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TERESA J. HILL
SECRETARY

August 16, 2007

Sanitation District #1 Northern Kentucky
1045 Eaton Drive
Fort Wright, Kentucky 41017

Re: Eastern Regional Wastewater Treatment Plant
KPDES No.: KY0105031
1271 East Main Street
Alexandria, Campbell County, Kentucky

Dear Commenter:

The oral and written comments received during the Oct. 11, 2006, public hearing and the public comment period concerning the above-referenced draft permit modification have been reviewed and responses prepared in accordance with Kentucky Pollutant Discharge Elimination System (KPDES) regulation 401 KAR 5:075, Section 12. The comments have been briefly summarized and Division of Water's responses provided in the following text:

Any person aggrieved by the issuance of a permit final decision may demand a hearing pursuant to KRS 224.10-420(2) within thirty (30) days from the date of the issuance of this letter. Any demand for a hearing on the permit shall be filed in accordance with the procedures specified in KRS 224.10-420, 224.10-440, 224.10-470, and the regulations promulgated thereto. The request for hearing should be submitted in writing to the Natural Resources and Environmental Protection Cabinet, Office of Administrative Hearings, 35-36 Fountain Place, Frankfort, Kentucky 40601 and the Commonwealth of Kentucky, Natural Resources and Environmental Protection Cabinet, Division of Water, 14 Reilly Road, Frankfort, Kentucky 40601. For your record keeping purposes, it is recommended that these requests be sent by certified mail. The written request must conform to the appropriate statutes referenced above.

If you have any questions regarding these responses, please contact Jory Becker, KPDES Branch, at (502) 564-3410, ext. 477. Further information on procedures and legal matters pertaining to the hearing request may be obtained by contacting the Office of Administrative Hearings at (502) 564-7312.

Sincerely,

David W. Morgan, Director
Division of Water

DWM:JMB

Comment No. 1: Construction of the ERWWTP (Eastern Regional Wastewater Treatment Plant) and implementation of the District's regional facility plan is not consistent with SWAP (Source Water Assessment Plans) goals as the regional facilities plan will reduce the source pollution in the Critical Source Water Protection Zone of the Richard Miller Treatment Plant (RMTP) intake.

Response: This regional plant and outfall will not increase the risk to the Cincinnati's RMTP intake, and should result in a reduced risk to the Cincinnati RMTP. The regional treatment plant will gain control over numerous, uncontrolled contaminant sources within the Cincinnati RMTP's zones of Critical Concern and High Concern, including failing septic systems, SSOs, and CSOs, as well as adding greater treatment of all current and additional waste-stream flow, including UV disinfection.

The SWAP program was designed to determine the number of point and non-point sources of potential pollution present in the designated three zones of drinking water protection, and thereby inform the water treatment plants as to what contaminants should be treated.

Various concerns were expressed by the City of Cincinnati and its agents. These follow:

Comment No. 2: The ORSANCO Compact and related pollution control standards require that the Ohio River be preserved as a safe and satisfactory source for public water supplies, and a guiding principle prohibits the discharge of waste by one state that injuriously affects the uses of the river.

Response: The ORSANCO Compact, found at KRS 224.18-760, does require all states to protect the uses of the Ohio River. The Cabinet believes for the reasons stated herein that this permit will fully protect all uses in the Ohio River.

Comment No. 3: A KPDES permit must include requirements in addition to or more stringent than EPA's effluent limitations guidelines or standards if necessary to achieve water quality standards, including narrative criteria. Applicable narrative criteria include the one that prohibits discharges that "injure, are chronically or acutely toxic to or produce adverse physiological or behavioral responses in humans."

Response: *Cryptosporidium* and *Giardia* have been cited as pathogens which should be regulated under this KPDES permit because they meet the narrative water quality standard found in 401 KAR 5:031, Section 2, which states:

> "Surface water shall not be aesthetically or otherwise degraded by substances that:...
>
> (d) Injure, are chronically or acutely toxic to or produce adverse physiological or behavioral responses in humans, animals, fish and other aquatic life .

There are no other current standards for those pathogens. The ambient environment contains *Cryptosporidium* and *Giardia* from a variety of sources, many of which are not regulated by the Clean Water Act. Elimination of this discharge would do little to change

the risk at the RMTP, 11 miles downstream from the point of the confluence between the Ohio River and Twelve Mile Creek. Because the majority of sources of these pathogens are nonpoint sources, EPA has established rules to regulate them at drinking water plants. On January 5, 2006, the *Long Term 2 Enhanced Surface Water Treatment Rule* (LT2) became final. LT2 is applicable to all public water systems that use surface water or ground water under the direct influence of surface water. It supplements existing regulations by focusing on *Cryptosporidium* in filtered systems with high source water occurrence and maintains microbial protection while risks from disinfection byproducts are addressed. LT2 focuses on source water monitoring, treatment bins and the microbial toolbox, and disinfection profiling and benchmarking. Water systems must conduct 24 months of source water monitoring for *Cryptosporidium* or *Escherichia (E. coli)* depending on the population served by the system. Systems will be classified into one of four "bins" based on the results of their source water monitoring. Additional treatment for *Cryptosporidium* may be required on water systems based upon their bin classification. After completing the initial round of source water monitoring, any system that plans on making a significant change to their disinfection practices must: create disinfection profiles for *Giardia lamblia* and viruses; calculate a disinfection benchmark; and consult with the state prior to making a significant change in disinfection practice.

Numerous safeguards are provided at the ERWWTP to ensure that Cincinnati's drinking water is protected. The Kentucky Administrative Regulations prohibit discharges of sewage within five miles upstream of a drinking water intake. See 401 KAR 5:005 Section 29(1)(b), Water Policy Memorandum No. 84-02 Five Mile Limit Policy, August 28, 1984. By regulation, then, this drinking water intake must be at least five miles from the sewer discharge. In fact, in this particular situation, there are 16 miles between the point of discharge of this effluent into Brush Creek and the intake into the Greater Cincinnati Water Works (GCWW) plant. In addition, a wastewater plant using chlorine disinfection cannot treat *Cryptosporidium* effectively as this parasite is chlorine resistant. However, UV (ultra violet) light treatment that has been shown to kill the organism, among others that may be present in wastewater effluent, will be provided at the ERWWTP. The microbiological quality of the plant effluent will be significantly improved with the new plant compared to the current situation.

In support of the UV treatment, the permittee submitted a report by Dr. Jennifer Clancy. The report, dated March 8, 2005, provided:

> The use of secondary treatment coupled with UV will provide protection against *Cryptosporidium*, although reduction of this parasite is still not a treatment design goal in wastewater systems. Effluent quality is measured by fecal coliforms or *E. coli*. The ability to meet effluent standards for 200 fecal coliforms per 100 mL also provides for *Cryptosporidium* inactivation since these organisms have similar UV susceptibility. The design applied UV dose of 26 $mJ \cdot cm^{-2}$ at peak flows can achieve >4 $\log_{10}$ (99.99%) and perhaps as much as 6 $\log_{10}$ (99.9999%) oocyst inactivation; even if the actual delivered dose is 5 $mJ \cdot cm^{-2}$, oocyst inactivation should be >3 $\log_{10}$ (99.9%). The facility design includes two parallel, completely redundant UV disinfection facility trains with redundant control systems. In addition, secondary power will be provided in the form of a standby

> generator for the entire facility, including UV disinfection, should a primary power failure occur. . . .

Comment No. 4: Permits must also ensure compliance with water quality requirements of all affected states.

Response: The Kentucky water quality standards for the pollutants of concern associated with this permit are as stringent as Ohio requirements and have been approved by the U.S. EPA.

Ohio EPA, U.S. EPA Region IV, U.S. EPA Region V, and ORSANCO have all had the opportunity to review and to comment on the draft KPDES permit. None of these agencies has objected to or opposed issuance of the permit. Furthermore, Ohio EPA did not comment on the currently proposed draft of the KPDES discharge into Brush Creek. It is important to note that this discharge is 5 miles further upstream from the RMTP intake than the previously proposed discharge into the Ohio River, on which Ohio EPA commented that special provisions for notification should be given in the KPDES permit due to the proximity of the wastewater discharge and the drinking water intakes of the RMTP, which are located on the Kentucky side of the Ohio River. To address these and other similar concerns, conditions have been added which are effective upon issuance of the permit in Part II, page II-5, for notification of the potentially affected downstream water utilities in the event of a discharge of partially treated wastewater.

Comment No. 5: Having a wastewater discharge so close to Cincinnati's drinking water intakes, which are on the Kentucky bank of the Ohio River, poses a serious, and unnecessary, threat to the source of the region's drinking water.

Response: In an effort to address some of the concerns expressed previously with the KPDES permit issued May 12, 2004, the Sanitation District evaluated alternatives to the discharge location from a point on the Ohio River approximately 11 miles upstream from the RMTP as part of the Regional Facility Planning Process. The selected alternative for the location of the discharge was to a point on Brush Creek. Brush Creek is a tributary of Twelve Mile Creek which is a tributary of the Ohio River. This has two positive effects on making the discharge more protective of Cincinnati's drinking water. First, it moves the discharge more than 16 miles away from Greater Cincinnati's drinking water intake. In addition, because the discharge is to a low-flow stream, the effluent limits on the permit have become more stringent. For example, Biochemical Oxygen Demand (BOD_5), Ammonia, and Chlorides were all limited when the discharge was proposed to the main stem of the Ohio River. Now, however, the allowable average concentrations in the discharge have been reduced. Also, Total Residual Chlorine, Total Phosphorous, Total Nitrogen and chronic Whole Effluent Toxicity (WET) have been added as limited parameters in the discharge.

These additional safeguards will be more protective of the environment and of Cincinnati's intake. It is also anticipated that when the new treatment plant is operational, water quality in Brush Creek will improve sufficiently to allow it to be removed from Kentucky's 303(d) list of impaired waters. This improvement is anticipated because of the improved quality of the effluent from the ERWWTP as compared with that of the existing Alexandria WWTP

The intake for the RMTP is located at ORMP 462.8. The drainage area for the Ohio River above this intake is approximately 71,250 square miles. Based upon an average daily flow of 80,000 cubic feet per second (cfs) [51,705 MGD, million gallons per day] for the Ohio River at the RMTP, the flow from the proposed ERWWTP at the design flow of 4 mgd would represent 0.008 percent of the flow in the Ohio River. Thus, the proposed design flow from the ERWWTP would represent less than one one-hundredth of one percent of the average flow in the Ohio River.

The Cabinet has determined that the discharge from the ERWWTP will be an insignificant source of pollutants to the Ohio River compared to the other existing point and non-point sources and does not increase the threat to Cincinnati's drinking water intake.

Comment No. 6: The Cabinet failed to address issues relating to pathogens, chemicals and solvents, endocrine-disrupting compounds, miscellaneous contaminants, inadequate mixing between ERWWTP effluent and Ohio River water, wastewater plant upsets and impact of increasing volumes resulting from area growth.

Response: For pathogen, refer to Response to Comment 3. Concern has been expressed about the so-called "emerging pollutants" including such substances as refractory contaminants, synthetic organic chemicals, chlorinated solvents and endocrine-disrupting compounds. The primary concern is that such substances may have an impact on human health and, as a result, violate the narrative water quality in 401 KAR 5:031 standard which states:

> Surface water shall not be aesthetically or otherwise degraded by substances that:
>
> Injure, are chronically or acutely toxic to or produce adverse physiological or behavioral responses in humans, animals, fish and other aquatic life . . .

These substances are often referred to as "emerging pollutants" and the reason is that the U.S. EPA, the Cabinet and the scientific community are only beginning to study and review their impact. While there is some indication that the substances may cause problems for human beings (Daughton 2005. PPCPS. U.S. EPA, Environmental Research Laboratory Sciences, Special Publication nerlesdl1) , it is important to know that the research so far is inconclusive on which, if any, of the substances, would meet the narrative water quality standard and trigger a requirement for an effluent limitation on the permit. While the Cabinet, along with the U.S. EPA, continue to monitor and study these substances, at this time there is insufficient evidence to establish the effects of these compounds or what an appropriate water quality criteria, if any, should be.

To control contaminants not otherwise addressed by permit limits, the Cabinet applies toxicity testing to the discharge. This permit includes toxicity testing limits at the most stringent level, a chronic limit of 1.0 TUc (*i.e.*, no toxicity in 100 percent effluent). The two toxicity tests that must be performed evaluate effects on survival, growth, development and reproduction of the test organisms. The last three effects (growth, development, reproduction) are the focal points of impacts that might result from exposure to endocrine disrupting chemicals.

Finally, flow and effluent mixing conditions in Brush Creek and the Ohio River were evaluated and limitations have been imposed in the permit that are protective of water quality standards under these conditions.

Comment No. 7: The Cabinet did not consider the importance of the Ohio River as a source of drinking water.

Response: Through its water quality standards, the Cabinet clearly considers the Ohio River a source of drinking water. The Ohio River basin is designated for a drinking water source in 401 KAR 5:026 Section 5. As such, it is subject to the surface water standards found in 401 KAR 5:031 for domestic water supply use in Section 5. Section 5, Table 1 sets forth the maximum allowable in-stream concentrations for specific substances. These standards were used in setting permit limits.

Comment No. 8: The ERWWTP discharge will have a direct impact on the RMTP's drinking water source at its intakes.

Response: See Response to Comments 3, 5, 6, 9 and 12.

Comment No. 9: In August 2005 the USGS, in collaboration with GCWW, conducted a rhodamine dye study to determine mixing conditions in the Ohio River in GCWW's critical zone of protection. This study indisputably demonstrated that the effluent discharge would not be completely mixed by the time the flow reached the GCWW and Northern Kentucky drinking water intakes at this low-flow condition.

Response: The USGS study, to which this comment refers, was conducted in August 2005 and reviewed by the Cabinet. The Cabinet met with the GCWW, specifically, to discuss the effects of this study. The contention of the City of Cincinnati is that the effluent plume will "hug" the shore of the Ohio River and thus not be diluted when it reaches the RMTP intakes. Cincinnati also argues that this demonstrates there is not a complete mix in the river from the effluent. It is important to point out that the Kentucky Administrative Regulations do not calculate dilution based on a "complete mix." 401 KAR 5:029, as a general proposition, sets forth the requirements for mixing zones and states:

> (6) Unless assigned on or before the effective date of this administrative regulation, an assigned mixing zone, from the point of discharge in a spatial direction, shall not exceed one-third (1/3) of the width of the receiving stream or one-half (1/2) of the cross sectional area.

In his prefiled written testimony for the Sanitation District in the matter of *City of Cincinnati v. Sanitation District No. 1, et al.*, File No. DOW 28146-039, Dr. David Dilks stated that the dilution data generated by the USGS study indicated that the ERWWTP effluent will be diluted approximately 1,000 fold by the time it reaches the Greater Cincinnati intake. He also noted that Dr. Holly's model, which predicted dilution at different river flows at low-flow conditions predicted the effluent would be diluted approximately 700 fold. The limitations imposed in the permit are protective of water quality standards under these mixing conditions.

However, with regard to the pathogens, this permit is actually more stringent because no mixing zone is assigned to pathogens including the pathogen marker *E. coli*. The limits for pathogens must be met at the end of the pipe. Therefore, the limits were calculated without providing any leeway for a mixing zone. Fecal coliform or *E.coli* content shall not exceed 200 colonies per 100 milliliters (mls) or 130 colonies per 100 ml respectively, as a monthly geometric mean in the ERWWTP effluent. This level of required treatment can be compared to the coliform levels in the sewage coming into the plant for treatment which may be in the order of one to ten million colonies per 100 ml (Bell *et al.* 1981. Applied and Environmental Microbiology, vol. 42, 204-210; Rose, *et.al.* 2004. Water Environmental Research Foundation). Several models have been proposed by Cincinnati and Sanitation District No. 1 including a model by David W. Dilks, Ph.D. of Limno Tech Incorporated and a model by Dr. Forrest M. Holly, Jr., E.E., Forrest Holly & Associates. It is important to remember that these are only proposed theoretical models and constitute the opinion of the modeler. Although the USGS study was sponsored by the Greater Cincinnati Water Works, a scientific study was performed where sampling data was collected from the Ohio River.

In August 2005, Koltun et. al. (USGS 2006) injected rhodamine dye into the Ohio River near the mouth of Twelve Mile Creek to assess the vertical and horizontal mixing of a non-degrading constituent (dye) in the river. Dye was found to be vertically mixed (approximately the same concentration at the water surface and at depth in the river at a given location) by 6 miles from the injection point. Dye was indicated to have diffused to both banks 9 to 10 miles downstream from the injection point. It should be noted that the RMTP intake is 11 miles downstream from the injection point. They (Koltun *et al.*) indicated that complete horizontal mixing did not occur and that the highest concentrations of dye tended to be in stream water next to the Kentucky shore of the river. The dye concentrations present in the water works intake were not presented in the study, precluding determination of a numerical dilution factor between the injection and intake points.

Dr. Dilks (March 11, 2005) modeled the lateral (horizontal) mixing of the effluent from the proposed ERRWTP for Sanitation District No. 1. The water quality modeling framework consisted of a U.S. Army Corps of Engineers hydrodynamics model RMA-2V and a U.S. EPA Water Quality Analysis Simulation Program (WASP) model originally developed as part of the U.S. EPA Wet Weather Demonstration Project for the Ohio River conducted by ORSANCO. As seen in the USGS sampling study (USGS 2006), he concluded that the majority of the future effluent from the ERWWTP would initially hug the Kentucky shoreline. Nine miles downstream of Twelve Mile Creek, the concentration on the Ohio side of the river was predicted in the models to be only slightly (4.5%) greater than on the Kentucky shoreline; approaching what "textbooks define as complete mixing." As noted above, the RMTP intake is 11 miles downstream. The effective dilution factor determined in his models at this 9 mile downstream point was 1,600 times.

Dr. Holly (March 7, 2005) also modeled the mixing process of the ERWWTP with the Ohio River down to the RMTP, but he conducted the modeling on behalf of the City of Cincinnati. The water quality modeling framework was based on FLUENT 6.1, a commercially available model. He concluded that the ERWWTP effluent was vertically completely mixed but not horizontally (laterally) with the Ohio River before it reached the RMTP intake. The dilution rates determined by the model (Table V.2) ranged from

approximately 1,428 to 8,576 times for a 4 MGD release and a 32,500 cubic feet per second Ohio River flow rate (flow rate determined by USGS 2006). Although the Holly dilution rates were determined at 11 miles and the Dilks dilution rates appear to be at 9 miles, the Dilks modeling was in the range of that found in the Holly modeling. One investigator (Dilks) concluded that, based on U.S. EPA and Army Corps of Engineers models, complete mixing would occur; the other investigator concluded that based on his model, which potentially is just as valid, complete mixing was unlikely to occur. Both modelers concluded that considerable mixing (1,428 to 8,576 fold dilution) of the ERWWTP effluent would occur before reaching the RMTP intake, and that the most stringent standards that Kentucky, Ohio, and U.S. EPA apply to wastewater treatment plants will be met. The permit provides for a margin of safety greater than one-thousand fold between the ERWWTP and the RMTP. The USGS study is a scientific study carried out under real conditions in the Ohio River.

Comment No. 10: Page 1, item 1.d. Item 1.d. indicates the production capacity is 4.0 MGD, but Table 3A, page 3, lists design flow as 30 MGD.

Response: Page 3 of the Fact Sheet, Table 3A incorrectly listed the design flow for the proposed plant to be 30 MGD. Page 1, Item 1 d. of the Fact Sheet correctly lists the flow of the plant to be 4.0 MGD. A correction has been made to page 3 of the Fact Sheet to reflect the proper plant capacity.

Comment No. 11: Page 2, item 1.f. This provision limits the reopening to outfall location.

Response: Both 401 KAR 5:075 Section 2 and 401 KAR 5:070 Section 6 state that when a KPDES permit is modified, only the provisions of the modification are subject to being reopened by the Cabinet. However, the relocation of the outfall predicated changes in other requirements within the permit, for which comments are also being considered as part of the permitting action.

Comment No. 12: Page 2, item 2.c. This item indicates one of the reasons for the current impairment is pathogens, yet states that the new and enlarged plant -- discharging far more wastewater than the old plant in this location -- will help restore stream uses. No evidence has been provided as to the efficiency of the plant in reducing or eliminating such pathogens as *Cryptosporidium* and *Giardia*.

Response: The ERWWTP does not represent an entirely new discharge. This proposed facility will replace several existing facilities. One of these, the existing Alexandria Wastewater Treatment Plant, is plagued with significant wet weather capacity issues. The discharge from this existing facility is to Brush Creek (a zero-flow stream), which is a tributary to Twelve Mile Creek (a zero-flow stream) which enters the Ohio River at Ohio River Mile Point (ORMP) 451.6.

The Alexandria Plant has long been in poor shape with frequent violations. It has a history of bypassing during wet weather events, an activity which dumps untreated sewage into Brush Creek. Certainly replacing this failing plant will significantly improve the quality of the effluent discharge since all waste will receive adequate treatment. The

new plant will also pick up the discharges of the Southern Campbell Industrial Park WWTP with a flow of .5 MGD and the Pond Creek WWTP permitted to treat .12 MGD.

One of the biggest challenges associated with *Cryptosporidium* is that in its environmentally resilient oocyst form, the parasite can persist in the water environment for extended periods of time and may actually remain viable in the aquatic environment for up to 6 months.

Following the secondary treatment process, the waste stream will be disinfected using UV irradiation. See Response 3. Protection of public health through the control of disease-causing microorganisms is the primary reason for wastewater disinfection. The primary mechanism by which UV light inactivates microorganisms is direct damage to cellular nucleic acids. Although KDOW requires redundant systems to consist of, at a minimum, a spare bank of UV bulbs, the District has elected to install a fully duplicate UV disinfection channel with a completely redundant disinfection system and controls. According to the system manufacturer (Trojan Technologies, Inc.), a commitment to this level of redundancy is extremely rare in the industry. The UV system has a design UV dose of 26 $mJ \cdot em^{-2}$ at peak flows. Secondary power will be provided in the form of a standby generator for the entire facility, including UV disinfection, in case of a primary power failure.

Technical literature is consistent in finding that 4-log to 6-log inactivation of *Cryptosporidium* occurs in drinking water at UV dosages less than 20 $mJ \cdot cm^{-2}$.

Dr. Clancy has evaluated the efficiency of UV for treating recycled backwash water which, like treated municipal wastewater, would contain low concentrations of solids. See Response 3. Her research confirms the high effectiveness of UV for inactivation of oocysts in recycled backwash water from drinking water plants.[1] Based upon the design of the UV system at the ERWWTP, Dr. Clancy has found the use of secondary treatment coupled with UV will provide protection against *Cryptosporidium.*

The Sanitation District submitted to the Cabinet an expert report from Clancy Environmental Consultants on March 8, 2005, discussing the effectiveness of UV treatment on *Cryptosporidium*. The report notes:

> UV has been demonstrated to be very effective for disinfection of wastewater effluents, CSOs and for reuse applications. UV has many advantages over chemical disinfection including (1) proven ability to disinfect pathogenic bacteria and most viruses, (2) proven effectiveness in meeting federal wastewater effluent standards based on the reduction of indicator organisms in the finished effluents to meet permitted effluent discharge limits, (3) increased safety compared to chlorine handling, (4) no known formation of toxic by-products, (5) increasing costs of chlorination due to regulations curbing chlorine discharge limits – thus

[1] In a study conducted on a drinking water plant in Pittsburgh, States et al. determined that clarification and filtration generally controlled passage of protozoa into the drinking water, but that "cysts and oocysts are also reintroduced into the drinking water plant via recycling of backwash water." [States et al., "Protozoa in River Waters: Sources, Occurrence, and Treatment, AWWA Journal, Volume 89, Issue 9, Ref. 35, Appendix 16].

> mandating dechlorination, and (6) stringent and costly regulations regarding storage and transport of chlorine gas as part of the Uniform Fire Protection Code.

A review of the Sanitation District's treatment showed, according to the Report:

> Two recently completed WERF studies provide important information on the efficacy of UV for inactivation of *Cryptosporidium* in wastewater effluents. Linden *et al* (2004) examined the use of UV specifically for inactivation of *Cryptosporidium* oocysts in wastewater. The results indicate that both low and medium pressure UV irradiation are very effective for inactivation of *Cryptosporidium parvum* oocysts spiked into secondary wastewater effluent. Infectivity assays using cell culture indicated that greater than 3 $\log_{10}$ inactivation is achieved in wastewater with a UV dose of only 3 mJ/cm^2.

Comment No. 13: Page 2, item 2.d. If the 7Q10 and harmonic mean flows are 0.0 cfs, then during these conditions, the receiving stream essentially becomes an open channel carrying the effluent with no dilution. During heavy storm events, the settled particles – including pathogens – will be scoured and enter the Ohio River.

Response: Although a 7Q10 zero harmonic flow determination for a stream does not mean that the stream will be completely dry, the flow out of the stream at the mouth may at times be near zero. With the added plant discharge, zero flow from Twelve Mile Creek into the Ohio River likely will be even less frequent. Over the five stream miles that the ERWWTP treated discharge is transported through the Brush Creek and Twelve Mile Creek systems, suspended solids that may be released from the plant will mix with the suspended solids present in the creeks, become incorporated into the creek sediments, be deposited on the stream banks and incorporated in soils, die in the case of pathogens because of light, heat, drying and time, or even be consumed by the aquatic life present in the streams. As indicated in the comment, during heavy storm events some of this material may resuspend and move into the Ohio River. Once there, the same transport and fate processes may occur thousands of more times before any of the material reaches the RMTP. The likelihood that any of these particles could be distinguished over similar particles present in the Ohio River or that they will pose a distinguishable risk to the water intake is quite low.

GCWW's monitoring of *Cryptosporidium* and *Giardia* for LT2 in the Ohio River indicates that these pathogens have not historically been present at a level of concern that would trigger additional treatment. This is despite the fact that the Alexandria WWTP discharges an effluent of inferior quality and under the same low-flow stream conditions, yet at a lower discharge rate than the ERWWTP. *If* settling and resuspension conditions do in fact exist, they would be more likely to occur under current conditions than under the higher discharge flow rates associated with this permit. There has been no evidence that settling and resuspension occur under current conditions.

Comment No. 14: Page 3, Table 3A. The City cited a report by Dr. Joan Rose in commenting that establishing the effluent limits in monthly, weekly and geometric averages is not protective of human health when attempting to mitigate acute infectious diseases associated with direct contact or ingestion.

Response: Nationally, U.S. EPA has established the frequency and averaging methods to be employed by wastewater treatment plants in monitoring effluents to confirm compliance. Kentucky's monitoring requirements reflect the national requirements. However, following national guidance does not unto itself indicate that human health will be protected with regards to direct contact or ingestion of the effluent even though recreational standards were applied. Dr. Rose's recommendations appear to be based on primary use of wastewater for human consumption or in locations where the public is known to receive direct exposure *(e.g.*, public parks lawn watering) [Rose *et. al.* 2004 WERF]. We would certainly agree that direct use of wastewater would require frequent monitoring and additional treatment before human consumption. The ERWWTP discharge is not proposed to be used as a drinking water or "reclaimed water" source. The ERWWTP has a certain minimal monitoring frequency, however, the plant will be responsible for meeting permit limits at all times. Periodically, the Cabinet will inspect and monitor the facility to assure that the facility is successfully treating wastewater and meeting permit limits. The permit limits for coliforms as a control for pathogens (130 colonies per 100 ml) applied to the ERWWTP effluent were developed to be protective of human health in a recreational scenario (*i.e.*, dermal contact, incidental ingestion of stream water during swimming). Although the regulations require this limit to be applied only during the recreation season in Kentucky (May – October), it is being applied year-round to further assure a high quality effluent.

Comment No. 15: Page 4, item 3B.d. Whole effluent toxicity testing is not an indicator of human health impact.

Response: One of the purposes of whole effluent toxicity testing is to provide an additional level of protection for aquatic life including chemicals for which permit limits were not implemented. However, it also provides additional controls over possible human health impacts. Scientists, because of ethical and monetary reasons, routinely use animals as surrogates to monitor for human health impacts. Basically, the physiological processes are similar in all organisms. Upon exposure, chemicals that affect the processes in one organism often will affect the same processes in any organism (*e.g.*, daphnia, fish, human). Toxicity in 100 percent whole-effluent chronic bioassays performed on the ERWWTP discharge can be used as an indicator of possible human health impacts and no-effects results as an indication that human health impacts will not occur.

Comment No. 16: Page 10, item 6.A. Under the same antidegradation stipulations, why not discharge the effluent into the Licking River or to one of its tributaries?

Response: Under the antidegradation stipulations, the alternatives to the Brush Creek discharge were evaluated by the Sanitation District, as a function of the Regional Facility Plan development. The plan concluded that the selected location for the discharge was the most cost effective and environmentally sound alternative.

It has been posed that the discharge be taken to the Licking River rather than to Brush Creek. Permitting this discharge to the Licking River has many problems associated with it, including water quality concerns that this discharge could not mitigate.and proximity of the discharge to Northern Kentucky Water District Taylor Mill Water intake. As the Sanitation District also noted, the base flow of the Licking River is much lower than the Ohio River resulting in less assimilation and dilution of the effluents before reaching any drinking water intake. In addition, the Sanitation District cited several substantial impediments to the Licking River discharge. The cost, according to the Sanitation District, of taking the discharge to the Licking River would be prohibitive. Routing a pipeline for the Licking River would be through more developed areas. A number of easements would be required to change the discharge location creating construction delays.

Comment No. 17: Page 10, item 8; KPDES permit, Page II-4: The notification requirements are not explicit enough. They do not provide triggers for notification, instead incorporating by reference a regulation which requires reporting of unanticipated bypasses or upsets which at a minimum ERWWTP should be required to notify GCWW directly.

Response: Language has been added to Part II, page II-5 for notification of the potentially affected downstream water utilities in the event of a discharge of partially treated wastewater.

Comment No. 18: Attachment A, page A1. Greater Cincinnati's intakes are closer to the discharge location than Northern Kentucky Water District's Fort Thomas intake. Calculations should take into account the intake *closest* to the discharge location.

Response: The Steady State Wasteload Allocation Model (SSTWAM) run contained in Attachment A, page A1 has been corrected to reflect the nearest downstream drinking water intake, which is the GCWW - RMTP. Although Northern Kentucky Water-Fort Thomas was mistakenly identified in the previous model run, the calculations were not affected as a result of the change.

Comment No. 19: The calculations must take into account the maximum flow, not just the average flow of 4 MGD, and also various flow combinations (wastewater plus the tributaries and the river) to determine the true impact on water quality and to determine effluent limits, (*e.g.*, maximum plant effluent with minimum creek and river flow).

Response: It is a misstatement to identify 4.0 MGD as the "average" flow from the ERWWTP. 4.0 MGD is the design capacity of the treatment plant and the plant can only accommodate flows exceeding this level for limited periods of time. KPDES permit conditions for municipal dischargers are based on the design flow of the facility.

Comment No. 20: Given that human health is a factor, what criteria were used to determine human safety, health and welfare? Drinking water issues are not evaluated. Part II, Page II-1: The standard conditions (#4) explicitly indicate that the POTW has an obligation to mitigate

when there is a reasonable likelihood that the discharge may affect human health or the environment. KDOW has ignored the potential impacts on human health or the environment.

Response: See Responses 3, 5, 6, 7, 8, 9, 12, 14 and 15.

Comment No. 21: Attachment A, page A3. The Reasonable Potential Analysis approach is deficient because only pollutants with numerical water quality criteria are considered. This approach renders meaningless the provision requiring protection of narrative water quality criteria, including the provision prohibiting degradation of surface waters by substances that injure, are chronically or acutely toxic to, or produce adverse physiological effects.

Response: The Cabinet found that no other substance of concern has the reasonable potential to injure, be chronically or acutely toxic to, or produce adverse effects in protected organisms including humans. This conclusion is also supported in Response 20.

Comment No. 22: Part II, Page II-3, item (13)(a): No duration for allowable bypasses is given.

Response: 401 KAR 5:002 Section 1 (36) states a "bypass" means the intentional diversion of sewage or waste-streams from a portion of a facility or industrial user's treatment facility. Since this event does not represent the normal operation of the facility, there is no allowable timeframe where this is permissible under the permit. Page II-4 of the permit states that bypassing will be prohibited. As well, requirements for reporting spill and bypass conditions and penalties associated with failure to report these conditions are set forth in 401 KAR 5:015.

Comment No. 23 Part II, Pages II-4: Notification timing is missing or not explicit.

Response: See Response 17.

Comment No. 24: Part IV, Page IV-2, item 3: This section seems to indicate that the toxicity limits could be exceeded for as long as 110 days before a toxicity reduction evaluation is triggered.

Response: Biomonitoring, otherwise known as WET testing, is required at the ERWWTP under Part IV of the KPDES permit. In accordance with the permit, a noncompliant result on WET testing requires the permittee to retest the effluent within 15 days of the first failure. Upon failure of the retest the permittee has two options: determine the persistence of the toxicant through an accelerated testing program or begin a toxicity reduction evaluation (TRE). If accelerated testing is chosen as the method of compliance, there will be a total of four additional tests required within 90 days of the failed retest. This results in a total of six WET tests to be performed in a potential 115-day period. If at any time the permittee receives two test results which are "significant" failures, a TRE is triggered. A significant failure in this particular case would be a numeric result of 1.2 TUc. Additionally, if four of the six total tests performed show a failure of toxicity, then a TRE is required.

Comment No. 25: The Cabinet failed to consider the impact of water-borne pathogens and the removal/inactivation of pathogens that survive in the environment, including *Cryptosporidium*, which is now regulated in the drinking water source (71 Fed.Reg. 653-786, January 2006) and includes limits for *Cryptosporidium*.

Response: *Cryptosporidium,* in its environmentally resilient oocyst form, can persist in the water environment for extended periods of time and may actually remain viable in the aquatic environment for up to 6 months. One study noted:

> ...*Giardia* and *Cryptosporidium* are common parasites in the Allegheny River with *Giardia* detected in 50% of the samples and *Crypto* in 42%. It is conceivable that if the method detection limits were lower, and recovery efficiencies closer to 100% rather than 25%, these parasites may have been detected in close to 100% of the samples.

Another study submitted by the District testing 257 rivers, streams, lakes and springs in 17 states revealed that *Cryptosporidium* was present in 55 percent of the samples at an average concentration of 43 oocysts/100 L.

In addition, ORSANCO conducted a study in 1996 –1997. The study showed that both *Cryptosporidium* and *Giardia* are present in the Ohio River and its tributaries in the Cincinnati area.

This is so, even though GCWW has commented that "[u]nder current conditions, *Cryptosporidium* has seldom been detected at the RMTP intake."

A study presently being conducted by the Water Environment Research Foundation (WERF) has found that "total contributions of *Cryptosporidium* oocysts from WWTP effluents to a large diverse watershed [are] found to be nearly insignificant compared to contributions from other sources." ["Sources and Variability of *Cryptosporidium* in the Milwaukee River Watershed," WERF Project Numer 99-HHE-2]. Similarly, in a recent study conducted by the Maryland Department of the Environment – Water Supply Program, on the Potomac River, it was determined that "Nonpoint sources of *Cryptosporidium* appear to be the dominant contribution to the fairly significant levels of *Cryptosporidium* measured in the raw water sources." ["Safe Drinking Water Act Annual Compliance Report for Calendar Year 2002," Maryland Department of the Environment – Water Supply Program, p. 8]. See also Response to Comments 3, 5, 12 and 19.

Comment No. 26: Total suspended solids limits contained in the draft permit are not conducive to the proper operation of the UV disinfection process. See also response to Comments 3 and 12.

Response: The design criteria the Cabinet uses to evaluate the proper sizing of a UV disinfection unit is 65 percent transmissivity at an effluent quality of 30 mg/l total suspended solids. At this effluent quality level, the plant must be able to meet the biological limitations such as that for the indicator *E. coli.* The design of this plant exceeds this minimum criteria by increasing the UV dosage to a level equivalent to 100 percent transmissivity at 30 mg/l total suspended solids. As well, it is expected that the plant will produce effluents with

concentrations of suspended solids in the range of 10 mg/l based on the design, thus increasing the margin of safety for inactivation of biological pollutants.

Comment No. 27: There are no discharge limits for refractory contaminants, such as synthetic organic chemicals and chlorinated solvents. There are no discharge limits for endocrine-disrupting compounds.

Response: See Response to Comment #6.

Comment No. 28: There was no consideration of contaminants with the potential for future regulation.

Response: Additional regulations that establish more stringent treatment standards frequently result in additional capital investments by the affected industry. The U.S. EPA identifies a problem, evaluates alternatives to addressing the problem, and develops regulations to protect human health and the environment. The wastewater industry has been dealing with the issue of new regulations and the associated capital needs since the promulgation of the CWA and the subsequent amendments. In March 1998, the EPA published a list of contaminants know as the Contaminant Candidate List (CCL). The CCL lists contaminants both chemical and microbiological in nature which the agency may consider for future regulation in drinking water. Like emerging pollutants, these are still under study. This list is related to drinking water and not to the treatment of sewage. As noted by Clancy in the March 8, 2005 report:

> In order to determine which contaminants might require regulation, the USEPA must gather data to determine if these pathogens represent a health risk and, if by regulating a specific contaminant, a health risk would be minimized. To be able to make these determinations, there is a significant amount of information needed on these organisms. Some CCL 1 microorganisms were newly recognized as agents of waterborne disease (e.g., the microsporidia), while others were suspected of waterborne occurrence (*H. pylori*). This means new research on specific contaminants is required including information on occurrence, health impacts, water treatment, and analytical methods. To do this, USEPA developed both short- and long-term research plans, proposed an unregulated contaminant monitoring program, and undertaken special occurrence studies.

See also Response to Comment 6.

Comment No. 29: There is incomplete mixing between ERWWTP effluent and Ohio River.

Response: See Response to Comment 9.

Based on the comment, some mixing will occur in Brush Creek and Twelve Mile Creek, and based on the USGS (2006), Holly (2005) and Dilks (2005) studies additional mixing will occur in the Ohio River of waters coming out of Twelve Mile Creek (1,428 times to

Your letter expresses concerns about the costs that the City of Cincinnati and its residents will bear in order to address the presence of *Cryptosporidium* and *Giardia* in surface waters resulting from the discharge of wastewater from this plant. While we understand your concerns, the regulations governing the agency's review are proposed state permits provides for objections only on specified grounds, which do not include such considerations, when a permit meets the requirements of the Clean Water Act. In this case, our review concluded that the permit meets the requirements of the Clean Water Act, including the requirement that all applicable water quality standards be achieved. Letter U.S. EPA to Congressman Steve Chabot, July 21, 2005.

Comment No. 34: The Cabinet is required to develop a TMDL for the Ohio River.

Response: Comments contending that the permit requires a Total Maximum Daily Load (TMDL) analysis for the Ohio River are in error. Both federal case law and U.S. EPA guidance hold that the permitting of new discharges to impaired waters is proper and lawful as long as the discharge is determined not to cause or contribute to that impairment, even though a TMDL has not yet been developed for the subject "impaired" waterway. Therefore, it was not necessary for KDOW, Ohio EPA and/or ORSANCO to prepare a pathogen TMDL for the Ohio River prior to issuance of the KPDES permit.

Comment No. 35: Several commenters joined the City of Cincinnati in making many of the above comments, albeit in less detail.

Response: The Cabinet incorporates its responses above to all related comments.

Comment No. 36: Modifications to the Safe Drinking Water Act (SDWA) in 1996 and 2006 have resulted in a shift in manner in which contaminants in drinking water are addressed. The 1996 modification required public water systems do a source water assessment and protection program. A collaborative effort by ORSANCO, the six bordering states, and other federal agencies resulted in a three-tiered delineation of the Ohio River: Zone of Critical Concern, Zone of High Concern, and the entire source water area. The proposed discharge from this facility is located in a Zone of High Concern and is within one mile of a Zone of Critical Concern.

Response: The 1996 amendments to the SDWA (Section 1452) required all public water systems to delineate their area of recharge for the source(s) of water, including systems using surface water and/or groundwater, to conduct an inventory of potential contaminant sources, types and locations, and to assess the risk to the public water system compliance posed by the potential contaminant sources. A source water assessment summary was to be made available to the public for larger systems as part of the Consumer Confidence Report. The source water assessment process has been used by many systems to develop source water management and response strategies, some of which include monitoring, coordinated response to spills, land-use ordinances, and financial incentives to manage or move potential contaminant sources. However, it must be stressed that the delineation scheme and assessment approach carry no inherent regulatory restrictions or provisions precluding the location of any potential contaminant source within any zone of concern.

No state has promulgated such restrictions. The SDWA source water assessment requirements do not require such restrictions must be developed and enforced.

Comment No. 37: Several commenters supported the issuance of the KPDES permit and stated they believed it would improve the quality of life of the citizens of Campbell County.

Response: The Cabinet acknowledges the comments.

Comment No. 38: One commenter stated that the Cabinet had failed to comply with the Clean Water Act and Kentucky's antidegradation requirements. The commenter also stated that Kentucky is not complying with Sections 208 and 303(e) of the Clean Water Act.

Response: The commenter asserts that the antidegradation requirements for high-quality waters apply to this permit. The commenter cites 401 KAR 5:029 Section 1(1),(2), (3), and (4), which are a portion of the Commonwealth's antidegradation policy. Of those cited subsections, only Section 1(1) applies to this permit because Brush Creek is an impaired water at the point of the ERWWTP's discharge. See the KPDES permit fact sheet, page 2. The antidegradation implementation procedure for impaired waters is found at 401 KAR 5:030 Section 1(4)(b): "All existing uses shall be protected and the level of water quality necessary to protect those existing uses shall be assured in impaired water. The process to allow a discharge into an impaired water and to assure protection of the water is regulated by the requirements in the Kentucky Pollution Discharge Elimination System Program." This KPDES permit assures protection of Brush Creek's water quality.

The commenter also asserts that this permit does not satisfy 401 KAR 5:029's intergovernmental and public participation provisions. Because Brush Creek is impaired, the intergovernmental and public participation provisions of the Cabinet's continuing planning process (401 KAR 5:029 Section 1(2)) do not apply. However, if Brush Creek had qualified as a high-quality water, then the intergovernmental and public participation provisions would have been satisfied by the Cabinet's approval of the Eastern Regional WWTP's Regional Facility Plan Update in August 2006. According to 401 KAR 5:030 Section 1(3)(b)(5), which applies to high-quality waters, "the approval of a POTW's regional facility plan pursuant to 401 KAR 5:006 shall demonstrate compliance with the alternatives analysis and socioeconomic demonstration for a regional facility." In addition, under 401 KAR 5:006 Section 6(1), the Cabinet submitted an environmental assessment report summarizing the Regional Facility Plan Update to the state Clearinghouse in February 2006, which would have satisfied the intergovernmental participation provision of 401 KAR 5:029 Section 1(2).

Comment No. 39: One commenter stated that the Division of Water is prohibited from issuing a KPDES permit prior to certification that the proposed discharge permit is consistent with the 1977 Ohio-Kentucky-Indiana Regional Water Quality Management Plan.

Response: 401 KAR 5:006 Section 7 states: "Construction grant, loan, and permit decisions shall be made in accordance with certified and approved water quality management plans, including regional facility plans...." The regulation does not require that the Cabinet "certify" the permit as consistent with the water quality management plan. Nonetheless,

the Cabinet's decision to issue the KPDES permit for the Eastern Regional WWTP is in accord with the 1977 OKI plan.

Comment No. 40: One commenter stated that the Cabinet must comply with the National Environmental Policy Act or a NEPA-like process before it can issue a KPDES permit for the Eastern Regional WWTP.

Response: Under 33 U.S.C. § 1371(c) and 40 CFR § 6.602, KPDES permit decisions are not subject to NEPA review. In addition, no NEPA-like process applies to KPDES permit decisions. However, the Cabinet did comply with its Wastewater State Revolving Fund NEPA-like process when it conducted an environmental review of the Regional Facility Plan Update for the Eastern Regional WWTP.

Comment No. 41: One commenter proposed that SD#1 engineer a pilot system that would pump all the wastewater into a lagoon. The wastewater would then be applied to the forests and farmlands of the region.

Response: Land application or spray irrigation of wastewater, like discharges, is a regulated activity by the agency. While this approach can often be a viable option, acreage requirements for land application can preclude the option in some instances. In the case of the proposed ERWWTP, extensive acreage that is not available to SD#1 would be required to adequately handle the land application needs.