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June 30, 2015

Ms. Mary Barnett  
Ecologist Coordinator  
Arkansas Department of Environmental Quality  
5301 Northshore Drive  
North Little Rock, AR 72118-5317

Re: NPDES Permit AR0033766  
TRE Action Plan Revision

Ms. Barnett,

As required by letter from ADEQ dated June 29, 2015, please find enclosed the revised TRE Action plan for the Paragould Light, Water and Cable (PLWC) Wastewater Treatment Plant (WWTP). We have revised the start of the TRE Action plan based on your recommendation.

If you have questions or need additional information, do not hesitate to contact me at (870) 239-7795 or [lellington@paragould.com](mailto:lellington@paragould.com). Thank you.

Sincerely,

Lisa Ellington  
Environmental Services Manager



TOXICITY REDUCTION EVALUATION  
ACTION PLAN  
PARAGOULD LIGHT WATER AND CABLE  
WASTEWATER TREATMENT FACILITY  
NPDES PERMIT AR0033766  
OUTFALL 001

Prepared for:  
Paragould Light Water and Cable  
1901 Jones Road  
Paragould, AR 72451

Prepared by:  
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Columbia, Missouri 65203

Project No. 15-224  
June 2015  
Revision 1

## Section 1 INTRODUCTION

This document presents a Toxicity Reduction Evaluation (TRE) Action Plan for The National Pollutant Discharge Elimination System (NPDES) Permit No. AR0033766 for the Paragould Light, Water and Cable (PLWC) Wastewater Treatment Facility (WWTF).

In a letter from the Arkansas Department of Environmental Quality (ADEQ) addressing a review of the 2015 Whole Effluent Toxicity (WET) tests, ADEQ noted that there has been lethal and sub-lethal failure of *C. dubia* in January 2015 and March 2015. ADEQ also noted that *C. dubia* passed for both lethal and sub-lethal in February and April 2015. The lethal *C. dubia* failures in January and March meet the requirement to initiate a TRE.

This same letter noted Part II.8.5 of the NPDES permit, which states that “Within ninety (90) days of confirming persistent toxicity, the permittee shall submit a Toxicity Reduction Evaluation (TRE) Plan and Schedule for conducting a TRE.....”

The TRE is defined as “a site specific study conducted in a stepwise process designed to identify the causative agents of effluent toxicity, isolate the sources of toxicity, evaluate the effectiveness of the toxicity control options, and then confirm the reductions in effluent toxicity” (USEPA, 1991).

This TRE plan outlines the technical approach to toxicity identification and control for WET in acute and chronic toxicity tests at Outfall 001. The typical approach to eliminating effluent toxicity involves first identifying the cause of toxicity either through a direct characterization and identification process using Phase I and Phase II Toxicity Identification Evaluation (TIE) procedures (USEPA 1991, USEPA 1993) or by identifying the source within the process stream(s) causing toxicity. When the cause and/or source of toxicity have been confirmed, control measures are then evaluated and selected. Control measures typically involve removing the source(s) of toxicity or additional treatment of the effluent. The contents of the proposed plan are as follows:

- Section 2: Project Organization,
- Section 3: Description of Outfall 001,
- Section 4: Analysis of Toxicity Data,
- Section 5: Toxicity Identification,
- Section 6: Selection of Control Method,
- Section 7: Routine Testing, Toxicity Monitoring & Sampling Plan,
- Section 8: Reporting,
- Section 9: Project Schedule, and
- Section 10: References.

## 2.0 PROJECT ORGANIZATION

Lisa Ellington – Environmental Services Manager (PLWC)

Role: Have samples collected and shipped, coordinate routine bio-monitoring, authorize additional analysis as recommended by the Project Manager, identify possible sources of toxicity, and assist the Project Manager with the designing source evaluations and treatment studies.

Kevin White – Project Manager (Gonzalez Companies, LLC)

Role: Identify necessary biological testing and coordinate sample collection and laboratory analysis with PLWC Environmental Services Manager and personnel, consult with laboratory support in the design of toxicity characterization/identification procedures, plan source evaluation and treatment studies, communicate the results and progress of the TRE to PLWC and the Arkansas Department of Environmental Quality.

Tom Wallace – Data Analysis (Geosyntec Consultants, Inc.)

Role: Review laboratory data and analysis procedures, recommend analysis procedures.

Arkansas Analytical – Laboratory Support

Role: Conduct biological and chemical testing to characterize and identify the source of toxicity, consult with the project manager in the design of toxicity characterization and identification procedures.

Jon Kremer – Quality Assurance Manager (Gonzalez Companies, LLC)

Role: Perform quality assurance and quality control activities for the project.

## 3.0 DESCRIPTION OF OUTFALL AND TREATMENT

The PLWC WWTF has a design flow of 6.0 million gallons per day (MGD) and treats municipal and industrial waste. Treatment includes a bar screen, grit removal, three individual oxidation ditches with four final clarifiers, followed by gaseous chlorine disinfection, de-chlorination and re-aeration. The sludge is dewatered, dried and land applied as an exceptional quality class 'A' bio-solid.

An equalization pond is used during wet weather conditions to reduce flow to the treatment process during or following storm events. The amount diverted to the equalization pond depends on the amount needed to keep the influent flow below 6.0 MGD. All water diverted through the equalization pond is eventually pumped through the treatment system. All diversions are controlled by manual valves.

## 4.0 ANALYSIS OF TOXICITY DATA

Prior to the fall of 2012, problems with toxicity did not appear to be an issue. Beginning in the fall of 2012 and continuing to the present, acute and chronic Whole Effluent Toxicity (WET) analysis has resulted in a mixture of passes and failures, primarily with the *C. dubia* analysis

performed by the contract laboratory. More recently, from 2014 until the present, failures of acute and/or chronic *C. dubia* tests have occurred and have resulted in numerous retests and more acute toxicity issues. Results of routine biomonitoring at outfall 001 are summarized in Table 4.1. The results show 3 lethal and 4 sub-lethal toxicity results to *C. dubia* in test results from 2014 to 2015. There were two sub-lethal toxicity measurements to *P. promelas* (fathead minnow) that corresponded to the sub-lethal test results for *C. dubia*. Both of these sub-lethal measurements were in 2013.

Table 4.1

Paragould City Light, Water and Cable  
Chronic Biomonitoring Summary  
January 2010 to April 2015

Sampling Date Start	Test Results per Species		Date Submitted to ADEQ	Method of Submittal
	Pimephales promelas	Ceriodaphnia dubia		
01/24/10	Passed	Passed	04/15/10	Mail
04/11/10	Passed	Passed	07/13/10	Mail
07/11/10	Passed	Passed	10/15/10	Mail
10/17/10	Passed	Passed	01/11/11	Mail
01/23/11	Passed	Passed	04/13/11	Mail
04/03/11	Passed	Passed	07/15/11	Mail
07/24/11	Passed	Passed	10/17/11	Mail
10/16/11	Passed	Passed	01/13/12	Mail
01/15/12	Passed	Passed	04/17/12	Mail
04/08/12	Passed	Passed	07/10/12	Mail
07/15/12	Passed	Passed	10/15/12	NetDMR
10/07/12	Passed	Invalid	01/10/13	NetDMR
10/23/12	---	Invalid	01/10/13	NetDMR
11/11/12	---	Passed	01/10/13	NetDMR
01/06/13	Passed	Sublethal	04/09/13	NetDMR
02/10/13	---	Invalid	04/09/13	NetDMR
03/10/13	---	Passed	04/09/13	NetDMR
04/21/13	Sublethal	Sublethal	05/13/13	NetDMR
05/14/13	Sublethal	Sublethal	06/10/13	NetDMR
06/02/13	Passed	Passed	07/16/13	NetDMR
07/07/13	Passed	Passed	10/21/13	NetDMR
10/06/13	Passed	Invalid	03/03/14	NetDMR
10/20/13	---	Passed	03/03/14	NetDMR
01/19/14	Passed	Passed	04/10/14	NetDMR
04/20/14	Passed	Lethal	05/13/14	NetDMR
05/26/14	---	Sublethal	07/07/14	NetDMR
06/11/14	---	Invalid	07/07/14	NetDMR
07/07/14	Passed	Passed	08/14/14	NetDMR
07/21/14	---	Passed	08/14/14	NetDMR
08/18/14	---	Invalid	09/14/14	NetDMR
09/15/14	---	Passed	10/08/14	NetDMR
10/06/14	Passed	Passed	01/08/15	NetDMR
01/19/15	Passed	Lethal	04/13/15	NetDMR
02/23/15	---	Passed	04/13/15	NetDMR
03/16/15	---	Lethal	04/13/15	NetDMR
04/06/15	Passed	Passed	05/11/15	NetDMR

## 5.0 TOXICITY IDENTIFICATION

Historical data showed no recurring elevated concentrations of ammonia, metals or organic compounds. Stable effluent CBOD5 and ammonia measurements indicate consistent plant effluent quality with minimal operational upsets.

Sporadic passes and failures in a series of WET tests can be a result of episodic events that may occur in the waste stream that is being tested or it can be an artifact of organism culture health and/or handling. With respect to the latter, a thorough review of the testing methodology and results of the Table 4.1 WET tests was conducted.

The tests are well documented and appear to adhere to USEPA testing requirements (EPA 821/R-02/013, Section 13). A thorough documentation of each test including mortalities, young production, water quality, etc. is provided within each report to assist in our review.

The most interesting observation in the failed tests that we reviewed was that frequently the higher dilutions (more effluent) show less toxic effects than lower dilutions (less effluent). This is sometimes called a “reverse dose-response” and is unusual. A reverse dose-response generally suggests a cause other than the effluent itself causing toxicity. This type of trend is usually a result of either dilution water effects or occasionally organism health/handling.

Atypical aspects of the results for each lethal and sub-lethal test are presented in Table 5.1.

Table 5.1

Test Date	<i>C. dubia</i> Test Result	Atypical Aspects of Test Results
4/20/2014	Lethal and sub-lethal toxicity	<ul style="list-style-type: none"> <li>Reverse dose response relationship for survival.</li> <li>Appreciable die-off in middle concentrations on days 2 and 3.</li> </ul>
5/27/2014	Sub-lethal toxicity	<ul style="list-style-type: none"> <li>No young production in controls until day 6.</li> <li>Mean number of young in controls (15.1) at lower end of acceptability.</li> <li>Reference test acceptable, but not done at same time as test so may not correlate.</li> </ul>
6/11/2014	invalid test result (test invalidated after discussion with ADEQ)	<ul style="list-style-type: none"> <li>CV % for control and critical dilution exceeded 40%.</li> </ul>
1/19/2015	Lethal and sub-lethal toxicity	<ul style="list-style-type: none"> <li>Reverse dose response relationship for survival.</li> <li>Sporadic mortalities scattered throughout test.</li> </ul>

<i>Table 5.1 Continued</i>		
Test Date	<i>C. dubia</i> Test Result	Atypical Aspects of Test Results
3/16/2015	Lethal and sub-lethal toxicity	<ul style="list-style-type: none"> <li>• Equal or greater mortality in lower concentrations compared to higher.</li> <li>• Sporadic mortalities scattered throughout test.</li> </ul>

Significant industrial user (SIU) discharge monitoring data does not identify a probable source of plant effluent toxicity. Only one monitoring event (Prestolite Wire, April 16, 2013) showed elevated metals levels (164 ug/L copper at daily flow rate of 1.16 MGD). This loading rate would have resulted in a daily average copper headworks loading of 70 ug/L at the measured plant flow rate of 2.7 MGD (approximately twice the average 2012-2015 influent copper concentration of 35 ug/L). Potentially, higher concentrations could have occurred during the day depending on the variability of discharge from the industry.

Toxic metals from industrial dischargers are a potential source of toxicity and will be considered as a potential source in the analysis.

## 6.0 SELECTION OF CONTROL METHOD

The selection of a control method will be based on the results of the toxicity identification portion of the study. Control methods can consist of elimination, substitution or treatment (or a combination) of the toxicant(s) that have been identified and confirmed as causing effluent toxicity. Identification and confirmation of a cause of toxicity and its subsequent elimination of control in the effluent can be used as a basis for a chemical-specific limit in the NPDES permit in lieu of a WET limit. Any evaluation of possible control strategies is premature at this point. Control strategies will be identified based on the results of toxicity identification efforts.

## 7.0 ROUTINE TESTING, TOXICITY MONITORING & SAMPLING PLAN,

To capture episodes of toxicity, PLWC will sample Outfall 001 monthly and submit the samples for toxicity screening. A composite sampler will collect samples on Monday, Wednesday and Thursday, once a month and they will be sent to Arkansas Analytical, for acute toxicity screening using *C. dubia*. The purpose of the screening tests will be to identify toxic samples. If toxicity screening does not indicate toxicity, the samples will be discarded.

If the screening process identifies toxic samples, a Phase I Toxicity Identification Evaluation (TIE) (USEPA 1991) will be conducted with continuation to Phase II and III TIE procedures (USEPA 1993a. and USEPA 1993b) if necessary to identify the source of effluent toxicity. Because recent WET tests have shown both acute and chronic toxicity to *C. dubia*, the toxicity assessment will focus first on acute toxicity only. In addition, because *P. promelas* has passed both acute and chronic tests during 2014 and 2015 testing, this test organism will not be included in the Phase I TIE.

Toxicity efforts as described above will continue for 3 months (a total of 9 acute toxicity screening using *C. dubia*). If no samples indicating toxicity are captured during this time, the project team will alter the screening to the NPDES WET analysis frequency. If samples continue to not indicate toxicity, the plan will focus on the testing procedures as a possible source of the lethal and sub-lethal results that initially triggered the TRE.

Routine biomonitoring will continue to be conducted at Outfall 001 at a frequency of once per quarter, as now required by the NPDES permit. WET analysis will be reviewed for potential anomalous findings such as reverse dose-response relationships. The team will work closely with the laboratory and ADEQ to address any atypical findings.

## **8.0 REPORTING**

Quarterly TRE Activities Reports will be submitted to ADEQ with the routine discharge report (DMR) submittal in January, April, July and October. Quarterly reports will contain information on toxicity screening and characterization including:

1. Additional data and /or substantiating documentation that identifies additional toxicants or sources of effluent toxicity,
2. Additional studies/evaluations and results on the treatability of the effluent toxicity, and
3. Additional data that identifies effluent toxicity control mechanisms that will reduce effluent toxicity to the level necessary to achieve no significant toxicity at the critical dilution.

A final report will be submitted upon completion of the TRE and contain at a minimum:

1. The source of the toxicity (constituents and class of toxicants),
2. Results of any treatability studies conducted,
3. Discussion of alternative treatment or management techniques to reduce or eliminate the toxicity,
4. Selection of the appropriate course of action to be followed, and
5. An implementation schedule for making require changes to reduce/eliminate toxicity.



## 9.0 PROJECT SCHEDULE

The anticipated schedule of activities is presented in Table 9.1. Since recent toxicity occurred in the 1st quarter of 2015, this TRE Action plan will be implemented with the first scheduled WET analysis in 2016 as required by the NPDES. The duration of the TRE testing program will be 24 months. The final report will be issued 2 months after sampling is complete.

If a routine WET analysis indicates toxicity before 2016, the TRE will begin upon its discovery.

Prior to the implementation of the TRE Action Plan, the review and investigation of rainfall data, influent streams and the QA/QC plan will be completed.

Routine Monitoring	Initial 6 Months of Schedule					
Monthly Testing	X	X	X	+		
Quarterly Report			X			X
Final Report						
Month of Project	1	2	3	4	5	6

+Continued monthly if necessary.

## 10.0 REFERENCES

Letter from ADEQ by Mary Barnett dated April 21, 2015. RE: Toxicity Reduction Evaluation (TRE) – Paragould City Light, Water and Cable, Outfall 001 NPDES Permit No. AR0033766 AFIN: 28-00060

NPDES permit AR0033766 - AFIN 28-00470

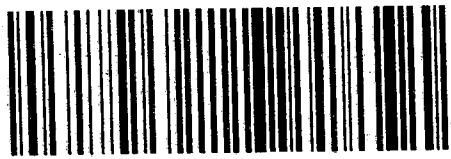
USEPA Toxicity Reduction Evaluation Guidance for Municipal Wastewater Treatment Plants, EPA/883B-99/002

USEPA. 1991. *Methods for Aquatic Toxicity Evaluations: Phase I Toxicity Characterization Procedures*, EPA/600/6-91/003, Second Edition.

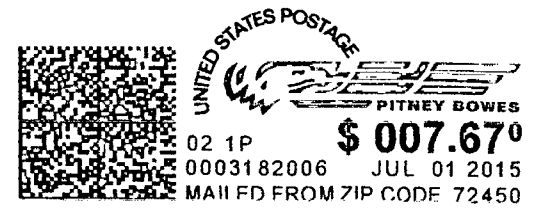
USEPA. 1993a. *Methods for Aquatic Toxicity Evaluations: Phase II Toxicity Identification Procedures for Samples Exhibiting Acute and Chronic Toxicity*, EPA/600/R-92/080.

USEPA. 1993b. *Methods for Aquatic Toxicity Evaluations: Phase III Toxicity Confirmation Procedures for Samples Exhibiting Acute and Chronic Toxicity*, EPA/600/R-92-081.

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