunfish, common carp, spottail shiner and bull head minnow. In addition, the populations of freshwater drum, smallmouth bass, largemouth bass and channel catfish have all either increased or stayed relatively constant between the years 1994-1995 and 2000-2001. All of the fisheries monitoring work is done during the period from May through September, which is the height of the warm-weather period of the year. If the consultant is correct and the entire Dresden Pool's temperature has exceeded the lethal limit for these species, then one would not expect to find them successfully living in the system as the actual river monitoring data shows they are doing.

The estimated maximum temperature in the Upper Dresden Pool is erroneous and should be removed from Figures 2.44 and 2.45. This grossly inaccurate assumption on the maximum main river temperature is used consistently in drawing the remainder of the conclusions in this report. Also, the arrows on the graphs add nothing to their interpretation and should be removed.

In view of the clarification provided by Midwest Generation at the meeting June 6 the upper maximum temperature has been removed from Figures 2-44 and -2-45.

The consultant has erroneously based the estimated maximum temperature of the Lower Dresden Pool on the maximum Joliet Station discharge canal temperature data. This is not representative of actual conditions. The discharge temperatures used by the consultant are those measured at the condenser outlet. This measurement is taken pre-cooling towers and the recorded temperatures do not reflect the temperature reductions achieved by the cooling towers or the heat loss through the discharge canal that significantly decrease the temperature before it is discharged to the main body of the river. Similarly, the consultant erroneously also concludes that the station discharge temperature measured at the condenser outlet is equivalent to the fully mixed temperature in the river. The use of both Joliet's cooling towers and the significant unit deratings are actual, undisputed facts. As such, any estimate which ignores these facts is not a reliable basis on which to predict river temperatures. These are the main tools Midwest Generation uses that have ensured its compliance with applicable thermal limits, particularly during the warm weather months that are the focus of this section of the report.

See the correction above. We have accepted the wording and explanations of Midwest Generation on role and operation of cooling towers.

The report makes the sweeping and significant statement that the "list of potentially indigenous species is obviously much larger." What is the basis for this key conclusion? How is a "potentially indigenous" species determined? Our recollection is that the Biological Subcommittee had not yet come to a consensus on this matter. At the least, if the consultant is going to opine on the potentially indigenous species for the waterway, then the basis for these findings must be disclosed so that they can be properly evaluated by the UAA Workgroup members.

This sentence was removed.

General note: Our name is Midwest Generation, not Midwest Generations. It is misspelled sporadically throughout the report. Corrected

Temperature is misspelled on the x-axis heading on both Figures.

Corrected.

QUESTION: Why are the lethal temperature values for the indicated fish species different in Figures 2.44 and 2.45? Which ones are correct (if any?) Why use two sources of information for lethal ranges? There is also a failure to acknowledge that these lethal ranges were derived largely from laboratory studies of "captive" fish in containers that could not avoid the higher temperatures. Also, these studies were of

juvenile and younger fish, not adults. Acclimation and the presence of thermal refugia are also ignored in the report, although both factors are extremely important to determining whether the existing temperature limits are limiting to the fish community.

Data for Figure 2-44 were provided by Midwest Generation in the presentation of Ms. Wozniak to the biological subcommittee and came from the reports prepared by consultants for Midwest Generation (Commonwealth Edison). The data on Figure 2-45 were identified in the caption and come from U.S. Fish and Wildlife. Figure 2-44 represents ranges, Figure 2-45 has mostly single values. Both Figures represent about the same lethality. We should point out that the purpose of this UAA is not to look for reasons to justify current high standards (which we cannot justify) but to look for reasons why the General Use Standards are not attained and whether or not the nonattainment can be rectified.

Page 2-94:

The consultant's "replotting" of the data collected and presented by Midwest Generation is not only a vastly understated description of what was done to our data but is also flawed by several errors in the underlying assumptions that form the basis for the data changes made. The inaccuracies are described more fully below.

There are several speculative statements in this section of the report that serve as the basis for significant findings that are not accurate. Many of the speculative comments are easily identified through the use of phrases such as "one may ***speculate*** that", "one can also deduct that" and "one can say." The correct facts are:

1) the power plant cooling systems do <u>not</u> "often take the entire flow of the river;"

Upon investigation the flow data on Figure 2-42 we have come to conclusion that unless Midwest Generation implements significant production cut backs the combined condenser capacity equals or exceeds the low flow in the River as it occurred in July 2001, shown on the Figure. Table 1.2 also documents that the 7-Q-10 flow is only about 74 percent of the capacity flow. Midwest Generation has informed us that production cut backs are being implemented.

2) the discharge channel temperature of the Joliet Plant is in fact "much different (warmer) than the river temperature immediately downstream of the power plants;"

3) the discharge plumes from the two Joliet Plants do <u>not</u> "join very quickly resulting in a very short mixing zone;"

4) the river temperature in the Upper Dresden pool downstream of the power plants during low flows is <u>not</u> "about the same as the mean of the two cooling water discharges;" and

5) the river data collected in 1999 does not support a finding that in 1999 "it appears that....more than 10% of the time the river temperature was above the secondary use standard." The data does not support the conclusion that the thermal standard was exceeded during this time.

Careful review of the existing data shows that the values derived by the consultant to purportedly represent the temperatures in the main body of the river are instead the actual monthly maximum temperatures recorded at the condenser outlet of the Joliet Plant No. 29. This is the temperature of the discharge that does not pass through the cooling towers. Thus, these temperatures do not account for the cooling provided by the towers that were in operation at the time. These temperatures would only be accurate if the cooling towers did not exist, which they do and they are operated when the river temperatures are elevated - - the fundamental premise of this portion of the report. Similarly, the consultant's findings based on these "no cooling" temperatures, wrongly assume that at the time of all these recorded temperatures, the actual river flow was at "low flow" conditions.

The consultant also incorrectly assumed that the design data for the Joliet Plant No. 29 provided in the UIW Report and by Midwest Generation are representative of the actual operating conditions at the Plant. This is not the case. The power plants could not physically operate at maximum loading if river flow conditions were consistently below the plants circulating water flow rates. Back pressure created by such operating conditions would necessitate major unit deratings to the extent that sustained high temperature outputs would not be possible. There are clear reasons these operating conditions seldom occur. First, contrary to the statement in the report, river flow is constantly fluctuating by orders of magnitude, and therefore, extremely low river flows are only sporadic (i.e. on the order of hours), rather than chronic. Contrary to the statement in the draft report, such low flows do not "often" occur, especially during the summer months. Second, Midwest Generation maintains vigilant watch over river and station operating temperatures/flows and use the available cooling towers, as well as unit deratings, to ensure that all thermal limits are met in the main body of the river (i.e. where the Secondary Contact limits are in effect) at those limited times when both these very low flow conditions and elevated temperatures do occur. Trying to equate a condenser outlet temperature with a main river temperature, as was done here, may theoretically constitute a "worst case scenario." However, this is not the hypothetical presented in the report. Instead, the "estimates" of what "often" happens in the river are not based on either actual river temperature or actual river flow data. This is particularly inappropriate and unnecessary when actual data for all of the time periods in question is readily available. The river data simply does not support the dire circumstances presented in the report.

It also should be noted in the report that there is no regulatory standard that requires the maintenance of a specific condenser discharge temperature. The standards, both General Use and Secondary Contact, apply to the main body of the river at the edge of an allowable mixing zone, which is subject to zone of passage and other regulatory

constraints on its size. Midwest Generation continues to operate the two Joliet Stations to consistently comply with these limitations.

In addition to the actual river temperature and flow data, thermal plume monitoring studies done during 2002 by Midwest Generation, which have been submitted to Illinois EPA and USEPA, conclusively show that the thermal plumes from the two Joliet stations comply with the current Secondary Contact thermal limits. The studies clearly show that the stations' discharge temperatures are not, as the report speculates, equivalent to the temperature in the main body of the river under typical summer weather and flow conditions. The 2002 thermal studies substantiate the station's compliance with the thermal limitations.

Particularly troubling is the absence in the consultant's report of any discussion of the efficiency of the cooling towers or how they assist in reducing Joliet Station 29's discharge temperature to acceptable levels prior to its entry into the main body of the lower Des Plaines River. Data provided by Midwest Generation is apparently ignored if it refutes the conclusions presented in the report. Midwest Generation (as well as Commonwealth Edison prior to December 1999) has spent considerable time, effort and money to study all aspects of the waterway to identify whether any significant adverse impacts are being caused to the river by power plant operations. This biological database on the waterway spans a period of over 20 continuous years. It includes continuous temperature and dissolved oxygen monitoring data collected since 1997. Continuous monitoring of the river temperature at the I-55 Bridge location has been conducted since 1988. This overwhelming amount of river data shows that actual conditions in the waterway do not reflect the "estimated conditions" or the misplaced findings based thereon that were included in the draft report. To omit this data from the report and to instead misrepresent that condenser temperatures at the stations are the same as the main river body temperatures simply cannot be reasonably defended as a scientific and objective approach to evaluating the thermal conditions in the UAA Study area.

We have corrected the caption on Figure 2-46 to reflect the fact that the plot represents the maximum temperatures and not continuous discharges. We have added a paragraph explaining the issue as provided to us during the June 6 meeting and removed reference regarding potential violation of the standing water quality standard and its 10 % duration.

Page 2-95:

Para. 2:

The statement that the temperatures at the I-55 Bridge during the 1999 period did not meet the maximum General Use thermal limit of 93 ^{o}F is false. There is actual, continuous river temperature data for that specific location that shows this statement is wrong. Perhaps this error was due to the other erroneous statement in the report that the

maximum allowable General Use thermal standard is only 91.7 °F. The General Use thermal standard, correctly stated, is 93 °F. This is the same maximum temperature set forth in the alternate use standard applicable to the Midwest Generation discharges at the I-55 Bridge. If those involved in the preparation of the report were using the lower but inaccurate 91.7°F value as the General Use standard, then the data may show readings between that value and the General Use Standard. This mistaken understanding of the correct General Use Thermal Standard would explain the erroneous conclusion in the report that the General Use thermal limits were exceeded at the I-55 Bridge in the summer of 1999.

> We have compared both the statewide General Use standard that set the maximum at 93°F and the alternate standard applicable only to the I-55 of 93°F. We have stated that the alternate standard, which is the current standing standard was met while the statewide General Use standard was not. Again this UAA must address the issue of attainability of the General Use standard. We have clarified the wording.

Figure 2.46—The consultant's "re-plotting" of the data Midwest Generation presented to the UAA workgroup, was never disclosed during any of the workgroup meetings. It "premiered" in the draft report. If Midwest Generation had been afforded an opportunity to consider the "replotting" of this data, we would have warned that the consultant had misunderstood the data and hence, all of its conclusions based thereon are severely flawed.

The mistakes start, but were readily identifiable, from the title of Figure 2.46 which presents the "replotted" data. The title describes the data as "continuous temperature records at I-55 and discharge channels of the Joliet power plant units." The fundamental problem is that Figure 2.46 does not present the continuous temperature data. It instead presents monthly maximum temperature readings (not continuous ones) collected at the condenser outlets of Joliet Plants Nos. 9 and 29, as well as the I-55 Bridge. Again, not only are these monthly maximum temperatures but they do not reflect the temperature reductions achieved by the cooling towers at Joliet 29, which significantly decreases the overall temperature of the discharge before it enters the lower Des Plaines River and travels several miles downstream to the I-55 Bridge. The data was fully explained at the June 4, 2002 UAA Biological Subcommittee meeting at which representatives of the consultant were present.

> We have corrected the caption to Figure 2-46. The original figure in Ms. Wozniak presentation did not specify that the temperature at Station 29 was before cooling towers and we did not realize that no measurements had been made at the canal outlet. We apologize to all those who provided thousands of data and hundreds plots and tables, some indicating possible problems (e.g., DO, bacteria, copper, sediment), that we were not able to discuss each plot or piece of used information individually with the source. In each case we gave a credit to the sources and if incorrect use or

misrepresentation was discovered, we made appropriate corrections.

Page 2-96: Bullet point:

The report does not disclose the source of, or how, the alleged total number of hours presented in the report during which "the temperature" (presumably at the I-55 Bridge, although this is not clear from the text) supposedly exceeded 90 °F. Further, the relevance of this analysis is questionable given that the General Use Standard is 93°F. This conclusion could not have been reliably determined from the data presented by Midwest Generation because the data showed monthly maximum values only (based on 15 minute readings). Therefore, the maximum for any given month was selected based on monitoring that lasted for 15 minutes. It is a gross mischaracterization of the data to then conclude that these values accurately describe the number of hours that a 90°F temperature was exceeded. Even if one were to total the maximum 15 minute interval value from each day of the month, the total could never reach, or come close to, an amount as high as 200 hours.

We state again that our starting point for the analysis was the statewide General Use Standard of 90°F (a), followed then by the analysis of the alternate use standard of 91°F (b), and Secondary Use standard of 93°F (c), considering also the appropriate respective allowed maxima, 93°F for (a) and (b) and 100°F for (c). 91.7 was a typo that; however, did not change the assessment about meeting the statewide General use standard. For the I-55 bridge analysis in 1999 we used actual continuous data measured at the I-55 bridge and reported in EA Engineering Science and Technology Reports on *Temperature and Dissolved Oxygen Monitoring of the Des Plaines River at the I-55 Bridge*, and not the Figure 2-95. We have specified it in the text and will make it more clear in the current revision. We have again reviewed the temperature chart on Figure 7 of the EA report on "Temperature and dissolved oxygen monitoring of the Des Plaines River at the I-55 Bridge May-September 1999" and found that the temperature indeed exceeded 90 °F for more than 200 hours. We did state that the alternate standard was not violated.

Para. 2:

The first sentence states that "...the Secondary Contact Indigenous Aquatic Life standard is above the lethal temperature of several warmwater fish species." Where is the evidence of all the fish kills that should have been taking place in the Lower Des Plaines for all these many years this standard has been in place? The consultant theorizes that adult fish vacate the river during the hotter months of the year to escape these "lethal" temperatures that have been allowed in the waterway. There is a fatal flaw in this reasoning. If all these fish left the waterway during the hotter months, then both Midwest Generation's routine fisheries monitoring program during these periods, as well as similar

programs run by the Illinois Department of Natural Resources, would have recorded such a drastic reduction in the fish population during the extended periods of hotter weather. In truth, there has been, and continues to be, a healthy assemblage of resident warmwater fish species in the waterway, existing along side the continued operations of the Joliet units under current Secondary Use Thermal Standards that are alleged to be "lethal" in the draft report. Certainly, avoidance of the immediate discharge canal area at the Joliet plants has been documented during the hottest times of the year, but fish continue to be found both upstream and downstream of these areas. They do not vacate the UAA Study area. They just avoid the limited area in the vicinity of the discharge canals when the temperatures are out of their preferred range. There is simply no data to suggest a "mass migration" of fish to the Kankakee River during the summer period. Nor is there any evidence to support the consultant's supposition that younger fish are killed by higher temperatures. To the contrary, the Midwest Generation fisheries monitoring program continues to collect both adult and young fish throughout the expanse of the Dresden Pool. The findings of these fish monitoring programs should be accurately presented in the report to replace the undocumented and unsupported "fish migration" theory.

> There is a difference between the formulation of a standard and actual observed lethal effects. Most standards developed by the USEPA and states are based on the science reported in the literature and bioassays. We have now literature data, including those provided by Midwest Generation, as well as bioassays by Dr. Burton, a consultant to Commonwealth Edison. This information indicates that temperatures above the statewide General Use maximum may be lethal to indigenous fish. The report informs about the possible migration as it was scientifically observed elsewhere. There is a credible evidence in the IBI data of the Upper Dresden Pool that shows a decrease of IBIs during summer months and concurrent increase in the Lower Dresden Pool. We did not include this information in the UAA because no fish tagging or radio surveys have been made to document this migration.

Page 2-96

The comparison of DO standards to temperature standards is flawed for several reasons. First, it does not properly account for the avoidance factor when dealing with temperature. Admittedly, for many contaminants other than temperature, it is not appropriate to factor in avoidance when considering criteria because either fish can not or do not avoid them (ammonia is a good example), they do not respond in a predictable manner (e.g. chlorine), or we just don't know how they will respond. Fish respond somewhat to low DO concentrations but the relationship is not well studied (EPA 1986). Thus, it is not appropriate to take avoidance into account for most parameters. However, temperature is different. There is no doubt that fish prefer some temperatures (typically those close to their optimum temperature for growth) and avoid others (typically ones quite close to their upper lethal temperature). Numerous authors have studied preference and avoidance temperatures and have published widely on this subject. Avoidance/attraction makes perfect ecological sense as other cold-blooded organisms routinely use similar means to achieve thermoregulation. Thus, when they are cold, turtles, snakes, crocs, etc.

lie in the sun to warm their bodies. When they get too hot, they avoid the heat by seeking out shady areas, going into burrows, etc. As a result of thermoregulation, fish seek out heated areas during much of the year, particularly during the winter. Conversely, they avoid potentially lethal temperatures during the hottest periods of the year. There is no reason that the well-established avoidance mechanism should not be considered when analyzing lethal conditions in a waterway. The relevant questions should include whether the area avoided is so large as to exclude a particular species from a significant portion of its summer range or whether the avoidance lasts so long as to result in long-term impacts (e.g., reduced growth, blockage of migratory passage, lower reproduction, etc). The results of Midwest Generation's long-term fisheries monitoring program in the Lower Des Plaines River has shown that such long-term avoidance does not occur.

> The consultant cannot support nor justify a higher standard that, based on the literature and Commonwealth Edison expert's bioassay studies, would be in a lethal zone and base it on a presumption that some organisms could hide and protect themselves from the heat. The IEPA will have an opportunity to evaluate the Midwest Generation's own UAA proposal where such suggestions could be made.

Para. 3:

Whether or not other States have the same temperature limitations should not have a bearing on what the appropriate thermal limits should be for the Lower Des Plaines River. Probably no where in the country is there a waterbody that has the same human disturbances, habitat and flow alterations, legacy sediment pollutants, barge traffic and effluent- and run-off dominated flow regime. There are particularly relevant facts that are not disclosed in the report's review of other States' thermal standards. It is precisely because of these unique river conditions that the UAA Biological Subcommittee could not identify a legitimate reference stream for comparison purposes to the Lower Des Plaines River. To draw such general state thermal standard comparisons, as the draft report does, certainly may serve to raise doubts about the appropriateness of the current Secondary Thermal Standards. However, such a sweeping comparison has only a superficial and prejudicial value. It does not withstand a more scrutinizing review that includes consideration of the unique conditions of this waterway. Simply stated, because the Lower Des Plaines River is unique, it is appropriate that it should have a unique thermal limit applied to it.

> We have clearly stated in our report and throughout these arguments that the Secondary Use and Indigenous Aquatic Life standards are not appropriate for the entire Lower Des Plaines River and should be replaced by the general Use Standards, with updates based on the recent USEPA regulations from ammonium and pathogens. To set a unique thermal standard without a justification supported by the Six UAA reasons is not possible in this UAA. The only adjustments we were able to suggest were for DO and pathogens in the Brandon Pool that were due to irreversible physical modification of the pool. These alternate

> standards were proposed in accordance with the USEPA regulations and guidance documents. We agree that to some the Lower Des Plaines River, as some other water bodies, is a unique water body; however, all water bodies of the United States must comply with the goals of the Clean Water Act unless an UAA proves that the statutory uses are not attainable. Attaining General use thermal standard is clearly possible.

This is not to say that the Lower Des Plaines River does not have the potential to improve. Indeed, Midwest Generation and MWRDGC data continue to show vast improvements in water quality and biology over the past 20 years of monitoring, something we are pleased by and proud to continue to document by our studies. Point source discharges to the system have been more tightly controlled by IEPA and it appears that non-point discharges are being addressed to the extent currently possible. The Lower Des Plaines River has the potential to be more than what was envisioned 30 years ago, but it also has significant limitations that will prevent it from ever attaining the quality or biological integrity of other natural river systems. The Lower Des Plaines is heavily used by industrial barge traffic; its flow regime is totally artificially controlled by a series of locks and dams; and over 75 % of its flow source is from POTW discharges. The upper portion of the waterway is concrete-walled, with little or no available habitat for aquatic organisms. The sediments found throughout the waterway are heavily polluted with heavy metals, PAHs, PCBs and other contaminants. Even if they were not contaminant-laden, due to the nature of the waterway, the sediments will continue to be of a fine, silty quality that is not conducive to the establishment of an aquatic biota which require a hard, cobble or rocky substrate on which to carry out their life cycle. While the portion of the waterway below the Brandon Lock and Dam appears to take on more of the characteristics of a "natural" river, it still is dominated by the same unalterable anthropogenic influences that dictate its fate as an industrialized waterway. Conditions begin to improve as one moves downstream past the I-55 Bridge, which is the reason this location was originally chosen to be the demarcation point between General Use and Secondary Contact classifications.

It is interesting to note, as Midwest Generation has in our January 24, 2003 thermal report, that the area downstream of I-55, while improved over the upstream reach, still does not meet the biological criteria (IBI) needed to classify it as a true General Use waterway, in so far as its biological community is concerned. The cause of this less than optimal biological condition below the I-55 Bridge cannot be attributed to high temperature, as the 93 °F General Use thermal limit is maintained in this portion of the waterway throughout the summer period. The indications are that there are still habitat limitations and sediment quality/quantity problems in this reach, which ultimately dictate the quantity and quality of the fish which reside there.

The Lower Des Plaines River is not currently classified as "marginal" or "nuisance", as incorrectly characterized by the consultant in the seventh line of this paragraph. The exact definition of Secondary Contact is as follows: (Il.Adm. Code Title 35, Subtitle C, Chapter I, Section 302.402)

Secondary contact and indigenous aquatic life standards are intended for those waters not suited for general use activities but which will be appropriate for all secondary contact uses and which will be capable of supporting an indigenous aquatic life limited only by the physical configuration of the body of water, characteristics and origin of the water and the presence of contaminants in amounts that do not exceed the water quality standards listed in Subpart D.

The term "marginal" or "nuisance" was used by some states to characterize thermal limits that are few degrees higher than 32°C. However, in spite of the characterization of the Secondary Use and Indigenous Aquatic Life use as stated above, many other standards, not just temperature, would be lethal based on current knowledge. For example, the Secondary Contact use standard for copper is 1000 µg/L, while the lethal concentrations (twice the standard as shown elsewhere in Chapter 2) is around 80 µg/L, a value an order of magnitude less than the Secondary Use standard. To advocate retention of the Secondary Contact and Indigenous Aquatic Life Use would imply to retain all other standards that would be lethal or otherwise toxic. We have documented that almost all other parameters are complying with the statewide General Use standards.

Page 2-97:Th

Para. 1:

The report repeats its unsubstantiated characterization that the Secondary Contact thermal limit is "lethal". Perhaps the error lies in the inaccurate interpretation that the existing thermal standard has allowed 100 °F temperatures to occur in the main body of the river. This is not the case. The existing standard has an excursion hour allowance that limits temperature to between 93 °F and 100 °F. Further, the IEPA has applied mixing zone and zone of passage constraints on thermal plumes from the Midwest Generation plants that adequately protect the aquatic organisms in the waterway. The field monitoring data collected by both Midwest Generation and MWRDGC demonstrate the protectiveness of the existing thermal standards. There have been consistent and improving populations of indigenous aquatic organisms recorded throughout the lower Des Plaines River over the past many years of monitoring.

We agree that there have been significant improvements in water quality upstream and in the Lower des Plaines River with concurrent improvements in biota but disagree with the protectiveness of the Secondary Contact and Indigenous Aquatic Life thermal standard..

Para. 2:

The report professes there is "a lack of data", which is wholly untrue, because such data was either submitted or, if not submitted, offered for review if needed. We know that no such requests for any data not already included in Midwest Generation's submissions was ever received and have not heard of any other workgroup member receiving and rejecting such a request. While time and budgetary limitations may have prevented the report's authors from looking at the data either provided by the workgroup members or readily available on the internet, it is wholly unjustified to claim this data does not exist. Most unfortunately, the lack of knowledge of such data does allow one to turn instead to "deduce" conclusions uncluttered by the actual data. In this section, these unsupported conclusions lead to the equally unsupported assertion that the 5 °F delta T above "natural" temperature General Use limitation is violated in the waterway. It is inconceivable how the basis for this conclusion can be described as "reasonable scientific confidence" when the actual data needed to draw this conclusion is characterized as unavailable. Moreover, there is no explanation for the sweeping conclusion that even though this 5 °F delta T General Use thermal limit does not apply to the Upper Dresden Pool, this limit should be attainable in the Upper Dresden Pool.

We have clarified this statement in the revised text, using also observations of Dr. Burton. We are aware of the problems with the interpretation of the delta rule. We suggest that a large delta T between upstream and downstream temperatures represents a thermal barrier to migrating organisms.

This section of the report also states that the mixing zone, including the zone of passage, requirements do not apply to all waters (whether classified as Secondary Contact or General Use). This is an incorrect interpretation of the Illinois mixing zone regulation. Further, Midwest Generation's 2002 Thermal Plume Studies demonstrate that the mixing zone requirements are consistently met in the Lower Des Plaines River.

We do not believe that we made such statement.

Page 2-97:

Para. 3:

The General Use thermal standards are criticized for their "confusing wording." The paragraph makes little sense. It appears the consultant has confused zone of passage and other mixing zone requirements (which are set forth at 35 Ill.Adm.Code Section 302.102) with the "natural" temperature requirements of the General Use thermal water quality standards (see 35 Ill.Adm.Code Section 302.211).

The consistent, demonstrated lack of understanding of the Secondary and General Use thermal standards has been documented here in numerous instances in the draft thermal chapter of the report. The chapter prepared by Midwest Generation for the IEPA's consideration does not contain such fundamental flaws. Further, Midwest Generation provided real data to accompany its accurate review of the thermal water quality standards. We recognize that our in-depth knowledge of the waterway cannot be matched by those who have only a limited familiarity with the waterway. However, Midwest Generation presented a thorough review and assessment of the six factors required by the UAA regulation. We have provided objective river data and other

information. We have offered suggested changes that would benefit both the aquatic community as well as the regulated community. Midwest Generation's report and proposal deserve a full review by the UAA workgroup.

No comment. We agree that Midwest Generation, as any other stakeholder, is fully entitled to present their own UAA proposal.

Para. 4: Conclusion on Temperature

The report's evaluation of the 6 UAA factors is limited to only a review of the thermal parameter. It does not consider the entire waterway. The language of the UAA regulation neither supports nor mandates this extremely narrow scope of review. Rather, the express language of several of the UAA factors refutes this approach. For example, the UAA factors address the presence of man-made conditions in the waterway and the lack of habitat which prevent the attainment of General Use standards. How can such factors be applied and evaluated only by looking at thermal conditions without reference to the waterway's man-made characteristics and limited habitat? The language of the UAA factors expressly contemplates and requires assessing these conditions in the waterway generally. They are conditions that clearly, if present, will affect the biological community on which the "fishable" standard underlying the UAA analysis is based. However, the results of such a broader, required evaluation would not support the conclusions presented in the draft report. Contrary to those conclusions, the results of the required, complete UAA factors review would show that due to the man-made conditions and the existing habitat, the Lower Des Plaines River will not support a full General Use (i.e. ("fishable/swimmable") standard.

Thermal problem is limited to the Dresden Island Pool and does not occur in the Brandon Pool. Almost all other investigated parameters do meet the General Use. The present status of the biota reflects the remaining few stressors, temperature being one of them. This UAA has to suggest that the remaining stressors should be corrected.

Although the report cites a direction by the IEPA to defer on a recommendation regarding future temperature limitations for the Lower Des Plaines River, that direction was ignored. Perhaps the desire to present the penultimate conclusion that the many erroneous facts and unsubstantiated conclusions served to create was simply irresistible. In line 10, it is stated that a socio-economic study is "... the only reason a departure from the Illinois General Use standard can be justified. The report accordingly concludes that the first five reasons for downgrading the thermal standard from that specified by the Illinois General Use standards cannot be applied." Given all of the corrections that need to be made to the report, and based on Midwest Generation's analysis of the relevant information, we submit that this conclusion is wholly refuted by the relevant facts and scientifically-based conclusions that those facts support.

We cannot comment on the above statement. It is not directed to us.

Page 2-98:

The reference to "underlying data" is unclear. Is this the consultant's perceptions or a reference to actual monitoring data? If the latter, the referenced data should be identified.

This section summarizes the findings. The sources of the information were identified in the preceding sections.

Several erroneous or unsupported conclusions are repeated here. As discussed elsewhere in these comments, these include:

(1) Ammonia toxicity is known to be influenced by temperature, but at previous UAA workgroup meetings, it was concluded that ammonia concentrations were no longer problematic in the waterway. Therefore, because there is not an ammonia toxicity concern applicable to this waterway, the thermal levels could not be contributing to a problem that does not exist. In addition, ammonia in sediments would not be impacted by higher temperatures, as temperature is primarily a surface phenomenon.

Temperature may affect the upper interstitial sediment – water layer where it suppresses nitrification of released ammonium. If ammonium becomes a problem the focus of attention should be first on the source of increased ammonium discharges.

(2) The system is not dominated by blue-green algae (as documented by the UIW report, Chapter 5--Phytoplankton/Periphyton). The system also does not support swimming. Therefore, the statement regarding swimming also is not applicable to the lower Des Plaines River.

Swimming is applicable because of the proposed and mandatory change of the use to a limited contact in the Dresden Pool. However, appearance of blue-greens is commonly tied to higher temperatures as documented in literature.

(3) This is a textbook statement that is not quantified or qualified as to its significance to the Lower Des Plaines River.

This statement was quantified in the Section on DO in the same chapter

(4) The Secondary Contact thermal limits are attacked as being lethal and it is implied that temperature is the only limiting factor to a better fish assemblage in the system. However, the fisheries data shows all species in the system to be doing well, given the existing physical constraints of the waterway.

The "lethality" and inappropriateness of the Secondary Use and Indigenous Aquatic Life use was explained throughout the report.

(5) Comparison of the Secondary Contact thermal limits with those found in other states is not a valid or reliable comparison due to the unique conditions in the waterway.

We disagree.

The consultant proceeds to address each of the six factors specified by the UAA process and dismisses the first five with little or no justification. In addition to the already discussed legal insufficiency to the scope of this evaluation of the UAA factors, the individual conclusions reached are also inaccurate and unreliable.

(1) The consultant states that the elevated temperatures in the Dresden Pool are not natural, but does not provide any data to support this statement. MWRD's discharges maintain "ambient" temperatures above what would be considered "natural" in this ecoregion. Natural also implies that there is a seasonal flow regime, which is absent in this waterway. A natural system would experience a springtime flushing event, followed by periods of relatively stable flow periods. Such is certainly not the case in the Lower Des Plaines River, whose flow is completely controlled by man in order to accommodate barge traffic and point and non-point source runoff events. Review of the U.S. Army Corps. of Engineers flow data records for the Brandon Road Lock and Dam will demonstrate that there is no "natural" flow regime or norm and flow rates change abruptly on an hourly basis, at times by orders of magnitude, year-round.

We agree with Midwest Generation that the system is not natural. We discussed this point also in conjunction with the application of reference conditions. Therefore, the Reason 1 does not allow the increase of the thermal standard above that commensurate with the general use standard.

(2) The sporadic low flow conditions in the waterway are characterized as having a minimal effect on the aquatic community. The basis for this conclusion is not identified. A statement is also made that river flow is increased by diversions, but this only occurs during the summer months, and the diversion amount is not generally great enough to provide a constant flow rate comparable to a "natural" waterway.

This statement typically refers to emphemeral conditions or conditions where lack or flow would prevent attainment of the (General Use) standards. Such conditions do not occur in the Lower Des Plaines River; therefore Reason 2 that would allow increase of the thermal standard above that of the General Use does not apply.

(3) The consultant's response to the issue of whether human caused conditions or sources of pollution prevent the attainment of use and cannot be remedied or would cause more environmental damage to correct than to leave in place is simply: "Reducing temperature would improve the biotic integrity of the Lower Des Plaines River." This response deliberately ignores all of the other human-induced limiting factors in the system which limit the aquatic life in the system much more than temperature does. This is precisely why this parameter-specific approach to applying the 6 UAA factors is not a correct interpretation of the

UAA regulatory requirements. Just because temperature is believed to be a parameter that is "easily controllable", it does not mean that it should be singled out as the only potentially adverse variable in this complex system. All of the UAA workgroup and subcommittee meetings have involved lengthy discussions regarding the variety of limiting factors in the waterway. None of these discussions identified temperature alone as severely limiting its recovery. All of the data and information presented in both the 1995 UIW Study, as well as the more recent Midwest Generation January, 2003 report demonstrate that thermal inputs are not the sole limiting factor preventing the waterway from achieving full General Use status. In addition, the State's 305(b) and 303(d) reports do not list "thermal" as one of the identified causes or sources of impairment of the lower Des Plaines River.

> All other chemical parameters (with exception of DO and temperature) meet the General Use standards and/or have been corrected in the last twenty years by massive pollution control programs upstream. The current DO, temperature and pathogen problems are correctable. Temperature is not singled out.

(4) The consultant, without basis or support, dismisses the premise that dams, diversions or other types of hydrologic modifications preclude the attainment of use, and it is not feasible to restore the waterbody to its original condition or operate such modification in a way that would result in the attainment of use. The UAA regulation requires a full and fair evaluation of this factor.

The above factors are highlighted here because a complete and accurate evaluation of the relevant data and information would show that they are the primary basis for the system's inability to attain full General Use. The waterway is significantly impacted by frequent barge traffic, unnatural hydrologic modifications and flow fluctuations caused by lock and dam operations and summer lake diversions that are not matched during the winter months when the waterway becomes completely dominated by POTW effluents and runoff. Habitat modification, due to channelization, flow manipulation, barge traffic, and fine grained sediments will continue to dictate what can live here, more than temperature.

> We agree that the waterway is modified water body. If the above argument and Reasons 4 was allowed to hold, all impounded waters in the state of Illinois, including the entire Illinois River Waterway would have to be downgraded to the Secondary Use.

(5) Physical habitat limitations in the system are summarily dismissed so that the reasons they preclude the attainment of aquatic life protection uses are not evaluated. However, even the area downstream of I-55, which is governed by General Use thermal limits, does not have the biological characteristics indicative of a "General Use" fisheries community, even though the habitat is similar in the whole reach. This would indicate that habitat is the primary limiting factor preventing establishment of a higher quality biological community, with or without a change in thermal standards.