COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF LOUISVILLE GAS AND	**)**	
ELECTRIC COMPANY FOR CERTIFICATES OF	**)**	
PUBLIC CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00027**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
ROBERT M. CONROY
DIRECTOR, RATES
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

Q. Please state your name, position, and business address.

A. My name is Robert M. Conroy. I am the Director of Rates for Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E" or "Company") and an employee of LG&E and KU Services Company, which provides services to LG&E and KU (collectively "Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I have previously testified before this Commission in numerous proceedings, including the Companies' most recent base rate cases (Case Nos. 2014-00371 (KU) and 2014-00372 (LG&E)) and environmental cost recovery compliance plan proceedings (Case Nos. 2011-00161 (KU) and 2011-00162 (LG&E)).

Q. Will you soon assume a new position with the Companies?

A. Yes. On February 1, 2016, I will assume the position of Vice President of State Regulation and Rates for the Companies. I will continue to be an employee of LG&E and KU Services Company in my new role. Also, I will continue to testify and participate in this proceeding, and do not anticipate having another witness adopt my testimony.

Q. What are the purposes of your testimony?

A. My testimony summarizes our other witnesses' testimony, LG&E's 2016 Environmental Compliance Plan ("2016 Plan"), and our request for certificates of public convenience and necessity ("CPCNs") for facilities contained in the 2016 Plan. I will also explain why LG&E is seeking environmental surcharge recovery of its 2016 Plan through the Environmental Cost Recovery ("ECR") Surcharge tariff beginning with bills that reflect the expense month July 2016, which will use the 10.00% return on common equity agreed to in LG&E's last rate case.[1] I will also address the plan to finance the proposed construction of facilities requiring CPCNs.

Overview of Testimony

Q. Please provide an overview of the testimony of the witnesses supporting LG&E's application in this proceeding.

A. In addition to my testimony, LG&E is presenting the testimony of seven other witnesses in this case in support of its application. These witnesses and the subjects of their testimony are:

- John N. Voyles, Jr., Vice President, Transmission and Generation Services, presents testimony that describes the engineering and construction aspects of the projects in LG&E's 2016 Plan that relate to disposal of coal combustion residuals ("CCR"),[2] and the projects' costs. Also, Mr. Voyles sponsors the 2016 Plan.
- R. Scott Straight, Director, Project Engineering, presents testimony that describes the engineering and construction aspects of the projects in LG&E's 2016 Plan not addressed by Mr. Voyles, and the projects' costs.
- Gary H. Revlett, Director, Environmental Affairs, presents testimony discussing the environmental regulations that necessitate LG&E's 2016 Plan. Also, Mr. Revlett discusses certain environmental regulations that likely will affect the Companies' coal-fired units in the near future.

[1] *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates*, Case No. 2014-00372, Order at 4 (June 30, 2015).

[2] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.

- Charles R. Schram, Director, Energy Planning, Analysis and Forecasting, presents testimony on the cost-effectiveness of the projects in LG&E's 2016 Plan, and presents as exhibits the cost-benefit studies LG&E performed related to the 2016 Plan.
- Derek A. Rahn, Manager, Revenue Requirement, presents testimony addressing how the environmental surcharge under LG&E's ECR tariff provisions will be calculated to include the costs of the 2016 Plan, presents the revisions to the monthly ECR reporting forms that LG&E proposes and explains why the revisions to the forms are appropriate, and discusses the bill impact on LG&E's customers.
- John J. Spanos, Senior Vice President, Gannett Fleming Valuation and Rate Consultants, LLC presents testimony demonstrating that the terminal net salvage value used with the depreciation rates and reserves in base rates does not reflect any surface impoundment closures under the Coal Combustion Residuals Final Rule ("CCR Rule") and proposes depreciation rates for the surface impoundment closures at each generation station to be used in the ECR filing.
- Christopher M. Garrett, Director, Accounting and Regulatory Reporting, presents testimony affirming that the costs for which LG&E is seeking recovery through its Environmental Surcharge tariff are not included in base rates, and describes the accounting associated with the projects in LG&E's 2016 Plan, all consistent with the Commission's prior orders. Also, Mr. Garrett addresses the accounting for the proposed CCR Rule compliance construction contained in Projects 29 and 30.

<u>2016 Plan and Recovery</u>

Q. Please describe the 2016 Plan LG&E proposes in this proceeding.

A. The projects in LG&E's 2016 Plan will serve the Mill Creek and Trimble County Generating Stations. LG&E's 2016 Plan contains three new capital projects; LG&E is seeking ECR recovery of the associated operating and maintenance ("O&M") expenses for only one project. (LG&E's 2016 Plan is attached as Exhibit JNV-1 to Mr. Voyles's testimony.) More specifically, LG&E's 2016 Plan contains projects to install low-cost and economical supplemental control technologies to reduce mercury re-emissions that will keep the Mill Creek coal-fired units and Trimble County Unit 1 in compliance, and provide operational flexibility in maintaining compliance, with the federal Mercury and Air Toxics Standards ("MATS Rule") for mercury (Project 28), and to conduct CCR Rule compliance construction at Mill Creek and Trimble County, with the construction of process water systems at those generating stations to enable ongoing coal-fired unit operations at those facilities (Projects 29 and 30).

Q. Please describe Project 28, installing supplemental mercury-related control technologies at Mill Creek and Trimble County Unit 1.

A. In addition to the baghouses (pulse-jet fabric filters) with powdered activated carbon ("PAC") injection added to the Mill Creek units and Trimble County Unit 1 in Projects 26 and 27 as part of LG&E's 2011 Plan, some additional investment is necessary to ensure these coal-fired units can continually meet the mercury-emission limits of the MATS Rule. In particular, a phenomenon called mercury reemission that occurs in the wet flue-gas desulfurization units ("WFGDs") serving these units could result in excessive mercury emissions.[3] The purpose of Project 28 is to install equipment to apply additives to the coal for Mill Creek Units 1 and 2 to improve mercury oxidation, which in turn improves mercury capture in WFGDs because

[3] Straight Testimony at 2-3.

oxidized mercury is water soluble (elemental mercury is not).[4] Project 28 further includes equipment for injecting an organosulfide chemical additive into the WFGD reaction tanks for the Mill Creek units and Trimble County Unit 1 to reduce mercury reemission.[5]

This project is related to the mercury-sorbent tests the Companies conducted on certain generating units from 2013 through 2015 and described to the Commission Staff in the Companies' quarterly ECR construction update meetings held during that time concerning the Companies' 2011 ECR Compliance Plan.[6] Based on the results of those tests, LG&E proposes to add the supplemental mercury control systems proposed in Project 28 to give LG&E the ability to inject these new additives either as a total substitute for PAC or in combination with PAC injection, depending on the price and effectiveness of each.

The total projected capital cost for all of these facilities at Mill Creek and Trimble County is $4.9 million, all of which LG&E seeks to recover through the ECR mechanism as part of its 2016 Plan Project 28. The projected annual O&M cost of these facilities presented on the second page of Exhibit JNV-1 is shown as zero for all years. That is not because the systems installed through Project 28 will have no O&M cost, particularly with respect to the cost of the additives to be injected and applied; rather, the cost of such additives will correspondingly offset PAC costs currently being recovered through the O&M shown in LG&E's monthly ECR reports

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[4] *Id.* at 5-6.
[5] *Id.* at 5-7.
[6] *See, e.g.*, Companies' 2011 ECR Compliance Plans Quarterly Report – Update #8, 3rd Quarter 2013 Report at 44 (Oct. 18, 2013); Companies' 2011 ECR Compliance Plans Quarterly Report – Update #7, 2nd Quarter 2013 Report at 38-39 (July 19, 2013); Companies' 2011 ECR Compliance Plans Quarterly Report – Update #6, 1st Quarter 2013 Report at 34-35 (Apr. 17, 2013); Companies' 2011 ECR Compliance Plans Quarterly Report – Update #5, 4th Quarter 2012 Report at 26 (Jan. 18, 2013).

for Projects 26 and 27 (approved as part of LG&E's 2011 Plan). Therefore, the zero-O&M costs shown in Exhibit JNV-1 represent the expectation that the O&M costs of Project 28 will be less than or equal to corresponding O&M cost decreases currently being reported for Projects 26 and 27.

Indeed, the projected O&M savings related to reduced PAC use are anticipated to be large enough that, as Mr. Schram's testimony shows these investments have the potential to pay for themselves in three years or less by reducing the need for PAC injection.[7]

Q. With regard to Project 28, does LG&E have to continue to comply with the MATS Rule after the Supreme Court's recent decision in *Michigan v. EPA*?[8]

A. As Mr. Revlett discusses in greater detail, the Supreme Court's decision in *Michigan v. EPA* did not vacate or stay the effect of the MATS Rule, which has been in effect since 2012; instead, the Court ruled that the U.S. Environmental Protection Agency ("EPA"), by failing to take into account the costs of regulating the emissions covered by the MATS Rule, did not meet the requirements necessary to find that it was appropriate and necessary to regulate such emissions.[9] The Court remanded the case to the U.S. Court of Appeals for the D.C. Circuit, which also has not yet stayed or vacated the rule.[10] Therefore, the rule remains in full effect. Moreover, EPA has already begun taking action to cure the rulemaking defect the Court cited: On December 1, 2015, EPA published in the Federal Register a proposed supplemental finding that, even when assessing the costs in several ways, it is appropriate and

[7] Schram Testimony at 10-11.
[8] 135 S.Ct. 2699; 192 L.Ed.2d 674 (2015).
[9] *Id.*
[10] *Id.*

necessary to regulate the emissions covered by the MATS Rule.[11] Thus, LG&E must comply with the MATS Rule, and there is every reason to believe it will continue to have to do so for the foreseeable future.

Q. Please describe Projects 29 and 30, CCR Rule compliance construction and related construction of process water systems at Mill Creek (Project 29) and Trimble County (Project 30).

A. For the reasons Mr. Revlett explains concerning compliance with the CCR Rule and federal Effluent Limitations Guidelines, it is prudent for LG&E to begin CCR Rule compliance construction at all of its currently active surface impoundments (i.e., those at Mill Creek and Trimble County) and to construct new process water systems at those stations, and to complete all construction activity by the end of the year 2023.

To the extent feasible and consistent with the CCR Rule, LG&E will beneficially use CCR to reduce the need for and cost of using virgin fill material to achieve proper grades prior to capping surface impoundments. One source of such fill material will be surface impoundments that LG&E plans to clean close.[12]

As Mr. Voyles explains, without surface impoundments, LG&E will require new process water systems to handle process water from ongoing station operations. LG&E plans to sequence the construction of the necessary process water systems to meet operational needs created by closures of existing surface impoundments.

The total projected capital cost of the proposed CCR Rule compliance construction and construction of new process water systems is $196.9 million for Mill Creek (of which LG&E seeks to recover $193.7 million through the ECR mechanism as part of its 2016 Plan Project 29) and $114.1 million for Trimble County (of which

[11] 80 Fed. Reg. 75,025 *et seq.* (Dec. 1, 2015).
[12] Voyles Testimony at 15.

LG&E seeks to recover $110.4 million through the ECR mechanism as part of its 2016 Plan Project 30).[13] As noted in the testimony of Mr. Voyles, as engineering proceeds and matures for each proposed closure and the assessments of the CCR Rule's criteria for each surface impoundment's circumstances becomes clearer, the closure approach and costs for a given surface impoundment could change, perhaps significantly, especially if larger quantities of virgin fill materials become necessary for closure.[14]

LG&E is not seeking O&M cost recovery through the ECR mechanism for these projects, as noted on the second page of Exhibit JNV-1. Mr. Garrett's testimony addresses cost recovery for ongoing groundwater-monitoring obligations under the CCR Rule.

Q. Are Projects 29 and 30 economical?

A. Yes. Mr. Voyles's testimony demonstrates that LG&E will address its surface impoundments in a lowest-reasonable-cost manner.

With respect to the process water systems LG&E proposes to construct at Mill Creek and Trimble County to enable ongoing coal-fired generating operations, Mr. Schram's retirement analyses show that building those facilities is economical.[15]

Certificates of Public Convenience and Necessity

Q. Is LG&E requesting CPCNs in this proceeding?

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[13] Please note that LG&E's cost for Trimble County reflects LG&E's 39% ownership share of the Trimble County Generating Station, not the total cost of capping and closing surface impoundments and constructing process water systems at Trimble County.
[14] Voyles Testimony at 15-16.
[15] Schram Testimony at 4-5.

A. Yes. LG&E is seeking two CPCNs for CCR Rule compliance construction regarding surface impoundments and process water construction projects at Mill Creek and Trimble County (one CPCN per generating station).

Q. How does the proposed construction meet the requirements for CPCNs set out in 807 KAR 5:001 § 15(2)?

A. As described in greater detail in the testimony of Messrs. Voyles and Revlett, LG&E will close conduct the CCR Rule compliance construction and construct related process water systems at Mill Creek and Trimble County in accordance with the CCR Rule and applicable state environmental regulations.

It is important to note that the CPCNs LG&E is requesting are not for the specific surface-impoundment-closure plans LG&E currently anticipates and describes in the testimony of Mr. Voyles. As noted in the testimonies of Messrs. Voyles and Revlett, those plans and their costs could change, perhaps significantly, as engineering progresses and matures for each surface impoundment and as the CCR Rule's application to each surface impoundment's circumstances becomes clearer. LG&E is therefore explicitly requesting CPCN authority at each of Mill Creek and Trimble County to perform all construction necessary to comply with the CCR Rule (and other applicable federal, state, and local requirements) in a lowest reasonable cost manner.

Furthermore, without the proposed process water systems at Mill Creek and Trimble County, LG&E could not operate the coal-fired units at those generating stations. The continued service of these units for LG&E's customers is in the public interest; as Mr. Schram's testimony shows, it is more cost-effective to continue to operate the units (including the cost to construct the proposed process water systems) than to retire the units in 2019 and replace their capacity and energy with purchased power. Moreover, the proposed construction is not wastefully duplicative—to the extent surface impoundments are not available to handle process water, process water systems are necessary to serve that purpose—nor will it unnecessarily encumber the landscape because the facilities will be physically adjacent to existing generating-unit-related facilities on the Mill Creek and Trimble County properties. And there is no facility or other utility with which the proposed construction will compete.

Concerning the remaining CPCN requirements, Mr. Voyles's testimony further provides a full description of the proposed construction projects and their projected capital costs. Mr. Revlett's testimony addresses the necessary environmental permit applications and other requirements. Finally, the Application itself contains the maps required for each requested CPCN.

Q. How does LG&E plan to finance the 2016 Plan projects, including those requiring CPCNs?

A. LG&E expects to finance the costs of the new facilities with a combination of new debt and equity. The mix of debt and equity used to finance the project will be determined so as to allow LG&E to maintain its strong investment-grade credit rating. To the extent that tax-exempt financing may be available for these projects, LG&E anticipates using such opportunities to the extent they are reasonably cost-effective.

<u>ECR Cost Recovery</u>

Q. How does LG&E propose to recover the cost of the pollution control projects in its 2016 Plan?

A. LG&E proposes to recover the cost of the projects in its 2016 Plan through its Rate Schedule ECR filed with this application and proposed to be effective for bills that reflect the expense month July 2016 (i.e., six months after the filing of the application in this proceeding, in accordance with KRS 278.183(2)).

Q. Please explain why it is appropriate for LG&E to recover the costs of its 2016 Plan projects through its ECR mechanism.

A. The relevant part of Kentucky's ECR statute states:

> [A] utility shall be entitled to the current recovery of its costs of complying with the Federal Clean Air Act as amended and those federal, state, or local environmental requirements which apply to coal combustion wastes and by-products from facilities utilized for production of energy from coal in accordance with the utility's compliance plan ….[16]

Project 28 pertains to the Mill Creek coal-fired units' and Trimble County Unit 1's ability to comply with the MATS Rule, which is a rule the EPA promulgated under the Federal Clean Air Act as amended. Furthermore, the Commission has approved ECR recovery of numerous air-compliance-related projects for LG&E.[17] Therefore, it is appropriate for LG&E to recover the cost of Project 28 through LG&E's ECR mechanism.

Also, as discussed above and in Mr. Revlett's testimony, the CCR Rule compliance construction and construction of process water systems LG&E is proposing in its 2016 Plan relate directly to "coal combustion wastes and by-products from facilities utilized for production of energy from coal" and are to be carried out in accordance with applicable environmental requirements. The ongoing groundwater monitoring and other maintenance activities LG&E will continue to conduct at any closed surface impoundments will also be done in accordance with environmental

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[16] KRS 278.183(1).

[17] *See, e.g.*, *In the Matter of: Application of Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity and Approval of Its 2011 Compliance Plan for Recovery by Environmental Surcharge*, Case No. 2011-00162, Order at 16-17 (Dec. 15, 2011).

requirements concerning "coal combustion wastes and by-products from facilities utilized for production of energy from coal," particularly the CCR Rule's requirements concerning any closed surface impoundments at Mill Creek and Trimble County. It is therefore appropriate for LG&E to seek ECR recovery of the costs contained in Projects 29 and 30.

Q. What evidence does LG&E present on the accounting of the cost for the 2016 Plan?

A. Mr. Garrett's testimony explains LG&E's reporting and accounting for the capital costs, removal costs, and O&M expenses associated with the pollution control facilities described in Mr. Voyles's and Mr. Straight's testimonies, and addresses LG&E's accounting for retirements and replacements associated with the 2016 Plan. Mr. Garrett further affirms that the environmental compliance costs LG&E proposes to recover through its surcharge are not already in existing base rates and will be accounted for consistent with prior Commission orders.

Return on Equity

Q. What return on common equity is LG&E currently authorized in its ECR tariff?

A. LG&E is currently authorized to earn a return on equity ("ROE") of 10.00% per the Commission's June 30, 2015 Order in Case No. 2014-00372, LG&E's most recent base-rate case.[18]

Q. What ROE is LG&E requesting in this proceeding?

A. The Company is requesting continuation of the 10.00% ROE. In LG&E's 2014 rate case, all of the parties to the case stipulated that the 10.00% ROE should be used in LG&E's monthly environmental surcharge filings beginning with the July 2015

[18] *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates*, Case No. 2014-00372, Order at 4 (June 30, 2015).

expense month.[19] The Commission's final order in that proceeding accepted the terms of the Stipulation, including the agreed upon 10.00% ROE for environmental surcharge filings.[20] The approved stipulation in the Company's most recent base-rate case has thus eliminated the controversy often associated with this issue. Moreover, it is particularly appropriate to continue with the 10.00% ROE in view of the Commission's recent approval of it in its June 30, 2015 final order in Case No. 2014-00372, as well as the ROE's recent implementation, which began with the expense month including July 1, 2015.[21] Finally, the Commission recently approved continuing to use a 10.00% ROE for ECR purposes in its final order in the Company's most recent two-year ECR review proceeding, which order was effective for the December 2015 expense month.[22]

Q. What revenue allocation is LG&E proposing in this case?

A. LG&E is proposing to continue using the two-step revenue-allocation methodology approved by the Commission in LG&E's 2011 ECR Plan proceeding, Case No. 2011-00162, which methodology LG&E has used in calculating its ECR charges since the Commission's approval in that proceeding.[23] The Commission reviewed this ECR revenue allocation methodology in its two most recent two-year reviews of LG&E's ECR mechanism and approved LG&E's ECR roll-ins based on the methodology.[24]

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[19] *Id.*
[20] *Id.*
[21] *Id.* at Appx. A pg. 4.
[22] *In the Matter of: an Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Louisville Gas and Electric Company for the Two-Year Billing Period Ending April 30, 2015*, Case No. 2015-00222, Order at 6-7 (Dec. 7, 2015).
[23] Case No. 2011-00162, Order at Appx. A pgs. 8-10.
[24] *In the Matter of: An Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Louisville Gas and Electric Company for the Two-Year Billing Period Ending April 30, 2013, Case No. 2013-00243*, Order (Nov. 14, 2013); *In the Matter of: an Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Louisville Gas and Electric Company for the Two-Year Billing Period Ending April 30, 2015*, Case No. 2015-00222, Order (Dec. 7, 2015).

In the most recent two-year review case, the Commission ordered LG&E to continue to use the methodology until the Commission directs LG&E to do otherwise.[25]

<u>Conclusion and Recommendation</u>

Q. What are your conclusion and recommendation to the Commission?

A. I recommend that the Commission grant LG&E its requested CPCNs to conduct CCR Rule compliance construction and construct related process water systems at Mill Creek and Trimble County. I further recommend that the Commission approve LG&E's 2016 Plan and application for cost recovery of its compliance costs through the Rate Schedule ECR tariff, the continuing use of the current 10.00% ROE for ECR purposes, and the use of the revised monthly ECR reporting forms beginning with the expense month of July 2016.

Q. Does this conclude your testimony?

A. Yes, it does.

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[25] *In the Matter of: an Examination by the Public Service Commission of the Environmental Surcharge Mechanism of Louisville Gas and Electric Company for the Two-Year Billing Period Ending April 30, 2015*, Case No. 2015-00222, Order at 5 (Dec. 7, 2015).

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) **SS:**
COUNTY OF JEFFERSON)

The undersigned, **Robert M. Conroy**, being duly sworn, deposes and says that he is Director - Rates for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Robert M. Conroy

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

(SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Robert M. Conroy
Director, Rates
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
Telephone: (502) 627-3324

Previous Positions

Manager, Rates	April 2004 – Feb 2008
Manager, Generation Systems Planning	Feb. 2001 – April 2004
Group Leader, Generation Systems Planning	Feb. 2000 – Feb. 2001
Lead Planning Engineer	Oct. 1999 – Feb. 2000
Consulting System Planning Analyst	April 1996 – Oct. 1999
System Planning Analyst III & IV	Oct. 1992 - April 1996
System Planning Analyst II	Jan. 1991 - Oct. 1992
Electrical Engineer II	Jun. 1990 - Jan. 1991
Electrical Engineer I	Jun. 1987 - Jun. 1990

Professional/Trade Memberships

Registered Professional Engineer in Kentucky, 1995.
Financial Research Institutes Advisory Board
Edison Electric Institute - Rates and Regulatory Affairs Committee
Southeastern Energy Exchange - Rates and Regulation Committee

Education

Essentials of Leadership, London Business School, 2004

Masters of Business Administration

Indiana University (Southeast campus), December 1998

Center for Creative Leadership, Foundations in Leadership program, 1998.

Bachelor of Science in Electrical Engineering;
Rose Hulman Institute of Technology, May 1987

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY FOR CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY AND APPROVAL OF ITS 2016 COMPLIANCE PLAN FOR RECOVERY BY ENVIRONMENTAL SURCHARGE	**))))))**	**CASE NO. 2016-00027**

DIRECT TESTIMONY OF
JOHN N. VOYLES, JR.
VICE PRESIDENT, TRANSMISSION AND GENERATION SERVICES
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is John N. Voyles, Jr. I am the Vice President of Transmission and Generation Services for Louisville Gas and Electric Company ("LG&E"), and I am an employee of LG&E and KU Services Company, which provides services to Kentucky Utilities Company ("KU") and LG&E (collectively "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Please describe your job responsibilities.

A. I have 39 years of experience in the utility industry. In addition to oversight of the Transmission system, my current responsibilities include support of the generating fleet for both Companies with Generation Engineering and System Lab departments. I am also responsible for Project Engineering, the department that oversees large construction projects including generating stations, pollution control equipment, and on-site Coal Combustion Residual (CCR)[1] byproduct storage management facilities. Prior to this assignment, I was the officer responsible for the generating fleet. Earlier in my career, I served as the corporate environmental director.

Q. Have you previously testified before this Commission?

A. Yes. I have previously testified before this Commission in the Companies' 2011 environmental compliance plan proceedings (Case Nos. 2009-00197 and 2011-00161 (KU) and 2009-00198 and 2011-00162 (LG&E)), in Case No. 2014-00002 in which

[1] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.

the Companies obtained a certificate of public convenience and necessity to construct the Brown Solar Facility, as well as recently in Case No. 2015-00194, in which the Commission affirmed its approval of the Companies' landfills to dispose of CCR.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

Exhibit JNV-1	Louisville Gas and Electric Company's 2016 Environmental Compliance Plan
Exhibit JNV-2	CCR Rule – Summary of Scope and Estimate Development
Exhibit JNV-3	Mill Creek CCR Management Facilities Plan
Exhibit JNV-4	Trimble County CCR Management Facilities Plan

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to describe certain of the proposed pollution control projects contained in LG&E's 2016 Environmental Compliance Plan ("2016 Plan"). The 2016 Plan is attached to my testimony as Exhibit JNV-1 and sets forth each new pollution control project for which LG&E is seeking environmental surcharge recovery. These projects are required for LG&E to comply with the federal Clean Air Act as amended ("CAA"), the federal Disposal of Coal Combustion Residuals from Electric Utilities ("CCR Rule"), the federal Mercury and Air Toxics Standards ("MATS Rule"). I will also be supporting LG&E's request for Certificates of Public Convenience and Necessity ("CPCNs") related to the proposed 2016 Plan projects by providing project details, including a description of the proposed projects, the timeframe for construction, and the estimated cost of the projects.

<u>Project Overview and Description</u>

Q. Please provide an overview of the projects in LG&E's 2016 Plan.

A. The three new projects (Projects 28 through 30) contained on Page 1 of Exhibit JNV-1 are required in order for LG&E to comply with the CAA, CCR Rule, MATS Rule, and state regulations applicable to LG&E's power plants and the disposal of CCR. The total capital cost of the new projects in the 2016 Plan is estimated to be approximately $315.9 million. As explained in the testimonies of Robert M. Conroy and Christopher M. Garrett, LG&E is seeking to recover through the ECR mechanism only the portion of the 2016 Plan's cost that is not already being recovered through base rates. Therefore, only the portion of the 2016 Plan's total projected cost that LG&E seeks to recover through the ECR mechanism, $309.1 million, is reflected in Exhibit JNV-1. LG&E is also seeking recovery of operating and maintenance expenses associated with Project 28 as detailed on Page 2 of Exhibit JNV-1.

Q. Please describe LG&E's 2016 Plan as shown in Exhibit JNV-1.

A. The new pollution control projects in LG&E's 2016 Plan are shown in Exhibit JNV-1. Page 1 of Exhibit JNV-1 lists the capital costs associated with LG&E's compliance plan.

- ***Column 1*** assigns a number to the project for identification purposes in sequence with the projects from Case No. 94-332 (1 through 5),[2] Case No. 2000-386 (6),[3] Case No. 2002-00147 (7 through 10),[4] Case No. 2004-00421

[2] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of a Compliance Plan and to Assess a Surcharge Pursuant to KRS 278.183 to Recover Costs of Compliance with Environmental Requirements for Coal Combustion Wastes and By-Products.*
[3] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of an Amended Compliance Plan for Purposes of Recovering the Costs of New and Additional Pollution Control Facilities and Amend Its Environmental Cost Recovery Surcharge Tariff*
[4] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of Its 2002 Compliance Plan for Recovery by Environmental Surcharge*

(11 through 17),[5] Case No. 2006-00208 (18 through 21),[6] Case No. 2009-00198 (22 through 25),[7] and Case No. 2011-00162 (26 through 27).[8]

- ***Column 2*** describes the air pollutant or byproduct to be controlled.
- ***Column 3*** identifies the pollution control facility that LG&E plans to upgrade, construct and/or close to comply with the environmental regulations identified in Column 5.
- ***Column 4*** identifies the specific location of the pollution control facility.
- ***Column 5*** identifies the environmental regulations that require LG&E to act on the associated project.
- ***Column 6*** identifies the environmental permits required for LG&E's projects to satisfy the environmental regulations.
- ***Column 7*** shows the anticipated completion date of the specific project.
- ***Column 8*** displays the estimated capital cost of the project.

Page 2 of Exhibit JNV-1 lists the expected annual incremental operations and maintenance expenses associated with each project.

- ***Column 1*** assigns a number to the project for identification purposes in sequence with the projects from Case No. 94-332 (1 through 5),[9] Case No.

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[5] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of Its 2004 Compliance Plan for Recovery by Environmental Surcharge*

[6] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*

[7] *In the Matter of: Application of Louisville Gas and Electric Company for a Certificate of Public Convenience and Necessity and Approval of Its 2009 Compliance Plan for Recovery by Environmental Surcharge*

[8] *In the Matter of: Application of Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity and Approval of Its 2011 Compliance Plan for Recovery by Environmental Surcharge*

[9] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of a Compliance Plan and to Assess a Surcharge Pursuant to KRS 278.183 to Recover Costs of Compliance with Environmental Requirements for Coal Combustion Wastes and By-Products.*

2000-386 (6),[10] Case No. 2002-00147 (7 through 10),[11] Case No. 2004-00421 (11 through 17),[12] Case No. 2006-00208 (18 through 21),[13] Case No. 2009-00198 (22 through 25),[14] and Case No. 2011-00162 (26 through 27).[15]

- ***Column 2*** describes the air pollutants or byproducts to be controlled.
- ***Column 3*** identifies the pollution control facilities that LG&E plans to upgrade, construct and/or close to comply with the environmental regulations.
- ***Column 4*** identifies the specific location of the pollution control facilities.
- ***Columns 5-13*** identify the incremental annual operation and maintenance costs associated with each project (through 2024).

<u>Changing Federal Environmental Regulations</u>

Q. How significantly has the federal landscape of environmental regulations changed since LG&E obtained approval of its 2011 Plan?

A. Since LG&E obtained approval of its 2011 Plan, the suite of federal environmental regulations the United States Environmental Protection Agency ("EPA") has promulgated that pertain to the generation of electricity from coal has continued to expand. The two federal regulations that necessitate nearly all of the capital costs in

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[10] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of an Amended Compliance Plan for Purposes of Recovering the Costs of New and Additional Pollution Control Facilities and Amend Its Environmental Cost Recovery Surcharge Tariff*

[11] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of Its 2002 Compliance Plan for Recovery by Environmental Surcharge*

[12] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of Its 2004 Compliance Plan for Recovery by Environmental Surcharge*

[13] *In the Matter of: Application of Louisville Gas and Electric Company for Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*

[14] *In the Matter of: Application of Louisville Gas and Electric Company for a Certificate of Public Convenience and Necessity and Approval of Its 2009 Compliance Plan for Recovery by Environmental Surcharge*

[15] *In the Matter of: Application of Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity and Approval of Its 2011 Compliance Plan for Recovery by Environmental Surcharge*

the 2016 Plan, which are the MATS Rule and CCR Rule, did not even exist in final form prior to 2011.

At that time, LG&E obtained approval to perform projects necessary to comply with, among other regulations, the National Ambient Air Quality Standards ("NAAQS"), the Cross State Air Pollution Rule ("CSAPR") and the then-proposed National Emission Standards for Hazardous Air Pollutants ("HAPS Rule"). As explained in the testimony of Gary H. Revlett, the EPA issued a final rule regarding air pollutants in the MATS Rule that contained even more stringent emission limits than in the proposed HAPS Rule.

Relatedly, the final CCR Rule, which provides a comprehensive set of requirements for the disposal of CCR from coal-fired power plants, is likewise more stringent and definitive than its proposed form. Thus, while the projects performed as part of the 2011 Plan were certainly required and remain viable, the newly-finalized regulations necessitate the additional pollution control projects LG&E has proposed in this case.

Q. With respect to the CCR Rule, please describe the status of the Companies' assessment of the structural stability; hydrologic and hydraulic ("H&H") and air effects; groundwater monitoring and assessment; and location requirements discussed in Mr. Revlett's testimony.

A. As described by Mr. Revlett, the CCR Rule establishes new operational standards and requirements for all CCR management facilities related to structural stability; H&H and air effects; groundwater monitoring and assessment; and location criteria, each of which is phased in over the first three years after the effective date of the Rule. The

Companies are in the process of performing the required assessments and have plans to assure that all of the necessary improvements and/or closures of the CCR management facilities are completed within the deadlines set forth in the Rule.

In 2015 the Companies began the process of evaluating the first criteria, structural integrity, for all active surface impoundments to determine if any of the impoundments did not meet the new, more stringent structural Factors of Safety (FOS) specified in the CCR Rule. If conditions are identified that would not meet the specified FOS, the Rule allows corrections to be made within a specified time period. Through the Companies' engineering analyses, the Bottom Ash Pond at the Trimble County Generating Station – although compliant with all previously existing safety standards – was found to require upgrading to meet the new, more stringent FOS criteria. In order to meet the new FOS requirements, an engineered repair was developed for the north and south embankments of the Bottom Ash Pond that consisted of placing a rock buttress along the outboard slope of the embankment. The buttress is a mass of stone (rip-rap) and provides the additional stability needed to exceed the required FOS for slope stability. The rock buttress work commenced in fall 2015 and was completed in mid-December at a total cost of approximately $955,000. As of this time, all of the active CCR surface impoundments at LG&E's generating stations meet or exceed the required FOS in the Rule.

Second, the CCR Rule also requires that all CCR surface impoundments at active generating stations demonstrate sufficient H&H capacities caused by extraordinary rainfall events. In 2015 the Companies began the process of evaluating the H&H capacities of all active surface impoundments to determine if any of the impoundments would need upgraded inflow flood control systems to meet the standards under the CCR Rule. The Companies' analysis determined that one surface impoundment at the Mill Creek Generating Station, the Main Ash Pond, presently cannot operate and maintain the associated design flood inflows for that impoundment. The Companies have contracted with an engineering firm to provide a compliant design. The design will be implemented by fall 2016 to comply with the requirements as set forth in the CCR Rule.

The CCR Rule further requires that all CCR management facilities at active generating stations implement a groundwater monitoring and assessment program. For each CCR management facility, the Companies are required to install a groundwater monitoring system and obtain eight independent samples by October 17, 2017. At this time, the Companies are in the process of selecting engineering firms that will develop the groundwater monitoring plans. Once plans are complete, the Companies will install the groundwater monitoring wells. After the groundwater wells are installed, the eight independent samples will be collected and analyzed, and the results will be statistically evaluated in accordance with the requirements specified in the CCR Rule. The work is scheduled to meet the required dates in the CCR Rule.

Finally, the CCR Rule requires that all CCR management facilities at active generating stations be evaluated for compliance with Location Restrictions by October 17, 2018. The Companies are still in the process of evaluating whether these Location Restrictions affect any of their CCR management facilities. As discussed in Mr. Revlett's testimony, there is a high probability that the groundwater monitoring and assessment requirements could trigger closure obligations for one or more of the surface impoundments on or before the required Location Restrictions deadline. In the event closure is not triggered by other requirements, the Companies will complete the evaluation of the Location Restrictions prior to the October 17, 2018 deadline.

Q. Are there other new regulations the EPA has promulgated that LG&E must consider as a part of evaluating this 2016 Plan?

A. Yes, the EPA has very recently finalized both the Clean Power Plan ("CPP") and Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category ("ELG"). The CPP, which the EPA announced in August 2015, contains the first-ever national standards that address carbon dioxide emissions from both new and existing power plants. The ELG, which was published in final form in November 2015, regulates process wastewater discharges from power plants operating as utilities.

Q. Have the Companies determined what changes, if any, to its generation fleet will be necessary to comply with the CPP and ELG?

A At this time determinations regarding changes to the Companies' generating fleet for compliance with the CPP and ELG are premature. With respect to the CPP, the Companies cannot complete an assessment of a possible compliance plan until the Commonwealth of Kentucky determines how it will proceed with its state plan as described by Mr. Revlett. Important as well for the CPP will be the outcome of the multiple legal challenges that have been filed by industry groups, coal companies, utilities, and twenty-seven states—including Kentucky. In late December 2015 numerous parties—including the Companies and Commonwealth of Kentucky—petitioned the EPA for reconsideration of the CPP.

As for the impact of the ELG regulations, the Companies are evaluating the new guidelines for discharge limitations as they pertain to the Companies' generating fleet process wastewater streams. Further engineering must be completed to evaluate the generating fleet wastewater streams to ensure the compliance alternatives identified are determined to be the lowest reasonable cost compliance plan.

While the Companies are not proposing projects in the 2016 Plan to comply with the CPP or ELG, certain of the emission reductions and changes to the effluent discharges of process waters achieved by the proposed Projects may ultimately help the Companies comply with these new rules. In evaluating the Projects proposed in this case, the Companies looked to optimize their 2016 Plan by finding economical means of complying with the CCR Rule and MATS Rule in a manner consistent with the CPP and ELG.

Q. Is it fair to characterize this as another period of rapid change with regard to the environmental and air pollutant regulations with which the Companies must comply?

A. Yes. The scope and number of federal regulations that apply to the Companies is vastly different than a mere decade ago. Today's regulations are much more intertwined and complex, which impacts compliance planning. Further complicating matters is that several of the regulations provide the Companies with a very short window of time by which to comply, or risk the shutdown of entire generating *stations*—not just individual generating units. The more recently finalized regulations

(CPP and ELG) have compliance deadlines that occur in six or seven years and specific actions have yet to be defined by the state of Kentucky. Consequently, the Companies are forced to nimbly address a suite of new rules in the face of legal and operational uncertainties. Compressed compliance deadlines, especially with regard to the CCR Rule, require the Companies to act now. The Companies have developed, through conceptual engineering, a plan to comply with these federal regulations within a timeframe that avoids jeopardizing the economic dispatch of the Companies' generating fleet.

Q. How do the types of Projects proposed in this case to comply with the CCR Rule (and related state regulations) differ from Projects in prior cases?

A. Compliance with the CCR regulations or related state regulations apply to all CCR management facilities at both operating and retired generating stations. Hence, the principal difference is that the vast majority of proposed capital investments in the 2016 Plan does not depend on the ongoing generating operations at the affected units, but are necessary regardless of whether the stations produce another kWh. For example, LG&E expects it will have to close a number of its past and current CCR management facilities that currently store CCR because of the requirements in the federal or state rules. These rules for CCR management facilities must be complied with irrespective of the continued operation of the generating units that produced the CCR.

Q. Given the fluidity of the regulations with which the Companies must comply, how are the Companies determining whether the proposed Projects are

economical as compared not only to other alternatives, but also as to retiring the affected units and stations?

A. For the Projects LG&E has proposed that support ongoing operations, such as at Mill Creek, the Company's present value revenue requirement analyses evaluate whether the project is economical for the station's continued operation from 2019 through 2021. If the Companies determine that complying with the CPP and ELG is more costly than retiring coal units and replacing the capacity, they can likely operate the units through 2021 without incurring any CPP and ELG compliance costs. These analyses, which are set forth in the testimony of Charles R. Schram, show that the Projects in the 2016 Plan are the lowest reasonable cost alternatives, even if the units cease to operate past 2021.

At Trimble County, in addition to the investments required for the 2016 Plan projects, the Companies are already proceeding with spending $277 million from 2016 through 2021 for Phase I of the landfill and CCR treatment and transport facility ("CCRT"). While the relative benefits from these significant long-term investments will greatly exceed their cost, the point at which their benefits exceed their cost will occur after 2021. As a result, the Companies evaluated the Trimble County Projects over the Companies' standard 30-year analysis period with high-level estimates for CPP and ELG compliance costs.

LG&E Compliance Projects

Q. How did LG&E determine what to include in its compliance projects?

A. The proposed Projects are the result of an intensive assessment and ongoing engineering effort by the Companies' Project Engineering group and outside engineering firms (most notably CH2M[16] with respect to the CCR Rule-related investments). Through the Companies' and outside firms' work, the Companies developed order-of-magnitude estimates regarding the compliance expenditures that would be required for each generating unit to meet the regulatory requirements.

Once that was accomplished, the Companies' Generation Planning group performed analyses to determine if all of the compliance equipment and investments would be the lowest reasonable cost alternatives to achieve compliance with the applicable regulations. Generation Planning also determined for each generating unit whether it would be more cost-effective to put in place the suite of compliance facilities established or to retire the unit. (Mr. Schram's testimony and its attachments contain the full details of that analysis). The 2016 Plan is in fact a cost-effective means for LG&E to comply with the applicable regulations.

<u>Project 28: Mercury Injection Control Systems</u>

Q. Does R. Scott Straight support the need for Project 28 in the 2016 Plan?

A. Yes. Mr. Straight describes the need for Project 28, which consists of installing supplemental injection systems on the Mill Creek units and Trimble County Unit 1 in order to further reduce mercury emissions.

<u>Projects 29 and 30: CCR Rule Compliance Construction and Construction of New Process Water Systems</u>

Q. Please provide an overview of Projects 29 and 30.

A. These Projects involve the closure of surface impoundments containing CCR and the construction of process water systems at the Mill Creek and Trimble County stations in order to assure compliance with the CCR Rule while supporting continued

[16] CH2M was known as "CH2M Hill" during a portion of the time the firm was performing engineering work for the Companies.

operation of the generating units at the stations. As Mr. Revlett explains, the CCR Rule requires that surface impoundments containing CCR close if the surface impoundment does not comply with the applicable structural and location requirements set forth in the Rule. In addition, any surface impoundment must close if it is determined to cause a statistical increase in CCR constituents in the groundwater above applicable groundwater protection standards. Therefore, in order to assure compliance with the CCR Rule's restrictions regarding surface impoundments while supporting continued operation of the generating units at the stations, LG&E is proposing in Projects 29 and 30 to close five surface impoundments at Mill Creek and two surface impoundments at Trimble County by 2023. Exhibits JNV-3 and JNV-4 are the CCR management facilities conceptual plans for the Mill Creek and Trimble County generating stations, respectively. The CCR management facilities plans for these stations are comprised of the evaluation performed by CH2M, as supplemented by JNV-2, which is the Companies' description and explanation of modifications to the scope and estimates that have occurred subsequent to CH2M's development of the station evaluations.

Q. How do the Companies plan to close the surface impoundments?

A. As explained in Mr. Revlett's testimony, the CCR Rule requires that CCR surface impoundments that do not meet the new structural, groundwater, and location requirements must close as set forth in the Rule. The utility must decide how to proceed based on a number of options. These options include closing the surface impoundment by capping it, or "clean closing" it by removing the CCR from the impoundment. Other options include relining and repurposing the impoundment.

In developing the closure plans for each generating station, the Companies are balancing several challenging factors: compressed compliance deadlines that risk the shutdown of entire stations; optimizing existing properties at each station; sequencing closures to support ongoing operations; and assessing how the closures of each surface impoundment can be performed in a manner that is the lowest reasonable cost option that meets the stringent requirements of the Rule aimed at minimizing environmental impacts. While these analyses continue to be refined as more detailed engineering work proceeds, the Companies have developed the closure plans and corresponding cost estimates presented in their applications that, except for a few impoundments, will involve leaving the CCR in place and installing a cap that meets the requirements of the CCR Rule. To the extent feasible and consistent with the CCR Rule, LG&E will beneficially use CCR to reduce the need for and cost of using virgin fill material to achieve proper grades prior to capping surface impoundments. One source of such fill material will be surface impoundments that LG&E plans to clean close.

As with the specific sequencing of when each closure will occur, the Companies will continue to evaluate whether capping and closing in this method is the lowest reasonable cost alternative of the three options under the CCR Rule for each surface impoundment in the context of the costs and benefits of each generating station and consistent with the CCR Rule's requirements. As engineering proceeds and matures for each proposed closure and the assessments of the CCR Rule's criterion for each surface impoundment's circumstances becomes clearer, the closure approach and costs for a given surface impoundment could change, perhaps significantly, especially if larger quantities of virgin fill materials become necessary for closure.

Q. Have the surface impoundments at Mill Creek and Trimble County triggered closure processes under the CCR Rule?

A. At this time, no surface impoundments have been determined to trigger mandatory closure under the structural, groundwater, or location requirements in the CCR Rule. As explained above, the CCR Rule requires the Companies to assess each surface impoundment by, among other things, placing groundwater monitoring wells around each surface impoundment and gathering samples over a period of time to determine if the groundwater contains CCR in an amount that is outside the allowable limits. At some of the Companies' generating facilities, there are multiple, adjacent surface impoundments. If the groundwater samples contain CCR constituents above the applicable limits, it may be difficult to determine which specific impoundment would trigger the closure process. While the two most recent CCR surface impoundments installed by the Companies were constructed with lining systems (Trimble County Gypsum Storage Pond and KU's Brown Auxiliary Ash Pond), if samples show CCR constituents above the applicable limits, it may not be possible to definitively determine which impoundment is the specific source, and closure of these lined surface impoundments ensures compliance with the CCR Rule. As the CCR Rule became effective in October 2015, the Companies' evaluation of all unlined and lined surface impoundments is ongoing.

Q. If the Companies' evaluation is ongoing, why is LG&E seeking approval to close surface impoundments at this time?

A. One of the most challenging aspects of the CCR Rule is that once a surface impoundment is deemed to have triggered the closure process under the Rule, the utility has a mere six months to cease placing CCR wastestreams in that impoundment and initiate the closure process. This compressed timeframe by which to begin closure has required the Companies to assess which impoundments, once the groundwater monitoring and data analysis required by the CCR Rule is complete, are likely to require closure based on information that is otherwise available. As explained in the testimony of Mr. Revlett, the information currently available indicates that the assessments required by the CCR Rule over the next several years are likely to trigger closure of the surface impoundments.

If not for the requirement to cease placement of CCR wastestreams into an existing surface impoundment within six months of a triggering event, the Companies would have preferred to wait to begin closure activities and construction of the process water systems until their analyses were complete. The timetable in the CCR Rule, however, simply does not permit the Companies to wait to make these determinations. As such, LG&E is proposing to close surface impoundments that, based on the Companies' judgment and experience, are reasonably anticipated to require closure under the CCR Rule. It is important to consider that these CCR Rule-related Projects differ from the usual projects in LG&E's Plans. The closures are not merely a means to comply with emission limits or discharge standards. The CCR Rule, if the trigger LG&E anticipates will occur is indeed met, *mandates* closure of the impoundments. LG&E believes, in consideration of the short timelines between triggering closure and cessation of placement of CCR wastestreams in an impoundment required to close, it is prudent to manage the process by determining economical means to effectuate the closures while supporting the ongoing generation at the stations, which will include the continued disposal of CCR.

Q. What is involved in the closure process that necessitates more than six months to initiate closure?

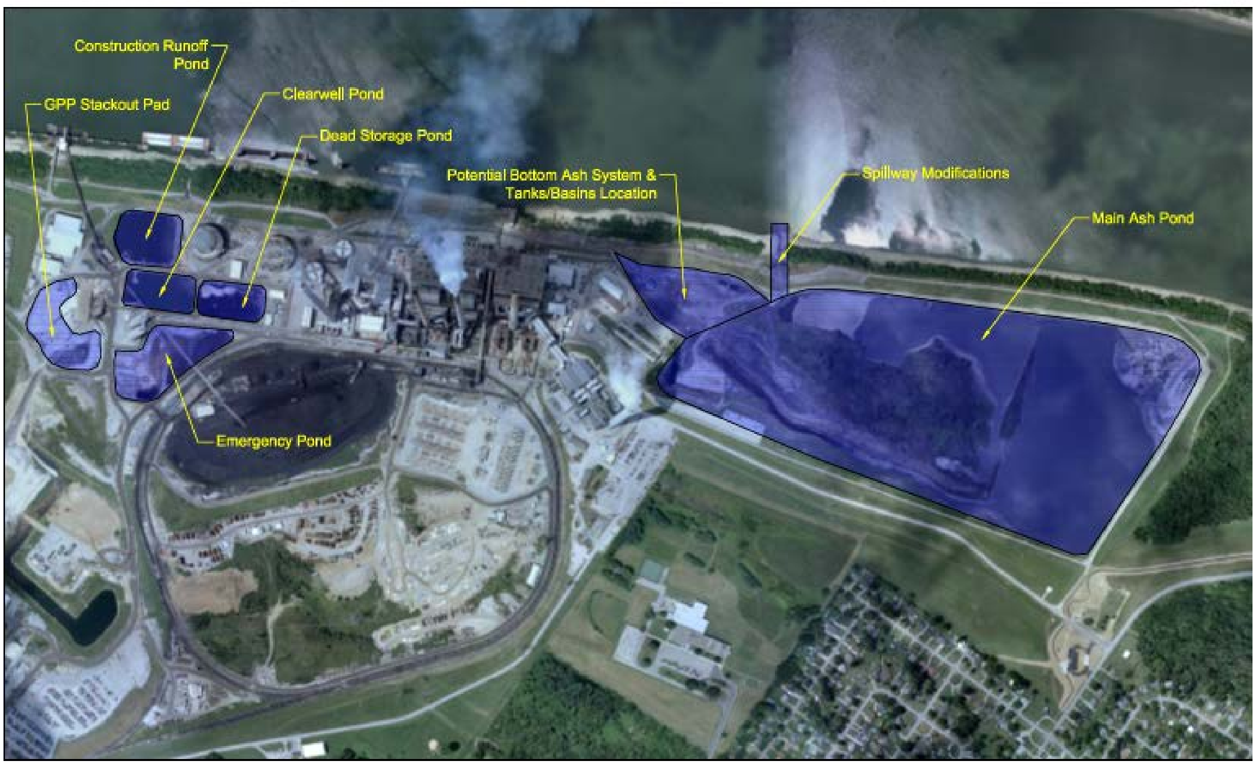
A. The Mill Creek and Trimble County stations are important components of LG&E's generating fleet. LG&E has had to develop conceptual engineering plans that allow for the closure of the surface impoundments that are likely to trigger closure under the CCR Rule in a manner that accommodates the continuing day-to-day operations of these stations, including continued disposal of CCR. Sequencing the closures in a manner that does not interfere with generating operations at each station is complex, and the precise order in which the closure activities will occur will depend on further engineering and operational analyses that are ongoing.

One of the most complex issues the Companies must address in closing the surface impoundments is how to handle the process water from ongoing operations in a manner that does not impede the closure processes or continued operation of the generating station. In order to manage this process, continue compliance with existing water discharge permits, and start the closure, LG&E will need to construct process water systems. LG&E will construct these systems, which will consist of elevated tanks, concrete basins, or a combination of both, to process the water involved in the closures and ongoing operations. The process water systems will be constructed on existing station property and will be sequenced appropriately to minimize costs and support future needs from the impact of other environmental rules and regulations.

The 2016 Plan also considers the impact of recently-enacted federal rules with which the Companies must comply; principally, the effects of ELG. As explained in the testimony of Mr. Revlett, utilities are required to begin complying with ELG as soon as possible beginning in 2018. Although there are no costs associated with complying with ELG in the 2016 Plan, consideration of these guidelines in designing the process water systems allows LG&E to optimize the closure process by increasing efficiencies in the interrelatedness of the CCR Rule and ELG, where possible. As explained in Mr. Revlett's testimony, the EPA has spoken directly to the interaction between the CCR Rule and ELG and encouraged utilities to make appropriate business decisions to meet both sets of requirements.

Q. Please explain what surface impoundments LG&E is proposing to close at Mill Creek in Project 29.

A. In Project 29, LG&E is proposing to close five surface impoundments at Mill Creek by 2021, as well as construct process water systems (sequenced appropriately as described above) as part of the Project. Specifically, LG&E plans to close the Dead Storage Pond, Clearwell Pond, Emergency Pond, Construction Runoff Pond, and the Main Ash Pond, which is the largest surface impoundment at the station. As a part of the closure of the Main Ash Pond, Project 29 includes costs for construction of a bottom ash dewatering system. The dewatering system aligns with the CCR Rule to minimize the water utilized to transport the bottom ash and facilitates dry handling for beneficial use in closing the Main Ash Pond and placement in existing special waste landfill. In addition to closing these five impoundments, LG&E is retrofitting the stackout pad at the Gypsum Processing Plant to assure compliance with the CCR Rule requirements affecting CCR piles. The CCR Rule applies to the stackout pad because it is considered a CCR pile as CCR is stored on the ground, albeit temporarily. Attached to my testimony as JNV-3 is the Mill Creek CCR Management Facilities Plan. The picture below represents the surface impoundments, in blue, that will be closed by 2021 as part of Project 29. The picture also notes possible locations of process water systems, as well.



Q. Is Project 29 economical?

A. Yes. The expected cost of the Project is $196.9 million. As discussed in the testimony of Mr. Schram, LG&E evaluated the costs of the process water systems along with the costs of the other projects in the 2016 Plan for Mill Creek (Project 28). Even if the Mill Creek units are assumed to cease operation after 2021, the proposed projects are least-cost. The CCR management facility closure projects are required regardless of whether the Mill Creek units continue to operate past 2021.

Q. Is LG&E requesting a CPCN for Project 29?

A. Yes. This is discussed in the testimony of Mr. Conroy.

Q. Please explain what surface impoundments LG&E is proposing to close at Trimble County in Project 30.

A. In Project 30, LG&E is proposing to close two surface impoundments—the Bottom Ash Pond and Gypsum Storage Pond—at Trimble County by 2023. LG&E plans to cap and close the surface impoundments, as well as construct process water systems (sequenced appropriately as described above) as part of the Project. Attached to my testimony as Exhibit JNV-4 is the Trimble County Pond Closure Plan. The picture below represents the surface impoundments, in blue, that will be closed by 2023 as part of Project 30, along with proposed locations of process water systems.

Q. Is Project 30 economical?

A. Yes. The expected cost of Project 30 is $114.1 million. As discussed in the testimony of Mr. Schram, the Companies evaluated the costs of the process water systems in LG&E Project 30 and KU Project 41 along with the costs of the other projects in the 2016 Plan for Trimble County (Project 28). Continuing to operate the Trimble County coal units with the proposed projects is least-cost. The CCR management facility closure projects at Trimble County are required regardless of whether the Trimble County coal units continue to operate.

Q. Is LG&E requesting a CPCN for Project 30?

A. Yes. This is discussed in the testimony of Mr. Conroy.

Q. Is LG&E closing CCR management facilities at Cane Run? If so, why are the closures not included in the 2016 Plan?

A. Yes. The need for additional CCR storage capacity at Cane Run was identified in 2007 to allow the existing coal-fired units to remain in operation as the existing landfill and Ash Pond were nearing their capacity. LG&E completed studies of potential options for additional CCR management facilities; and in late 2009 LG&E submitted a landfill permit to KDWM. Subsequent to that submittal, the EPA promulgated the HAPS Rule (finalized later as the MATS Rule), and the Companies made the decision to retire the coal-fired units and construct the Cane Run 7 natural gas combined cycle unit.

In 2012, LG&E began designing closure plans for the CCR management facilities at the Cane Run station and requested permits from the KDWM. In January 2013, KDWM issued a permit for the beneficial reuse of CCR in the closure of the Ash Pond. In early 2013, LG&E proceeded under the permit to begin the Ash Pond closure, using CCR materials being produced during the remaining operating time of the Cane Run coal units prior to their retirement in 2015, to form contours for closure. In 2015, LG&E completed the engineering for the design of the final cap and closure of the Ash Pond. Construction of the cap and closure will occur in 2016. Mr. Garrett's testimony describes the accounting treatment of these closure costs.

Q. What is your recommendation to the Commission?

A. My recommendation is that the Commission approve the projects in the 2016 Plan for recovery by environmental surcharge. I further recommend that the Commission grant LG&E the CPCNs it has requested.

Q. Does this conclude your testimony?

A. Yes it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **John N. Voyles, Jr.**, being duly sworn, deposes and says that he is Vice President, Transmission and Generation Services for Kentucky Utilities Company and Louisville Gas and Electric Company and an employee of LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

John N. Voyles, Jr.

John N. Voyles, Jr.

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

John N. Voyles, Jr.

Vice President, Transmission and Generation Services
Louisville Gas and Electric Company and Kentucky Utilities Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-4762

Education

Rose-Hulman Institute of Technology, B.S. in Mechanical Engineering - 1976

Previous Positions

LG&E Energy, LLC
October 2010 - Present --Vice President, Transmission and Generation Services

E.ON U.S. LLC
June 2008 – October 2010 --Vice President, Transmission and Generation Services
2003 - 2008 -Vice President, Regulated Generation

LG&E Energy Corp.
February - May 2003 -- Director, Generation Services

Louisville Gas and Electric Company
1998 - 2003 -- General Manager, Cane Run, Ohio Falls and Combustion Turbines
1996 -1998 -- General Manager, Jefferson County Operations
1991 - 1995 -- Director, Environmental Excellence
1989 - 1991 -- Division Manager, Power Production, Mill Creek
1984 - 1989 -- Assistant Plant Manager, Mill Creek
1982 - 1984 -- Technical and Administrative Manager, Mill Creek
1976 - 1982 -- Mechanical Engineer

Professional Development

Emory Business School -- Management Development Program
Center for Creative Leadership (La Jolla, CA)
University of Louisville -The Effective Executive
Harvard Business School - Finance for the Non-Financial Manager
MIT - Leading Innovation & Growth: Managing the International Energy Co.

Board/Committee Memberships

Fund for the Arts - Board Member
Ohio Valley Electric Co. (OVEC) - Board member and Executive Committee member
Electric Energy, Inc. - Board member

Edison Electric Institute (EEI) - Committee member Energy Supply Executive Advisory Committee and the Environment Executive Advisory Committee
Electric Power Research Institute (EPRI) - Chairman, Research Advisory Committee

LOUISVILLE GAS AND ELECTRIC COMPANY
2016 ENVIRONMENTAL COMPLIANCE PLAN (Case No. 2016-00027)

Project	Air Pollutant or Waste/By-Product To Be Controlled	Control Facility	Generating Station	Environmental Regulation*	Environmental Permit*	Actual or Scheduled Completion	Actual (A) or Estimated (E) Projected Capital Cost ($Million)
28	Mercury (Hg)	Supplemental Mercury Related Control Technologies	Mill Creek Units 1/2	Clean Air Act (1990) and MATS	Louisville Metropolitan Air Pollution Control District and Ky Division for Air Quality Title V Permits	2016	$2.6 (E)
			Mill Creek Unit 3			2016	$0.9 (E)
			Mill Creek Unit 4			2016	$0.9 (E)
			Trimble County Unit 1			2016	$0.6 (E)
29	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Mill Creek Station	EPA CCR Rule	Division of Waste Management - Landfill Permit Division of Water - KPDES Permit	2020	$193.7 (E)
30	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Construction and Construction of New Process Water Systems	Trimble County Station (See Note 1)			2023	$110.4 (E)
							$309.1

* Sponsored by Witness Revlett

Note 1: KU and LG&E's costs split 48% / 52% respectively
Note 2: CCP now known as CCR; HAPS now known as MATS; CATR now known as CSAPR

LOUISVILLE GAS AND ELECTRIC COMPANY
2016 ENVIRONMENTAL COMPLIANCE PLAN (Case No. 2016-00027)

Project	Air Pollutant or Waste/By-Product To Be Controlled	Control Facility	Generating Station	Estimated Annual Operations and Maintenance Costs (Through 2024)								
				2016	2017	2018	2019	2020	2021	2022	2023	2024
28	Mercury (Hg)	Supplemental Mercury Related Control Technologies (See Note 1)	Mill Creek Units 1/2	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Mill Creek Unit 3	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Mill Creek Unit 4	$0	$0	$0	$0	$0	$0	$0	$0	$0
			Trimble County Unit 1	$0	$0	$0	$0	$0	$0	$0	$0	$0
29	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Constuction and Construction of New Process Water Systems	Mill Creek Station	$0	$0	$0	$0	$0	$0	$0	$0	$0
30	Fly & Bottom Ash, Gypsum	CCR Rule Compliance Constuction and Construction of New Process Water Systems	Trimble County Station (See Note 2)	$0	$0	$0	$0	$0	$0	$0	$0	$0

Note 1: The $0 O&M costs shown on Project 28 represent LG&E's expectation that the cost of the proposed additives will balance or partially offset costs currently being recovered through the O&M shown in LG&E’s monthly ECR reports for Projects 26 and 27 (approved as part of LG&E’s 2011 Plan)

Note 2: KU and LG&E's costs split 48% / 52% respectively.

Project Engineering – LG&E and KU

CCR Rule – Summary of Scope & Estimate Development

Comparison of CH2M September 2015 Reports vs. 2016 ECR Filing

This document summarizes the comparison of the LG&E and KU (collectively, the "Companies") CCR Rule Compliance Construction and Construction of New Process Water Systems projects included in the January 2016 Environmental Cost Recovery ("2016 ECR") filing to the CH2M Reports. Table 1 below summarizes the cost differences between the CH2M reports and the 2016 ECR filing.

Station	**CH2M Report**	**2016 ECR**
E.W. Brown	$ 101,307,000	$ 101,307,000
Ghent	$ 365,482,000	$ 364,177,000
Green River	$ 56,829,000	$ 56,829,000
Mill Creek	$ 189,945,000	$ 196,941,000
Pineville	$ 8,029,000	$ 8,009,000
Trimble County	$ 291,022,000	$ 292,511,000
Tyrone	$ 13,141,000	$ 13,103,000

Table 1 –Comparison of CH2M Reports and 2016 ECR Filing

The basis of the Companies' compliance plan initiated with the engineering conceptual work performed in concert with CH2M, which is an outside engineering firm, throughout 2015. This initial conceptual engineering was finalized in station specific reports issued by CH2M in September of 2015. After the CH2M reports were issued, Project Engineering continued to perform additional analyses of the scope, schedule and cost to align with a refined sequencing of surface impoundment closures and potential selection of the locations for the new water process systems at each station. This ongoing engineering and planning was incorporated into the 2016 ECR filing.

CH2M Reports

Through most of 2015, the Companies worked with CH2M to review each specific surface impoundment that would need to be evaluated for closure. A conceptual closure profile was developed for each surface impoundment with calculations of estimated quantities of material required to fill the impoundment, construct the closure profile and for cover soils to meet the CCR Rule closure requirements. Included in these estimates were the conceptual cost estimates to engineer and construct new process water systems at each plant to manage the CCR transport waters prior to discharge. These new process water systems are required prior to closing the surface impoundments to support the ongoing operation of the stations' process waters. The operation of these new process water systems then allow the surface impoundments to be removed from the stations' process water streams, allowing the de-watering of the surface impoundments prior to the completion of the closure activities.

The September CH2M reports include an executive summary, conceptual closure narrative, estimate of material volumes and areas, implementation schedules, conceptual layout drawings, and the cost estimate spreadsheets for each impoundment at each station.

2016 ECR

Since finalizing the CH2M reports in September 2015, the Companies continued refining the closure plans for each station. This refinement included continued reviews of the sequencing of surface impoundment closures at each station to ensure impacts to each station's operations were minimized. Additional minor scopes were identified that would be required to support the surface impoundment closure plans and to bring some stations into compliance with the CCR Rule. Examples of these minor scope additions was the need to engineer and construct a new ash treatment basin ("ATB") spillway (with dike modifications) along with a new gypsum stack out pad at Mill Creek. Work continued with developing these emergent items and understanding their costs and schedule impacts. Additionally, further review of the CH2M conceptual plans resulted in sequencing changes needed to meet construction and regulatory deadlines while minimizing operations impacts. These additions and modifications were incorporated into the Companies' 2016 ECR plan. A more detailed explanation of these additions to the CCR Rule Compliance Construction and Construction of New Process Water Systems are discussed below.

E.W. Brown

New construction costs for process water tanks/basins in the CH2M report were shifted from 2016 into 2017, with the exception of $500K for engineering activities. Construction is now planned for the new process water systems over a two year period (2017-2018). Moving construction out of 2016 allows continued analysis of the impacts of the Clean Power Plan and Effluent Limitation Guidelines regulations on E.W. Brown, while still meeting the required in service date of early 2019 to support the CCR Rule surface impoundment closure requirements. The shifting of construction dollars out of 2016 resulted in escalation. However, the estimated escalation from the shift was considered minor after reviewing the E.W. Brown estimate, therefore, no additional monies were deemed necessary. Table 1 shows that the cost estimates for E.W. Brown are the same for the CH2M report and the 2016 ECR plan.

Ghent

The first change in the estimated costs at Ghent resulted from determining that the timing for groundwater monitoring for ATB #1 in the CH2M report was incorrect. Groundwater monitoring is required to start in 2016 and continue through 2017 to meet regulatory deadlines. Along with the timing of groundwater monitoring, it was determined that the timing of spend for closure activities of Ghent's surface impoundments was too short. The CH2M report was based on closure activities beginning in 2020 and extending through 2021. Based on Project Engineering's review of the necessary construction period for Ghent, changes were incorporated to start closure activities in 2019 and continue through 2022. The cost differences in the Ghent values in Table 1 are solely attributed to the adjustment in the timing of when spending will occur.

Mill Creek

After receipt of the finalized CH2M report, it was determined that for Mill Creek to remain in compliance with the CCR Rule requirements a new gypsum stack out pad was required to provide the hardscaping required for groundwater protection. The existing gypsum stack out pad was deemed to be deficient in coverage area, as well as the condition of the pad was not adequate to ensure minimal CCR leachate conveyance through the pad into the soil. The 2016 ECR plan for Mill Creek was increased by $3.5M for the construction of a new gypsum stack-out pad. Another scope identified post CH2M report was the need to construct a modified ATB spillway with a larger capability to meet the CCR Rule Hydrologic and Hydraulic requirements. $1.5M was added to the CH2M report values to account for this new scope with the remainder of the cost being consumed through the estimate contingency. Both of these scopes were identified through the Companies' continued review of the new CCR Rule requirements. In addition to the $5.0M added, adjustments to the sequencing surface impoundment closures resulted in approximately $2.0M for escalation.

Trimble County

The Bottom Ash Pond (BAP) required two adjustments to the CH2M report which are reflected in the 2016 ECR plan. The BAP Rock Buttress Project was added to the CH2M report at a cost of approximately $955K to account for scope required to meet the CCR Rule for dike stability that is more stringent in the CCR Rule than current State requirements. Much like the projects at Mill Creek, the Rock Buttress Project was an unplanned project that emerged out of analysis performed on the dikes of the BAP. The project began in October 2015 and was completed in December of 2015. Additionally, in order to comply with the new CCR Rule, the timing of spend for groundwater monitoring at the BAP was adjusted to occur in 2016 through 2017 similar to the adjustments made to the Ghent project. The Gypsum Storage Pond cost was slightly modified to include timing adjustments to the pre-closure/preparation scope. Dollars were shifted from the CH2M report timeline of 2016 through 2018 to 2017 through 2019.

Pineville and Tyrone

The timing of engineering spend was brought forward into 2016 from 2017, and construction quality assurance services were delayed a year, from 2017 to 2018. The Companies deemed it beneficial to begin engineering work at Pineville and Tyrone stations in concert with the active stations to take advantage of lessons learned and economies of scale. Additionally, the timing of several activities for Tyrone in the CH2M report were adjusted to correct a clerical error in the CH2M report.

Green River

No changes have been made to the Green River plan.

TECHNICAL MEMORANDUM

Coal Combustion Residual Pond Closure Evaluation: Mill Creek Generating Station

PREPARED FOR: Louisville Gas & Electric Company and Kentucky Utilities Company

PREPARED BY: CH2M HILL Engineers

DATE: September 29, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL Engineers (CH2M) with performing coal combustion residuals (CCR) evaluations for eight sites to develop conceptual CCR ash pond closure approaches and cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E.W. Brown, Cane Run, Green River, Tyrone, and Pineville.

This technical memorandum applies to Mill Creek Generating Station. The following scope activities were completed:

- Reviewed LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015).
- Developed a CCR pond closure approach that considers regulatory, civil, geotechnical, and stormwater aspects as it relates to CCR and ash ponds and associated cost estimates for the site. Discussion of the conceptual CCR pond closure approach is included in Section 2, and drawings are contained in Attachment 1.
- The Ash Treatment Basin (ATB), Construction Pond, Clearwell Pond, Emergency Pond, and Dead Storage Pond were identified as the applicable CCR units for Mill Creek. Other CCR units that may be affected by the CCR regulations at the site but that were not evaluated further include the Charah Gypsum Beneficial Reuse Facility, Gypsum Stockpile Area (80,000 tons), CCR Landfill, Fly Ash Silo and Loadout areas, Retired CCR Landfill, and Former Poz-O-Tec Fill Area.
- Construct new concrete process tanks (four) for management of wastewater that can no longer be managed in the ponds that will be closed; construct dewatering facility for removing water from solids.
- The estimated cost for closing the ponds is summarized in Table 1-1. Detailed cost information is included in Attachment 2.

Table 1-1. Mill Creek Proposed Conceptual Cost Estimate

Proposed Conceptual CCR Pond Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
ATB	$26.1 M	$37.3 M	$48.4 M
Clearwell Pond	$3.5 M	$5.0 M	$6.5 M
Emergency Pond	$3.5 M	$5.0 M	$6.5 M
Dead Storage Pond	$4.2 M	$6.0 M	$7.8 M
Construction Runoff Pond	$4.6 M	$6.5 M	$8.5 M

Table 1-1. Mill Creek Proposed Conceptual Cost Estimate

Proposed Conceptual CCR Pond Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
Concrete Process Tanks	$78.1 M	$111.6 M	145.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX and OPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Pond Closure Approach

2.1 Development of Proposed Conceptual CCR Pond Closure Approach

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The Mill Creek Generating Station is an operating facility with CCR wastewater generated and discharged to the ponds. The following defines the considered approach for closure for each of the five ponds. Additional assumptions are summarized in Section 2.2.

ATB

- Expected CCR material discharges to ATB are summarized in Table 2-1. Material accumulation in ATB will continue until the future production airspace capacity of ATB is maximized in 2015 (see Table 3-1).
- Surface water within ATB will be removed before closure begins, as needed, to allow surface improvement and dry material placement in ATB. Other potential subgrade improvements are described under the assumptions below.
- CCR materials and subliner soils from the Clearwell Pond, Emergency Pond, Dead Storage Pond, and Construction Runoff Pond will be disposed within ATB (see Table 3-2A).
- The station will construct new concrete process tanks in a location to be determined by LG&E-KU plant personnel. There will be four concrete tanks covering approximately 8.0 acres at a depth of 24-feet (two tanks 660-feet x 165-feet and two tanks 660-feet x 100-feet). Also within this vicinity of

the concrete tanks, will be a dewatering system facility to remove water from solids. Includes cost for design and engineering along with mechanical improvements and/or additions.

- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade and will include the components described in the design assumptions below. Conceptual grades are shown in Drawing 2. Significant grading features include the following:
  - Incorporate two 10-acre flat areas (for material storage and future wastewater treatment plant [WWTP]) with a 2 percent slope.
  - A perimeter drainage ditch is shown within the dike. The ditch shows a high point near the northeastern corner, dropping at approximately 0.5 percent to the south and northwest around ATB. Two discharge penetrations are shown through the dike at the southern end of ATB.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 3 feet above the ditch invert. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Drawing 2 has a net airspace capacity of approximately 662,823 cubic yards above the existing CCR surface grade.

Clearwell, Emergency, Dead Storage, and Construction Runoff Ponds

- The CCR will be excavated from the ponds starting in 2017 to allow completion before the end of 2017. One foot of subsoils below the CRR also will be removed. The material will be transported for disposal in ATB (see Table 3-2A).
- Surface water present in the Clearwell, Emergency, Dead Storage, and Construction Runoff Ponds will be removed in parallel with CCR removal.
- The Clearwell, Emergency and Dead Storage ponds will be reinstated as a process water pond (for non-CCR materials) after being lined with a flexible membrane liner (FML). The Construction Runoff Pond will be backfilled with clean material and clean closed.
- The ponds will be completed sequentially, with each pond being completed as a process water pond before the next pond is taken offline. The order of ponds is Dead Storage Pond, Clearwell Pond, Emergency Pond, and Construction Runoff Pond.

Regulatory Strategy

- Compliance with the Final CCR Rule.
- Closure activities will be permitted by the Kentucky Department of Environmental Protection (KYDEP) under the Final CCR Rule.

The amount of CCR required to fill the ATB ponds and removed from the remaining ponds was developed using computer aided engineering (CAE) software in AutoCAD using drawings provided by LG&E-KU. The proposed conceptual pond closure approach drawings are provided in Attachment 1.

2.2 Design Assumptions

This section discusses the design assumptions associated with the conceptual design.

Ash Treatment Basin

The general design assumptions used for the conceptual alternative (ATB) is as derived from the LG&E-KU drawing discussed above and are summarized below:

- The existing grade is established from AutoCAD files provided by LG&E-KU on June 23, 2015.

- The ATB embankment will be used without modification. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings, which is not part of this project.
- The top of the ATB dike already includes an aggregate perimeter road.
- All volume calculations are based on an in-place (moist) density 1 ton per cubic yard (74 yards per cubic foot) for all cut and placed CCR material and does not account for shrinkage/swell during placement. A 2 percent volume reduction has been included in consideration of settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- The conceptual pond closure approaches are assumed to be geotechnically stable as shown. This must be confirmed during design development.
- Improvements assumed to prepare a workable CCR surface include removing surface water, localized regrading to facilitate dewatering, and installing a geotextile, a layer of dry CCR, and geogrid.
- The CH2M conceptual approach included filling ATB with CCR materials within but below the existing top of embankment elevation and included retention and control of stormwater.
- Final surface drainage channels are within the ATB dikes, would include final cover, and would be lined with turf reinforcement mat.
- The final cover (cap) is considered equivalent on a material quantity basis to the published CCR rule final cover requirements.
- The final cover (cap) is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite or strip drains and 2 feet of soil cover. A vegetative cover will be established.
- A 5 percent slope was used for the final cover. The slope in the two 10-acre areas is reduced to 2 percent.
- Ditches were included in the grading for the pond. The ditch geometry for ATB was assumed to consist of a trapezoidal channel with 4H:1V on the inner slope and 3H:1V on the outer side slopes. A bottom width of 10 feet was used to convey the estimated 100-year, 24-hour storm event (worst case) flow, as documented in the CH2M memorandum dated January 2015. Additional drainage features over the 5 percent cover (such as more closely spaced surface water ditches or other features) may be required, which have not been considered herein.
- A new surface water management pond will be installed south of ATB to manage clean surface water from the closed ATB. The existing primary outlet structure will be removed, and a new outlet structure will be installed adjacent to the new surface water treatment pond.
- No special dewatering structures will be required to remove decant water from the wet coal ash materials in the ash pond.

Clearwell, Emergency, and Dead Storage Ponds

The general design assumptions used for the conceptual alternative (Clearwell, Emergency, and Dead Storage ponds) is as derived from the LG&E-KU drawing and summarized below:

- The existing grade is established from AutoCAD files provided by LG&E-KU on June 23, 2015.
- The ponds will be cleaned to the bottom of the CCRs, which will be placed in the ATB.

- One foot of material will be excavated and removed below the CCR material, which will include any leachate collection liner and piping and potentially contaminated subsoil. This material will be disposed in ATB.
- Clean fill will be placed to grades shown, and a FML and cover material will be installed.
- FML and geotextile will be installed.
- No perimeter berm will be used since ponds are incised.
- The existing pump stations are sufficient for future use.

Construction Runoff Pond

The general design assumptions used for the conceptual alternative (Construction Runoff pond) is as derived from the LG&E-KU drawing and summarized below:

- The existing grade is established from AutoCAD files provided by LG&E-KU on June 23, 2015.
- The ponds will be cleaned to the bottom of the CCRs, which will be placed in the ATB (see Table 3-2A).
- One foot of material will be excavated and removed below the CCR material, which will include any leachate collection liner and piping and potentially contaminated subsoil. This material will be disposed in ATB (see Table 3-2A).
- Clean fill will be placed to fill the pond void up to surrounding surface grades shown and the pond will be clean closed.

3 Estimated Material Volumes and Areas

The amount of bottom ash, fly ash, and gypsum generated by the power plant and available for use as fill is summarized in Table 3-1. Total production rates by year are as communicated by LG&E-KU on June 23, 2015.

Table 3-1. Estimated CCR Production by Year – Total and Distributed to ATB

	Total CCR Production (Tons)				Assumed CCR Distribution (Tons)
Year	Bottom Ash	Fly Ash	Gypsum	TOTAL	ATB[1]
2015	81,349	325,397	736,260	**1,143,006**	210,730
2016	83,284	333,137	762,967	**1,179,389**	-
2017	82,556	330,225	778,939	**1,191,721**	-
2018	83,448	333,792	799,683	**1,216,922**	-
2019	83,183	332,731	797,264	**1,213,178**	-
2020	85,006	340,023	814,867	**1,239,896**	-
TOTAL					**210,730**

Notes:
[1] Material assumed to be sent to ATB until the closure airspace capacity is full, with the remainder sent to landfill. Remaining material is assumed to be either beneficially used offsite or sent to the onsite landfill.

The conceptual alternative was developed using AutoCAD files provided by LG&E-KU as described under Section 2.2, Design Assumptions. Summaries of the estimated material quantities for each pond are shown in Tables 3-2A through 3-2E.

Table 3-2A. Proposed Conceptual Estimated Material Quantities - ATB

Item	Units	Quantity
Total surface area	AC	73.1
Standing surface water (to remove)	GAL	84,337,490
Length of perimeter	LF	7,710
CUT: Existing Surface to Final Cover Subgrade		
Cut to Shape Cover Subgrade - Keep in ATB	CY	335,048
Cut to Shape Cover Subgrade/Ditch - Keep in ATB	CY	18,847
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**662,823**
FILL SOURCES:		
From Clearwell Pond - CCR and subsoil	CY	45,065
From Emergency Pond - CCR and subsoil	CY	62,027
From Dead Storage Pond - CCR and subsoil	CY	41,196
From Construction Runoff Pond - CCR and subsoil	CY	85,985
TOTAL POTENTIAL FILL	**CY**	**210,730**
Final cover soil volume	CY	237,340
New Surface Water Pond (Surface Area)	AC	3.3
New Surface Water Outlet	Each	1

Table 3-2B. Proposed Conceptual Estimated Material Quantities - Clearwell Pond

Item	Units	Quantity
Area of pond	AC	1.9
Standing Surface Water (to remove)	GAL	3,095,581
Length of perimeter	LF	1,190
CUT:		
From existing surface to estimated CCR extents - send to ATB	CY	42,000
From subsoil below CCR - Send to ATB	CY	3,065

Table 3-2C. Proposed Conceptual Estimated Material Quantities - Emergency Pond

Item	Units	Quantity
Area of pond	AC	2.8
Standing Surface Water (to remove)	GAL	4,561,908
Length of perimeter	LF	1,620
CUT:		
From existing surface to estimated CCR extents - send to ATB	CY	57,510
From subsoil below CCR - Send to ATB	CY	4,517

Table 3-2D. Proposed Conceptual Estimated Material Quantities – Dead Storage Pond

Item	Units	Quantity
Area of pond	AC	1.6
Standing Surface Water (to remove)	GAL	2,606,805
Length of perimeter	LF	1,055
CUT:		
From existing surface to estimated CCR extents - send to ATB	CY	38,615
From subsoil below CCR - Send to ATB	CY	2,518

Table 3-2E. Proposed Conceptual Estimated Material Quantities – Construction Runoff Pond

Item	Units	Quantity
Area of pond	AC	2.2
Standing Surface Water (to remove)	GAL	3,584,356
Length of perimeter	LF	1,160
CUT:		
From existing surface to estimated CCR extents - send to ATB	CY	82,436
From subsoil below CCR - Send to ATB	CY	3,549

4 Schedule

Exhibit 4-1 in Attachment 3 illustrates the proposed schedule to complete the design, permitting, and construction for each of the pond closures.

5 Construction Cost Estimate

The estimated construction cost for closing the Ponds as described in Section 2 above is shown in Table 5-1.

Proposed Conceptual Closure Alternative	Low (-30%)	Total Capital Cost	High (+30%)
ATB	$26.1 M	$37.3 M	$48.4 M
Clearwell Pond	$3.5 M	$5.0 M	$6.5 M
Emergency Pond	$3.5 M	$5.0 M	$6.5 M
Dead Storage Pond	$4.2 M	$6.0 M	$7.8 M
Construction Runoff Pond	$4.6 M	$6.5 M	$8.5 M
Concrete Process Tanks	$78.1 M	$111.6 M	145.1 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX and OPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

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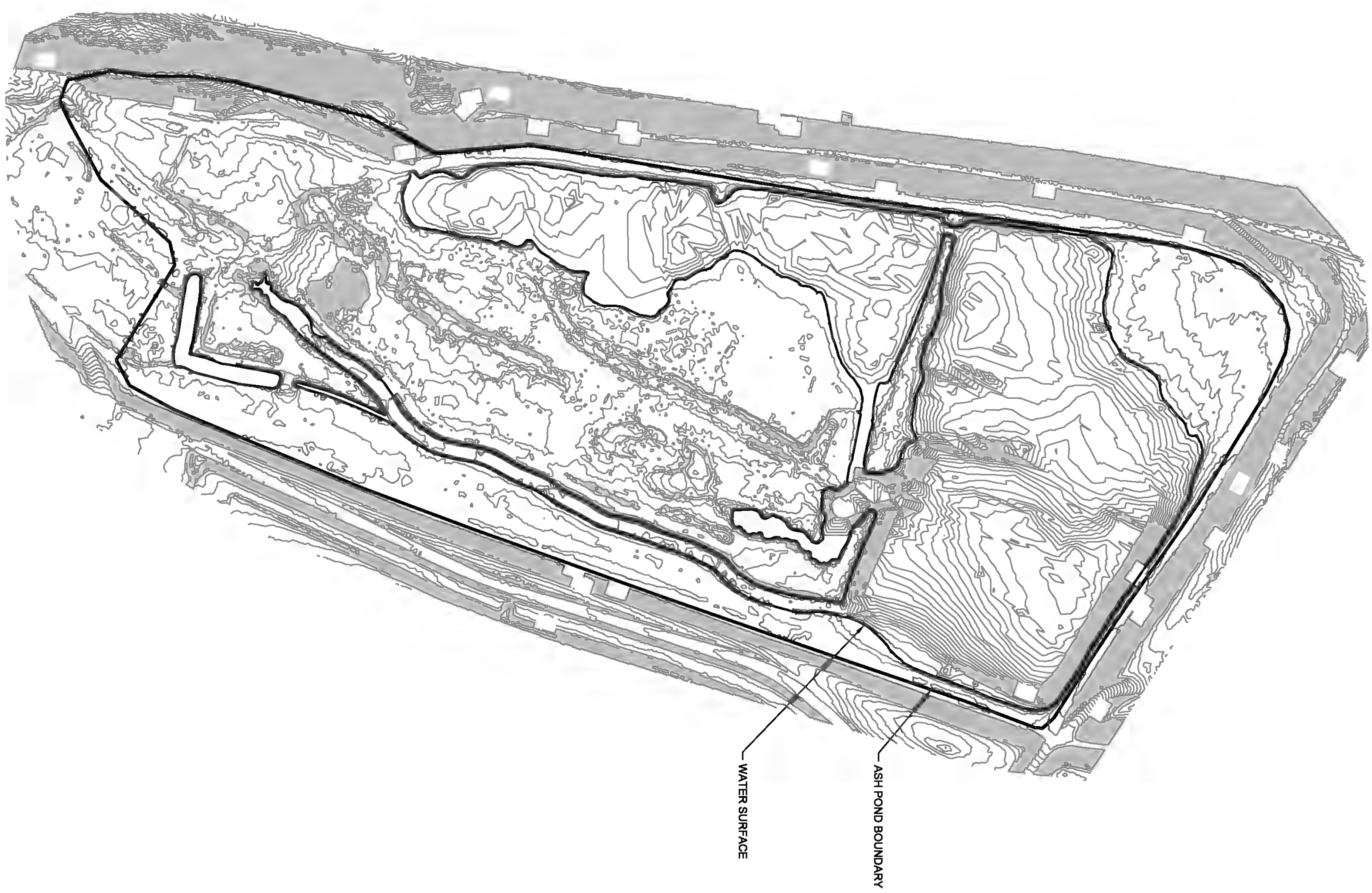
Attachment 1
Proposed Conceptual Alternative
CCR Closure



CH2MHILL®

MILL CREEK
EXISTING CONDITIONS
ASH TREATMENT BASIN

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 1
SHEET	of

NO.	DATE	REVISION	BY	APVD

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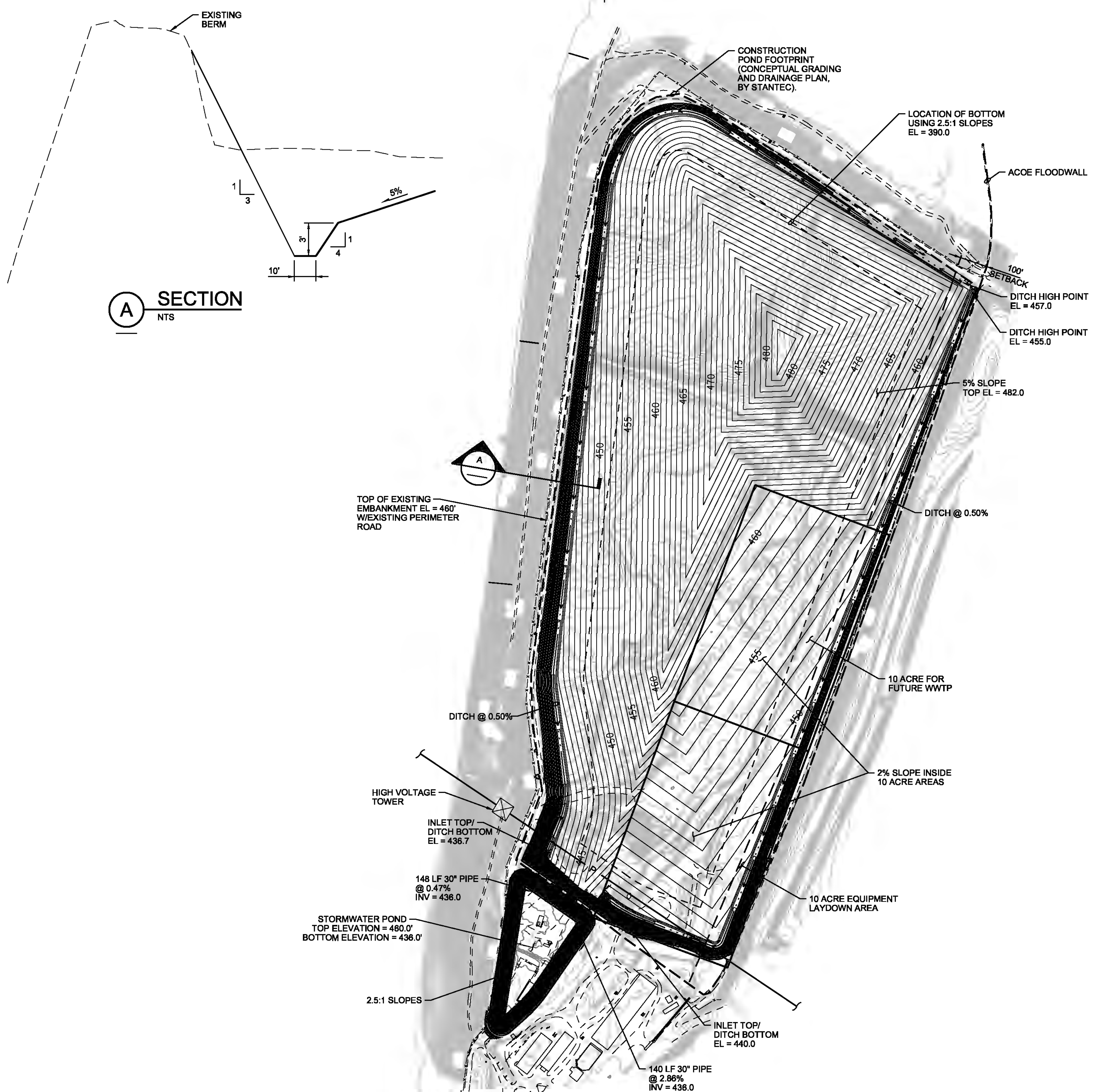

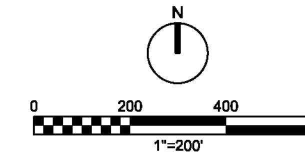

ITEM	UNITS	ASH TREATMENT BASIN	STORMWATER POND
TOTAL SURFACE AREA	ACRES	73.1	3.3
LENGTH OF PERIMETER	LINEAR FEET	7710	1700
TOTAL CUT - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	335048	90155
TOTAL FILL - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	997871	359
NET - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	662823 (FILL)	88989 (CUT)
FINAL COVER VOLUME	CUBIC YARDS	237340	-
TOTAL AIRSPACE MINUS FINAL COVER (ASH)	CUBIC YARDS	425483	-

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL®

MILL CREEK
PROPOSED CONCEPTUAL CLOSURE PLAN
ASH TREATMENT BASIN

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2
SHEET	of

CH2MHILL

MILL CREEK
EXISTING CONDITIONS
FOUR PROCESS PONDS

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

NO.	DATE	REVISION	BY	APVD

DSGN	DR	CHK	APVD

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 3
SHEET	of

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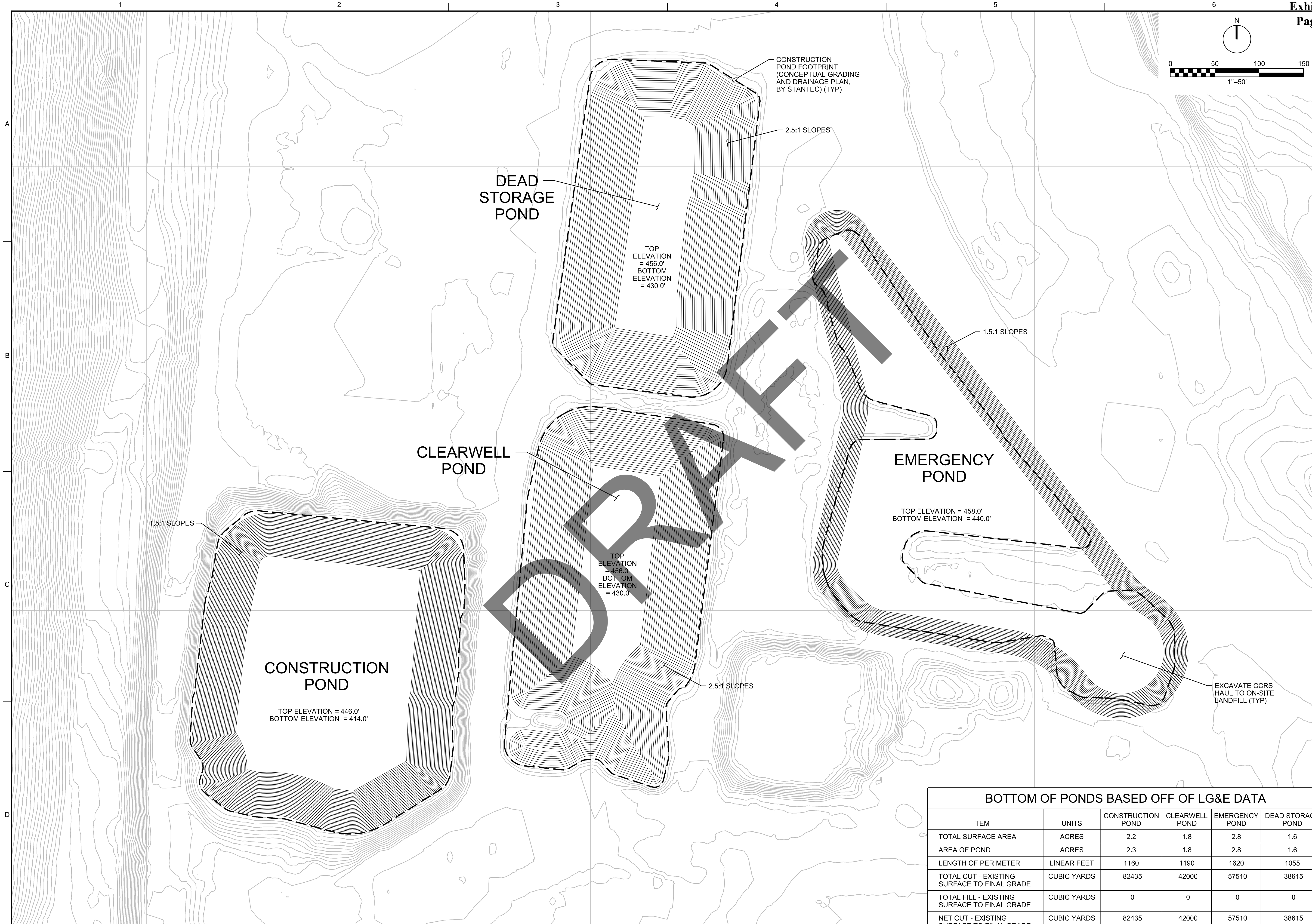

BOTTOM OF PONDS BASED OFF OF LG&E DATA

ITEM	UNITS	CONSTRUCTION POND	CLEARWELL POND	EMERGENCY POND	DEAD STORAGE POND
TOTAL SURFACE AREA	ACRES	2.2	1.8	2.8	1.6
AREA OF POND	ACRES	2.3	1.8	2.8	1.6
LENGTH OF PERIMETER	LINEAR FEET	1160	1190	1620	1055
TOTAL CUT - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	82435	42000	57510	38615
TOTAL FILL - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	0	0	0	0
NET CUT - EXISTING SURFACE TO FINAL GRADE	CUBIC YARDS	82435	42000	57510	38615

NO.	DATE	REVISION	DR	CHK	APVD	BY	APVD

DSGN

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL®

MILL CREEK
PROPOSED CONCEPTUAL
CLOSURE PLAN
FOUR PROCESS PODS

VERIFY SCALE
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DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 4
SHEET	of

Attachment 2
Proposed Conceptual Alternative Cost Estimate

COST SUMMARY

Site:	Mill Creek Generation Station	**Base Year:**	2015
Location:	Fishtown, Kentucky	**Date:**	September
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Ash Treatment Basin	Emergency Pond	Dead Storage Pond	Clearwell Pond	Construction Pond	Concrete Tanks
Remedial Technology	Fill ATB with CCR's, install final cover and close in-place.	Remove CCR's and convert to Process Water Pond	Remove CCR's and convert to Process Water Pond	Remove CCR's and convert to Process Water Pond	Remove CCR's, backfill with clean material and install vegetative cover.	Installation of CCR concrete tanks
Description	Increase size of basin footprint to reflect existing conditions; move non-contact stormwater detention basin to the south; completely fill with CCR material; incorporate two approx. 10 Acre flat areas for (material storage and future WWTP); and final cover installed	Completely cleaned of ash, backfilled with clean fill to desired grade and lined with a FML and Fabriform, then converted into process water pond (non-CCR)	Completely cleaned of ash, backfilled with clean fill to desired grade and lined with a FML and Fabriform, then converted into process water pond (non-CCR)	Completely cleaned of ash, backfilled with clean fill to desired grade and lined with a FML and Fabriform, then converted into process water pond (non-CCR)	Completely cleaned of ash, backfilled with clean fill to desired grade and install final vegetative cover.	Installation of four new concrete treatement tanks to handle waste water associtated with CCR materials at the facility.
Impoundment Closure	$36,004,455	$4,800,060	$5,778,542	$4,826,171	$6,315,448	$0
LG&E Overhead	$1,260,156	$168,002	$202,249	$168,916	$221,041	$0
New Construction	$0	$0	$0	$0	$0	$107,855,943
LG&E Overhead	$0	$0	$0	$0	$0	$3,774,958
Total Initial Costs	$37,264,611	$4,968,062	$5,980,791	$4,995,087	$6,536,489	$111,630,902
Upper ROM Range	$48,443,994	$6,458,481	$7,775,028	$6,493,614	$8,497,435	$145,120,172
Lower ROM Range	$26,085,227	$3,477,644	$4,186,553	$3,496,561	$4,575,542	$78,141,631

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

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CCR Rule - Mill Creek Generating Station Cost Estimate - ATB

21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - ATB	**$37,264,611**	**6%**	**6%**	**1%**	**0%**	**25%**	**62%**	**0%**	**0%**	**0%**	**0%**	100%
IMPOUNDMENT CLOSURE	**$27,695,734**	**6%**	**6%**	**1%**	**0%**	**25%**	**62%**	**0%**	**0%**	**0%**	**0%**	100%
Mobilization/Demobilization	**$100,000**	0%	0%	0%	0%	80%	20%	0%	0%	0%	0%	100%
Sediment & Erosion Control	**$45,000**	0%	0%	0%	0%	60%	40%	0%	0%	0%	0%	100%
Site Preparation	**$40,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Dewatering	**$1,686,750**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$500,000**	0%	0%	0%	0%	60%	40%	0%	0%	0%	0%	100%
Utility Services	**$100,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	100%
Perimeter Berm (not required)	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$216,223**	0%	0%	0%	0%	60%	40%	0%	0%	0%	0%	100%
Closure	**$6,550,624**	0%	0%	0%	0%	60%	40%	0%	0%	0%	0%	100%
Final Cover	**$11,065,778**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
Storm Water Management Pond	**$1,197,610**	0%	0%	0%	0%	20%	80%	0%	0%	0%	0%	100%
Surface Water Features	**$100,000**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
Primary Outlet Structure	**$70,000**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	100%
Surface Restoration	**$289,150**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
Groundwater Monitoring	**$273,600**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	100%
Conceptual Design	**$250,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$1,500,000**	0%	80%	20%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$2,000,000**	0%	0%	0%	0%	20%	80%	0%	0%	0%	0%	100%
Closure Report	**$75,000**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	100%
CCR Rule Compliance Activities	**$1,561,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal	$27,695,734											
Contingency	$8,308,720	6%	6%	1%	0%	25%	62%	0%	0%	0%	0%	100%
Subtotal with Contingency	$36,004,455											
LG&E & KU Overheads	$1,260,156	6%	6%	1%	0%	25%	62%	0%	0%	0%	0%	100%
Project Total (rounded)	$37,264,611											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - ATB											
IMPOUNDMENT CLOSURE	**$1,561,000**	**$1,642,909**	**$442,850**	**$123,105**	**$8,152,019**	**$20,765,533**	**$0**	**$0**	**$0**	**$0**	$32,687,416
Mobilization/Demobilization	$0	$0	$0	$0	$93,589	$24,333	$0	$0	$0	$0	**$117,922**
Sediment & Erosion Control	$0	$0	$0	$0	$31,586	$21,900	$0	$0	$0	$0	**$53,486**
Site Preparation	$0	$0	$0	$0	$46,794	$0	$0	$0	$0	$0	**$46,794**
Dewatering	$0	$0	$0	$0	$1,973,259	$0	$0	$0	$0	$0	**$1,973,259**
Repair On-Site Pond Embankments	$0	$0	$0	$0	$350,958	$243,331	$0	$0	$0	$0	**$594,288**
Utility Services	$0	$0	$0	$0	$116,986	$0	$0	$0	$0	$0	**$116,986**
Perimeter Berm (not required)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	$0	$0	$0	$0	$151,770	$105,227	$0	$0	$0	$0	**$256,997**
Closure	$0	$0	$0	$0	$4,597,982	$3,187,934	$0	$0	$0	$0	**$7,785,916**
Final Cover	$0	$0	$0	$0	$0	$13,463,211	$0	$0	$0	$0	**$13,463,211**
Storm Water Management Pond	$0	$0	$0	$0	$280,207	$1,165,661	$0	$0	$0	$0	**$1,445,867**
Surface Water Features	$0	$0	$0	$0	$0	$121,665	$0	$0	$0	$0	**$121,665**
Primary Outlet Structure	$0	$0	$0	$0	$40,945	$42,583	$0	$0	$0	$0	**$83,528**
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	$0	$0	$0	$0	$0	$351,795	$0	$0	$0	$0	**$351,795**
Groundwater Monitoring	$0	$56,909	$118,370	$123,105	$0	$0	$0	$0	$0	$0	**$298,384**
Conceptual Design	$0	$260,000	$0	$0	$0	$0	$0	$0	$0	$0	**$260,000**
Final Design and Permitting and permitting support	$0	$1,248,000	$324,480	$0	$0	$0	$0	$0	$0	$0	**$1,572,480**
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	$0	$0	$0	$0	$467,943	$1,946,645	$0	$0	$0	$0	**$2,414,588**
Closure Report	$0	$0	$0	$0	$0	$91,249	$0	$0	$0	$0	**$91,249**
CCR Rule Compliance Activities	$1,561,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$1,561,000**
Subtotal	**$1,561,000**	**$1,642,909**	**$442,850**	**$123,105**	**$8,152,019**	**$20,765,533**	**$0**	**$0**	**$0**	**$0**	$32,687,416
Contingency	$0	$0	$0	$0	$4,903,112	$4,903,112	$0	$0	$0	$0	**$9,806,225**
Subtotal with Contingency	**$1,561,000**	**$1,642,909**	**$442,850**	**$123,105**	**$13,055,131**	**$25,668,646**	**$0**	**$0**	**$0**	**$0**	$42,493,641
LG&E & KU Overheads	$54,635	$57,502	$15,500	$4,309	$456,930	$898,403	$0	$0	$0	$0	**$1,487,277**
Project Total (rounded)	**$1,616,000**	**$1,700,000**	**$458,000**	**$127,000**	**$13,512,000**	**$26,567,000**	**$0**	**$0**	**$0**	**$0**	$43,980,000

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Mill Creek Generating Station
Location: Fishtown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - ATB
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$100,000.00	$100,000	
SUBTOTAL Mobilization/Demobilization				**$100,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	9,000	LF	$5.00	$45,000	Perimeter of the pond +
SUBTOTAL Sediment & Erosion Control				**$45,000**	
Site Preparation					
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$40,000**	
Dewatering					
Dewatering and discharge through NPDES permit	84,337,490	GL	$0.02	$1,686,750	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$1,686,750**	
Repair On-Site Pond Embankments					
Access Modications on existing CCR Pond embankments	1	LS	$500,000.00	$500,000	Heavy vegetation on the outboard north and west slopes, which inhibits detailed inspection and could mask potential problem conditions on the slopes (per EPA Dam Assessment report).
SUBTOTAL Repair On-Site Pond Embankments				**$500,000**	
Utility Services					
Utility Modifications	1	LS	$100,000.00	$100,000	LG&E-KU to complete.
Shoring for tower foundations	1	LS	$0.00	$0	Shoring assumed to not be required.
SUBTOTAL Utility Services				**$100,000**	
Perimeter Berm (not required)	**1**	**LS**	**$0.00**	**$0**	
SUBTOTAL Perimeter Berm (not required)				**$0**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	5,711	CY	$37.86	$216,223	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$216,223**	
Closure					
Geotextile (as needed, assume 100% of 73.1 acre area for filling)	353,804	SY	$2.46	$870,358	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of 167.7 acre area f	353,804	SY	$3.00	$1,061,412	CH2M HILL, recent quote on similar project
Regrade material within CCR surface	353,804	CY	$8.10	$2,865,812	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Placement and Compaction (CCR from Plant)	210,730	CY	$2.39	$503,645	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Placement and Compaction (from Clearwater Pond)	45,065	CY	$2.39	$107,705	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Placement and Compaction (from Emergency Pond)	62,027	CY	$2.39	$148,245	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Placement and Compaction (from Dead Storage Pond)	41,196	CY	$2.39	$98,458	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Placement and Compaction (from Construction Runoff Pond)	85,985	CY	$2.39	$205,504	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Cut/regrade for cover subgrade/ditch	18,847	CY	$8.10	$152,661	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Moisture Conditioning/Dust Control	817,654	CY	$0.57	$466,063	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	353,804	SY	$0.20	$70,761	RSM 31 22 16.10 3300
SUBTOTAL Closure				**$6,550,624**	
Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	3,184,236	SF	$0.65	$2,069,753	
Geocomposite (includes materials and installation)	3,184,236	SF	$0.55	$1,751,330	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	176,902	CY	$20.00	$3,538,040	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	58,967	CY	$20.00	$1,179,335	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	235,869	CY	$4.36	$1,028,388	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	235,869	CY	$2.39	$563,726	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	235,869	CY	$0.57	$134,445	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Drainage System Piping	73	AC	$10,000.00	$730,000.00	Allowance
Finish Grading, gentle slopes	353,804	SY	$0.20	$70,761	RSM 31 22 16.10 3300
SUBTOTAL Final Cover				**$11,065,778**	
Storm Water Management Pond					
Sediment and Erosion Control Measures	2,000	LF	$5.00	$10,000	Perimeter of the pond +
Excavate Load and Haul (excavator)	89,920	CY	$9.56	$859,635	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Placement and Compaction	89,920	CY	$2.39	$214,909	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	89,920	CY	$0.57	$51,254	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottoms	15,972	SY	$3.87	$61,812	RSM 31 22 16.10 3500
SUBTOTAL Storm Water Management Pond				**$1,197,610**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$100,000.00	$100,000	allowance
SUBTOTAL Surface Water Features				**$100,000**	
Primary Outlet Structure					
Demolition and Disposal of existing Outfall Structure	1	LS	$20,000.00	$20,000	allowance
Construct new Outfall Structure	1	LS	$50,000.00	$50,000	allowance
SUBTOTAL Primary Outlet Structure				**$70,000**	
Emergency Outlet Structure					
Modify	0	LS	$0.00	$0	Not Applicable
SUBTOTAL Emergency Outlet Structure				**$0**	
Surface Restoration					
Mechanical Seeding & Mulching	73.0	AC	$3,550.00	$259,150	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$289,150**	
Groundwater Monitoring					
New Monitoring wells, 4" (7,710 LF perimeter)	11	EA	$17,600.00	$193,600	assumes well spacing 1 well/750 feet; 11 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$273,600**	
SUBTOTAL CONSTRUCTION				**$22,234,734**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$250,000.00	$250,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$1,500,000.00	$1,500,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$2,000,000.00	$2,000,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$22,234,734.45	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$3,900,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$26,134,734**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Mill Creek Generating Station Cost Estimate - Emergency Pond
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Emergency Pond	**$4,968,062**	**0%**	**13%**	**6%**	**80%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%											
IMPOUNDMENT CLOSURE	**$3,692,354**	**0%**	**13%**	**6%**	**80%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%	**$0**	**$509,808**	**$254,392**	**$3,337,420**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$4,101,620**
Mobilization/Demobilization	**$10,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$11,249	$0	$0	$0	$0	$0	$0	**$11,249**
Sediment & Erosion Control	**$8,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$8,999	$0	$0	$0	$0	$0	$0	**$8,999**
Site Preparation	**$5,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$5,624	$0	$0	$0	$0	$0	$0	**$5,624**
Dewatering	**$91,238**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$102,631	$0	$0	$0	$0	$0	$0	**$102,631**
Repair On-Site Pond Embankments	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Utility Services	**$75,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$84,365	$0	$0	$0	$0	$0	$0	**$84,365**
Perimeter Berm (not required)	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	**$2,272**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$2,555	$0	$0	$0	$0	$0	$0	**$2,555**
Excavation and Haul CCRs to ATB	**$680,780**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$765,785	$0	$0	$0	$0	$0	$0	**$765,785**
Liner System & Fabriform	**$1,002,172**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$1,127,307	$0	$0	$0	$0	$0	$0	**$1,127,307**
Surface Water Features	**$100,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$112,486	$0	$0	$0	$0	$0	$0	**$112,486**
Mechanical Improvements/Additions	**$500,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$562,432	$0	$0	$0	$0	$0	$0	**$562,432**
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	**$13,118**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$14,755	$0	$0	$0	$0	$0	$0	**$14,755**
Groundwater Monitoring	**$150,400**	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$78,208	$81,336	$0	$0	$0	$0	$0	$0	$0	**$159,544**
Soil Sampling	**$4,375**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$4,921	$0	$0	$0	$0	$0	$0	**$4,921**
Conceptual Design	**$100,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$104,000	$0	$0	$0	$0	$0	$0	$0	$0	**$104,000**
Final Design and Permitting and permitting support	**$300,000**	0%	80%	20%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$249,600	$64,896	$0	$0	$0	$0	$0	$0	$0	**$314,496**
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	**$500,000**	0%	0%	20%	80%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$108,160	$449,946	$0	$0	$0	$0	$0	$0	**$558,106**
Closure Report	**$75,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$84,365	$0	$0	$0	$0	$0	$0	**$84,365**
Subtotal	**$3,692,354**												**$0**	**$509,808**	**$254,392**	**$3,337,420**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$4,101,620**
Contingency	$1,107,706	0%	13%	6%	80%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$1,230,486	$0	$0	$0	$0	$0	$0	**$1,230,486**
Subtotal with Contingency	**$4,800,060**												**$0**	**$509,808**	**$254,392**	**$4,567,906**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,332,106**
LG&E & KU Overheads	$168,002	0%	13%	6%	80%	0%	0%	0%	0%	0%	0%	100%	$0	$17,843	$8,904	$159,877	$0	$0	$0	$0	$0	$0	**$186,624**
Project Total (rounded)	**$4,968,062**												**$0**	**$528,000**	**$263,000**	**$4,728,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,519,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Mill Creek Generating Station
Location: Fishtown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Emergency Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$10,000.00	$10,000	
SUBTOTAL Mobilization/Demobilization				**$10,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1,600	LF	$5.00	$8,000	Perimeter of the pond.
SUBTOTAL Sediment & Erosion Control				**$8,000**	
Site Preparation					
Surveying	1	LS	$3,000.00	$3,000	
Utility Locating	1	EA	$2,000.00	$2,000	
SUBTOTAL Site Preparation				**$5,000**	
Dewatering					
Dewatering and discharge through NPDES permit	4,561,908	GL	$0.02	$91,238	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$91,238**	
Repair On-Site Pond Embankments					
Existing CCR Pond embankments are incised	0	LS	$0.00	$0	Embankments are incised.
SUBTOTAL Repair On-Site Pond Embankments				**$0**	
Utility Services					
Utility Modifications	1	LS	$25,000.00	$25,000	Assume for each pond. LG&E-KU to complete.
Shoring for conveyor support foundations	1	LS	$50,000.00	$50,000	Shoring assumed to be required for conveyor support.
SUBTOTAL Utility Services				**$75,000**	
Perimeter Berm (not required)	**1**	**LS**	**$0.00**	**$0**	
SUBTOTAL Perimeter Berm (not required)				**$0**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	60	CY	$37.86	$2,272	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$2,272**	
Excavation and Haul CCRs to ATB					
Excavate and Load, from stockpile	57,510	CY	$9.56	$549,796	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Over Excavate and Load, from stockpile	4,517	CY	$9.56	$43,183	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Moisture Conditioning/Dust Control	62,027	CY	$0.57	$35,355	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottoms	13,552	SY	$3.87	$52,446	RSM 31 22 16.10 3500
SUBTOTAL Excavation and Haul CCRs to ATB				**$680,780**	
Liner System & Fabriform					
60-mil Tex/smooth HDPE	128,447	SF	$0.85	$109,180	
10 oz. Geotextile (includes materials and installation)	128,447	SF	$0.20	$25,689	CH2M HILL recent project.
- Fabriform (6" thick product)	128,447	SF	$6.73	$864,448	Based on previous engineer's estimate
Finish Grading, gentle slopes	14,272	SY	$0.20	$2,854	RSM 31 22 16.10 3300
SUBTOTAL Liner System & Fabriform				**$1,002,172**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$100,000.00	$100,000	
SUBTOTAL Surface Water Features				**$100,000**	
Mechanical Improvements/Additions					
Piping from ash pond to plant	1	LS	$500,000.00	$500,000	Allowance
SUBTOTAL Mechanical Improvements/Additions				**$500,000**	
Emergency Outlet Structure					
Modify	0	LS	$0.00	$0	not applicable
SUBTOTAL Emergency Outlet Structure				**$0**	
Surface Restoration					
Mechanical Seeding & Mulching	3	AC	$3,550.00	$10,118	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$3,000.00	$3,000	
SUBTOTAL Surface Restoration				**$13,118**	
Groundwater Monitoring					
New Monitoring wells, 4" (1,620 LF perimeter)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$150,400**	
Soil Sampling					
Confirmation Sampling (5/Acre)	14	EA	$100.00	$1,400	
Confirmation Sample Analysis	14	EA	$150.00	$2,100	single marker metal
Sample Packaging and Shipping	4	EVENT	$250.00	$875	4 samples per cooler
SUBTOTAL Soil Sampling				**$4,375**	
SUBTOTAL CONSTRUCTION				**$2,642,354**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$100,000.00	$100,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$300,000.00	$300,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$500,000.00	$500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$2,642,354.12	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,050,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$3,692,354**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Mill Creek Generating Station Cost Estimate - Dead Storage Pond

21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check
Proposed Conceptual Alternative CCR Closure - Dead Storage Pond	**$5,778,542**	**0%**	**15%**	**85%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%
IMPOUNDMENT CLOSURE	**$4,445,032**	**0%**	**15%**	**85%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%
Mobilization/Demobilization	**$10,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Sediment & Erosion Control	**$5,500**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Site Preparation	**$15,350**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Dewatering	**$52,136**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Utility Services	**$25,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Perimeter Berm (not required)	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$1,479**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Excavation and Haul CCRs to ATB	**$447,285**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Liner System & Fabriform	**$576,702**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$100,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Mechnical Improvements/Additions	**$2,000,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$8,680**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Groundwater Monitoring	**$150,400**	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%
Soil Sampling	**$2,500**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Conceptual Design	**$100,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$300,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$500,000**	0%	20%	80%	0%	0%	0%	0%	0%	0%	0%	100%
Closure Report	**$75,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal	**$4,445,032**											
Contingency	$1,333,510	0%	15%	85%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal with Contingency	**$5,778,542**											
LG&E & KU Overheads	$202,249	0%	15%	85%	0%	0%	0%	0%	0%	0%	0%	100%
Project Total (rounded)	**$5,980,791**											

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Dead Storage Pond											
IMPOUNDMENT CLOSURE	**$0**	**$676,208**	**$4,104,490**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$4,780,698**
Mobilization/Demobilization	$0	$0	$10,816	$0	$0	$0	$0	$0	$0	$0	**$10,816**
Sediment & Erosion Control	$0	$0	$5,949	$0	$0	$0	$0	$0	$0	$0	**$5,949**
Site Preparation	$0	$0	$16,603	$0	$0	$0	$0	$0	$0	$0	**$16,603**
Dewatering	$0	$0	$56,390	$0	$0	$0	$0	$0	$0	$0	**$56,390**
Repair On-Site Pond Embankments	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Utility Services	$0	$0	$27,040	$0	$0	$0	$0	$0	$0	$0	**$27,040**
Perimeter Berm (not required)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	$0	$0	$1,600	$0	$0	$0	$0	$0	$0	$0	**$1,600**
Excavation and Haul CCRs to ATB	$0	$0	$483,783	$0	$0	$0	$0	$0	$0	$0	**$483,783**
Liner System & Fabriform	$0	$0	$623,761	$0	$0	$0	$0	$0	$0	$0	**$623,761**
Surface Water Features	$0	$0	$108,160	$0	$0	$0	$0	$0	$0	$0	**$108,160**
Mechnical Improvements/Additions	$0	$0	$2,163,200	$0	$0	$0	$0	$0	$0	$0	**$2,163,200**
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	$0	$0	$9,388	$0	$0	$0	$0	$0	$0	$0	**$9,388**
Groundwater Monitoring	$0	$78,208	$81,336	$0	$0	$0	$0	$0	$0	$0	**$159,544**
Soil Sampling	$0	$0	$2,704	$0	$0	$0	$0	$0	$0	$0	**$2,704**
Conceptual Design	$0	$104,000	$0	$0	$0	$0	$0	$0	$0	$0	**$104,000**
Final Design and Permitting and permitting support	$0	$312,000	$0	$0	$0	$0	$0	$0	$0	$0	**$312,000**
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	$0	$104,000	$432,640	$0	$0	$0	$0	$0	$0	$0	**$536,640**
Closure Report	$0	$0	$81,120	$0	$0	$0	$0	$0	$0	$0	**$81,120**
Subtotal	**$0**	**$676,208**	**$4,104,490**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$4,780,698**
Contingency	$0	$0	$1,434,209	$0	$0	$0	$0	$0	$0	$0	**$1,434,209**
Subtotal with Contingency	**$0**	**$676,208**	**$5,538,700**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$6,214,908**
LG&E & KU Overheads	$0	$23,667	$193,854	$0	$0	$0	$0	$0	$0	$0	**$217,522**
Project Total (rounded)	**$0**	**$700,000**	**$5,733,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$6,433,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Mill Creek Generating Station — COST ESTIMATE SUMMARY

Site: Mill Creek Generating Station
Location: Fishtown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Dead Storage Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$10,000.00	$10,000	
SUBTOTAL Mobilization/Demobilization				**$10,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1,100	LF	$5.00	$5,500	Perimeter of the pond.
SUBTOTAL Sediment & Erosion Control				**$5,500**	
Site Preparation					
Clearing/Grubbing	1	AC	$10,350.00	$10,350	
Surveying	1	LS	$3,000.00	$3,000	
Utility Locating	1	EA	$2,000.00	$2,000	
SUBTOTAL Clearing/Grubbing				**$15,350**	
Dewatering					
Dewatering and discharge through NPDES permit	2,606,805	GL	$0.02	$52,136	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$52,136**	
Repair On-Site Pond Embankments					
Existing CCR Pond embankments are incised	0	LS	$0.00	$0	Embankments are incised.
SUBTOTAL Repair On-Site Pond Embankments				**$0**	
Utility Services					
Utility Modifications	1	LS	$25,000.00	$25,000	Assume for each pond. LG&E-KU to complete.
Shoring for conveyor support foundations	0	LS	$0.00	$0	Not applicable
SUBTOTAL Utility Services				**$25,000**	
Perimeter Berm (not required)	**1**	**LS**	**$0.00**	**$0**	
SUBTOTAL Perimeter Berm (not required)				**$0**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	39	CY	$37.86	$1,479	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$1,479**	
Excavation and Haul CCRs to ATB					
Excavate and Load to ATB	38,615	CY	$9.56	$369,159	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Over Excavate and Load to ATB	2,581	CY	$9.56	$24,674	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Moisture Conditioning/Dust Control	41,196	CY	$0.57	$23,482	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottoms	7,744	SY	$3.87	$29,969	RSM 31 22 16.10 3500
SUBTOTAL Excavation and Haul CCRs to ATB				**$447,285**	
Liner System & Fabriform					
60-mil Tex/smooth HDPE	73,915	SF	$0.85	$62,828	
10 oz. Geotextile (includes materials and installation)	73,915	SF	$0.20	$14,783	CH2M HILL recent project.
- Fabriform (6" thick product)	73,915	SF	$6.73	$497,448	Based on previous engineer's estimate
Finish Grading, gentle slopes	8,213	SY	$0.20	$1,643	RSM 31 22 16.10 3300
SUBTOTAL Liner System & Fabriform				**$576,702**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$100,000.00	$100,000	
SUBTOTAL Surface Water Features				**$100,000**	
Mechnical Improvements/Additions					
Piping from ash pond to plant	1	LS	$1,000,000.00	$1,000,000	Allowance
New Pump	1	LS	$1,000,000.00	$1,000,000	Allowance
SUBTOTAL Mechnical Improvements/Additions				**$2,000,000**	
Emergency Outlet Structure					
Modify	0	LS	$0.00	$0	not applicable
SUBTOTAL Emergency Outlet Structure				**$0**	
Surface Restoration					
Mechanical Seeding & Mulching	2	AC	$3,550.00	$5,680	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$3,000.00	$3,000	
SUBTOTAL Surface Restoration				**$8,680**	
Groundwater Monitoring					
New Monitoring wells, 4" (1,055 LF perimeter)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$150,400**	
Soil Sampling					
Confirmation Sampling (5/Acre)	8	EA	$100.00	$800	
Confirmation Sample Analysis	8	EA	$150.00	$1,200	single marker metal
Sample Packaging and Shipping	2	EVENT	$250.00	$500	4 samples per cooler
SUBTOTAL Soil Sampling				**$2,500**	
SUBTOTAL CONSTRUCTION				**$3,395,032**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$100,000.00	$100,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$300,000.00	$300,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$500,000.00	$500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$3,395,031.96	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,050,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$4,445,032**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Mill Creek Generating Station Cost Estimate - Clearwell Pond
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Clearwell Pond	$4,995,087	**0%**	**16%**	**84%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%											
IMPOUNDMENT CLOSURE	**$3,712,440**	**0%**	**16%**	**84%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%	**$0**	**$613,808**	**$3,377,014**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$3,990,822**
Mobilization/Demobilization	**$10,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$10,816	$0	$0	$0	$0	$0	$0	$0	**$10,816**
Sediment & Erosion Control	**$8,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$8,653	$0	$0	$0	$0	$0	$0	$0	**$8,653**
Site Preparation	**$15,350**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$16,603	$0	$0	$0	$0	$0	$0	$0	**$16,603**
Dewatering	**$61,912**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$66,964	$0	$0	$0	$0	$0	$0	$0	**$66,964**
Repair On-Site Pond Embankments	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Utility Services	**$25,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$27,040	$0	$0	$0	$0	$0	$0	$0	**$27,040**
Perimeter Berm (not required)	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	**$1,669**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$1,805	$0	$0	$0	$0	$0	$0	$0	**$1,805**
Excavation and Haul CCRs to ATB	**$497,716**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$538,330	$0	$0	$0	$0	$0	$0	$0	**$538,330**
Liner System & Fabriform	**$682,874**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$738,597	$0	$0	$0	$0	$0	$0	$0	**$738,597**
Surface Water Features	**$100,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$108,160	$0	$0	$0	$0	$0	$0	$0	**$108,160**
Mechnical Improvements/Additions	**$1,100,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$1,189,760	$0	$0	$0	$0	$0	$0	$0	**$1,189,760**
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	**$6,550**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$7,084	$0	$0	$0	$0	$0	$0	$0	**$7,084**
Groundwater Monitoring	**$150,400**	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$78,208	$81,336	$0	$0	$0	$0	$0	$0	$0	**$159,544**
Soil Sampling	**$2,969**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$3,211	$0	$0	$0	$0	$0	$0	$0	**$3,211**
Conceptual Design	**$100,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$104,000	$0	$0	$0	$0	$0	$0	$0	$0	**$104,000**
Final Design and Permitting and permitting support	**$300,000**	0%	80%	20%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$249,600	$64,896	$0	$0	$0	$0	$0	$0	$0	**$314,496**
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	**$500,000**	0%	20%	80%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$104,000	$432,640	$0	$0	$0	$0	$0	$0	$0	**$536,640**
Closure Report	**$75,000**	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$81,120	$0	$0	$0	$0	$0	$0	$0	**$81,120**
Subtotal	$3,712,440												**$0**	**$613,808**	**$3,377,014**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	$3,990,822
Contingency	$1,113,732	0%	16%	84%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$1,197,247	$0	$0	$0	$0	$0	$0	$0	**$1,197,247**
Subtotal with Contingency	**$4,826,171**												**$0**	**$613,808**	**$4,574,261**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,188,069**
LG&E & KU Overheads	$168,916	0%	16%	84%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$21,483	$160,099	$0	$0	$0	$0	$0	$0	$0	**$181,582**
Project Total (rounded)	**$4,995,087**												**$0**	**$635,000**	**$4,734,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,369,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Mill Creek Generating Station — COST ESTIMATE SUMMARY

Site: Mill Creek Generating Station
Location: Fishtown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Clearwell Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$10,000.00	$10,000	
SUBTOTAL Mobilization/Demobilization				**$10,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1,600	LF	$5	$8,000	Perimeter of the pond.
SUBTOTAL Sediment & Erosion Control				**$8,000**	
Site Preparation					
Clearing/Grubbing	1	AC	$10,350	$10,350	
Surveying	1	LS	$3,000	$3,000	
Utility Locating	1	EA	$2,000	$2,000	
SUBTOTAL Site Preparation				**$15,350**	
Dewatering					
Dewatering and discharge through NPDES permit	3,095,581	GL	$0.02	$61,912	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$61,912**	
Repair On-Site Pond Embankments					
Existing CCR Pond embankments are incised	0	LS	$0	$0	Embankments are incised.
SUBTOTAL Repair On-Site Pond Embankments				**$0**	
Utility Services					
Utility Modifications	1	LS	$25,000	$25,000	Assume for each pond. LG&E-KU to complete.
Shoring for conveyor support foundations	0	LS	$0	$0	not applicable
SUBTOTAL Utility Services				**$25,000**	
Perimeter Berm (not required)	**1**	**LS**	**$0.00**	**$0**	
SUBTOTAL Perimeter Berm (not required)				**$0**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	44	CY	$37.86	$1,669	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$1,669**	
Excavation and Haul CCRs to ATB					
Excavate and Load to ATB	42,000	CY	$9.56	$401,520	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Over Excavate and Load to ATB	3,065	CY	$9.56	$29,301	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Moisture Conditioning/Dust Control	45,065	CY	$0.57	$25,687	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottoms	10,648	SY	$3.87	$41,208	RSM 31 22 16.10 3500
SUBTOTAL Excavation and Haul CCRs to ATB				**$497,716**	
Liner System & Fabriform					
60-mil Tex/smooth HDPE	87,523	SF	$0.85	$74,395	
10 oz. Geotextile (includes materials and installation)	87,523	SF	$0.20	$17,505	CH2M HILL recent project.
- Fabriform (6" thick product)	87,523	SF	$6.73	$589,030	Based on previous engineer's estimate
Finish Grading, gentle slopes	9,725	SY	$0.20	$1,945	RSM 31 22 16.10 3300
SUBTOTAL Liner System & Fabriform				**$682,874**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$100,000	$100,000	
SUBTOTAL Surface Water Features				**$100,000**	
Mechanical Improvements/Additions					
Piping from ash pond to plant	1	LS	$1,000,000	$1,000,000	Allowance
Removal of Pump and Infrastructure	1	LS	$100,000	$100,000	Allowance
SUBTOTAL Mechanical Improvements/Additions				**$1,100,000**	
Emergency Outlet Structure					
Modify	0	LS	$0	$0	not applicable
SUBTOTAL Emergency Outlet Structure				**$0**	
Surface Restoration					
Mechanical Seeding & Mulching	1	AC	$3,550	$3,550	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$3,000	$3,000	
SUBTOTAL Mechanical Seeding & Mulching				**$6,550**	
Groundwater Monitoring					
New Monitoring wells, 4" (1,190 LF perimeter)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$150,400**	
Soil Sampling					
Confirmation Sampling (5/Acre)	10	EA	$100	$950	
Confirmation Sample Analysis	10	EA	$150	$1,425	single marker metal
Sample Packaging and Shipping	2	EVENT	$250	$594	4 samples per cooler
SUBTOTAL Soil Sampling				**$2,969**	
SUBTOTAL CONSTRUCTION				**$2,662,440**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1		$100,000	$100,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1		$300,000	$300,000	LG&E provided, based on experience
PDI	1		$75,000	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1		$500,000	$500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$2,662,440	$0	LG&E provided
Closure Report	1	LS	$75,000	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,050,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$3,712,440**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

Site: Mill Creek Generating Station
Location: Fishtown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Clearwell Pond
Base Year: 2015
Date: 1/18/2016

DRAFT
CCR Rule - Mill Creek Generating Station Cost Estimate - Construction Runoff Pond
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
Proposed Conceptual Alternative CCR Closure - Construction Pond	**$6,315,448**	**0%**	**10%**	**5%**	**85%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%											
IMPOUNDMENT CLOSURE	**$4,858,037**	**0%**	**10%**	**5%**	**85%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	100%	**$0**	**$509,808**	**$254,392**	**$4,648,654**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,412,855**
Mobilization/Demobilization	**$10,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$11,249	$0	$0	$0	$0	$0	$0	**$11,249**
Sediment & Erosion Control	**$6,250**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$7,030	$0	$0	$0	$0	$0	$0	**$7,030**
Site Preparation	**$15,350**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$17,267	$0	$0	$0	$0	$0	$0	**$17,267**
Dewatering	**$71,687**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$80,638	$0	$0	$0	$0	$0	$0	**$80,638**
Repair On-Site Pond Embankments	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Utility Services	**$25,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$28,122	$0	$0	$0	$0	$0	$0	**$28,122**
Perimeter Berm (not required)	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	**$1,627**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$1,830	$0	$0	$0	$0	$0	$0	**$1,830**
Excavation and Haul CCRs to ATB	**$912,236**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$1,026,141	$0	$0	$0	$0	$0	$0	**$1,026,141**
Final Fill/Soil Cover	**$2,351,240**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$2,644,825	$0	$0	$0	$0	$0	$0	**$2,644,825**
Surface Water Features	**$250,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$281,216	$0	$0	$0	$0	$0	$0	**$281,216**
Primary Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	**$10,810**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$12,160	$0	$0	$0	$0	$0	$0	**$12,160**
Groundwater Monitoring	**$150,400**	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$78,208	$81,336	$0	$0	$0	$0	$0	$0	$0	**$159,544**
Soil Sampling	**$3,438**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$3,867	$0	$0	$0	$0	$0	$0	**$3,867**
Conceptual Design	**$100,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$104,000	$0	$0	$0	$0	$0	$0	$0	$0	**$104,000**
Final Design and Permitting and permitting support	**$300,000**	0%	80%	20%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$249,600	$64,896	$0	$0	$0	$0	$0	$0	$0	**$314,496**
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	**$500,000**	0%	0%	20%	80%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$108,160	$449,946	$0	$0	$0	$0	$0	$0	**$558,106**
Closure Report	**$75,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$84,365	$0	$0	$0	$0	$0	$0	**$84,365**
Subtotal	**$4,858,037**												**$0**	**$509,808**	**$254,392**	**$4,648,654**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$5,412,855**
Contingency	$1,457,411	0%	10%	5%	85%	0%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$1,623,856	$0	$0	$0	$0	$0	$0	**$1,623,856**
Subtotal with Contingency	**$6,315,448**												**$0**	**$509,808**	**$254,392**	**$6,272,511**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$7,036,711**
LG&E & KU Overheads	$221,041	0%	10%	5%	85%	0%	0%	0%	0%	0%	0%	100%	$0	$17,843	$8,904	$219,538	$0	$0	$0	$0	$0	$0	**$246,285**
Project Total (rounded)	**$6,536,489**												**$0**	**$528,000**	**$263,000**	**$6,492,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$7,283,000**

Assumptions	
LG&E & KU Overheads	3.50%
Escalation	4.00%
Contingency	30.00%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Mill Creek Generating Station **COST ESTIMATE SUMMARY**

Site: Mill Creek Generating Station
Location: Fishtown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Construction Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$10,000.00	$10,000	
SUBTOTAL Mobilization/Demobilization				**$10,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	1,250	LF	$5.00	$6,250	Perimeter of the pond.
SUBTOTAL Sediment & Erosion Control				**$6,250**	
Site Preparation					
Clearing/Grubbing	1	AC	$10,350.00	$10,350	
Surveying	1	LS	$3,000.00	$3,000	
Utility Locating	1	EA	$2,000.00	$2,000	
SUBTOTAL Site Preparation				**$15,350**	
Dewatering					
Dewatering and discharge through existing NPDES permit	3,584,356	GL	$0.02	$71,687	Assumes minor treatment required for TSS. Pump water to existing outlet structure
SUBTOTAL Dewatering				**$71,687**	
Repair On-Site Pond Embankments					
Existing CCR Pond embankments are incised	0	LS	$0.00	$0	Embankments are incised; dam on west side along river
SUBTOTAL Repair On-Site Pond Embankments				**$0**	
Utility Services					
Utility Modifications	1	LS	$25,000.00	$25,000	Assume for each pond. LG&E-KU to complete.
Shoring for conveyor support foundations	0	LS	$0.00	$0	not applicable
SUBTOTAL Utility Services				**$25,000**	
Perimeter Berm (not required)	**1**	**LS**	**$0.00**	**$0**	
SUBTOTAL Perimeter Berm (not required)				**$0**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)	43	CY	$37.86	$1,627	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$1,627**	
Excavation and Haul CCRs to ATB					
Excavate and Load	82,436	CY	$9.56	$788,088	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Over Excavate and Load from lagoon bottom	3,549	CY	$9.56	$33,928	$2.36 excavator 1 cy cap = 100cy/hr (RSM 31 23 16.42 0200) + $4.36 haul 12cy 15mph 2 mile (31 23 23.20 1018)+ $2.84 dozer 200 hp 50 ft, clay (31 23 16.46 4040)
Moisture Conditioning/Dust Control	85,985	CY	$0.57	$49,011	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Surface Grading, lagoon bottoms	10,648	SY	$3.87	$41,208	RSM 31 22 16.10 3500
SUBTOTAL Excavation and Haul CCRs to ATB				**$912,236**	
Final Fill/Soil Cover					
- Excavation and Load-out (from off-site borrow area)	84,210	CY	$20.00	$1,684,200	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	1,775	CY	$20.00	$35,500	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	85,985	CY	$4.36	$374,895	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	85,985	CY	$2.39	$205,504	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	85,985	CY	$0.57	$49,011	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	10,648	SY	$0.20	$2,130	RSM 31 22 16.10 3300
SUBTOTAL Final Fill/Soil Cover				**$2,351,240**	
Surface Water Features					
Items to meet NPDES Permit requirements	1	LS	$250,000.00	$250,000	cost to include revising NPDES permit to close out this pond and include the new discharge pond from the "new" Clearwell Pond
SUBTOTAL Surface Water Features				**$250,000**	
Primary Outlet Structure					
SUBTOTAL Primary Outlet Structure				**$0**	
Emergency Outlet Structure					
Modify	0	LS	$0.00	$0	not applicable
SUBTOTAL Emergency Outlet Structure				**$0**	
Surface Restoration					
Mechanical Seeding & Mulching	2	AC	$3,550.00	$7,810	Seeding, slope mix, 6#, hydro/air seeding w/mulch & fertilizer (RSM 32 92 19.14 4600) + 40% re-application
Quantity/Final Survey	1	LS	$3,000.00	$3,000	Assume for each of the 4 ponds.
SUBTOTAL Surface Restoration				**$10,810**	
Groundwater Monitoring					
New Monitoring wells, 4" (1,160 LF perimeter)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL Groundwater Monitoring				**$150,400**	
Soil Sampling					
Confirmation Sampling (5/Acre)	11	EA	$100.00	$1,100	
Confirmation Sample Analysis	11	EA	$150.00	$1,650	single marker metal
Sample Packaging and Shipping	3	EVENT	$250.00	$688	4 samples per cooler
SUBTOTAL Soil Sampling				**$3,438**	
SUBTOTAL CONSTRUCTION				**$3,808,037**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$100,000.00	$100,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$300,000.00	$300,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$500,000.00	$500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$3,808,036.81	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$1,050,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$4,858,037**	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Mill Creek Generating Station Cost Estimate - Concrete Tanks
24-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	Check	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Proposed Conceptual Alternative CCR Closure - Auxiliary Pond	**$107,855,943**	**0%**	**22%**	**41%**	**36%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**										
NEW CONSTRUCTION	**$82,966,110**	**0.0%**	**23.2%**	**41.6%**	**35.2%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**	**$0**	**$20,044,778**	**$37,298,288**	**$32,854,939**	**$0**	**$0**	**$0**	**$0**	**$0**	**$90,198,005**
BA CCRT Preliminary Design and Engineering	$540,800	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	$0	$562,432	$0	$0	$0	$0	$0	$0	$0	$562,432
BA CCRT Mechanical Improvements/Additions	$15,142,400	0%	10%	50%	40%	0%	0%	0%	0%	0%	100%	$0	$1,574,810	$8,189,010	$6,813,256	$0	$0	$0	$0	$0	$16,577,076
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	$20,152,468	0%	30%	40%	30%	0%	0%	0%	0%	0%	100%	$0	$6,287,570	$8,718,764	$6,800,636	$0	$0	$0	$0	$0	$21,806,970
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	$14,830,442	0%	10%	40%	50%	0%	0%	0%	0%	0%	100%	$0	$1,542,366	$6,416,242	$8,341,115	$0	$0	$0	$0	$0	$16,299,724
Dewatering Facility Order of Magnitude Capital Cost	$32,300,000	0%	30%	40%	30%	0%	0%	0%	0%	0%	100%	$0	$10,077,600	$13,974,272	$10,899,932	$0	$0	$0	$0	$0	$34,951,804
Subtotal	**$82,966,110**											**$0**	**$20,044,778**	**$37,298,288**	**$32,854,939**	**$0**	**$0**	**$0**	**$0**	**$0**	**$90,198,005**
Contingency	$24,889,833	0%	20%	40%	40%	0%	0%	0%	0%	0%	100%	$0	$0	$0	$27,059,402	$0	$0	$0	$0	$0	$27,059,402
Subtotal with Contingency	**$107,855,943**											**$0**	**$20,044,778**	**$37,298,288**	**$59,914,341**	**$0**	**$0**	**$0**	**$0**	**$0**	**$117,257,407**
LG&E & KU Overheads	$3,774,958	0%	23%	42%	35%	0%	0%	0%	0%	0%	100%	$0	$701,567	$1,305,440	$2,097,002	$0	$0	$0	$0	$0	$4,104,009
TOTAL PROJECT COST	**$111,631,000**											**$0**	**$20,746,000**	**$38,604,000**	**$62,011,000**	**$0**	**$0**	**$0**	**$0**	**$0**	**$121,361,000**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

Notes:

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Mill Creek Generating Station" technical memo dated July 24, 2015

2 - Assumes the use of CCR material to create grades to support the pond cap.

3 - Assumes the use of Soil material to create pond cap or other design features.

4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.

5 -Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Mill Creek Generating Station — COST ESTIMATE SUMMARY

Site: Mill Creek Generating Station
Location: Fishtown, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Construction Pond
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
NEW CONSTRUCTION					
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	1.0	LS	$20,152,468.39	$20,152,468	2 tanks, each is 360' x 90'x 24' deep. 2 tanks (~1.5 acres) - Total CCR tanks (-Contingency)
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	1.0	LS	$14,830,441.99	$14,830,442	**Rerfer to tab "Capital Cost Estimate" shows the Order of Magnitude Cost (-Contingency), details are not reflected below**
Dewatering Facility Order of Magnitude Capital Cost	1.0	LS	$32,300,000.00	$32,300,000	**From ELG Cost Sheet (-Contingency) July 2, 2015**
FGD Treatment Tanks					Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mix Tank Mixers	1.0	LS	$103,748.11	$103,748	" "
Flocculation Tank Mixers	1.0	LS	$103,748.11	$103,748	" "
Ferric Chloride Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Sulfuric Acid Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Organosulfide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Polyblend System	1.0	LS	$53,400.00	$53,400	" "
Sodium Hydroxide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Common Equipment					
Ferric chloride tank	1.0	LS	$18,299.38	$18,299	" "
Sulfuric Acid tank	1.0	LS	$18,299.38	$18,299	" "
Sodium Hydroxide Tank	1.0	LS	$18,299.38	$18,299	" "
Safety Shower	1.0	LS	$30,000.00	$30,000	" "
Total Equipment Cost (TEC)	**1.0**	**LS**	**$407,000.00**	**$407,000**	" "
Freight	1.0	LS	$12,843.31	$12,843	" "
Purchased Equipment Cost - Delivered (PEC-D)	**1.0**	**LS**	**$419,843.31**	**$419,843**	" "
FGD Treatment Tanks					
Mix Tanks Wall Concrete	1.0	LS	$62,273.73	$62,274	" "
Mix Tanks Slab Concrete	1.0	LS	$9,556.25	$9,556	" "
Floculation Tanks Wall Concrete	1.0	LS	$62,273.73	$62,274	" "
Floculation Tanks Slab Concrete	1.0	LS	$9,556.25	$9,556	" "
Settling Tanks Wall Concrete	1.0	LS	$3,062,222.22	$3,062,222	" "
Settling Tanks Slab Concrete	1.0	LS	$5,027,998.61	$5,027,999	" "
Total Ramp concrete, cy	1.0	LS	$308,101.52	$308,102	" "
Common Items					
Excavation - Soft	1.0	LS	$1,393,411.96	$1,393,412	" "
Pre Engineered building	1.0	LS	$120,000.00	$120,000	" "
Lining Tanks	1.0	LS	$1,047,151.75	$1,047,152	" "
Construction Material					
Construction Material	1.0	LS	$11,102,546.03	$11,102,546	" "
State Sales Tax	1.0	LS	$4,079.05	$4,079	" "
Subtotal Construction Material	**1**	LS	$11,106,625.08	**$11,106,625**	" "
Total Equipment and Construction	**1.0**	**LS**	**$11,526,468.39**	**$11,526,468**	" "
					" "
Other Construction					
Electrical and I&C	1.0	LS	$576,000.00	$576,000	" "
Piping	1.0	LS	$922,000.00	$922,000	" "
Yard Improvements (a)	1.0	LS	$922,000.00	$922,000	" "
Metals and Finishes	1.0	LS	$346,000.00	$346,000	" "
Subtotal Equipment/Construction/Other	**1**	LS	$14,292,468.39	**$14,292,468**	" "
Total Direct Costs (TDC)	**1.0**	**LS**	**$14,292,468.39**	**$14,292,468**	" "
Contractor's Field General Conditions	1.0	LS	$715,000.00	$715,000	" "
Contractor's OH&P	1.0	LS	$2,144,000.00	$2,144,000	" "
Contingency	**1.0**	**LS**	**$2,858,000.00**	**$2,858,000**	" "
Escalation Factor	**1.0**	**LS**	**$0.00**	**$0**	" "
Total Construction Cost (TCC)	**1.0**	**LS**	**$20,009,468.39**	**$20,009,468**	" "
Engineering, SDCc and Startup	**1.0**	**LS**	**$3,001,000.00**	**$3,001,000**	" "
Total Estimated Order of Magnitude Capital Cost	**1.0**	**LS**	**$23,010,468.39**	**$23,010,468**	" "
Total Estimated Order of Magnitude Capital Cost (-Contingency)	**1.0**	**LS**	**$20,152,468.39**	**$20,152,468**	Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mechanical Improvements/Additions					
Piping from Ash Pond to Plant	1	LS	$500,000.00	$0	allowance
Piping to new concrete tank	1	LS	$250,000.00	$0	allowance
SUBTOTAL Mechanical Improvements/Additions				**$0**	
SUBTOTAL NEW CONSTRUCTION				$67,282,910	

Mill Creek Facility Backup Quantities Dave Lake 7/9/2015

CCR Production Rates

CCR Production Handling Assumptions:

% Bot Ash Wet Sluice to ATB:	100%
% Fly Ash Wet Sluice to ATB:	100%
% Gypsum to ATB:	0%

CCR Production - 2015 Plan (tons)

	Mill Creek				Accumulated Material (Tons)
Year	Bot Ash	Fly Ash	Gypsum	TOTAL	ATB
2015	81,349	325,397	736,260	1,143,006	210,730
2016	83,284	333,137	762,967	1,179,389	
2017	82,556	330,225	778,939	1,191,721	
2018	83,448	333,792	799,683	1,216,922	
2019	83,183	332,731	797,264	1,213,178	
2020	85,006	340,023	814,867	1,239,896	
2021	85,183	340,732	816,533	1,242,448	
2022	84,508	338,032	810,297	1,232,836	
2023	87,917	351,669	842,744	1,282,330	
2024	89,051	356,204	853,712	1,298,967	
2025	89,767	359,067	860,470	1,309,304	
Total:				**Assumed Additional Accumulated Material (2015 thru closure):**	210,730

Projected Material Generation - Handling Assumptions:

A. Bottom Ash and Flyash:
- Until January 1, 2019 assume all fly ash and bottom ash deposited in Ash Treatment Basin, and
- After January 1, 2019 all material to the Ash Treatment Basin until 5% slopes are formed

B. Gypsum
- Gypsum to be used if necessay for fill, but based on projected bottom ash and fly ash generation rates, gypsum will not be needed as extra fill volume

Approximate density of CCR in-place: 1 ton/CY Assume dry material for this exersize

Orange:	Updated Quantities
Yellow:	Based on assumptions as listed

Pond Quantity Balance Estimate - By Pond:

Ash Treatment Basin

Item	Units	ATB	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	73.1				
Standing Surface Water (to remove)	GAL	84,337,490	Assume 5-ft average over pond area. Confirm with CAD.		5	ft
Length of perimeter	LF	7,710				
CUT:						
CCR cut in 2017	CY	335,048	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
Cut/regrade for cover subgrade/ditch	CY	18,847	Assume Trapazoidal channel 4H:1V 3-ft deep with 10-ft bottom	CAD - confirm cut to grade ditches for final cover	66	SF
FILL (to cover subgrade):						
CCR for Fill - from Baseline	CY	210,730				
CCR for Fill - from Clearwell Pond closure	CY	45,065				
CCR for Fill - from Emergency Pond closure	CY	62,027				
CCR for Fill - from Dead Storage Pond closure	CY	41,196				
CCR for Fill - from Construction Runoff Pond closure	CY	85,985				
Total Fill - after Baseline to develop 5% slope	CY	425,483	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	666,742	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	15,601				
Final Cover Soil Volume	CY	237,340	CAD to update			
Final Cover Surface Area	AC	73.1	CAD to update			
Structural Support						
Geogrid	AC	87.7	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	87.7	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Surface Water Containment						
Concrete tank for surface water containment			Place holder for this item			

Clearwell Pond

Item	Units	Clearwell Pond	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	1.9				
Standing Surface Water (to remove)	GAL	3,095,581	Assume 5-ft deep over pond area. Confirm with CAD.		5	ft
Length of perimeter	LF	1,190				
Excavate remaining CCR material and deposite in ATB	CY	42,000	CAD - confirm volume of CCR in existing pond	CAD - confirm volume of CCR in existing pond		
Over excavate (contaminated soil) for clean close	CY	3,065	Excavate an additional 1-ft to remove contaminated soil		1	ft
Reinstate as Process Water Pond (non-CCR)						
Install new FML to line pond	CY	9,725	Assumed total surface area plus 2-ft x 2-ft anchor trench, 40 mil LLDPE liner			
Geofabric	CY	9,725	Assumed Mound running NW to SE length 800-LF	Each mound is estimated to approximately 40,400 cubic yards of fill		
Cover Aggregate	CY	3,065	Assume 1-ft thick granular cover material		1	ft

Emergency Pond

Item	Units	Emergency Pond	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	2.8				
Standing Surface Water (to remove)	GAL	4,561,908	Assume 5-ft deep over pond area. Confirm with CAD.		5	ft
Length of perimeter	LF	1,620				
Excavate remaining CCR material and deposite in ATB	CY	57,510	CAD - confirm volume of CCR in existing pond	CAD - confirm volume of CCR in existing pond		
Over excavate (contaminated soil) for clean close	CY	4,517	Excavate an additional 1-ft to remove contaminated soil		1	ft
Reinstate as Process Water Pond (non-CCR)						
Install new FML to line pond	CY	14,272	Assumed total surface area plus 2-ft x 2-ft anchor trench, 40 mil LLDPE liner			
Geofabric	CY	14,272	Assumed Mound running NW to SE length 800-LF	Each mound is estimated to approximately 40,400 cubic yards of fill		
Cover Aggregate	CY	4,517	Assume 1-ft thick granular cover material		1	ft

Dead Storage Pond

Item	Units	Dead Storage Pond	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	1.6				
Standing Surface Water (to remove)	GAL	2,606,805	Assume 5-ft deep over pond area. Confirm with CAD.		5	ft
Length of perimeter	LF	1,055				
Excavate remaining CCR material and deposite in ATB	CY	38,615	CAD - confirm volume of CCR in existing pond	CAD - confirm volume of CCR in existing pond		
Over excavate (contaminated soil) for clean close	CY	2,581	Excavate an additional 1-ft to remove contaminated soil		1	ft
Reinstate as Process Water Pond (non-CCR)						
Install new FML to line pond	CY	8,213	Assumed total surface area plus 2-ft x 2-ft anchor trench, 40 mil LLDPE liner			
Geofabric	CY	8,213	Assumed Mound running NW to SE length 800-LF	Each mound is estimated to approximately 40,400 cubic yards of fill		
Cover Aggregate	CY	2,581	Assume 1-ft thick granular cover material		1	ft

Construction Runoff Pond

Item	Units	Construction Runoff Pond	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	2.2				
Standing Surface Water (to remove)	GAL	3,584,356	Assume 5-ft deep over pond area. Confirm with CAD.		5	ft
Length of perimeter	LF	1,160				
Excavate remaining CCR material and deposite in ATB	CY	82,436	CAD - confirm volume of CCR in existing pond	CAD - confirm volume of CCR in existing pond		
Over excavate (contaminated soil) for clean close	CY	3,549	Excavate an additional 1-ft to remove contaminated soil		1	ft
Reinstate as Process Water Pond (non-CCR)						
Install new FML to line pond	CY	11,163	Assumed total surface area plus 2-ft x 2-ft anchor trench, 40 mil LLDPE liner			
Geofabric	CY	11,163	Assumed Mound running NW to SE length 800-LF	Each mound is estimated to approximately 40,400 cubic yards of fill		
Cover Aggregate	CY	3,549	Assume 1-ft thick granular cover material		1	ft

Other Key Assumptions:

[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
FGD Treatment Tanks									
Mix Tank Mixers	3.0	hp	2	43,228	86,457	8,646	103,748	103,748	
Flocculation Tank Mixers	3.0	hp	2	43,228	86,457	8,646	103,748	103,748	
Ferric Chloride Feed Pumps	8.4	gph	2	6,266	12,533	1,400	15,333	15,333	
Sulfuric Acid Feed Pumps	8.4	gph	2	6,266	12,533	1,400	15,333	15,333	
Organosulfide Feed Pumps	3.4	gph	2	6,266	12,533	1,400	15,333	15,333	
Polymer Blending Systems	0.8	gph	2	25,000	50,000	1,700	53,400	53,400	
Sodium Hydroxide Feed Pumps	8.4	gph	2	6,266	12,533	1,400	15,333	15,333	
Other Wastewater Treatment Tanks									
Mix Tank Mixers	15.0	hp	2	59,442	118,884	11,888	142,661		142,661
Flocculation Tank Mixers	15.0	hp	2	59,442	118,884	11,888	142,661		142,661
Ferric Chloride Feed Pumps	47.8	gph	2	6,266	12,533	1,400	15,333		15,333
Sulfuric Acid Feed Pumps	47.8	gph	2	6,266	12,533	1,400	15,333		15,333
Organosulfide Feed Pumps	19.1	gph	2	6,266	12,533	1,400	15,333		15,333
Polymer Blending Systems	4.8	gph	2	25,000	50,000	1,700	53,400		53,400
Sodium Hydroxide Feed Pumps	47.8	gph	2	6,266	12,533	1,400	15,333		15,333
Mix Tank Blower	500	SCFM	2	2,850	5,700	1,140	7,980		7,980
Common Equipment									-
Ferric chloride tank	15,000	gal	1	30,499	30,499	6,100	36,599	18,299	18,299
Sulfuric Acid tank	15,000	gal	1	30,499	30,499	6,100	36,599	18,299	18,299
Organosulfide Tank	7,000	gal	1	15,615	15,615	3,123	18,738		18,738
Polymer feed Totes	265	gal	6		-	-	-		-
Sodium Hydroxide Tank	15,000	gal	1	30,499	30,499	6,100	36,599	18,299	18,299
Safety Shower			2	25,000	50,000	5,000	60,000	30,000	30,000
Area Labor Adjustment Factor	100.0%	applies to installation cost only							
Total Equipment Cost (TEC)							**919,000**	**407,000**	**512,000**
Area Labor Adjustment Factor									
Total Process Equipment					723,756				
Freight	4%	of Proc Equip					29,000	12,843	16,157
Purchased Equipment Cost - Delivered (PEC-D)							**948,000**	**419,843**	**528,157**
FGD Treatment Tanks									
Mix Tanks Wall Concrete	96	CY	1	650	62,274		62,274	62,274	
Mix Tanks Slab Concrete	32	CY	1	300	9,556		9,556	9,556	
Floculation Tanks Wall Concrete	96	CY	1	650	62,274		62,274	62,274	
Floculation Tanks Slab Concrete	32	CY	1	300	9,556		9,556	9,556	
Settling Tanks Wall Concrete	4711	CY	1	650	3,062,222		3,062,222	3,062,222	
Settling Tanks Slab Concrete	16,760	CY	1	300	5,027,999		5,027,999	5,027,999	
Total Ramp concrete	514	CY	2	300	308,102		308,102	308,102	
Other Treatment Tanks									
Mix Tanks Wall Concrete	116	CY	1	650	75,647		75,647		75,647
Mix Tanks Slab Concrete	73	CY	1	300	21,920		21,920		21,920
Floculation Tanks Wall Concrete	116	CY	1	650	75,647		75,647		75,647
Floculation Tanks Slab Concrete	73	CY	1	300	21,920		21,920		21,920
Settling Tanks Wall Concrete	4,249	CY	1	650	2,761,778		2,761,778		2,761,778
Settling Tanks Slab Concrete	10,245	CY	1	300	3,073,494		3,073,494		3,073,494
Total Ramp concrete	514	CY	2	300	308,102		308,102		308,102
Common Items									
Excavation - Soft	376,076	CY	1	5.97	2,245,171		2,245,171	1,393,412	851,759
Pre Engineered building	1,200	ft2	1	200	240,000		240,000	120,000	120,000
Lining Tanks	56,242	SY	1	30	1,687,250		1,687,250	1,047,152	640,099
Construction Material							19,052,910	11,102,546	7,950,364
State Sales Tax	1.0%	Proc Eq					7,000	4,079	2,921
Total Constuction Material							**19,059,910**	**11,106,625**	**7,953,285**
Total Equipment and Construction							**20,007,910**	**11,526,468**	**8,481,442**
Electrical and I&C	5%						1,000,000	576,000	424,000
Piping	8%						1,601,000	922,000	679,000
Yard Improvements (a)	8%	of Equip + Const.					1,601,000	922,000	679,000
Metals and Finishes	3%	of Equip + Const.					600,000	346,000	254,000
Subtotal							24,809,910	14,292,468	10,517,442
Total Direct Costs (TDC)							**24,809,910**	**14,292,468**	**10,517,442**
Contractor's Field General Conditions	5%	of TDC					1,240,000	715,000	526,000
Contractor's OH&P	15%	of TDC					3,721,000	2,144,000	1,578,000
Contingency	20%	of TDC					4,962,000	2,858,000	2,103,000
Escalation Factor	0%	of TDC					0	0	0
Total Construction Cost (TCC)							**34,732,910**	**20,009,468**	**14,724,442**
Engineering, SDC[c] and Startup	15%	of TCC					5,210,000	3,001,000	2,209,000
Total Estimated Order of Magnitude Capital Cost							**39,942,910**	**23,010,468**	**16,933,442**

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
Annual Cost of Capital (7% over 20 years)							$3,770,000	$2,172,000	$1,598,000

(a) Includes fencing, grading, roads, sidewalks, and similar items.
(b) The enclosed Engineer's Estimate is only an estimate of possible construction costs. This estimate is limited to the conditions existing at its issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.
(c) SDC stands for Services During Construction (Startup, Engineer/Site Reps, etc.)

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Mass Balances - FGD Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	FGD Wastewater	Mix Tank Influent	Sodium Hydroxide Feed (2)	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
3-Month Average Flow											
Volumetric Flow, 3-month average	gpm	1,324	1,324	0.07	0.07	0.03	0.66	0.066	1,351	125	1,219
Total Mass Flow	lb/hr	675,780	675,780	42	47	16	331	61	676,230	66,277	609,953
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	14	0	0	0			
Mass Flow Liquid	lb/hr	662,530	662,530	42	47	16	331	61	662,966	53,022	609,944
Mass Flow Solids	lb/hr	13,251	13,251	0	14	0	0	0	13,265	13,255	9.1
Specific Gravity		0.00	0.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	0.0	0.0	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	2,112	2,112	0.11	0.11	0.04	1.06	0.066	2,156	200	1,945
Total Mass Flow	lb/hr	1,077,982	1,077,982	68	75	25	528	61	1,078,700	105,650	973,049
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	22	0	0	0			
Mass Flow Liquid	lb/hr	1,056,845	1,056,845	68	75	25	528	61	1,057,540	84,520	973,020
Mass Flow Solids	lb/hr	21,137	21,137	0	22	0	0	0	21,159	21,130	29.2
Specific Gravity		0.00	0.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	0.0	0.0	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx	User Entered

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Mass Balances - Other Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	Other Wastewater	Mix Tank Influent	Sodium Hydroxide Feed	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
DESIGN FLOW											
Volumetric Flow, 3 month ave	gpm	9,365	9,365	0.47	0.47	0.19	4.68	0.468	9,372	2	9,371
Total Mass Flow	lb/hr	4,686,715	4,686,715	300	429	111	2,343	431	4,689,898	894	4,689,004
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	99	0	0	0			
Mass Flow Liquid	lb/hr	4,686,246	4,686,246	300	330	111	2,343	431	4,689,330	396	4,688,934
Mass Flow Solids	lb/hr	469	469	0	99	0	0	0	568	497	70.3
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	24,611	24,611	1.23	1.23	0.49	12.31	0.468	24,630	11	24,619
Total Mass Flow	lb/hr	12,316,576	12,316,576	788	868	291	6,158	431	12,324,941	5,612	12,319,329
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	260	0	0	0			
Mass Flow Liquid	lb/hr	12,315,344	12,315,344	788	868	291	6,158	431	12,323,449	4,490	12,318,959
Mass Flow Solids	lb/hr	1,232	1,232	0	260	0	0	0	1,492	1,122	369.6
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx	User Entered

Equipment Sizing

	FGD Treatment	Other Water Treatment	Tom's comments - red = not addressed, black = addressed
Mix Tanks			
Average Flow, gpm	950	9,571	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,807	15,924	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	29.5	16.6	
HDT Peak, Min	10	10	
Mix Tank Volume, gal	28,070	159,240	
Mix Tank Volume, cf	3,752	21,287	
Side Water Depth, ft	20	23	Need to account for the mix tanks being higher than the settling tanks to allow fro head drop
Freeboard, ft	2	2	
Wall Height, ft	22	25	
Length/width, ft	14	30	inside dimensions
Slab Area, sf	430	986	
Wall length, ft	29	63	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,293	1,571	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	96	116	
Slab Volume, cy	32	73	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.81	15.92	
Actual HP	3	15	
Number	2	2	
Outlet Pipe Nominal Diameter, in	16	32	FRP Pipe
Outlet Pipe ID, in	16	32	
Outlet Pipe Velocity, fps	4.48	3.18	Design for2 to 5 fps
Pipe Head Loss to Floculation Tank, Ft	0.70	0.33	
Number of Dip Tubes	1	2	We will want to design 2 different size dip tubes for other wastewater, a lower one that is smaller for low flows and a larger one for high flow conditions. We need a minimum velocity to suck solids out of the tank, and max velocity to prevent shear.

Flocculation Tanks			
Average Flow, gpm	950	9,571	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,807	15,924	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	29.5	16.6	
HDT Peak, Min	10	10	
Flocculation Tank Volume, gal	28,070	159,240	
Flocculation Tank Volume, cf	3,752	21,287	
Side Water Depth, ft	20.0	23.0	
Freeboard, ft	2	2	
Wall Height, ft	22.0	25.0	
Length/width, ft	14	30	inside dimensions
Slab Area, sf	430	986	
Wall length, ft	29	63	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,293	1,571	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	96	116	
Slab Volume, cy	32	73	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.81	15.9	
Actual HP	3.0	15	
Number	2	2	
Outlet Pipe Nominal Diameter, in	16	32	FRP
Outlet Pipe ID, in	16	32	
Outlet Pipe Velocity, fps	4.48	3.18	Design for max 3-4 fps
Pipe Head Loss to Floculation Tank	0.70	0.33	
Number of Dip Tubes	1	2	

Settling Tanks			
Average Flow, gpm	950	9,571	Calculate overflow rate on peak flow, solids storage on average flow
Max Design Flow, gpm	2,807	15,924	
Design solids, mg/L	20,000	100	
Daily solids production , lbs/day	228,519	13,873	
Solids concentration (Settled solids)	20%	5%	Settled solids
Solids density, lbs/cf	80	80	dry solids
Solids generation, cf/day	14,282	3,468	
Solids Storage, days	91	228	
Solids Storage per tank, cf	1,306,800	792,000	> 1 yr solids capacity for Other WW ssytem.
Number of Tanks	2	2	
Wall Height, ft	24	24	
Freeboard, ft	2	2	
Side Water Depth, ft	22	22	
Water depth above settled solids	10	10	
Solids Depth,ft	12	12	
Total Tank Volume, gal per tank	17,920,584	10,860,960	
Total Tank Volume, CF per tank	2,395,800	1,452,000	
Solids Storage Volume, gal per tank	9,774,864	5,924,160	
Solids Storage Volume, CF per tank	1,306,800	792,000	
Tank Width, ft	165	100	Set based on solids storage capacity for FGD WW and overflow rate for other WW Treatment
L/W Ratio	4	6.6	
Tank Length, ft	660	660	Tank length for Other WW is set equal to the FGD WW tank and the Other WW tank width
Slab Area, sf	226,260	138,307	
Wall length, ft	2,650	2,390	
Wall Area, sf	63,600	57,360	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	

Wall thickness, ft	2.0	2.0	
Wall Volume, cy	4,711	4,249	
Slab Volume, cy	16,760	10,245	
Overflow Rate Average, gpm/sf	0.0087	0.1450	
Overflow Rate peak, gpm/sf	0.0258	0.2413	Want to stay at < 0.26 gpm/sf
Flow capacity based on average overflow rate, gpm	1,000	9,600	one train
Flow capacity based on Peak overflow rate, gpm	2,810	15,920	One train

Access Ramp to Settling Tank

Access Ramp Inside Settling tank Width, ft	30	30	Need two way truck traffic
Ramp Slope, %	12%	12%	
Ramp tickness, ft	1.50	1.50	Assumed.
Ramp Length, ft	201	201	
Ramp area, sf	6043	6043	
Ramp side wall area sf	2400	2400	
Ramp side wall Thickness, ft	2	2	
Sidewall concerte, cft	4800	4800	
Access Ramp concrete, cft	9065	9065	
Total Ramp concrete, ft3	13865	13865	
Total Ramp concrete, cy	514	514	Per ramp

Excavation	376,076		

Liner

Liner, ft2	299,350	206,825	
Liner, SY	33,261	22,981	

Chemical Feeds

Ferric Chloride Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,807	15,924	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	Use 50
Maximum Feed Rate, gph	8.4	47.8	
Average Flow to treat, gpm	950	9,571	
Average Feed Rate, gph	2.9	28.7	
Average Treatment Volume, MGD	1.37	13.78	
Average Usage, gpd	68	689	
Average usage of chemical for FGD WW and Other WW	758		
Max Day Treatment Volume, MG	4.04	22.9	
Maximum Usage, gpd	202	1147	
Max usage of chemical for FGD WW and Other WW, gpd	1,349		
Nominal Storage Tank Volume, gal	11,000		
Number of Tanks	1		
Total Storage Volume, gal	15,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	11		
Storage Time at average usage, days	20		Size for 14 to 21 days capacity at average usage

Sulfuric Acid Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,807	15,924	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	8	48	
Average Flow to treat, gpm	950	9,571	
Average Feed Rate, gph	2.9	29	
Average Treatment Volume, MGD	1.4	13.8	
Average Usage, gpd	68	689	
Average usage of chemical for FGD WW and Other WW	758		
Max Day Treatment Volume, MG	4.04	22.9	
Maximum Usage, gpd	202	1147	
Max usage of chemical for FGD WW and Other WW	1,349		
Nominal Storage Tamk Volume, gal	11,000		
Number of tanks	1		
Total Storage Volume, gal	15,000		Each tank. Includes 4000 gal for tanker truck.
Storage Time at normal max usage, days	11		
Storage Time at average usage, days	20		Size for 14 to 21 days capacity at average usage

Sodium Hydroxide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,807	15,924	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	8.4	47.8	
Average Flow to treat, gpm	950	9,571	
Average Feed Rate, gph	2.9	28.7	
Average Treatment Volume, MGD	1.37	13.8	
Average Usage, gpd	68	689	
Average usage of chemical for FGD WW and Other WW	758		
Max Day Treatment Volume, MG	4.04	22.9	
Normal Maximum Usage, gpd	202	1147	
Max usage of chemical for FGD WW and Other WW	1,349		
Nominal Storage Tank Volume, gal	11,000		common Tank
Number of tanks	1		
Total Storage Volume, gal	15,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	8		
Storage Time at average usage, days	20		Size for 14 to 21 days capacity at average usage

Organosulfide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,807	15,924	
Dose (volume of chemical/volume of wastewater), ppmv	20	20	
Maximum Feed Rate, gph	3.37	19.1	
Average Flow to treat, gpm	950	9,571	
Average Feed Rate, gph	1.1	11.5	
Average Treatment Volume, MGD	1.37	13.8	
Average Usage, gpd	27.4	276	
Average usage of chemical for FGD WW and Other WW, gpd	303		
Max Day Treatment Volume, MG	4.04	22.9	
Normal Maximum Usage, gpd	80.8	459	
Max usage of chemical for FGD WW and Other WW, gpd	539		
Nominal Storage Tank Volume, gal	3,000		
Number of tanks	1		
Total Storage Volume, gal	7,000		
Storage Time at normal max usage, days	13		

Storage Time at average usage, days	23		Size for ~ 21 days capacity at average usage

Polymer Feed System

Number of polymer blending units	2	2	
Maximum Flow to treat, gpm	2,807	15,924	
Dose (volume of chemical/volume of wastewater), ppmv	5	5	1:100 ratio neat polymer to water
Maximum Feed Rate, gph	0.84	4.78	
Dilution Water Feed (volume to volume of neat polymer)	100	100	
Maximum Flow of Dilution water, gph	84.2	477.7	
Average Flow to treat, gpm	950	9,571	
Average Feed Rate, gph	0.29	2.87	
Average Treatment Volume, MGD	1.37	13.78	
Average Usage, gpd	6.8	68.9	
Average usage of chemical for FGD WW and Other WW, gpd	76		
Max Day Treatment Volume, MG	4.04	22.9	
Normal Maximum Usage, gpd	20.2	115	
Max usage of chemical for FGD WW and Other WW, gpd	135		
Nominal Storage Tote Volume, gal	265		265 or 320 gallons are standard volumes/sizes for totes
Number of totes	6		
Total Storage Volume, gal	1,590		
Storage Time at normal max usage, days	12		
Storage Time at average usage, days	21		Size for ~ 21 days capacity at average usage

Note: User Input

12 feet of solids, 10 feet of water and 2 feet of freeboard

Head loss influent Mix tank to Floccuation Tank FGD Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		16	16		0.78	2,807	6.25	4.48	0.31	150	0.00	0.24	0.24
	pipe	FRP		16	16	20		2,807	6.25	4.48	0.31	150	0.07	0.00	0.07
0	tee, branch	FRP		16	16		0.72	2,807	6.25	4.48	0.31	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		16	16		0.19	2,807	6.25	4.48	0.31	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		16	16		0.19	2,807	6.25	4.48	0.31	150	0.00	0.06	0.06
				16	16			2,807							
	pipe	FRP		16	16	4		2,807	6.25	4.48	0.31	150	0.01	0.00	0.01
1	exit loss	FRP		16	16		1.00	2,807	6.25	4.48	0.31	150	0.00	0.31	0.31

Total head loss **0.70**
total minor loss **0.62**

Head loss influent Mix tank to Floccuation Tank, Other Water Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		32	32		0.78	7,962	17.74	3.18	0.16	150	0.00	0.12	0.12
	pipe	FRP		32	32	23		7,962	17.74	3.18	0.16	150	0.02	0.00	0.02
0	tee, branch	FRP		32	32		0.72	7,962	17.74	3.18	0.16	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		32	32		0.19	7,962	17.74	3.18	0.16	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		32	32		0.19	7,962	17.74	3.18	0.16	150	0.00	0.03	0.03
				32	32			7,962							
				32	32										
	pipe	FRP		32	32	4		7,962	17.74	3.18	0.16	150	0.00	0.00	0.00
1	exit loss	FRP		32	32		1.00	7,962	17.74	3.18	0.16	150	0.00	0.16	0.16

Total head loss **0.33**
total minor loss **0.31**

228,855.00

804
204
164016
328032

12149.33333

24298.66667

Excavation Calculation FGD WW and Other WW Tanks

Settling Tank Depth below grade=	22	ft	
Depth Below Tank for Excavation =	4	ft	
Depth of excavation	26	ft	
Side Slope (H:V) =	1	ft/ft	
Tank wall thickness	2	ft	
FGD WW Tank Length =	660	ft	
FGD WW Tank Width =	165	ft	
Number of FGD WW Tanks =	2	each	
Other WW Tank Length =	660	ft	
Other WW Tank Width =	100	ft	
Number of Other WW Tanks =	2	each	
Total Length of tanks with walls	664	ft	
Total Width of tanks with walls	540	ft	
Excavated tank area volume	10,154,040	cf	Trapezoidal calculation, average width of cut time average length of cut times depth
Total Excavated Volume	376,076	cy	

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Tretment Tank System
Ramps	*Access to Settling Tanks*	Number	2	2
		Length, ft	201	201
		Width, ft	30	30
		Slope, %	12%	12%
		Materials	Reinforced Concrete	Reinforced Concrete
Mix Tanks	*Tanks*	Number	2	2
		Average Flow, gpm	950	9,571
		Peak Flow, gpm	2,807	15,924
		Detention Time at Average Flow, min	30	17
		Detention Time at Peak Flow, min	10	10
		Dimension, ft (square)	14	30
		Wall Height, ft	22	25
		Freeboard, ft	2	2
		Side Water Depth, ft	20	23
		Volume, gal	28,070	159,240
		Materials	Reinforced Concrete	Reinforced Concrete
	Mix Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	3	15
	Mix Tank Blower	Number		2
		Type		Rotary Lobe
		Air Required, scfm		500
		Horsepower, each		20
	Dip Tubes	Number	2	2
		Diameter, in	16	32
		Head loss, ft	0.70	0.33
		Materials	FRP	FRP
FlocculationTanks	*Tanks*	Number	2	2
		Average Flow, gpm	950	9,571
		Peak Flow, gpm	2,807	15,924
		Detention Time at Average Flow, min	30	17
		Detention Time at Peak Flow, min	10	10
		Dimension, ft (square)	14	30
		Wall Height, ft	22	25
		Freeboard, ft	2	2
		Side Water Depth, ft	20	23
		Volume, gal	28,070	159,240
		Materials	Reinforced Concrete	Reinforced Concrete
	Flocculation Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	3	15
	Dip Tubes	Number	2	2
		Diameter, in	16	32
		Head loss, ft	0.70	0.33
		Materials	FRP	FRP
Settling Tanks	*Tanks*	Number	2	2
		Average Flow, gpm	950	9,571
		Peak Flow, gpm	2,807	15,924
		Solids Concentration, mg/L	20,000	100
		Average dry solids generation, lbs/day	228,519	13,873
		Solids Settled Concentration (%)	20%	5%
		Solids density, lbs/cf	80	80
		Solids Generation, cf/day	14,282	3,468
		Length, ft	660	660
		Width, ft	165	100
		Wall Height, ft	24	24
		Freeboard, ft	2	2
		Side Water Depth, ft	22	22
		Settling Depth, ft	10	10

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Tretment Tank System
		Solids Depth, ft	12	12
		Total Liquid Volume, gal per tank	17,920,584	10,860,960
		Solids Storage Design Criteria, days	90	90
		Solids Storage Volume, cf	1,306,800	792,000
		Solid Storage Provided per tank, days	91	228
		Average Overflow Rate, gpm/sf	0.01	0.15
		Peak Overflow Rate, gpm/sf	0.03	0.24
		Materials	Reinforced Concrete	Reinforced Concrete
Ferric Chloride Feed System	***Ferric Chloride Storage Tank***	Number	1	
		Tank Volume, gal	15,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	68	689
		Average Chemical Use, gal/d	758	
		Peak Chemical Use, gal/d	202	1,147
		Peak Chemical Use, gal/d	1,349	
		Average Use Storage, days	20	
		Peak Use Storage, days	11	
		Chemical Stored	35% Ferric Chloride	
	Ferric Chloride Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	8.4	47.8
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	35% Ferric Chloride	35% Ferric Chloride
Sulfuric Acid Feed System	***Sulfuric Acid Storage***	Number	1	
		Tank Volume, gal	15,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	68	689
		Average Chemical Use, gal/d	758	
		Peak Chemical Use, gal/d	202	1,147
		Peak Chemical Use, gal/d	1,349	
		Average Use Storage, days	20	
		Peak Use Storage, days	11	
		Chemical Stored	93% Sulfuric Acid	
	Sulfuric Acid Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	8.4	47.8
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	93% Sulfuric Acid	0
Sodium Hydroxide Feed System	***Sodium Hydroxide Storage***	Number	1	
		Tank Volume, gal	15,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	68	689
		Average Chemical Use, gal/d	758	
		Peak Chemical Use, gal/d	202	1,147
		Peak Chemical Use, gal/d	1,349	
		Average Use Storage, days	20	
		Peak Use Storage, days	8	
		Chemical Stored	25% and 50% NaOH	
	Sodium Hydroxide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	8.4	47.8
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	25% and 50% NaOH	0
Organosulfide Feed System	***Organosulfide Tote/tank Storage***	Number	1	
		Tank Volume, gal	7,000	
		Dose, ppmv	20	20
		Average Chemical Use, gal/d	27	276
		Average Chemical Use, gal/d	303	
		Peak Chemical Use, gal/d	81	459
		Peak Chemical Use, gal/d	539	
		Average Use Storage, days	23	
		Peak Use Storage, days	13	
		Chemical Stored	Organosulfide	
		Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Tretment Tank System
	Organosulfide Feed Pumps	Capacity, gph	3.37	19.1
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Organosulfide	Organosulfide
Polymer Feed System	***Polymer Tote Storage***	Number	6	
		Volume, gal each	265	
		Volume Storage, gal	1,590	
		Dose, ppmv	5	5
		Average Chemical Use, gal/d	7	69
		Average Chemical Use, gal/d	76	
		Peak Chemical Use, gal/d	20	115
		Peak Chemical Use, gal/d	135	
		Average Use Storage, days	21	
		Peak Use Storage, days	12	
		Chemical Stored	Anionic Emulsion Polymer	
	Polymer Blending Systems	Type	Polymer Blending System	Polymer Blending System
		Capacity, gph	0.84	4.8
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Anionic Emulsion Polymer	Anionic Emulsion Polymer

LG&E-KU

Mill Creek Station

Settling Tank-based Treatment System

Table 2. Electrical Load

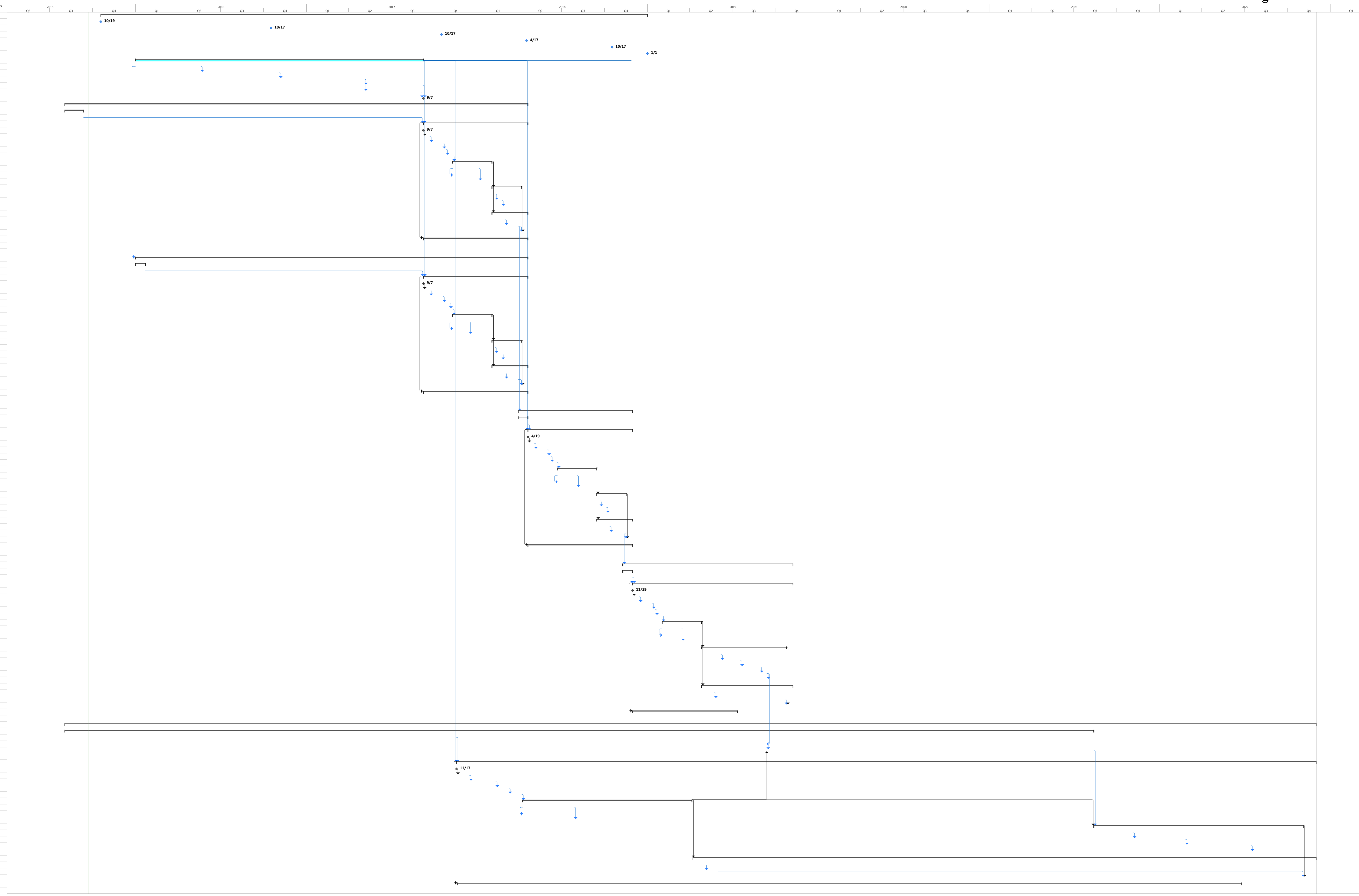
Item	Location	HP	No. Provided	No. Active	Installed HP	Active HP	% of Time On	Total HP for O&M
FGD WW Teatment								
Mix Tank Mixers	TBD	3	2	1	6	3	100%	3
Floculation Tank Mixers	TBD	3	2	1	6	3	100%	3
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Other WW Teatment								
Mix Tank Mixers	TBD	15	2	1	30	15	100%	15
Floculation Tank Mixers	TBD	15	2	1	30	15	100%	15
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Mix Tank Blower	TBD	20	2	1	40	20	10%	2
Miscellaneous (bldg heating, lights, etc.)		100			100	100	30%	30
Totals					232	166		78
MW								0.058812
MW-Hr/year								520

LG&E-KU
Mill Creek Station
Settling Tank-based Treatment System
Table 4. Estimated O&M Cost

Item	Quantity	Units	Unit Cost	Cost
Labor	1,040	hours/yr	$30	$31,200
Maintenance (% of Purchased Equipment Cost)	948,000	$	3%	$28,440
Solids for Disposal	207,328	tons/yr	-	-
Energy	520	MW-Hr/yr	$100	$52,000
Chemicals				
Ferric Chloride	221,194	gal/yr	$2	$367,181
Acid	66,358	gal/yr	$2	$155,278
Organosulfide	88,477	gal/yr	$20	$1,769,548
Polymer	22,119	gal/yr	$8	$176,070
Caustic	221,194	gal/yr	$1	$243,313
Total Annual O&M				$2,823,000
Cost per 1000 Gallon Treated (excludes labor)				**$0.50**
Annualized Cost				$6,593,000

Attachment 3
Schedule

ID	Task Name	Duration	Start	Finish	Predecessors
1	**Regulatory Milestones**	**836 days**	**Mon 10/19/15**	**Tue 1/1/19**	
2	CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3	Structural Integrity - Initial Assessment(s)	0 days	Mon 10/17/16	Mon 10/17/16	
4	Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5	Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6	Groundwater - Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7	Groundwater Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8	**Engineering Phase**	**440 days**	**Fri 1/1/16**	**Thu 9/7/17**	
9	Preliminary Design	100 days	Fri 1/1/16	Thu 5/19/16	
10	Final Design	120 days	Fri 5/20/16	Thu 11/3/16	9
11	KY DEP Permitting	130 days	Fri 11/4/16	Thu 5/4/17	10
12	KY PSC Rate Approval	90 days	Fri 5/5/17	Thu 9/7/17	11
13	Procurement of Contractor	70 days	Fri 5/5/17	Thu 8/10/17	11
14	Issue NtP	0 days	Thu 9/7/17	Thu 9/7/17	13,12
15	**Clearwell Pond**	**709 days**	**Mon 8/3/15**	**Thu 4/19/18**	
16	**LG&E Activities**	**30 days**	**Mon 8/3/15**	**Fri 9/11/15**	
17	Remove and Discharge surface water	30 days	Mon 8/3/15	Fri 9/11/15	
18	**Contractor Activities**	**160 days**	**Thu 9/7/17**	**Thu 4/19/18**	**17,8**
19	Mobilize	0 days	Thu 9/7/17	Thu 9/7/17	
20	Install Sediment and Erosion Control	10 days	Fri 9/8/17	Thu 9/21/17	19
21	Site Preparation	20 days	Fri 9/22/17	Thu 10/19/17	20
22	Roads	5 days	Fri 10/20/17	Thu 10/26/17	21
23	On Site Impoundments	10 days	Fri 10/27/17	Thu 11/9/17	22
24	**Preclosure Activities**	**60 days**	**Fri 11/10/17**	**Thu 2/1/18**	**23**
25	Excavate and Haul CCR Material to ATB	40 days	Fri 11/10/17	Thu 1/4/18	
26	Piping Improvements - Plant to Pond	60 days	Fri 11/10/17	Thu 2/1/18	25SS
27	Surface Grading Lagoon Bottoms	5 days	Fri 1/5/18	Thu 1/11/18	25
28	**Redevelopment Activities**	**45 days**	**Fri 2/2/18**	**Thu 4/5/18**	**24**
29	Shape Cover Subgrade	5 days	Fri 2/2/18	Thu 2/8/18	
30	Place HDPE Liner and Geotextile	10 days	Fri 2/9/18	Thu 2/22/18	29
31	Liner System & Fabriform	30 days	Fri 2/23/18	Thu 4/5/18	30
32	**Surface Water Features**	**55 days**	**Fri 2/2/18**	**Thu 4/19/18**	**24**
33	Primary Outlet Structure	20 days	Fri 2/2/18	Thu 3/1/18	
34	Emergency Outlet Structure	20 days	Fri 3/2/18	Thu 3/29/18	33
35	Surface Restoration	10 days	Fri 4/6/18	Thu 4/19/18	28,34
36	**Construction Management Services**	**160 days?**	**Fri 9/8/17**	**Thu 4/19/18**	**18SS**
37	CQA and OE services	160 days	Fri 9/8/17	Thu 4/19/18	
38					
39	**Dead Storage Pond**	**600 days**	**Fri 1/1/16**	**Thu 4/19/18**	**9SS**
40	**LG&E Activities**	**15 days**	**Fri 1/1/16**	**Thu 1/21/16**	
41	Remove and Discharge surface water	15 days	Fri 1/1/16	Thu 1/21/16	
42	**Contractor Activities**	**160 days**	**Thu 9/7/17**	**Thu 4/19/18**	**41,8**
43	Mobilize	0 days	Thu 9/7/17	Thu 9/7/17	
44	Install Sediment and Erosion Control	10 days	Fri 9/8/17	Thu 9/21/17	43
45	Site Preparation	20 days	Fri 9/22/17	Thu 10/19/17	44
46	Roads	10 days	Fri 10/20/17	Thu 11/2/17	45
47	On Site Impoundments	5 days	Fri 11/3/17	Thu 11/9/17	46
48	**Preclosure Activities**	**60 days**	**Fri 11/10/17**	**Thu 2/1/18**	**47**
49	Excavate and Haul CCR Material to ATB	25 days	Fri 11/10/17	Thu 12/14/17	
50	Piping Improvements - Plant to Pond	60 days	Fri 11/10/17	Thu 2/1/18	49SS
51	Surface Grading Lagoon Bottoms	5 days	Fri 12/15/17	Thu 12/21/17	49
52	**Redevelopment Activities**	**45 days**	**Fri 2/2/18**	**Thu 4/5/18**	**48**
53	Shape Cover Subgrade	5 days	Fri 2/2/18	Thu 2/8/18	
54	Place HDPE Liner and Geotextile	10 days	Fri 2/9/18	Thu 2/22/18	53
55	Liner System & Fabriform	30 days	Fri 2/23/18	Thu 4/5/18	54
56	**Surface Water Features**	**55 days**	**Fri 2/2/18**	**Thu 4/19/18**	**48**
57	Primary Outlet Structure	20 days	Fri 2/2/18	Thu 3/1/18	
58	Emergency Outlet Structure	20 days	Fri 3/2/18	Thu 3/29/18	57
59	Surface Restoration	10 days	Fri 4/6/18	Thu 4/19/18	52,58
60	**Construction Management Services**	**160 days**	**Fri 9/8/17**	**Thu 4/19/18**	**42SS**
61	CQA and OE services	160 days	Fri 9/8/17	Thu 4/19/18	
62					
63	**EMERGENCY Pond**	**175 days**	**Fri 3/30/18**	**Thu 11/29/18**	**34**
64	**LG&E Activities**	**15 days**	**Fri 3/30/18**	**Thu 4/19/18**	
65	Remove and Discharge surface water	15 days	Fri 3/30/18	Thu 4/19/18	
66	**Contractor Activities**	**160 days**	**Thu 4/19/18**	**Thu 11/29/18**	**65,8**
67	Mobilize	0 days	Thu 4/19/18	Thu 4/19/18	
68	Install Sediment and Erosion Control	10 days	Fri 4/20/18	Thu 5/3/18	67
69	Site Preparation	20 days	Fri 5/4/18	Thu 5/31/18	68
70	Roads	5 days	Fri 6/1/18	Thu 6/7/18	69
71	On Site Impoundments	10 days	Fri 6/8/18	Thu 6/21/18	70
72	**Preclosure Activities**	**60 days**	**Fri 6/22/18**	**Thu 9/13/18**	**71**
73	Excavate and Haul CCR Material to ATB	30 days	Fri 6/22/18	Thu 8/2/18	
74	Piping Improvements - Plant to Pond	60 days	Fri 6/22/18	Thu 9/13/18	73SS
75	Surface Grading Lagoon Bottoms	5 days	Fri 8/3/18	Thu 8/9/18	73
76	**Redevelopment Activities**	**45 days**	**Fri 9/14/18**	**Thu 11/15/18**	**72**
77	Shape Cover Subgrade	5 days	Fri 9/14/18	Thu 9/20/18	
78	Place HDPE Liner and Geotextile	10 days	Fri 9/21/18	Thu 10/4/18	77
79	Liner System & Fabriform	30 days	Fri 10/5/18	Thu 11/15/18	78
80	**Surface Water Features**	**55 days**	**Fri 9/14/18**	**Thu 11/29/18**	**72**
81	Primary Outlet Structure	20 days	Fri 9/14/18	Thu 10/11/18	
82	Emergency Outlet Structure	20 days	Fri 10/12/18	Thu 11/8/18	81
83	Surface Restoration	10 days	Fri 11/16/18	Thu 11/29/18	76,82
84	**Construction Management Services**	**160 days**	**Fri 4/20/18**	**Thu 11/29/18**	**66SS**
85	CQA and OE services	160 days	Fri 4/20/18	Thu 11/29/18	
86					
87	**Construction Runoff Pond**	**260 days**	**Fri 11/9/18**	**Thu 11/7/19**	**82**
88	**LG&E Activities**	**15 days**	**Fri 11/9/18**	**Thu 11/29/18**	
89	Remove and Discharge surface water	15 days	Fri 11/9/18	Thu 11/29/18	
90	**Contractor Activities**	**245 days**	**Thu 11/29/18**	**Thu 11/7/19**	**89,8**
91	Mobilize	0 days	Thu 11/29/18	Thu 11/29/18	
92	Install Sediment and Erosion Control	10 days	Fri 11/30/18	Thu 12/13/18	91
93	Site Preparation	20 days	Fri 12/14/18	Thu 1/10/19	92
94	Roads	5 days	Fri 1/11/19	Thu 1/17/19	93
95	On Site Impoundments	10 days	Fri 1/18/19	Thu 1/31/19	94
96	**Preclosure Activities**	**60 days**	**Fri 2/1/19**	**Thu 4/25/19**	**95**
97	Excavate and Haul CCR Material to ATB	30 days	Fri 2/1/19	Thu 3/14/19	
98	Piping Improvements - Plant to Pond	60 days	Fri 2/1/19	Thu 4/25/19	97SS
99	Surface Grading for Closure	5 days	Fri 3/15/19	Thu 3/21/19	97
100	**Closure Activities**	**130 days**	**Fri 4/26/19**	**Thu 10/24/19**	**96**
101	Shape Cover Subgrade	30 days	Fri 4/26/19	Thu 6/6/19	
102	Place FML and Geocomposite	30 days	Fri 6/7/19	Thu 7/18/19	101
103	Placement and Compaction of Fill	30 days	Fri 7/19/19	Thu 8/29/19	102
104	Cover soil	10 days	Fri 8/30/19	Thu 9/12/19	103
105	Vegetated Cover	30 days	Fri 9/13/19	Thu 10/24/19	104
106	**Surface Water Features**	**140 days**	**Fri 4/26/19**	**Thu 11/7/19**	**96**
107	Primary Outlet Structure	20 days	Fri 4/26/19	Thu 5/23/19	
108	Emergency Outlet Structure	20 days	Fri 5/24/19	Thu 6/20/19	107
109	Surface Restoration	10 days	Fri 10/25/19	Thu 11/7/19	100,108
110	**Construction Management Services**	**160 days**	**Fri 11/30/18**	**Thu 7/11/19**	**90SS**
111	CQA and OE services	160 days	Fri 11/30/18	Thu 7/11/19	
112	**ATB**	**1914 days**	**Mon 8/3/15**	**Thu 12/1/22**	
113	**LG&E Activities**	**1574 days**	**Mon 8/3/15**	**Thu 8/12/21**	
114	Remove and Discharge surface water	600 days	Mon 8/3/15	Fri 11/17/17	
115	Accumulate CCR in 2016-2018	725 days	Fri 12/2/16	Thu 9/12/19	104FF
116	Place Beneficial Use CCR to achieve final grades	500 days	Fri 9/13/19	Thu 8/12/21	115,123
117	**Contractor Activities**	**1314 days**	**Fri 11/17/17**	**Thu 12/1/22**	**114,8**
118	Mobilize	0 days	Fri 11/17/17	Fri 11/17/17	
119	Install Sediment and Erosion Control	20 days	Mon 11/20/17	Fri 12/15/17	118
120	Site Preparation	40 days	Mon 12/18/17	Fri 2/9/18	119
121	Roads	20 days	Mon 2/12/18	Fri 3/9/18	120
122	On Site Impoundments	20 days	Mon 3/12/18	Fri 4/6/18	121
123	**Preclosure Activities**	**260 days**	**Mon 4/9/18**	**Fri 4/5/19**	**122**
124	Stabilize upper CCR surface	80 days	Mon 4/9/18	Fri 7/27/18	
125	Dewater during stabilization	80 days	Mon 4/9/18	Fri 7/27/18	124SS
126	Cut/regrade for cover subgrade/ditch	180 days	Mon 7/30/18	Fri 4/5/19	124
127	**Closure Activities**	**320 days**	**Fri 8/13/21**	**Thu 11/3/22**	**116,123**
128	Shape Cover Subgrade	60 days	Fri 8/13/21	Thu 11/4/21	
129	Place FML and Geocomposite	80 days	Fri 11/5/21	Thu 2/24/22	128
130	Cover soil	100 days	Fri 2/25/22	Thu 7/14/22	129
131	Vegetated Cover	80 days	Fri 7/15/22	Thu 11/3/22	130
132	**Surface Water Features**	**954 days**	**Mon 4/8/19**	**Thu 12/1/22**	**123**
133	Primary Outlet Structure	20 days	Mon 4/8/19	Fri 5/3/19	
134	Emergency Outlet Structure	20 days	Mon 5/6/19	Fri 5/31/19	133
135	Surface Restoration	20 days	Fri 11/4/22	Thu 12/1/22	127,134
136	**Construction Management Services**	**1200 days**	**Mon 11/20/17**	**Fri 6/24/22**	**117SS**
137	CQA and OE services	1200 days	Mon 11/20/17	Fri 6/24/22	



Project: Brown rev11
Date: Tue 9/22/15

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

TECHNICAL MEMORANDUM

Coal Combustion Residual Evaluation: Trimble County Generating Station

PREPARED FOR:	Louisville Gas & Electric Company and Kentucky Utilities Company
PREPARED BY:	CH2M HILL Engineers
DATE:	September 29, 2015

1 Executive Summary

Louisville Gas & Electric Company and Kentucky Utilities Company (LG&E-KU) tasked CH2M HILL Engineers. (CH2M) with performing coal combustion residuals (CCR) evaluations for seven generation stations to develop conceptual CCR ash pond closure approaches and capital cost estimates. The generating stations under evaluation are Ghent, Trimble County, Mill Creek, E.W. Brown, Green River, Tyrone, and Pineville. This report applies solely to Trimble County Generating Station. The following scope activities were completed:

- Review of LG&E-KU provided historical CCR information and kickoff meeting workshop (June 2015)
- Developed a CCR pond closure compliance alternative that considers regulatory, civil, geotechnical, and stormwater aspects as it relates to CCR ash ponds and associated cost estimates for the generating station. Discussion of the conceptual approach is included in Section 2, and drawings are contained in Attachment 1. The applicable ponds at Trimble County are the Bottom Ash Pond (BAP) and Gypsum Storage Pond.
- Construct new concrete process tanks (four) for management of wastewater that can no longer be managed in the ponds that will be closed; construct dewatering facility for removing water from solids.

The estimated cost for closing the two ponds is summarized in Exhibit 1-1. Cost information is included in Attachment 2.

Proposed Conceptual Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
BAP Closure	$76.1 M	$108.7 M	$141.3 M
Gypsum Storage Closure	$23.3 M	$33.3 M	$43.3 M
Concrete Process Tanks and Dewatering Facility	$75.1 M	$107.2 M	$139.4 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

2 Proposed Conceptual CCR Closure

2.1 Development of Proposed Conceptual CCR Closure

The proposed conceptual CCR pond closure approach was developed based on previous work completed by CH2M and discussions with LG&E-KU during the kickoff meeting on June 23, 2015. The Trimble County Generating Station is an operating facility with CCR wastewater generated and discharged to the ponds. The following defines the considered approach for closure for each of the two ponds. Additional assumptions are summarized in Section 2.2.

BAP

- Completely fill with CCR material generated at the facility, regrade ash in pond to balance cuts/fills, and install final cover. The surface water drainage channels will be sized to provide retention, and an outlet structure will be sized or breach of the dike to regulate discharge during a storm event.
- Surface water within BAP will be removed before closure begins, as needed, to allow surface improvement and dry material placement in BAP. Other potential subgrade improvements are described under assumptions below.
- BAP will receive material from the station and gypsum storage pond (in 2018) until airspace capacity is full. Excess CCR material will be properly disposed of in a landfill. Details are located in Section 3 - Estimated Material Volumes and Areas, Table 3-1

Gypsum Storage Pond

- Completely fill with CCR material generated at the facility, regrade ash in pond to balance cuts/fills, and install final cover. The surface water drainage channels will be sized to provide retention and an outlet structure will be sized or breach of the dike to regulate discharge during a storm event to the existing construction sedimentation pond.
- Surface water within Gypsum Storage Pond will be removed before closure begins, as needed, to allow surface improvement and dry material placement in Gypsum Storage Pond. Other potential subgrade improvements are described under assumptions below.
- Gypsum Storage Pond will receive material from the station until airspace capacity is full. Excess CCR material will be properly disposed of in BAP. Details are located in Section 3 - Estimated Material Volumes and Areas, Table 3-1

Regulatory Strategy

- Compliance with the Final CCR Rule.
- Closure activities will be permitted by the Kentucky Department of Environmental Protection (KYDEP).

The volume of CCR to be managed (that is, excavated, placed and regarded within the ponds) was developed using AutoCAD drawings provided by LG&E-KU and computer aided engineering (CAE) software. The proposed conceptual pond closure approach is presented in drawings provided in Attachment 1.

2.2 Design Assumptions

General

The general design assumptions used for the proposed conceptual CCR pond closure approach is as outlined in our proposal and discussed with LG&E-KU at our kickoff meeting on June 23, 2015, and summarized below:

- It is anticipated for this analysis that Trimble County Generation Station will be able to discharge pond water via National Pollutant Discharge Elimination System (NPDES) permitted outfall.
  - CH2M assumes that Trimble County Generation Station will be able to develop an acceptable regulatory approach(es) to support managing water. BAP was constructed post 1982 and contains fly ash transport water. At the time of closure, the BAP is estimated to contain in excess of 410 million gallons (MG) of water and the Gypsum Storage Pond contains an excess of 225 MG of water. This accumulated water will need to be removed in order to close this ponds. Costs associated with development of this approach and implementation of the approach are not included in this project or cost estimate. However, a cost to dewater the pond has been included but does not include treatment. It is anticipated that LG&E-KU will have an approved management approach in-place by 1st quarter of 2017. Once approval to dewater is in place, BAP and Gypsum Storage Pond will begin the dewatering process and closure activities will begin. For this scenario to be feasible it is assumed that the CCR ponds will meet structural integrity requirements within the Final CCR Rule.
    - BAP is estimated to have 410 MG of water. CH2M estimated within the schedule 900 working days (approximately 3.5 years) to dewater BAP. The rate of dewatering for BAP will be 500,000 gallons per day (GPD) to achieve this schedule. The cost estimate and schedule does not take into account permitting and infrastructure development for the treatment of process water.
    - Gypsum Storage Pond is estimated to have 225 MG of water. CH2M estimated within the schedule 450 working days (approximately 2.0 years) to dewater the Gypsum Storage Pond. The rate of dewatering for Gypsum Storage Pond will be 500,000 GPD to achieve this schedule. The cost estimate and schedule does not take into account permitting and infrastructure development for the treatment of process water.
- The existing conditions were established from AutoCAD files provided by LG&E-KU on June 23, 2015. In order to estimate the volume of CCR in the BAP and Gypsum Storage Pond, a surface was developed in AutoCAD based on data and elevations provided by LG&E-KU. It was determined that the ash in the BAP and Gypsum Storage Pond could be regraded to balance cuts/fills and closed.
- Volume calculations are based on an in-place (moist) density 1 ton per cubic yard (74 pounds per cubic foot) for all cut and placed CCR material, and does not account for shrinkage/swell during placement. Quantities do not consider settlement of in-place CCR because of dewatering or new fill/cover loads. Changes to these assumptions should be verified during design development.
- It is assumed these CCR ponds meet the structural integrity requirements, and the pond closure approaches are geotechnically stable as shown. This information will be confirmed during design development.

- Improvements to prepare a workable CCR surface include removing surface water, localized regrading to facilitate dewatering, and installing a geotextile, a layer of dry CCR, and geogrid.
- Final cover surface drainage channels are inside the perimeter dikes, and would include final cover and be lined with structural reinforcement (turf reinforcement mat, riprap etc.), as necessary.
- The dikes will be used without increasing or decreasing height. Some improvements may be required based on the U.S. Environmental Protection Agency (USEPA) dam assessment findings but are outside this project scope. The dikes may be able to be knocked down and used for final cover. However, this will need to be coordinated with the appropriate regulatory agency and therefore these volumes were not included in this evaluation.
- CCR within the ponds will be regarded and used to fill the pond beneath the final cover.
- The final cover (cap) is assumed to consist of 40-mil linear low-density polyethylene liner (LLDPE) placed directly on subgrade (CCR) and covered with geocomposite and 2 feet of soil cover. A vegetative cover will be established. The 2 feet of soil cover will consist of 1.5 feet of soil and 0.5 foot of vegetated topsoil. The final cover will extend on top of the dikes, due to the potential that ash may be contained within the dikes.
- A maximum of five percent slope was used for the final cover. CH2M developed closure design to reach the five percent slope or to account for beneficial reuse of CCR material until 2023 within the pond will be regarded and used to fill the pond beneath the final cover.
- Modification will be required to the NPDES discharge structure location to ensure permit compliance.
  - The CCR pond discharge structures will be modified to ensure stormwater flows to the NPDES discharge structure and permit compliance.
  - The waste material from the discharge structures will be disposed of properly.
- It is anticipated these pond closure approaches will handle the stormwater runoff, but verification will be performed in design development.

BAP

The general design assumptions used for the proposed conceptual closure approach (BAP) is as derived from the LG&E-KU drawing and summarized below:

- Material accumulated in BAP will include some wet discharges; but by 2017, the CCR material sent to BAP (CCR material) are expected to be dry. Expected CCR material discharges to BAP are summarized in Table 3-1. Material accumulation in BAP will continue until at least 2019, but could continue until 2023 or until the future fill capacity of BAP is maximized.
  - It is anticipated that capacity (5% cover slope) for BAP will be achieved in the 1st quarter of 2023, based on the projections provided by LG&E-KU in the June 2015 kickoff meeting workshop. This date may change due to actual plant generation rates.
  - BAP to receive material from the Gypsum Storage Pond around first quarter of 2018. Material will be re-routed from the Gypsum Storage Pond to an unloading location. Material quantities are summarized in Table 3-2A. Material accumulation in BAP will be completed by first quarter of 2023.
  - BAP to receive beneficial reuse material until December 31, 2023
- CCR materials from BAP will be placed, graded, and used to fill the pond beneath the final cover.
- CCR Rule Compliance Activities will begin in 2015.
- The top of the BAP berm already includes an aggregate perimeter road.

- A new BAP primary outlet structure will be required to regulate discharge. The outlet structure will discharge to the north to an existing drainage swale.
- Surface water within BAP will be partially removed before closure begins to allow surface stabilization and dry material placement.
- Surface drainage channels are within the BAP dikes.
- Surface water will be discharged off the final cover through the existing discharge outlet pipe on the east side or breach in dike. The discharge is to the existing drainage structures.
- A groundwater monitoring well system currently exists and was considered sufficient.
- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade, and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-1. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the berm. The ditch shows a high point near the south end, dropping at approximately 0.5 percent to the northwest. One existing discharge penetration is shown through the dike leading to the NPDES permitted outfall.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the berm crest, whichever is lower. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-1 has an airspace capacity of approximately 5,283,100 cubic yards above the existing CCR surface grade.
- Airspace capacity under ABT cover could be increased (or reduced), as necessary, by approximately 152,500 cubic yards per foot by extending the 4H:1V ditch slope height to the full perimeter berm elevation, or reducing the maximum height of the mound. Capacity could be reduced by modifying the 4H:1V ditch slope height. Ditch grades should also be refined to create local low points at the perimeter drainage ditch discharge point. Such design refinements should not significantly change the estimated closure costs.

Gypsum Storage Pond

The general design assumptions used for the proposed conceptual closure approach (Gypsum Storage Pond) is as derived from the LG&E-KU drawing and summarized below:

- The Gypsum Storage Pond base consists of a compacted clay layer; geosynthetic clay liner (GCL); and a 60 mil flexible membrane liner (FML).
- Material accumulated in Gypsum Storage Pond will include some wet discharges; but by January 2017, the CCR material sent to BAP (gypsum) are expected to be dry. Expected CCR material discharges to Gypsum Storage Pond are summarized in Table 3-1. Material accumulation in Gypsum Storage Pond will continue until at least 2019, but could continue until 2023 or until the future fill capacity of BAP is maximized.
  - It is anticipated that capacity (5% cover slope) for Gypsum will be achieved in the 1st quarter of 2018, based on the projections provided by LG&E-KU in the June 2015 kickoff meeting workshop. This date may change due to actual plant generation rates.
  - Gypsum Storage Pond to receive material from the plant until around first quarter of 2018. Material will be re-routed from the Gypsum Storage Pond to an unloading location at BAP. Material quantities are summarized in Table 3-2B. Material accumulation in Gypsum Storage Pond will be completed by first quarter of 2018.
- The station will construct new concrete process tanks in a location to be determined by LG&E-KU plant personnel. There will be four concrete tanks covering approximately 12.4 acres at a depth of

24-feet (two tanks 740-feet x 185-feet feet and two tanks 740-feet x 180-feet). Also within this vicinity of the concrete tanks, will be a dewatering system facility to remove water from solids.

- CCR materials from the Gypsum Storage Pond will be placed, graded, and used to fill the pond beneath the final cover.
- The top of the Gypsum Storage Pond berm already includes an aggregate perimeter road.
- Surface water within Gypsum Storage Pond will be removed before closure begins to allow surface stabilization and dry material placement.
- Surface drainage channels are within the Gypsum Storage Pond embankments.
- Surface water would be discharged off the final cover through a new Gypsum Storage Pond primary outlet structure will be required to regulate discharge. The outlet structure will discharge to the north to an existing construction sediment pond then to drainage swale. In addition, the existing discharge structure may be able to be modified to regulate discharge to the existing drainage swale.
- A groundwater monitoring well system currently exists and was considered sufficient.
- A final cover will be constructed. Cover construction will include preliminary grading to shape the cover subgrade, and will include the components described in the assumptions below. Conceptual grades are shown in Attachment 1, Exhibit 2-2. Significant grading features include the following:
  - A perimeter drainage ditch is shown within the berm. The ditch shows a high point near the west end, dropping at approximately 0.5 percent to the east. One existing discharge penetration is shown through the dike leading to the NPDES permitted outfall.
  - The final grades include 4H:1V slopes along the inside of the ditch, extending no higher than 10 feet above the ditch invert or the top elevation of the berm crest, whichever is lower. The 4H:1V ditch slope then transitions to a 5 percent cover slope to the crest.
  - The final cover shown on Exhibit 2-2 has an airspace capacity of approximately 1,747,200 cubic yards above the existing CCR surface grade.
- Airspace capacity under Gypsum Storage Pond cover could be increased (or reduced), as necessary, by approximately 53,900 cubic yards per foot by extending the 4H:1V ditch slope height to the full perimeter berm elevation, or reducing the maximum height of the mound. Capacity could be reduced by modifying the 4H:1V ditch slope height. Ditch grades should also be refined to create local low points at the perimeter drainage ditch discharge point. Such design refinements should not significantly change the estimated closure costs.

3 Estimated Material Volumes and Areas

The volume of fly ash, bottom ash, and gypsum generated by the station and available for use as fill is summarized in Table 3-1. Total production rates by year were provided by LG&E-KU on June 23, 2015, and the portion sent to the ponds each year are based on the 2015 year to date production rates provided by LGE-KU on July 1, 2015.

Table 3-1. Estimated CCR Production by Year – Total and Distribution by Ponds

	Total CCR Production (Tons)				Assumed CCR Distribution (Tons)	
Year	**Bot Ash**	**Fly Ash**	**Gypsum**	**TOTAL**	**BAP [1]**	**Gypsum Storage Pond [2]**
2015	51,952	207,810	496,454	756,216	259,762	496,454
2016	62,958	251,833	538,194	852,986	314,791	538,194
2017	63,732	254,930	534,152	852,814	318,662	534,152

2018	62,686	250,746	542,295	855,727	677,312[3]	70,644[3]
2019	62,284	249,135	539,487	850,906	850,906	
2020	61,651	246,602	534,571	842,824	842,824	
2021	61,982	247,927	534,620	844,529	844,529	
2022	61,096	244,382	529,256	834,734	834,734	
2023	62,147	248,589	536,011	846,747	34,299[4]	
				TOTAL	**4,977,819[5]**	**1,639,444[5]**

Notes:
[1] Assumes that 100 percent of bottom ash and fly ash will be sent to the BAP through October 17, 2018, which will be the baseline for closure design.
[2] Assumes that 100 percent of gypsum will be sent to the Gypsum Storage Pond through October 17, 2018, which will be the baseline for closure design.
[3] Material assumed to be sent to Gypsum Storage Pond until the closure airspace capacity is full, with remainder sent to BAP.
[4] Material assumed to be sent to BAP until the closure airspace capacity is full, with remainder sent to landfill. Approximately 0.8 M tons of bottom ash, fly ash, and gypsum will need to be diverted to the land fill from 2023.
[5] Final cover volume is removed from the calculation of Assumed CCR Distribution.

The proposed CCR pond closure approach was developed using CAE software and AutoCAD files provided by LG&E-KU as described under assumptions above. Summaries of the estimated material quantities for each pond are shown in Tables 3-2A and 3-2B.

Table 3-2A. Proposed Conceptual Pond Closure Approach Estimated Material Quantities – BAP

Item	Units	Quantity
Total surface area	AC	94.6
Standing surface water (to remove)	GAL	410,955,900
Length of perimeter	LF	8,700
CUT: Existing Surface to Final Cover Subgrade		
Cut/regrade for cover subgrade/ditch	CY	4,900
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**4,982,700**
FILL SOURCES:		
From cut for final cover subgrade	CY	4,900
From CCR accumulation in BAP - Jan. 2017 thru 2018	CY	1,570,500
From CCR accumulation in BAP - Jan. 2019 thru 2023	CY	3,407,300
TOTAL POTENTIAL FILL through 2018	**CY**	**3,317,700**
TOTAL POTENTIAL FILL through 2023	**CY**	**4,219,700**
Final cover soil volume	CY	305,300
Potential Excess Fill: (to be accommodated in settlement)	**CY**	**105,700**
Potential Excess Fill: (to be sent to Landfill)	**CY**	**812,500**

Table 3-2B. Proposed Conceptual Pond Closure Approach Estimated Material Quantities –Gypsum Storage Pond

Item	Units	Quantity
Total surface area	AC	33.4
Standing surface water (to remove)	GAL	225,005,750
Length of perimeter	LF	4,700
CUT: Existing Surface to Final Cover Subgrade		
Cut for final cover: Stormwater channel	CY	9,800
FILL REQUIRED: Existing Surface to Final Cover Subgrade	**CY**	**1,660,200**
FILL SOURCES:		
Cut for final cover: Stormwater channel	CY	9,800
From CCR accumulation in BAP - Jan. 2017 thru 2018	CY	1,650,400
TOTAL POTENTIAL FILL through 2018	**CY**	**1,650,400**
Final cover soil volume	CY	107,800
Potential Excess Fill: (to be accommodated in settlement)	**CY**	**35,400**
Potential Excess Fill: (to be sent to BAP in 2018)	**CY**	**460,700**

The proposed conceptual pond closure approach shows that CCR from the Gypsum Storage Pond can be closed in-place. The Gypsum Storage Pond dikes may be able to be knocked down and used for final cover. However, this will need to be coordinated with the appropriate regulatory agency and therefore these volumes were not included in this evaluation. There is sufficient area available in BAP to balance ash cut/fills volumes and close in-place.

4 Schedule

Exhibits 2-3 in Attachment 3 show the proposed schedule to complete the design, permitting, and construction for each of the pond closures.

5 Construction Cost Estimate

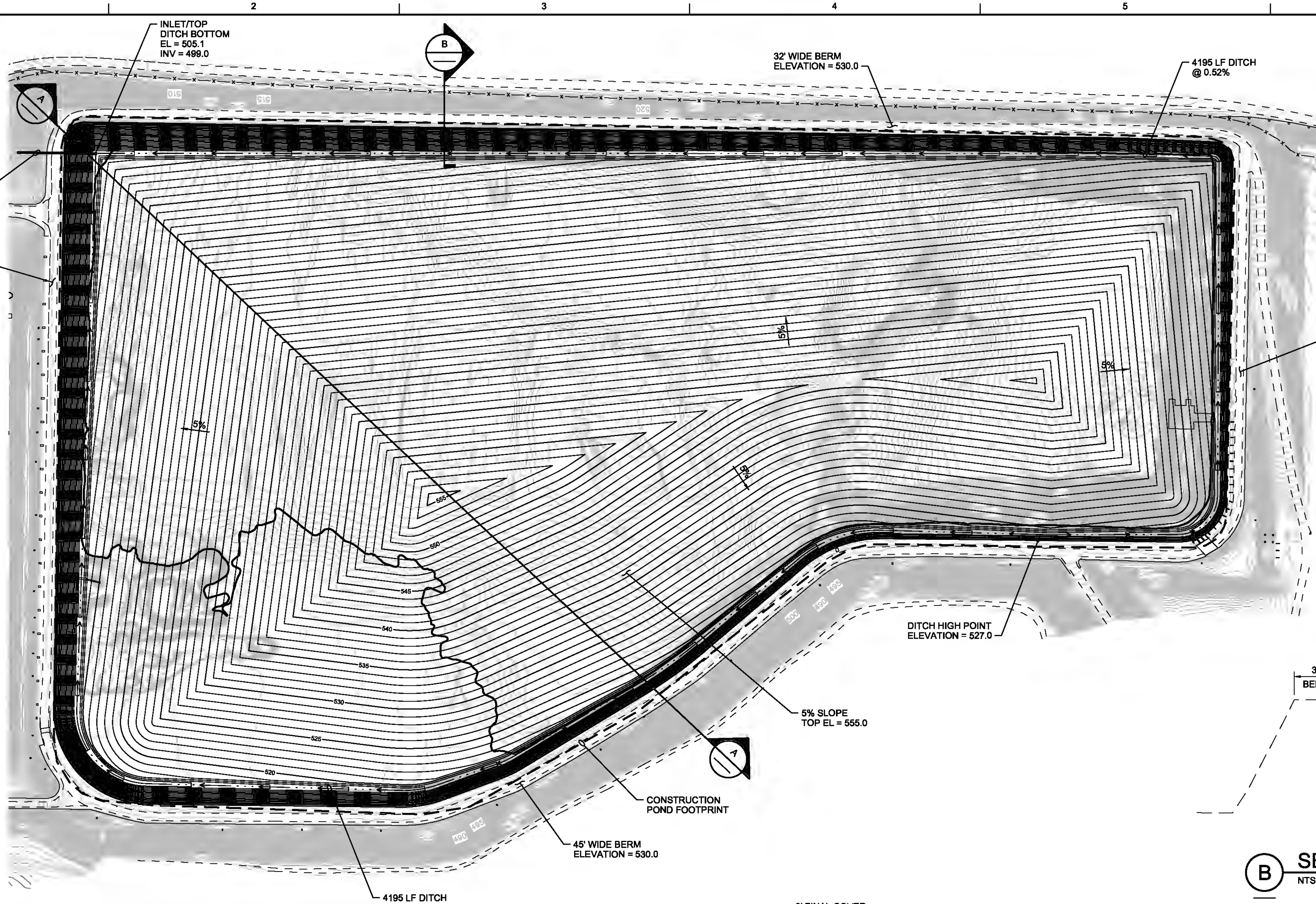
The estimated construction cost for closing the ponds as described in Section 2 is shown within Attachment 2.

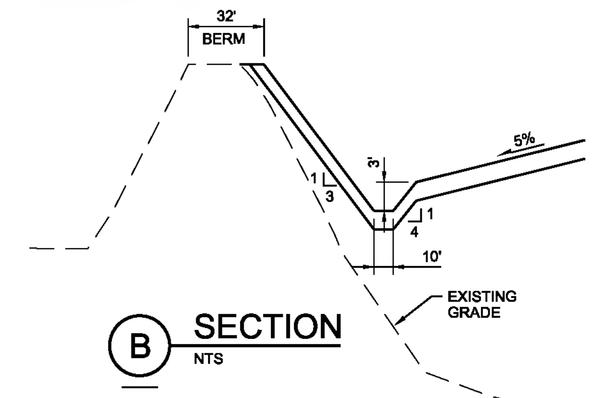
Proposed Conceptual Closure Approach	Low (-30%)	Total Capital Cost	High (+30%)
BAP Closure	$76.1 M	$108.7 M	$141.3 M
Gypsum Storage Pond Closure	$23.3 M	$33.3 M	$43.3 M
Concrete Tanks	$75.1 M	$107.2 M	$139.4 M

This cost estimate should be considered a Feasibility or Study (Class 4) cost estimate. A summary breakdown for CAPEX costs for each station for the selected design basis are provide Attachments section. Class 4 estimates are generally prepared based on limited information, and subsequently have wide accuracy ranges. Typically, engineering is from 1 to 5 percent complete, and would comprise at a minimum the following: plant capacity, block schematics, layout, PFDs for main process systems and engineered process and utility equipment lists. The expected accuracy range for the estimates prepared for this study is +30 percent/-30 percent. A contingency of 30 percent has been included in the cost estimates as a provision for unforeseeable, additional costs within the general bounds of the project scope; particularly where experience has shown that unforeseeable costs are likely to occur.

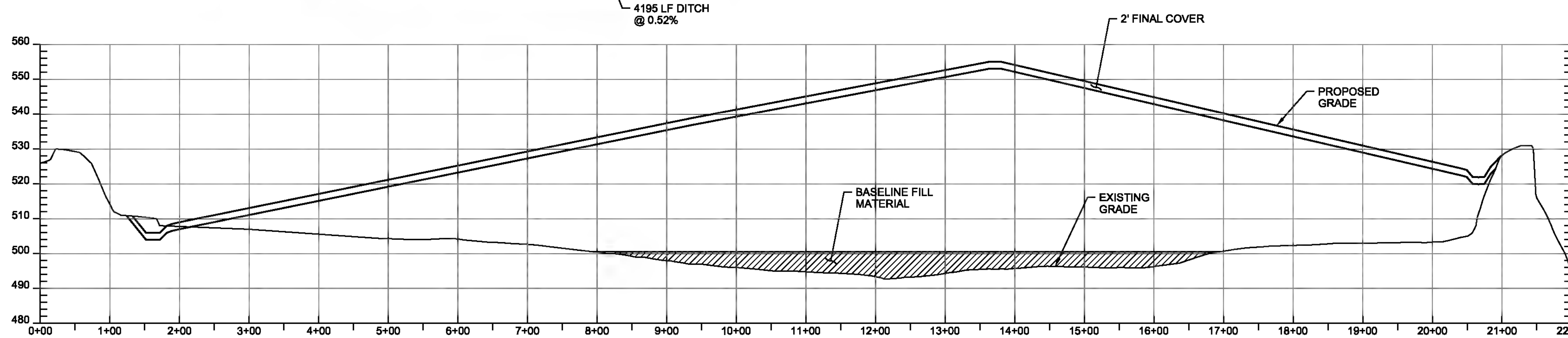
This cost estimate, along with any resulting conclusions on project financial or economic feasibility or funding requirements, is prepared for guidance in project evaluation and implementation from information available at the time the estimate was prepared. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, firm selected for final engineering design, and other variable factors. As a result, the final project costs will vary from the cost estimate presented herein. Because of these factors, project feasibility and funding needs must be carefully reviewed before making specific financial decisions or establishing project budgets to help ensure proper project evaluation and adequate funding. This cost estimate does not include price variations that may be the result of specifications specific for client, nor does it include supply from client preferred suppliers.

Attachment 1
Proposed Conceptual Alternative CCR Closure





B SECTION
NTS



A SECTION
SCALE: 1" = 100' HORIZ
1" = 20' VERT

ITEM	UNITS	ATB
TOTAL SURFACE AREA	ACRES	94.6
LENGTH OF PERIMETER	LINEAR FEET	8,700
CUT	CUBIC YARDS	4,900
FILL TO FINAL GRADE	CUBIC YARDS	4,982,700
COVER FILL TO FINAL GRADE	CUBIC YARDS	305,300
EXCESS MATERIAL	CUBIC YARDS	812,500
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	-

NO.	DATE	REVISION	BY	APVD

DSGN | DR | CHK | APVD

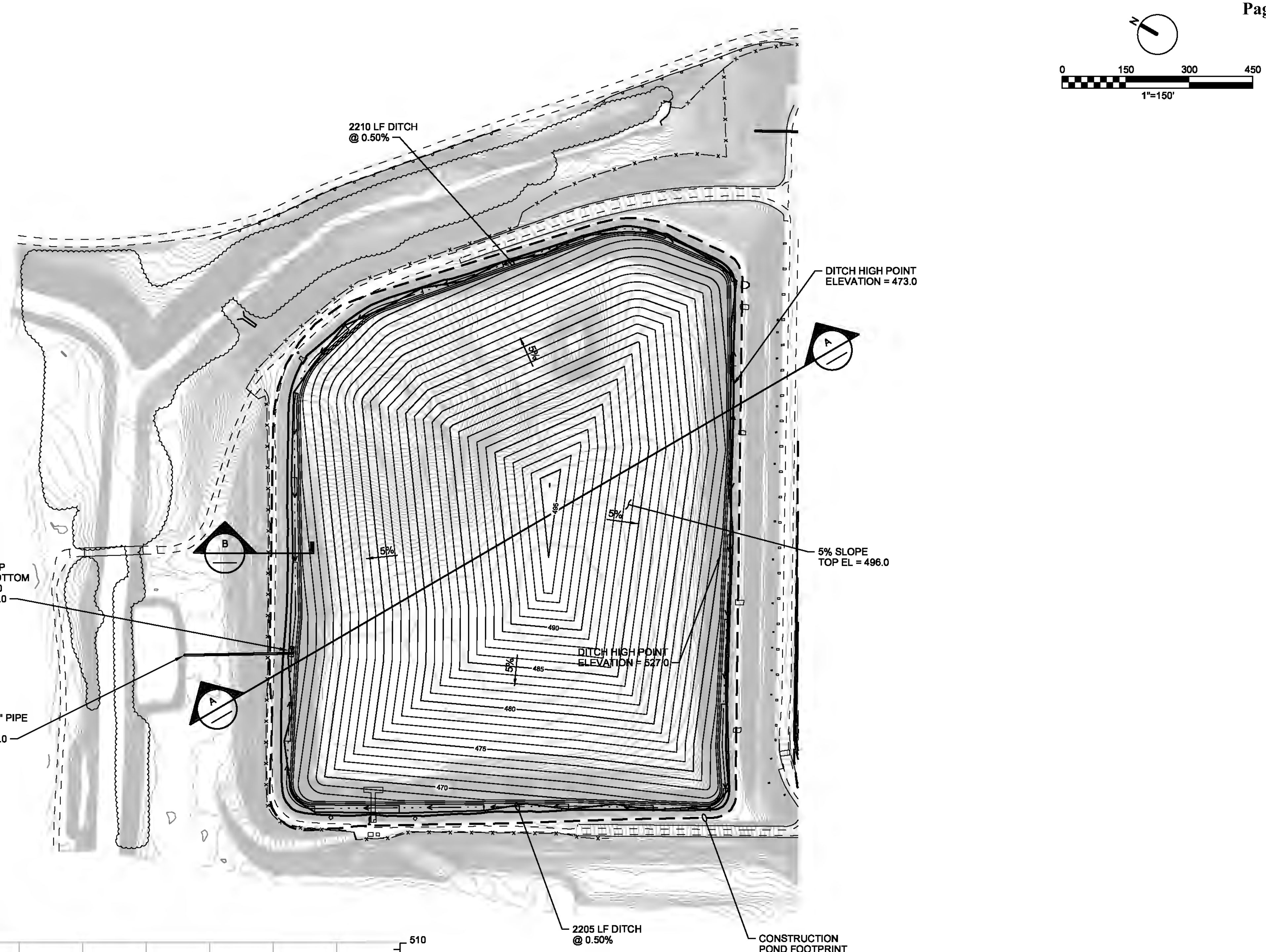
COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

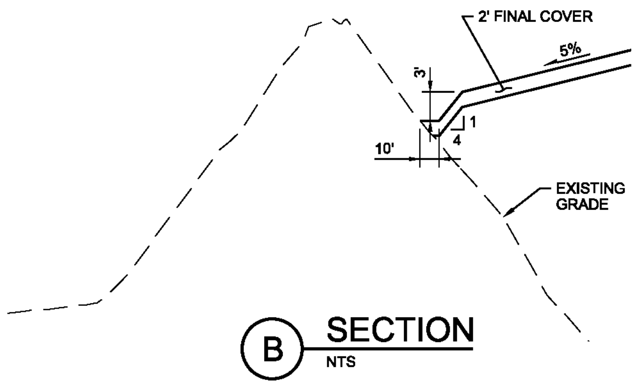
CH2MHILL.

TRIMBLE
CONCEPTUAL CLOSURE PLAN
ASH TREATMENT BASIN

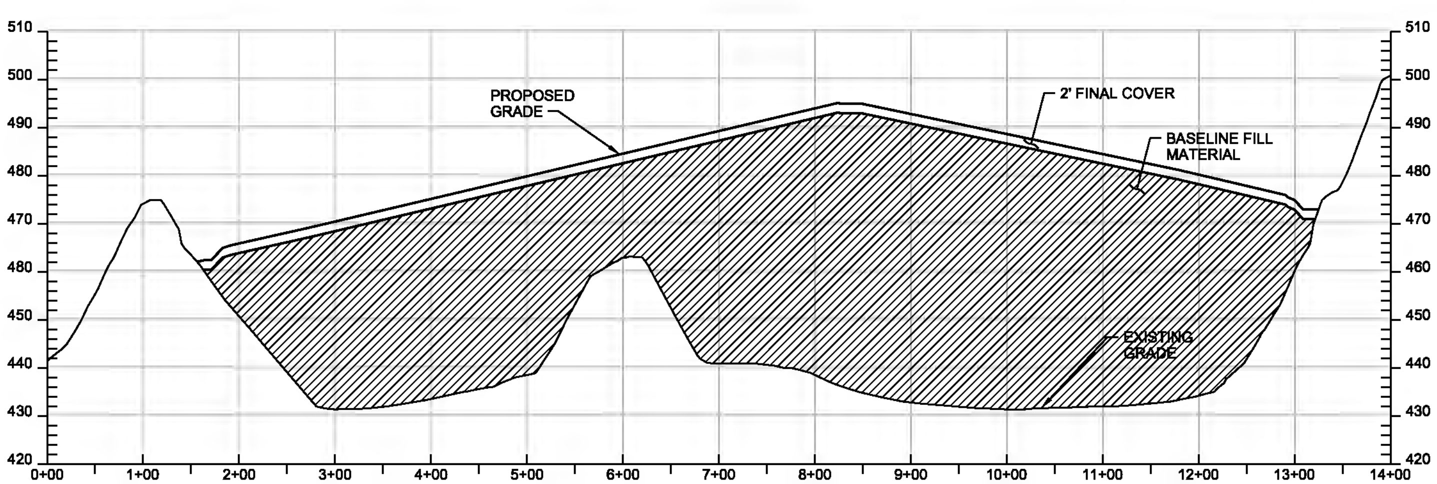
VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-1
SHEET	of





B SECTION
NTS



A SECTION
SCALE: 1" = 100' HORIZ
1" = 20' VERT

ITEM	UNITS	GYPSUM STACK
TOTAL SURFACE AREA	ACRES	33.4
LENGTH OF PERIMETER	LINEAR FEET	4,700
CUT	CUBIC YARDS	4,900
FILL TO FINAL GRADE	CUBIC YARDS	1,660,200
COVER FILL TO FINAL GRADE	CUBIC YARDS	107,800
EXCESS MATERIAL	CUBIC YARDS	460,700
TOTAL AIRSPACE AVAILABLE	CUBIC YARDS	-

NO.	DATE	REVISION	BY	APVD
DSGN	DR	CHK	APVD	

COAL COMBUSTION RESEDUAL EVALUATION
LOUISVILLE GAS AND ELECTRIC COMPANY
AND KENTUCKY UTILITIES
LOUISVILLE, KENTUCKY

CH2MHILL

TRIMBLE
CONCEPTUAL CLOSURE PLAN
GYPSUM STACK

VERIFY SCALE
BAR IS ONE INCH ON ORIGINAL DRAWING.
0 1"

DATE	JULY 2015
PROJ	488248
DWG	EXHIBIT 2-2
SHEET	of

Attachment 2
Proposed Conceptual Alternative Cost Estimate

COST SUMMARY

Site:	Trimble County Generating Station	**Base Year:**	2015
Location:	Bedford, Kentucky	**Date:**	September
Phase:	Proposed Conceptual CCR Closure	**ROM Level:**	Class 4

	Ash Treatment Basin	Gypsum Storage	Concrete Tanks
Remedial Technology	Fill ATB with CCR's, install final cover and close in-place. (Not including Pond water management)	Fill Gypsum Storage with CCR's, install final cover and close in-place.	Installation of CCR concrete tanks
Description	Completely fill with CCR material and final cover installed. CCR fill from plant operations.	Completely fill with CCR material and final cover installed. CCR fill from plant operations.	Installation of four new concrete treatement tanks to handle waste water associtated with CCR materials at the facility.
Impoundment Closure	$105,048,293	$32,171,062	$0
LG&E Overhead	$3,676,690	$1,125,987	$0
New Construction	$0	$0	$103,620,614
LG&E Overhead	$0	$0	$3,626,721
Total Initial Costs	$108,724,984	$33,297,049	$107,247,336
Upper ROM Range	$141,342,479	$43,286,164	$139,421,536
Lower ROM Range	$76,107,488	$23,307,935	$75,073,135

This is not an offer for construction and/or project execution. Please note, these order of magnitude cost estimates are assumed to represent the actual installed cost within the range of - 30 percent to + 30 percent of the costs indicated. The cost estimate has been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on actual labor, material costs, and competitive variable factors. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific decisions to help ensure proper project evaluation and adequate funding.

CCR Rule - Trimble Generating Station Cost Estimate - ATB
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Check
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin	**$105,048,293**	**1%**	**1%**	**3%**	**10%**	**11%**	**26%**	**19%**	**16%**	**12%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$80,806,379**	**1.5%**	**1.5%**	**3.1%**	**9.5%**	**10.5%**	**26.4%**	**19.5%**	**16.0%**	**12.1%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$100,000**	0%	0%	0%	0%	80%	0%	0%	0%	20%	0%	0%	0%	100%
Sediment & Erosion Control	**$90,000**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Site Preparation	**$91,750**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Dewatering	**$16,438,235**	0%	0%	10%	30%	30%	30%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$250,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Utility Services	**$100,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Perimeter Berm	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$490,497**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Pre-Closure / Preparation	**$42,352,122**	0%	0%	0%	5%	5%	35%	35%	20%	0%	0%	0%	0%	100%
Final Cover (Install FML)	**$12,652,050**	0%	0%	0%	0%	0%	0%	0%	30%	70%	0%	0%	0%	100%
Mechanical Improvements/Additions	**$1,500,000**	0%	0%	0%	0%	20%	60%	20%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$125,000**	0%	0%	0%	0%	0%	0%	0%	20%	80%	0%	0%	0%	100%
Primary Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$432,925**	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
Groundwater Monitoring	**$308,800**	0%	0%	0%	0%	0%	20%	40%	40%	0%	0%	0%	0%	100%
Conceptual Design	**$500,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$1,500,000**	0%	40%	40%	20%	0%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$2,500,000**	0%	0%	10%	10%	10%	20%	20%	20%	10%	0%	0%	0%	100%
Closure Report	**$100,000**	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%
CCR Rule Compliance Activities in 2015	**$1,200,000**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal	**$80,806,379**													
Contingency	$24,241,913.82	1%	1%	3%	10%	11%	26%	19%	16%	12%	0%	0%	0%	100%
Subtotal with Contingency	**$105,048,293**													
LG&E & KU Overheads	$3,676,690	1%	1%	3%	10%	11%	26%	19%	16%	12%	0%	0%	0%	100%
TOTAL PROJECT COST	**$108,724,984**													

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin													
IMPOUNDMENT CLOSURE	**$1,200,000**	**$1,222,000**	**$2,697,320**	**$8,660,414**	**$9,956,022**	**$25,923,647**	**$19,924,678**	**$16,994,679**	**$13,356,358**	**$0**	**$0**	**$0**	**$99,935,118**
Mobilization/Demobilization	$0	$0	$0	$0	$93,589	$0	$0	$0	$27,371	$0	$0	$0	**$120,960**
Sediment & Erosion Control	$0	$0	$0	$0	$52,644	$54,749	$0	$0	$0	$0	$0	$0	**$107,393**
Site Preparation	$0	$0	$0	$0	$53,667	$55,814	$0	$0	$0	$0	$0	$0	**$109,481**
Dewatering	$0	$0	$1,777,960	$5,547,234	$5,769,123	$5,999,888	$0	$0	$0	$0	$0	$0	**$19,094,204**
Repair On-Site Pond Embankments	$0	$0	$0	$0	$292,465	$0	$0	$0	$0	$0	$0	$0	**$292,465**
Utility Services	$0	$0	$0	$112,486	$0	$0	$0	$0	$0	$0	$0	$0	**$112,486**
Perimeter Berm	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Roads	$0	$0	$0	$0	$573,813	$0	$0	$0	$0	$0	$0	$0	**$573,813**
Pre-Closure / Preparation	$0	$0	$0	$2,382,019	$2,477,300	$18,034,741	$18,756,131	$11,146,501	$0	$0	$0	$0	**$52,796,692**
Final Cover (Install FML)	$0	$0	$0	$0	$0	$0	$0	$4,994,770	$12,120,642	$0	$0	$0	**$17,115,413**
Mechanical Improvements/Additions	$0	$0	$0	$0	$350,958	$1,094,988	$379,596	$0	$0	$0	$0	$0	**$1,825,541**
Surface Water Features	$0	$0	$0	$0	$0	$0	$0	$32,898	$136,857	$0	$0	$0	**$169,755**
Primary Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	$0	$0	$0	$0	$0	$0	$0	$0	$592,488	$0	$0	$0	**$592,488**
Groundwater Monitoring	$0	$0	$0	$0	$0	$75,140	$156,292	$162,544	$0	$0	$0	$0	**$393,977**
Conceptual Design	$0	$520,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$520,000**
Final Design and Permitting and permitting support	$0	$624,000	$648,960	$337,459	$0	$0	$0	$0	$0	$0	$0	$0	**$1,610,419**
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	$0	$0	$270,400	$281,216	$292,465	$608,326	$632,660	$657,966	$342,142	$0	$0	$0	**$3,085,175**
Closure Report	$0	$0	$0	$0	$0	$0	$0	$0	$136,857	$0	$0	$0	**$136,857**
CCR Rule Compliance Activities in 2015	$1,200,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$1,200,000**
Subtotal	**$1,200,000**	**$1,222,000**	**$2,697,320**	**$8,660,414**	**$9,956,022**	**$25,923,647**	**$19,924,678**	**$16,994,679**	**$13,356,358**	**$0**	**$0**	**$0**	$99,935,118
													$0
Contingency	$0	$0	$0	$0	$0	$0	$0	$14,990,268	$14,990,268	$0	$0	$0	**$29,980,535**
Subtotal with Contingency	**$1,200,000**	**$1,222,000**	**$2,697,320**	**$8,660,414**	**$9,956,022**	**$25,923,647**	**$19,924,678**	**$31,984,947**	**$28,346,625**	**$0**	**$0**	**$0**	$129,915,653
													$0
LG&E & KU Overheads	$42,000	$42,770	$94,406	$303,114	$348,461	$907,328	$697,364	$1,119,473	$992,132	$0	$0	$0	**$4,547,048**
TOTAL PROJECT COST	**$1,242,000**	**$1,264,770**	**$2,791,726**	**$8,963,529**	**$10,304,482**	**$26,830,975**	**$20,622,042**	**$33,104,420**	**$29,338,757**	**$0**	**$0**	**$0**	$134,462,701

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Trimble Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$100,000.00	$100,000	
SUBTOTAL Mobilization/Demobilization				**$100,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	18000	LF	$5.00	$90,000	allowance for BPM
SUBTOTAL Sediment & Erosion Control				**$90,000**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Clear & grub areas to recevie fill, as required
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$91,750**	
Dewatering					
Dewatering and discharge through NPDES permit	410,955,884	GL	$0.04	$16,438,235	500,000 gl/day. Assumes major treatment required for TSS. Pump water to new outlet structure for entire project (3 years). Does not include treatment associated with zero discharge restriction or NPDES Outfall development
SUBTOTAL Dewatering				**$16,438,235**	
Repair On-Site Pond Embankments					
Access Modications on existing CCR Pond embankments	1	LS	$250,000.00	$250,000	Minimal, based off of USEPA dam assessment report
SUBTOTAL Repair On-Site Pond Embankments				**$250,000**	
Utility Services					
Utility Modifications	1	LS	$100,000.00	$100,000	Allowance LG&E-KU to complete.
SUBTOTAL Shoring for tower foundations				**$100,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)(40' x 1' x perimete	12,956	CY	$37.86	$490,497	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$490,497**	
Pre-Closure / Preparation					
Divider Dike - Excavation and Load (CCR from facility operations)(dike is 1,500 ' long x 25' wide at top, 3:1 slopes, 20' tall)	85,300	CY	$1.39	$118,567	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
Divider Dike - Hauling (assume 2 mile cycle)(CCR from facility operations)	85,300	CY	$2.96	$252,488	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Divider Dike - Placement and Compaction	85,300	CY	$2.39	$203,867	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Divider Dike - Moisture Conditioning/Dust Control	85,300	CY	$0.57	$48,621	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Geotextile (as needed, assume 100% of area for filling)	549,340	SY	$2.46	$1,351,376	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of area for filling)	549,340	SY	$3.00	$1,648,020	CH2M HILL, recent quote on similar project
Excavation and Load from Stockpile after Dec 2017 (CCR from facility operations)	5,283,080	CY	$1.39	$7,343,481	1 988 RT Loader (8 CY), rent $85.95 + FOG $95.81/hr + opr $75/hr x 50 hrs/9,216 CY/week
Hauling (assume 2 mile cycle)(CCR from facility operations)	5,283,080	CY	$2.96	$15,637,917	3 each, Cat 735 off-road trcuks (26CY); rent $54.39/hr + FOG $52.18/hr + Opr $75/hr = $182/hr x 10 hrs/day x 5 days per week x 3 each /9,216 CY/week
Placement and Compaction	5,283,080	CY	$2.39	$12,626,561	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	5,283,080	CY	$0.57	$3,011,356	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes (assume 100% of pond)	549,340	SY	$0.20	$109,868	RSM 31 22 16.10 3300
SUBTOTAL Pre-Closure / Preparation				**$42,352,122**	
Final Cover (Install FML)					
Final Cover: 40-mil Tex/smooth LLDPE	4,944,060	SF	$0.65	$3,213,639	
10 oz. Geotextile (includes materials and installation)	4,944,060	SF	$0.20	$988,812	CH2M HILL recent project.
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	228,946	CY	$20.00	$4,578,915	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	76,315	CY	$20.00	$1,526,305	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	305,261	CY	$4.36	$1,330,938	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	305,261	CY	$2.39	$729,574	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	305,261	CY	$0.57	$173,999	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	549,340	SY	$0.20	$109,868	RSM 31 22 16.10 3300
SUBTOTAL Final Cover (Install FML)				**$12,652,050**	
Mechanical Improvements/Additions					
Piping to Ash Pond from Plant	1	LS	$1,500,000.00	$1,500,000	allowance
SUBTOTAL Piping to Ash Pond from Plant				**$1,500,000**	
Surface Water Features					
Physical or Chemical Treatment plus CO2 Injection System	1	LS	$125,000.00	$125,000	May 2015 cost estimate -Green River System
SUBTOTAL Physical or Chemical Treatment plus CO2 Injection System				**$125,000**	
Primary Outlet Structure					
SUBTOTAL Primary Outlet Structure				**$0**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	113.5	AC	$3,550.00	$402,925	
Quantity/Final Survey	1	LS	$30,000.00	$30,000	
SUBTOTAL Surface Restoration				**$432,925**	
Groundwater Monitoring					
New Monitoring wells, 4" (9,216 LF perimeter)	13	EA	$17,600.00	$228,800	assumes well spacing 1 well/750 feet; 13 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$308,800**	
SUBTOTAL CONSTRUCTION				**$74,931,379**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1	LS	$500,000.00	$500,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1	LS	$1,500,000.00	$1,500,000	LG&E provided, based on experience
PDI	1	LS	$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1	LS	$2,500,000.00	$2,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$2,500,000.00	$0	LG&E provided
Closure Report	1	LS	$100,000.00	$100,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$4,675,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$79,606,379**	
NEW CONSTRUCTION					
FGD Treatment Tanks					
Common Equipment					
Common Items					
Construction Material					
Other Construction					

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Ash Treatment Basin
Base Year: 2015
Date: 1/18/2016

Assumptions:

1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.
6. No allowance for pond water management.
7. No allowance for floating membrane and pumping for rain water management.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

CCR Rule - Trimble Generating Station Pond Cost Estimate - Gypsum Storage

21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Check
Proposed Conceptual Alternative CCR Closure - Gypsum Storage	**$32,171,062**	**0%**	**10%**	**12%**	**13%**	**48%**	**17%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**
IMPOUNDMENT CLOSURE	**$24,746,971**	**0.0%**	**9.9%**	**11.9%**	**13.4%**	**47.7%**	**17.1%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Mobilization/Demobilization	**$50,000**	0%	0%	0%	0%	80%	20%	0%	0%	0%	0%	0%	0%	100%
Sediment & Erosion Control	**$46,500**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Site Preparation	**$91,750**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Dewatering	**$9,000,230**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Repair On-Site Pond Embankments	**$250,000**	0%	0%	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	100%
Utility Services	**$25,000**	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Roads	**$176,049**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Pre-Closure / Preparation	**$6,423,630**	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Closure/Final Cover	**$4,781,057**	0%	0%	0%	0%	30%	70%	0%	0%	0%	0%	0%	0%	100%
Surface Water Features	**$150,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Primary Outlet Structure	**$300,000**	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%
Emergency Outlet Structure	**$0**	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Surface Restoration	**$152,355**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
Groundwater Monitoring	**$150,400**	0%	0%	20%	40%	40%	0%	0%	0%	0%	0%	0%	0%	100%
Conceptual Design	**$500,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Final Design and Permitting and permitting support	**$1,000,000**	0%	60%	20%	20%	0%	0%	0%	0%	0%	0%	0%	0%	100%
PDI	**$75,000**	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Construction Management, including CQA and OE services	**$1,500,000**	0%	0%	10%	30%	30%	30%	0%	0%	0%	0%	0%	0%	100%
Closure Report	**$75,000**	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	100%
Subtotal	**$24,746,971**													
Contingency	$7,424,091	0%	10%	12%	13%	48%	17%	0%	0%	0%	0%	0%	0%	100%
Subtotal with Contingency	**$32,171,062**													
LG&E & KU Overheads	$1,125,987	0%	10%	12%	13%	48%	17%	0%	0%	0%	0%	0%	0%	100%
TOTAL PROJECT COST	**$33,297,049**													

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Proposed Conceptual Alternative CCR Closure - Gypsum Storage													
IMPOUNDMENT CLOSURE	**$0**	**$2,558,115**	**$3,190,214**	**$3,717,239**	**$13,810,041**	**$5,144,276**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$28,419,885**
Mobilization/Demobilization	$0	$0	$0	$0	$46,794	$12,167	$0	$0	$0	$0	$0	$0	**$58,961**
Sediment & Erosion Control	$0	$0	$0	$0	$27,199	$28,287	$0	$0	$0	$0	$0	$0	**$55,486**
Site Preparation	$0	$0	$0	$0	$53,667	$55,814	$0	$0	$0	$0	$0	$0	**$109,481**
Dewatering	$0	$0	$0	$0	$10,528,996	$0	$0	$0	$0	$0	$0	$0	**$10,528,996**
Repair On-Site Pond Embankments	$0	$0	$0	$0	$146,232	$152,082	$0	$0	$0	$0	$0	$0	**$298,314**
Utility Services	$0	$0	$0	$28,122	$0	$0	$0	$0	$0	$0	$0	$0	**$28,122**
Roads	$0	$0	$0	$0	$205,952	$0	$0	$0	$0	$0	$0	$0	**$205,952**
Pre-Closure / Preparation	$0	$1,336,115	$2,779,119	$2,890,284	$0	$0	$0	$0	$0	$0	$0	$0	**$7,005,518**
Closure/Final Cover	$0	$0	$0	$0	$1,677,948	$4,071,821	$0	$0	$0	$0	$0	$0	**$5,749,769**
Surface Water Features	$0	$0	$0	$0	$175,479	$0	$0	$0	$0	$0	$0	$0	**$175,479**
Primary Outlet Structure	$0	$0	$0	$0	$350,958	$0	$0	$0	$0	$0	$0	$0	**$350,958**
Emergency Outlet Structure	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Surface Restoration	$0	$0	$0	$0	$0	$185,363	$0	$0	$0	$0	$0	$0	**$185,363**
Groundwater Monitoring	$0	$0	$32,535	$67,672	$70,379	$0	$0	$0	$0	$0	$0	$0	**$170,585**
Conceptual Design	$0	$520,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$520,000**
Final Design and Permitting and permitting support	$0	$624,000	$216,320	$224,973	$0	$0	$0	$0	$0	$0	$0	$0	**$1,065,293**
PDI	$0	$78,000	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$78,000**
Construction Management, including CQA and OE services	$0	$0	$162,240	$506,189	$526,436	$547,494	$0	$0	$0	$0	$0	$0	**$1,742,359**
Closure Report	$0	$0	$0	$0	$0	$91,249	$0	$0	$0	$0	$0	$0	**$91,249**
Subtotal	**$0**	**$2,558,115**	**$3,190,214**	**$3,717,239**	**$13,810,041**	**$5,144,276**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$28,419,885**
Contingency	$0	$0	$0	$0	$4,263,056	$4,263,056	$0	$0	$0	$0	$0	$0	$8,526,112
Subtotal with Contingency	**$0**	**$2,558,115**	**$3,190,214**	**$3,717,239**	**$18,073,097**	**$9,407,332**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$36,945,997**
LG&E & KU Overheads	$0	$89,534	$111,657	$130,103	$632,558	$329,257	$0	$0	$0	$0	$0	$0	$1,293,110
TOTAL PROJECT COST	**$0**	**$2,647,649**	**$3,301,871**	**$3,847,342**	**$18,705,655**	**$9,736,589**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$38,239,107**

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Trimble Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

CCR Rule - Trimble Generating Station Cost Estimate - Concrete Tanks
21-Sep-15

Item	Cost 2015 Dollars	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Check
Proposed Conceptual Alternative CCR Closure - Gypsum Storage	**$103,620,614**	**0%**	**0%**	**50%**	**50%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**100%**
NEW CONSTRUCTION	**$79,708,165**	**0.0%**	**0.0%**	**50.0%**	**50.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**0.0%**	**100%**
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	$23,800,328	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	$23,407,837	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Dewatering Facilityl Order of Magnitude Capital Cost	$32,300,000	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Mechanical Improvements/Additions	$200,000	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal	$79,708,165													
Contingency	$23,912,449.40	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
Subtotal with Contingency	**$103,620,614**													
LG&E & KU Overheads	$3,626,721	0%	0%	50%	50%	0%	0%	0%	0%	0%	0%	0%	0%	100%
TOTAL PROJECT COST	**$107,247,336**													

Item	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Proposed Conceptual Alternative CCR Closure - Gypsum Storage													
NEW CONSTRUCTION	**$0**	**$0**	**$43,106,175**	**$44,830,422**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$87,936,598**
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	$0	$0	$12,871,217	$13,386,066	$0	$0	$0	$0	$0	$0	$0	$0	$26,257,283
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cost	$0	$0	$12,658,958	$13,165,317	$0	$0	$0	$0	$0	$0	$0	$0	$25,824,275
Dewatering Facilityl Order of Magnitude Capital Cost	$0	$0	$17,467,840	$18,166,554	$0	$0	$0	$0	$0	$0	$0	$0	$35,634,394
Mechanical Improvements/Additions	$0	$0	$108,160	$112,486	$0	$0	$0	$0	$0	$0	$0	$0	$220,646
Subtotal	**$0**	**$0**	**$43,106,175**	**$44,830,422**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$87,936,598**
Contingency	$0	$0	$13,190,490	$13,190,490	$0	$0	$0	$0	$0	$0	$0	$0	$26,380,979
Subtotal with Contingency	**$0**	**$0**	**$56,296,665**	**$58,020,912**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$114,317,577**
													$0
LG&E & KU Overheads	$0	$0	$1,970,383	$2,030,732	$0	$0	$0	$0	$0	$0	$0	$0	$4,001,115
TOTAL PROJECT COST	**$0**	**$0**	**$58,267,048**	**$60,051,644**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$118,318,692**
													$0

Assumptions	
LG&E & KU Overheads	3.5%
Escalation	4.0%
Contingency	30%

1 - 2015 Costs are based on CH2M "Coal Combustion Residual Evaluation: Trimble Generating Station" technical memo dated July 24, 2015.
2 - Assumes the use of CCR material to create grades to support the pond cap.
3 - Assumes the use of Soil material to create pond cap or other design features.
4 - Assumes the use of Soil and Liner material(s) to create Clean Close facility.
5 - Dollars presented in Year 2016 through 2024 assumes escalation at a rate calculated by the Escalation Assumption.

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Gypsum Storage
Base Year: 2015
Date: 1/18/2016

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL	NOTES
IMPOUNDMENT CLOSURE					
Mobilization/Demobilization					
Workplan, procurement, mobilization, demobilization	1	LS	$50,000.00	$50,000	
SUBTOTAL Mobilization/Demobilization				**$50,000**	
Sediment & Erosion Control					
Sediment and Erosion Control Measures	9300	LF	$5.00	$46,500	allowance for BPM
SUBTOTAL Sediment & Erosion Control				**$46,500**	
Site Preparation					
Clearing/Grubbing	5	AC	$10,350.00	$51,750	Clear & grub areas to recevie fill, as required
Surveying	1	LS	$25,000.00	$25,000	
Utility Locating	1	EA	$15,000.00	$15,000	
SUBTOTAL Site Preparation				**$91,750**	
Dewatering					
Dewatering and discharge through NPDES permit	225,005,750	GL	$0.04	$9,000,230	500,000 gl/day. Assumes major treatment required for TSS. Pump water to new outlet structure for entire project (3 years). Does not include treatment associated with zero discharge restriction or NPDES Outfall development
SUBTOTAL Dewatering				**$9,000,230**	
Repair On-Site Pond Embankments					
Access Modications on existing CCR Pond embankments	1	LS	$250,000.00	$250,000	Minimal, based off of USEPA dam assessment report
SUBTOTAL Repair On-Site Pond Embankments				**$250,000**	
Utility Services					
Utility Modifications	1	LS	$25,000.00	$25,000	LG&E-KU to complete. Cost to coordinate.
SUBTOTAL Utility Services				**$25,000**	
Roads					
Dense Grade Aggregate (materials, hauling and placement)(27' wide x 1' thick x perimeter)	4650	CY	$37.86	$176,049	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
SUBTOTAL Roads				**$176,049**	
Pre-Closure / Preparation					
Geotextile (as needed, assume 100% of area for filling)	194,084	SY	$2.46	$477,447	woven, 200 lb tensile (RSM 31 32 19.16 1500)
Tensar TriAx (TX140) Geogrid (as needed, assume 100% of area for filling)	194,084	SY	$3.00	$582,252	CH2M HILL, recent quote on similar project
Placement and Compaction (from Plant)	1,772,161	CY	$2.39	$4,235,465	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
Moisture Conditioning/Dust Control	1,772,161	CY	$0.57	$1,010,132	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Cut/regrade for cover subgrade/ditch	9,817	CY	$8.10	$79,518	$8.10/ CY 200 HP dozer 300' (RSM 31 23 16.46 4420)+ no haul
Finish Grading, gentle slopes (assume 100% of pond)	194,084	SY	$0.20	$38,817	RSM 31 22 16.10 3300
SUBTOTAL Pre-Closure / Preparation				**$6,423,630**	
Closure/Final Cover					
Final Cover: 40-mil Tex/smooth LLDPE	1,746,756	SF	$0.65	$1,135,391	
Geocomposite (includes materials and installation)	1,746,756	SF	$0.55	$960,716	
Cover Soil (2 feet thick)					
- Excavation and Load-out (from off-site borrow area)	72,643	CY	$20.00	$1,452,855	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Excavation and Load-out (from off-site borrow area)(top soil)	24,214	CY	$20.00	$484,285	Allowance based on PE's recent bid evaluation at Cane Run (includes FOB)
- Hauling (assume 2-mile cycle)	96,857	CY	$4.36	$422,297	2013 RSMeans Site Work and Landscape Cost Data, 31 23 2320 0018
- Placement and Compaction	96,857	CY	$2.39	$231,488	$2.01 Placement; Dozer, 300 hp, 300', common earth (RSM 31 23 23.14 5420) + $0.38 Compaction; sheepsfoot, 12" lift, 2 passes (RSM 31 23 23.23 5680)
- Moisture Conditioning/Dust Control	96,857	CY	$0.57	$55,208	4,000 gallon water truck; rent $17.03/hr + FOG $33.80/hr + opr $55/hr = $105.83/hr x 10 hrs/day x 5 days/week / 9,216 CY/week
Finish Grading, gentle slopes	194,084	SY	$0.20	$38,817	RSM 31 22 16.10 3300
SUBTOTAL Closure/Final Cover				**$4,781,057**	
Surface Water Features					
Items to meet NPDES Permit requirements for discharge	1	LS	$150,000.00	$150,000	allowance
SUBTOTAL Surface Water Features				**$150,000**	
Primary Outlet Structure					
Install outlet structure	1	LS	$150,000.00	$150,000	May 2015 cost estimate - Green River System Second Outfall Structure
Demolition of existing pump station and disposal	1	LS	$50,000.00	$50,000	
Clean out (1) construction sediment pond	1	LS	$100,000.00	$100,000	allowance
SUBTOTAL Primary Outlet Structure				**$300,000**	
Emergency Outlet Structure					
Surface Restoration					
Mechanical Seeding & Mulching	40.1	AC	$3,550.00	$142,355	
Quantity/Final Survey	1	LS	$10,000.00	$10,000	
SUBTOTAL Surface Restoration				**$152,355**	
Groundwater Monitoring					
New Monitoring wells, 4" (1,813 LF perimeter)(minimum 1 up-gradient and 3 down-gradient)	4	EA	$17,600.00	$70,400	assumes well spacing 1 well/750 feet; 4 wells to 75 feet deep
Groundwater Monitoring Events	8	Ea	$10,000.00	$80,000	unit cost reflects lab, QA/QC eval, report per event
SUBTOTAL SUBTOTAL Groundwater Monitoring				**$150,400**	
SUBTOTAL CONSTRUCTION				**$21,596,971**	
Design, Project & Construction Management, and Closure Report					
Conceptual Design	1		$500,000.00	$500,000	LG&E provided, based on experience
Final Design and Permitting and permitting support	1		$1,000,000.00	$1,000,000	LG&E provided, based on experience
PDI	1		$75,000.00	$75,000	LG&E provided, based on experience
Construction Management, including CQA and OE services	1		$1,500,000.00	$1,500,000	LG&E provided, based on experience
Construction Contractor Performance and Payment Bonds	0.0%		$21,596,970.94	$0	LG&E provided
Closure Report	1	LS	$75,000.00	$75,000	Document Const. Work, QA/QC, and Record DWGs
SUBTOTAL Design, Project & Construction Management, and Closure Report				**$3,150,000**	
SUBTOTAL IMPOUNDMENT CLOSURE				**$24,746,971**	
NEW CONSTRUCTION					
Total FGD Concrete Tank Estimated Order of Magnitude Capital Cost	1.0	LS	$23,800,327.73	$23,800,328	**2 tanks, each is 740'x185'x24' deep; 2 tanks (~6.3 acres) - Total CCR tanks (-Contingency)(this estimate contains only the CCR portion of the cost for both tanks)**
Total Other WW Concrete Tank Estimated Order of Magnitude Capital Cos	1.0	LS	$23,407,836.93	$23,407,837	**Rerfer to tab "Capital Cost Estimate" shows the Order of Magnitude Cost (-Contingency), details are not reflected below**
Dewatering Facility Order of Magnitude Capital Cost	1.0	LS	$32,300,000.00	$32,300,000	**From ELG Cost Sheet (-Contingency) July 2, 2015**
FGD Treatment Tanks					Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mix Tank Mixers	1.0	LS	$99,908.31	$99,908	" "
Flocculation Tank Mixers	1.0	LS	$99,908.31	$99,908	" "
Ferric Chloride Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Sulfuric Acid Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Organosulfide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Polymer Blending Systems	1.0	LS	$53,400.00	$53,400	" "
Sodium Hydroxide Feed Pumps	1.0	LS	$15,332.72	$15,333	" "
Common Equipment					
Ferric chloride tank	1.0	LS	$14,950.55	$14,951	" "
Sulfuric Acid tank	1.0	LS	$4,464.43	$4,464	" "
Sodium Hydroxide Tank	1.0	LS	$17,183.10	$17,183	" "
Safety Shower	1.0	LS	$30,000.00	$30,000	" "
Total Equipment Cost (TEC)	1.0	LS	$381,000.00	$381,000	" "
Freight	1.0	LS	$12,041.72	$12,042	" "
Purchased Equipment Cost - Delivered (PEC-D)	1.0	LS	$393,041.72	$393,042	" "
Mix Tanks Wall Concrete	1.0	LS	$51,414.06	$51,414	" "
Mix Tanks Slab Concrete	1.0	LS	$7,874.04	$7,874	" "

Site: Trimble County Generating Station
Location: Bedford, Kentucky
Phase: Proposed Conceptual Alternative CCR Closure - Gypsum Storage
Base Year: 2015
Date: 1/18/2016

Floculation Tanks Wall Concrete	1.0	LS	$51,414.06	$51,414	" "
Floculation Tanks Slab Concrete	1.0	LS	$7,874.04	$7,874	" "
Settling Tanks Wall Concrete	1.0	LS	$3,432,000.00	$3,432,000	" "
Settling Tanks Slab Concrete	1.0	LS	$6,300,696.36	$6,300,696	" "
Total Ramp Concrete	1.0	LS	$308,101.52	$308,102	" "
Common Items					
Excavation - Soft	1.0	LS	$1,719,848.99	$1,719,849	" "
Pre Engineered building	1.0	LS	$120,000.00	$120,000	" "
Lining Tanks	1.0	LS	$1,217,033.91	$1,217,034	" "
Construction Material					
Construction Material	1.0	LS	$13,216,256.98	$13,216,257	" "
State Sales Tax	1.0	LS	$3,029.03	$3,029	" "
Total Constuction Material	**1**	LS	$13,219,286.01	**$13,219,286**	" "
Total Equipment and Construction	**1.0**	**LS**	**$13,612,327.73**	**$13,612,328**	" "
Other Construction					
Electrical and I&C	1.0	LS	$681,000.00	$681,000	" "
Piping	1.0	LS	$1,089,000.00	$1,089,000	" "
Yard Improvements (a)	1.0	LS	$1,089,000.00	$1,089,000	" "
Metals and Finishes	1.0	LS	$408,000.00	$408,000	" "
Subtotal	**1**	LS	$16,879,327.73	**$16,879,328**	" "
Total Direct Costs (TDC)	**1.0**	**LS**	**$16,879,327.73**	**$16,879,328**	" "
Contractor's Field General Conditions	1.0	LS	$844,000.00	$844,000	" "
Contractor's OH&P	1.0	LS	$2,532,000.00	$2,532,000	" "
Contingency	**1.0**	**LS**	**$3,376,000.00**	**$3,376,000**	" "
Total Construction Cost (TCC)	**1.0**	**LS**	**$23,631,327.73**	**$23,631,328**	" "
Engineering, SDCc and Startup	**1.0**	**LS**	**$3,545,000.00**	**$3,545,000**	" "
Total Estimated Order of Magnitude Capital Cost	**1.0**	**LS**	**$27,176,327.73**	**$27,176,328**	" "
Total Estimated Order of Magnitude Capital Cost (-Contingency)	**1.0**	**LS**	**$23,800,327.73**	**$23,800,328**	Linked to the total cost from the Capital Cost Estimate Tab, developed from Technical Memorandum " Physical/Chemical Treatment - Settling Tank Treatment Design Basis" dated August 18, 2015 by CH2M
Mechanical Improvements/Additions					
Piping to new concrete tank from Gypsum Stack	1	LS	$50,000.00	$50,000	allowance
Piping to new concrete tank from ATB	1	LS	$50,000.00	$50,000	
Items to be constructed to meet NPDES Permitting Requirements	1	LS	$100,000.00	$100,000	allowance
SUBTOTAL Mechanical Improvements/Additions				**$200,000**	
SUBTOTAL NEW CONSTRUCTION				$79,708,165	

Assumptions:
1. Areas and volumes were estimated based on CADD files provided by client. Conceptual grading plans were prepared and quantity take-offs obtained from.
2. CCR volume quantities include utilizing CCR from existing operations.
3. Existing pond embankments to be used.
4. Groundwater Monitoring well installation is not included.
5. Road repair is not included in this cost estimate.

This cost estimate prepared is considered a Budget Level estimate. It is considered accurate to + 30 percent to – 30 percent, based upon a conceptual alternatives in our technical memo.

The cost estimates shown have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final cost of the project will depend upon the actual labor and material costs, competitive market conditions, final project costs, implementation schedule and other variable factors. As a result, the final project costs will vary from the estimates presented herein. Because of this, project feasibility and funding needs must be carefully reviewed prior to making specific financial decisions to help ensure proper project evaluation and adequate funding. The estimate is based on material, equipment, and labor pricing as of ___________. The client should be cautioned that such prices are highly subject to variation. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.

Trimble County Facility Backup Quantities   Nathan Zink   7/6/2015

CCR Production Rates

CCR Production Handling Assumptions:

% Bot Ash Wet Sluice to ATB1:	100%
% Fly Ash Wet Sluice to ATB1:	100%
% Gypsum returned:	100%

CCR Production - 2015 Plan (tons)

Year	Trimble County Bot Ash	Fly Ash	Gypsum	TOTAL	Accumulated Material (Tons) ATB	Gypsum Stack			
2015	51,952	207,810	496,454	756,216	259,762	496,454	baseline Gypsum (2nd Quarter 2018		
2016	62,958	251,833	538,194	852,986	314,791	538,194		1,772,161	Quarterly Gypsum
2017	63,732	254,930	534,152	852,814	318,662	534,152	baseline ATB		135,573.69
2018	62,686	250,746	542,295	855,727	313,432	542,295		1,545,582	
2019	62,284	249,135	539,487	850,906	311,419	539,487	beneficial re-use		
2020	61,651	246,602	534,571	842,824	308,253	534,571		4,219,740	
2021	61,982	247,927	534,620	844,529	309,909	534,620			
2022	61,096	244,382	529,256	834,734	305,478	529,256			5,765,322
2023	62,147	248,589	536,011	846,747	310,736	536,011			5,283,080
2024	-	-	-	-	-	-			482,242
2025	-	-	-	-	-	-			211,687
Total:				**Assumed Additional Accumulated Material (2015 thru closure):**	2,752,442	4,785,041		7,537,483	

Projected Material Generation - Handling Assumptions:

A. Bottom Ash and Flyash:
- Until October 19, 2015 assume all fly ash and bottom ash slurried to ATB Pond, and
- After December 2017 assume all material will be dry processed
- After October 19, 2018 all material to the ATB Pond

B. Gypsum
- Until October 19, 2018 assume all gypsum slurried to Gypsum Stack and
- After October 19, 2018 all material to the Main Ash Pond

Approximate density of CCR in-place: 1 ton/CY

Orange:	To be confirmed by CAD
Yellow:	Based on assumptions as listed

Pond Quantity Balance Estimate - By Pond:

Gypsum Stack

Item	Units	Gypsum	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	33.4				
Standing Surface Water (to remove)	GAL	225,005,750	1,114,036 CY of Volume for the wet pond area. Confirmed with CAD.		8	ft
Length of perimeter	LF	4,650				
CUT:						
CCR cut in 2017 - for Gypsum Stack	CY	10	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
Cut/regrade for cover subgrade/ditch	CY	9,817	Assume Trapazoidal channel 3H:1V 3-ft deep with 10-ft bottom	CAD - confirm cut to grade ditches for final cover	57	SF
FILL (to cover subgrade):						
CCR for Fill - from Baseline	CY	1,772,161				
Total Fill - Existing surface to final grade	CY	1,747,215	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	1,807,614	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	35,443				
Final Cover Soil Volume	CY	96,857	CAD to update			
Final Cover Surface Area	AC	33.4	CAD to update			
Structural Support						
Geogrid	AC	40.1	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	40.1	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Amount of CCR/import fill required to close pond [a]	CY	899,585	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Cut: existing surface to final grade	CY	409,085	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Total Fill: existing surface to final grade	CY	1,698,880	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
Net: existing surface to final grade	CY	1,289,795	OLD - from CH2M concept to make 5% cover. Smaller valley/trench instead.			
		3,148,738.00				

ATB

Item	Units	ATB	Notes	Key Item to Confirm for Final Estimate:	Estimated input value:	
Total surface area	AC	94.6				
Standing Surface Water (to remove)	GAL	410,955,884	2,034,702 CY of Volume for the wet pond area. Confirmed with CAD.		13	ft
Length of perimeter	LF	8,712				
CUT						
Cut for Final Cover: Stormwater channel	CY	4,915	Approx. cut to create ditches in CH2M Jan. 2015 TM. CAD to update.	CAD - confirm cut to grade ditches for final cover		
FILL						
From Gypsum Stack	CY	24,946				
CCR fill - For closure at 5% slope	CY	5,283,080	Assumed Mound running NW to SE length 800-LF	Each mound is estimated to approximately 40,400 cubic yards of fill		
Total Fill - Existing surface to final grade	CY	29,861	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
Total Fill for Closure of Pond	CY	135,522	CAD to optimize surface to minimize net fill required	CAD - find final cover grading option to minimize net fill		
2% Settlement Material Need	CY	105,662				
Final Cover Soil Volume	CY	305,261	Total surface area +20% and 2-ft of cover soil - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Final Cover Surface Area	AC	94.6	CAD to update			
Structural Support						
Geogrid	AC	113.5	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Geofabric	AC	113.5	Total surface area +20% - CAD to update	Anchor trench to estmate 20-ft offset from total surface area	20%	
Total Fill: existing surface to final grade	CY	399,120	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Net: existing surface to final grade	CY	300,455	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Final cover volume	CY	113,790	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			
Amount of CCR/import fill required to close pond [a]	CY	512,910	OLD - from CH2M concept to make 5% cover. Revise based on updated grades.			

[a] Dewatering and settlement of ash through closure activities will affect the quantities of fill material. In situ ash and geotechnical soil borings and testing are recommended to determine settlement during closure design.

[b] Represents volume of pond.

Other Key Assumptions:

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Mass Balances - FGD Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	FGD Wastewater	Mix Tank Influent	Sodium Hydroxide Feed (2)	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
DESIGN FLOW											
Volumetric Flow, 3-month averag	gpm	1,175	1,175	0.06	0.06	0.02	0.59	0.059	1,199	111	1,082
Total Mass Flow	lb/hr	599,729	599,729	38	41	14	294	54	600,129	58,819	541,310
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	12	0	0	0			
Mass Flow Liquid	lb/hr	587,970	587,970	38	41	14	294	54	588,357	47,055	541,302
Mass Flow Solids	lb/hr	11,759	11,759	0	12	0	0	0	11,772	11,764	8.1
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	2,053	2,053	0.10	0.10	0.04	1.03	0.059	2,095	194	1,890
Total Mass Flow	lb/hr	1,047,868	1,047,868	66	72	24	514	54	1,048,565	102,699	945,867
Suspended Solids	%	2.0%	2.00%	0%		0%	0%	0%	2.0%	20%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	22	0	0	0			
Mass Flow Liquid	lb/hr	1,027,321	1,027,321	66	72	24	514	54	1,027,997	82,159	945,838
Mass Flow Solids	lb/hr	20,546	20,546	0	22	0	0	0	20,568	20,540	28.4
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.06	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	65.9	62.4

Notes:

xx User Entered

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Mass Balances - Other Wastewater

Streams		1	2	3	4	5	6	7	8	9	10
	Units	Other Wastewater	Mix Tank Influent	Sodium Hydroxide Feed	Ferric Chloride Feed	Organo-sulfide Feed	Polymer Feed	Sulfuric Acid Feed	Settling Tank Influent	Settled Solids	Settling Tank Enfluent
DESIGN FLOW											
Volumetric Flow, 3 month ave	gpm	5,213	5,213	0.26	0.26	0.10	2.61	0.261	5,217	1	5,216
Total Mass Flow	lb/hr	2,608,846	2,608,846	167	239	62	1,304	240	2,610,618	673	2,609,945
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.01%	5%	0.002%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	55	0	0	0			
Mass Flow Liquid	lb/hr	2,608,585	2,608,585	167	184	62	1,304	240	2,610,302	396	2,609,906
Mass Flow Solids	lb/hr	261	261	0	55	0	0	0	316	277	39.1
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.01	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	63.3	62.4
DESIGN MAX FLOW											
Volumetric Flow, Peak	gpm	34,144	34,144	1.71	1.71	0.68	17.07	0.261	34,171	61	34,108
Total Mass Flow	lb/hr	17,087,366	17,087,366	1,093	1,205	403	8,543	240	17,098,972	31,158	17,067,813
Suspended Solids	%	0.01%	0.01%	0%		0%	0%	0%	0.01%	5%	0.003%
Chemical Feed	ppmv			50	50	20	500	50			
Chem Solids Generation	lb/hr			0	361	0	0	0			
Mass Flow Liquid	lb/hr	17,085,658	17,085,658	1,093	1,205	403	8,543	240	17,096,902	29,600	17,067,301
Mass Flow Solids	lb/hr	1,709	1,709	0	361	0	0	0	2,070	1,558	512.0
Specific Gravity		1.00	1.00	1.28	1.41	1.18	1.00	1.84	1.00	1.01	1.00
Density	lb/cf	62.4	62.4	79.9	88.0	73.6	62.4	114.8	62.4	63.3	62.4

Notes:

xx	User Entered

Equipment Sizing

	FGD Treatment	Other Water Treatment	Tom's comments - red = not addressed, black = addressed
Mix Tanks			
Average Flow, gpm	1,175	5,213	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,053	34,144	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	17	20	
HDT Peak, Min	10	3	
Mix Tank Volume, gal	20,530	102,432	
Mix Tank Volume, cf	2,744	13,693	
Side Water Depth, ft	18	23	Need to account for the mix tanks being higher than the settling tanks to allow fro head drop
Freeboard, ft	2	2	
Wall Height, ft	20	25	
Length/width, ft	12	24	inside dimensions
Slab Area, sf	354	644	
Wall length, ft	27	51	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,068	1,270	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	79	94	
Slab Volume, cy	26	48	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.05	10.24	
Actual HP	2.0	10.0	
Number	2	2	
Outlet Pipe Nominal Diameter, in	14	40	FRP Pipe
Outlet Pipe ID, in	14	40	
Outlet Pipe Velocity, fps	4.28	4.36	Design for max 2-5 fps
Pipe Head Loss to Flocculation Tank, Ft	0.64	0.61	
Number of Dip Tubes	1	2	We will want to design 2 different size dip tubes for other wastewater, a lower one that is smaller for low flows and a larger one for high flow conditions. We need a minimum velocity to suck solids out of the tank, and max velocity to prevent shear.

Flocculation Tanks

Design Flow, gpm	1,175	5,213	Design flow for Sludge Generation storage, 3 month rolling average
Max Design Flow, gpm	2,053	34,144	Use for Mix Tanks, Settling tank overflow rate
Number of Tanks	2	2	
HDT Average, Min	17	20	
HDT Peak, Min	10	3	
Flocculation Tank Volume, gal	20,530	102,432	
Flocculation Tank Volume, cf	2,744	13,693	
Side Water Depth, ft	18	23	
Freeboard, ft	2	2	
Wall Height, ft	20.0	25.0	
Length/width, ft	12	24	inside dimensions
Slab Area, sf	354	644	
Wall length, ft	27	51	Wall length split between Mix tanks and floc tanks
Wall Area, sf	1,068	1,270	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.00	2.00	
Wall Volume, cy	79	94	
Slab Volume, cy	26	48	
Mixing horsepower, HP/1,000 gal	0.1	0.1	
Calculated HP	2.05	10.2	
Actual HP	2.0	10.0	
Number	2	2	
Outlet Pipe Nominal Diameter, in	14	40	FRP
Outlet Pipe ID, in	14	40	
Outlet Pipe Velocity, fps	4.28	4.36	Design for max 2-5 fps
Pipe Head Loss to Floculation Tank	0.64	0.61	
Number of Dip Tubes	2	2	

Settling Tanks

Design Flow, gpm	1,175	5,213	Calculate overflow rate on peak flow, solids storage on average flow
Max Design Flow, gpm	2,053	34,144	
Design solids, mg/L	20,000	100	
Daily solids production , lbs/day	282,562	8,639	
Solids concentration (Settled solids)	20%	5%	Settled solids
Solids density, lbs/cf	80	80	dry solids
Solids generation, cf/day	17,660	2,160	
Solids Storage, days	93	740	About 2 yrs for Other WW
Solids Storage per tank, cf	1,642,800	1,598,400	
Number of Tanks	2	2	
Wall Height, ft	24	24	
Freeboard, ft	2	2	
Side Water Depth, ft	22	22	
Water depth above settled solids	10	10	
Solids Depth,ft	12	12	
Total Tank Volume, gal per tank	22,528,264	21,919,392	
Total Tank Volume, CF per tank	3,011,800	2,930,400	
Solids Storage Volume, gal per tank	12,288,144	11,956,032	
Solids Storage Volume, CF per tank	1,642,800	1,598,400	
Tank Width, ft	185	180	Set based on solids storage capacity for FGD WW and overflow rate for other WW Treatment
L/W Ratio	4	4.1	
Tank Length, ft	740	740	Tank length for Other WW is set equal to the FGD WW tank and the Other WW tank width
Slab Area, sf	283,531	275,472	
Wall length, ft	2,970	2,950	
Wall Area, sf	71,280	70,800	
Slab thichness, ft	2	2	
Wall thickness, in	24	24	
Wall thickness, ft	2.0	2.0	
Wall Volume, cy	5,280	5,244	
Slab Volume, cy	21,002	20,405	
Overflow Rate Average, gpm/sf	0.0086	0.0391	
Overflow Rate peak, gpm/sf	0.015	0.256	Want to stay at < 0.26 gpm/sf
Flow capacity based on average overflow rate, gpm	1,200	5,200	one train

Flow capacity based on Peak overflow rate, gpm	2,050	34,140	One train

Access Ramp to Settling Tank			
Access Ramp Inside Settling tank Width, ft	30	30	Need two way truck traffic
Ramp Slope, %	12%	12%	
Ramp tickness, ft	1.50	1.50	Assumed.
Ramp Length, ft	201	201	
Ramp area, sf	6043	6043	
Ramp side wall area sf	2400	2400	
Ramp side wall Thickness, ft	2	2	
Sidewall concerte, cft	4800	4800	
Access Ramp concrete, cft	9065	9065	
Total Ramp concrete, ft3	13865	13865	
Total Ramp concrete, cy	514	514	Per ramp

Excavation, cy	567,975		

Liner

Liner, ft2	363,699	356,143	
Liner, SY	40,411	39,571	

Chemical Feeds

Ferric Chloride Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	Use 50
Maximum Feed Rate, gph	6.2	102.4	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	3.5	15.6	
Average Treatment Volume, MGD	1.69	7.51	
Average Usage, gpd	85	375	
Average usage of chemical for FGD WW and Other WW	460		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	148	2458	
Max usage of chemical for FGD WW and Other WW, gpd	2,606		
Nominal Storage Tank Volume, gal	8,000		
Number of Tanks	1		
Total Storage Volume, gal	12,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	5		
Storage Time at average usage, days	26		Size for 14 to 21 days capacity at average usage

Sulfuric Acid Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	6	102	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	3.525	15.639	
Average Treatment Volume, MGD	1.692	7.50672	
Average Usage, gpd	84.6	375	
Average usage of chemical for FGD WW and Other WW	460		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	148	2458	
Max usage of chemical for FGD WW and Other WW	2,606		
Nominal Storage Tamk Volume, gal	10,000		
Number of tanks	1		
Total Storage Volume, gal	14,000		Each tank. Includes 4000 gal for tanker truck.
Storage Time at normal max usage, days	4		
Storage Time at average usage, days	22		Size for 14 to 21 days capacity at average usage

Sodium Hydroxide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	50	50	
Maximum Feed Rate, gph	6.2	102.4	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	3.5	15.6	
Average Treatment Volume, MGD	1.69	7.5	
Average Usage, gpd	85	375	
Average usage of chemical for FGD WW and Other WW	460		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	148	2458	
Max usage of chemical for FGD WW and Other WW	2,606		
Nominal Storage Tank Volume, gal	10,000		common Tank
Number of tanks	1		
Total Storage Volume, gal	14,000		Includes 4000 gallon extra capacity for tank truck loading
Storage Time at normal max usage, days	5		
Storage Time at average usage, days	30		Size for 14 to 21 days capacity at average usage

Organosulfide Feed

Number of pumps	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	20	20	
Maximum Feed Rate, gph	2.46	41.0	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	1.41	6.26	
Average Treatment Volume, MGD	1.69	7.5	
Average Usage, gpd	33.8	150	
Average usage of chemical for FGD WW and Other WW, gpd	184		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	59.1	983	
Max usage of chemical for FGD WW and Other WW, gpd	1,042		
Nominal Storage Tank Volume, gal	4,000		
Number of tanks	1		
Total Storage Volume, gal	8,000		
Storage Time at normal max usage, days	4		
Storage Time at average usage, days	22		Size for 14 to 21 days capacity at average usage

Polymer Feed System

Number of polymer blending units	2	2	
Maximum Flow to treat, gpm	2,053	34,144	
Dose (volume of chemical/volume of wastewater), ppmv	5	5	1:100 ratio neat polymer to water
Maximum Feed Rate, gph	0.62	10.24	
Dilution Water Feed (volume to volume of neat polymer)	100	100	
Maximum Flow of Dilution water, gph	61.6	1024.3	
Average Flow to treat, gpm	1,175	5,213	
Average Feed Rate, gph	0.35	1.56	
Average Treatment Volume, MGD	1.69	7.51	
Average Usage, gpd	8.5	37.5	
Average usage of chemical for FGD WW and Other WW, gpd	46		
Max Day Treatment Volume, MG	2.96	49.2	
Normal Maximum Usage, gpd	14.8	246	
Max usage of chemical for FGD WW and Other WW, gpd	261		
Nominal Storage Tote Volume, gal	265		265 or 320 gallons are standard volumes/sizes for totes
Number of totes	4		
Total Storage Volume, gal	1,060		
Storage Time at normal max usage, days	4		
Storage Time at average usage, days	23		Size for 14 to 21 days capacity at average usage

Note: User Input

Head loss influent Mix tank to Floccuation Tank FGD Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		14	14		0.78	2,053	4.57	4.28	0.29	150	0.00	0.22	0.22
	pipe	FRP		14	14	18		2,053	4.57	4.28	0.29	150	0.06	0.00	0.06
0	tee, branch	FRP		14	14		0.72	2,053	4.57	4.28	0.29	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		14	14		0.19	2,053	4.57	4.28	0.29	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		14	14		0.19	2,053	4.57	4.28	0.29	150	0.00	0.05	0.05
				14	14			2,053							
	pipe	FRP		14	14	4		2,053	4.57	4.28	0.29	150	0.01	0.00	0.01
1	exit loss	FRP		14	14		1.00	2,053	4.57	4.28	0.29	150	0.00	0.29	0.29

Total head loss **0.64**
total minor loss **0.56**

Head loss influent Mix tank to Floccuation Tank, Other Water Treatment

Quantity	Pipe /Fitting	Material	SDR	Nominal	ID	Pipe Length L	Loss Coef	Flow	Flow	Pipe Velocity	Velocity Head	Hazen C	Headloss in Pipe	Minor Loss	Subtotal head
				(in)	(in)	(ft)		(gpm)	(ft^3/s)	(ft/sec)	(ft)		(ft)	(ft)	(ft)
1	entrance	FRP		40	40		0.78	17,072	38.04	4.36	0.30	150	0.00	0.23	0.23
	pipe	FRP		40	40	23		17,072	38.04	4.36	0.30	150	0.02	0.00	0.02
0	tee, branch	FRP		40	40		0.72	17,072	38.04	4.36	0.30	150	0.00	0.00	0.00
-	elbow, 45 degree	FRP		40	40		0.19	17,072	38.04	4.36	0.30	150	0.00	0.00	0.00
1	elbow, 90 degree	FRP		40	40		0.19	17,072	38.04	4.36	0.30	150	0.00	0.06	0.06
				40	40			17,072							
				40	40										
	pipe	FRP		40	40	4		17,072	38.04	4.36	0.30	150	0.00	0.00	0.00
1	exit loss	FRP		40	40		1.00	17,072	38.04	4.36	0.30	150	0.00	0.30	0.30

Total head loss **0.61**
total minor loss **0.59**

Excavation Calculation FGD WW and Other WW Tanks

Settling Tank Depth below grade=	22	ft	
Depth Below Tank for Excavation =	4	ft	
Depth of excavation	26	ft	
Side Slope (H:V) =	1		
Tank wall thickness	2	each	
FGD WW Tank Length =	740	ft	
FGD WW Tank Width =	185	ft	
Number of FGD WW Tanks =	2		
Other WW Tank Length =	740	ft	
Other WW Tank Width =	180	ft	
Number of Other WW Tanks =	2		
Total Length of tanks with walls	744	ft	
Total Width of tanks with walls	740	ft	
Excavated tank area volume	15,335,320	cf	Trapezoidal calculation, average with of cut time average length of cut times depth
Total Excavated Volume	567,975	cy	

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
Ramps	*Access to Settling Tanks*	Number	2	2
		Length, ft	201	201
		Width, ft	30	30
		Slope, %	12%	12%
		Materials	Reinforced Concrete	Reinforced Concrete
Mix Tanks	*Tanks*	Number	2	2
		Average Flow, gpm	1,175	5,213
		Peak Flow, gpm	20,530	102,432
		Detention Time at Average Flow, min	17	20
		Detention Time at Peak Flow, min	10	3
		Dimension, ft (square)	12	24
		Wall Height, ft	20	25
		Freeboard, ft	2	2
		Side Water Depth, ft	18	23
		Volume, gal	20,530	102,432
		Materials	Reinforced Concrete	Reinforced Concrete
	Mix Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	2	10
	Mix Tank Blower	Number		2
		Type		Rotary Lobe
		Air Required, scfm		500
		Horsepower, each		20
	Dip Tubes	Number	2	2
		Diameter, in	14	40
		Head loss, ft	0.64	0.61
		Materials	FRP	FRP
FlocculationTanks	*Tanks*	Number	2	2
		Average Flow, gpm	1,175	5,213
		Peak Flow, gpm	2,053	34,144
		Detention Time at Average Flow, min	17	20
		Detention Time at Peak Flow, min	10	3
		Dimension, ft (square)	12	24
		Wall Height, ft	20	25
		Freeboard, ft	2	2
		Side Water Depth, ft	18	23
		Volume, gal	20,530	102,432
		Materials	Reinforced Concrete	Reinforced Concrete
	Flocculation Tank Mixers	Number	2	2
		Type	Hyerboloid	Hyerboloid
		Turbine tip Speed, ft/sec	2 to 6	2 to 6
		Control	VFD	VFD
		Mixing Criteria, HP/1,000 gal	0.1	0.1
		Horsepower, each	2	10
	Dip Tubes	Number	2	2
		Diameter, in	14	40
		Head loss, ft	0.64	0.61
		Materials	FRP	FRP
Settling Tanks	*Tanks*	Number	2	2
		Average Flow, gpm	1,175	5,213
		Peak Flow, gpm	2,053	34,144
		Solids Concentration, mg/L	20,000	100
		Average dry solids generation, lbs/day	282,562	8,639
		Solids Settled Concentration (%)	20%	5%
		Solids density, lbs/cf	80	80
		Solids Generation, cf/day	17,660	2,160
		Length, ft	740	740
		Width, ft	185	180
		Wall Height, ft	24	24
		Freeboard, ft	2	2
		Side Water Depth, ft	22	22
		Settling Depth, ft	10	10

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
		Solids Depth, ft	12	12
		Total Liquid Volume, gal per tank	22,528,264	21,919,392
		Solids Storage Design Criteria, days	90	90
		Solids Storage Volume, gal	12,288,144	11,956,032
		Solid Storage Provided per tank, days	93	740
		Average Overflow Rate, gpm/sf	0.01	0.04
		Peak Overflow Rate, gpm/sf	0.01	0.26
		Materials	Reinforced Concrete	Reinforced Concrete
Ferric Chloride Feed System	*Ferric Chloride Storage Tank*	Number	1	
		Tank Volume, gal	12,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	85	375
		Average Chemical Use, gal/d	460	
		Peak Chemical Use, gal/d	148	2,458
		Peak Chemical Use, gal/d	2,606	
		Average Use Storage, days	26	
		Peak Use Storage, days	5	
		Chemical Stored	35% Ferric Chloride	
	Ferric Chloride Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.2	102.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	35% Ferric Chloride	35% Ferric Chloride
Sulfuric Acid Feed System	*Sulfuric Acid Storage*	Number	1	
		Tank Volume, gal	14,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	85	375
		Average Chemical Use, gal/d	460	
		Peak Chemical Use, gal/d	148	2,458
		Peak Chemical Use, gal/d	2,606	
		Average Use Storage, days	22	
		Peak Use Storage, days	4	
		Chemical Stored	93% Sulfuric Acid	
	Sulfuric Acid Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.2	102.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	93% Sulfuric Acid	0
Sodium Hydroxide Feed System	*Sodium Hydroxide Storage*	Number	1	
		Tank Volume, gal	14,000	
		Dose, ppmv	50	50
		Average Chemical Use, gal/d	85	375
		Average Chemical Use, gal/d	460	
		Peak Chemical Use, gal/d	148	2,458
		Peak Chemical Use, gal/d	2,606	
		Average Use Storage, days	30	
		Peak Use Storage, days	5	
		Chemical Stored	25% and 50% NaOH	
	Sodium Hydroxide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	6.2	102.4
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	25% and 50% NaOH	0

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 1. Design Basis

Facility	Equipment	Design Criteria	FGD Treatment Tank System	Other Treatment Tank System
Organosulfide Feed System	*Organosulfide Tote/tank Storage*	Number	1	
		Tank Volume, gal	8,000	
		Dose, ppmv	20	20
		Average Chemical Use, gal/d	34	150
		Average Chemical Use, gal/d	184	
		Peak Chemical Use, gal/d	59	983
		Peak Chemical Use, gal/d	1,042	
		Average Use Storage, days	22	
		Peak Use Storage, days	4	
		Chemical Stored	Organosulfide	
	Organosulfide Feed Pumps	Type	Stepping Motor Diaphragm	Stepping Motor Diaphragm
		Capacity, gph	2.46	41.0
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Organosulfide	Organosulfide
Polymer Feed System	*Polymer Tote Storage*	Number	4	
		Volume, gal each	265	
		Volume Storage, gal	1,060	
		Dose, ppmv	5	5
		Average Chemical Use, gal/d	8	38
		Average Chemical Use, gal/d	46	
		Peak Chemical Use, gal/d	15	246
		Peak Chemical Use, gal/d	261	
		Average Use Storage, days	23	
		Peak Use Storage, days	4	
		Chemical Stored	Anionic Emulsion Polymer	
	Polymer Blending Systems	Type	Polymer Blending System	Polymer Blending System
		Capacity, gph	0.62	10.2
		Number	2	2
		Power	120 v	121 v
		Chemical Pumped	Anionic Emulsion Polymer	Anionic Emulsion Polymer

LG&E-KU

Trimble County Station

Settling Tank-based Treatment System

Table 2. Electrical Load

Item	Location	HP	No. Provided	No. Active	Installed HP	Active HP	% of Time On	Total HP for O&M
FGD WW Teatment								
Mix Tank Mixers	TBD	2	2	1	4	2	100%	2
Floculation Tank Mixers	TBD	2	2	1	4	2	100%	2
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Other WW Teatment								
Mix Tank Mixers	TBD	10	2	1	20	10	100%	10
Floculation Tank Mixers	TBD	10	2	1	20	10	100%	10
Chemical Feed Pumps	TBD	1	10	5	10	5	100%	5
Mix Tank Blower	TBD	20	2	1	40	20	10%	2
Miscellaneous (bldg heating, lights, etc.)		100			100	100	30%	30
Mix Tank Blower								
Totals					208	154		66
MW								0.049764
MW-Hr/year								440

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
FGD Treatment Tanks									
Mix Tank Mixers	2	hp	2	41,628	83,257	8,326	99,908	99,908	
Flocculation Tank Mixers	2	hp	2	41,628	83,257	8,326	99,908	99,908	
Ferric Chloride Feed Pumps	6	gph	2	6,266	12,533	1,400	15,333	15,333	
Sulfuric Acid Feed Pumps	6	gph	2	6,266	12,533	1,400	15,333	15,333	
Organosulfide Feed Pumps	2	gph	2	6,266	12,533	1,400	15,333	15,333	
Polymer Blending Systems	1	gph	2	25,000	50,000	1,700	53,400	53,400	
Sodium Hydroxide Feed Pumps	6	gph	2	6,266	12,533	1,400	15,333	15,333	
Other Wastewater Treatment Tanks									
Mix Tank Mixers	10	hp	2	44,860	89,720	8,972	107,664		107,664
Flocculation Tank Mixers	10	hp	2	44,860	89,720	8,972	107,664		107,664
Ferric Chloride Feed Pumps	102	gph	2	6,266	12,533	1,400	15,333		15,333
Sulfuric Acid Feed Pumps	102	gph	2	6,266	12,533	1,400	15,333		15,333
Organosulfide Feed Pumps	41	gph	2	6,266	12,533	1,400	15,333		15,333
Polymer Blending Systems	10	gph	2	25,000	50,000	1,700	53,400		53,400
Sodium Hydroxide Feed Pumps	102	gph	2	6,266	12,533	1,400	15,333		15,333
Mix Tank Blower	500	SCFM	2	2,850	5,700	1,140	7,980		7,980
Common Equipment									-
Ferric chloride tank	12,000	gal	1	24,918	24,918	4,984	29,901	14,951	14,951
Sulfuric Acid tank	2,606	gal	1	7,441	7,441	1,488	8,929	4,464	4,464
Organosulfide Tank	1,042	gal	1	4,531	4,531	906	5,438		5,438
Polymer feed Totes	265	gal	4		-	-	-		-
Sodium Hydroxide Tank	14,000	gal	1	28,639	28,639	5,728	34,366	17,183	17,183
Safety Shower			2	25,000	50,000	5,000	60,000	30,000	30,000
Area Labor Adjustment Factor	100.0%	applies to installation cost only							
Total Equipment Cost (TEC)							**791,000**	**381,000**	**410,000**
Area Labor Adjustment Factor									
Total Process Equipment					617,444				
Freight	4%	of Proc Equip					25,000	12,042	12,958
Purchased Equipment Cost - Delivered (PEC-D)							**816,000**	**393,042**	**422,958**
FGD Treatment Tanks									
Mix Tanks Wall Concrete	79	CY	1	650	51,414		51,414	51,414	
Mix Tanks Slab Concrete	26	CY	1	300	7,874		7,874	7,874	
Floculation Tanks Wall Concrete	79	CY	1	650	51,414		51,414	51,414	
Floculation Tanks Slab Concrete	26	CY	1	300	7,874		7,874	7,874	
Settling Tanks Wall Concrete	5280	CY	1	650	3,432,000		3,432,000	3,432,000	
Settling Tanks Slab Concrete	21,002	CY	1	300	6,300,696		6,300,696	6,300,696	
Total Ramp Concrete	514	CY	2	300	308,102		308,102	308,102	
Other Treatment Tanks									
Mix Tanks Wall Concrete	94	CY	1	650	61,148		61,148		61,148
Mix Tanks Slab Concrete	48	CY	1	300	14,315		14,315		14,315
Floculation Tanks Wall Concrete	94	CY	1	650	61,148		61,148		61,148
Floculation Tanks Slab Concrete	48	CY	1	300	14,315		14,315		14,315
Settling Tanks Wall Concrete	5,244	CY	1	650	3,408,889		3,408,889		3,408,889
Settling Tanks Slab Concrete	20,405	CY	1	300	6,121,593		6,121,593		6,121,593
Total Ramp concrete, cy	514	CY	2	300	308,102		308,102		308,102
Common Items									
Excavation - Soft	567,975	CY	1	6	3,390,810		3,390,810	1,719,849	1,670,961
Pre Engineered building	1,200	ft2	1	200	240,000		240,000	120,000	120,000
Lining Tanks	79,982	SY	1	30	2,399,472		2,399,472	1,217,034	1,182,439
Construction Material							26,179,165	13,216,257	12,962,908
State Sales Tax	1.0%	of Equipment					6,000	3,029	2,971
Total Constuction Material							**26,185,165**	**13,219,286**	**12,965,879**
Total Equipment and Construction							**27,001,165**	**13,612,328**	**13,388,837**
Electrical and I&C	5%						1,350,000	681,000	669,000
Piping	8%						2,160,000	1,089,000	1,071,000
Yard Improvements (a)	8%	of Equip + Const.					2,160,000	1,089,000	1,071,000
Metals and Finishes	3%	of Equip + Const.					810,000	408,000	402,000
Subtotal							33,481,165	16,879,328	16,601,837
Total Direct Costs (TDC)							**33,481,165**	**16,879,328**	**16,601,837**
Contractor's Field General Conditions	5%	of TDC					1,674,000	844,000	830,000
Contractor's OH&P	15%	of TDC					5,022,000	2,532,000	2,490,000
Contingency	20%	of TDC					6,696,000	3,376,000	3,320,000
Escalation Factor	0%	of TDC					0	0	0
Total Construction Cost (TCC)							**46,873,165**	**23,631,328**	**23,241,837**
Engineering, SDC[c] and Startup	15%	of TCC					7,031,000	3,545,000	3,486,000

LG&E-KU
Trimble County Station
Settling Tank-based Treatment System
Table 3. Estimated Capital Cost

Item	Value	Units	No. Provided	Unit Cost ($ ea)	Amount	Installation ($ ea)	Total Installed Cost ($)	CCR Cost	ELG Cost
Total Estimated Order of Magnitude Capital Cost							**53,904,165**	**27,176,328**	**26,727,837**
Annual Cost of Capital (7% over 20 years)							5,088,000	$2,565,000	$2,523,000

(a) Includes fencing, grading, roads, sidewalks, and similar items.
(b) The enclosed Engineer's Estimate is only an estimate of possible construction costs. This estimate is limited to the conditions existing at its issuance and is not a guaranty of actual price or cost. Uncertain market conditions such as, but not limited to: local labor or contractor availability, wages, other work, material market fluctuations, price escalations, force majeure events, and developing bidding conditions etc may affect the accuracy of this estimate. CH2M Hill is not responsible for any variance from this estimate or actual prices and conditions obtained.
(c) SDC stands for Services During Construction (Startup, Engineer/Site Reps, etc.)

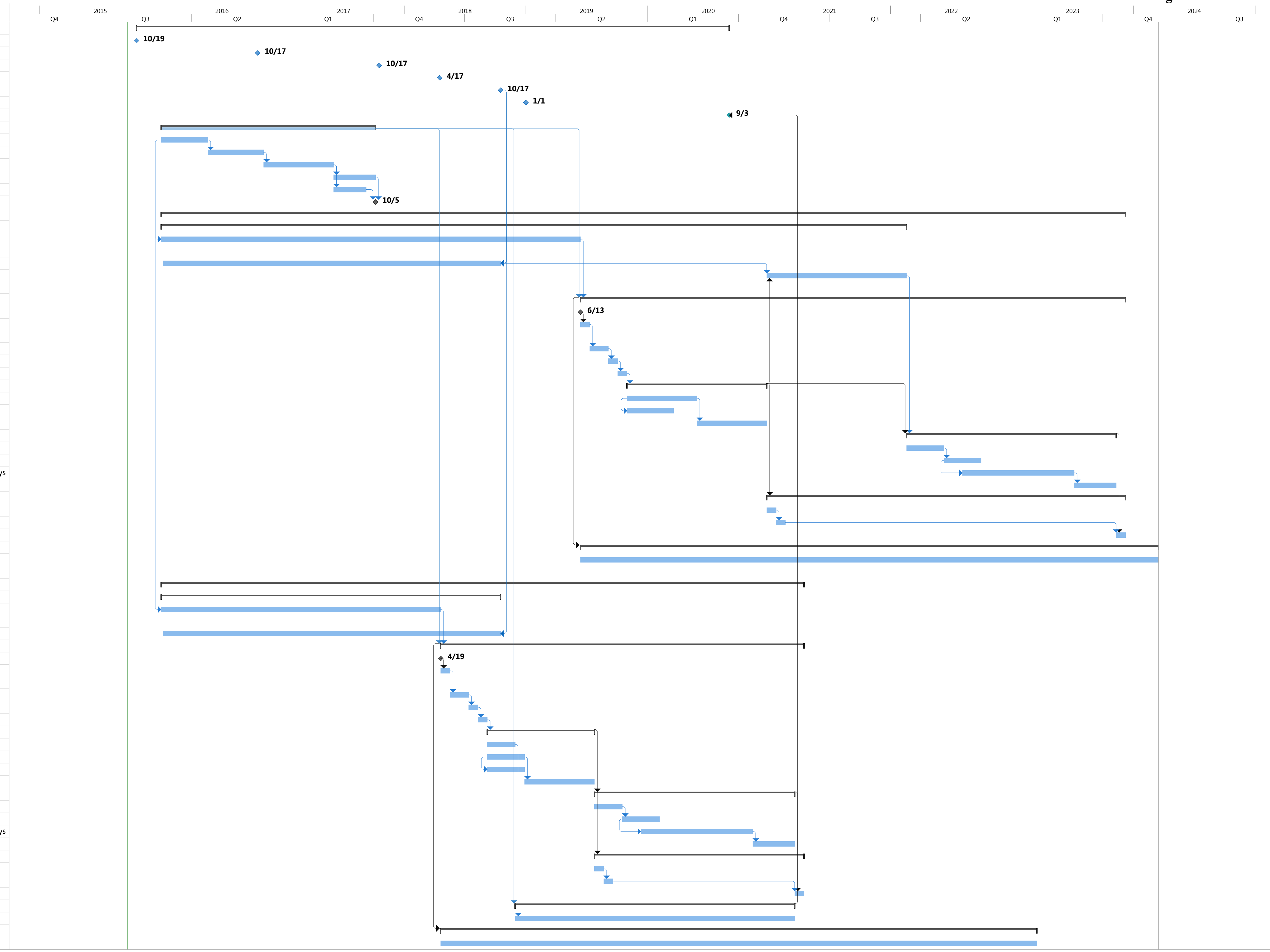
LG&E-KU

Trimble County Station
Settling Tank-based Treatment System
Table 4. Estimated O&M Cost

Item	Quantity	Units	Unit Cost	Cost
Labor	1,040	hours/yr	$30	$31,200
Maintenance (% of Purchased Equipment Cost)	816,000	$	3%	$24,480
Solids for Disposal	231,497	tons/yr	-	-
Energy	440	MW-Hr/yr	$100	$44,000
Chemicals				
Ferric Chloride	134,301	gal/yr	$2	$222,940
Acid	40,290	gal/yr	$2	$94,280
Organosulfide	53,721	gal/yr	$20	$1,074,410
Polymer	13,430	gal/yr	$8	$106,904
Caustic	134,301	gal/yr	$1	$147,731
Total Annual O&M				$1,746,000
Cost per 1000 Gallon Treated (excludes labor)				**$0.51**
Annualized Cost				$6,834,000

Attachment 3
Schedule

ID		Task Mode	Task Name	Duration	Start	Finish	Predecessors
1			**Regulatory Milestones**	**1273 days**	**Mon 10/19/15**	**Thu 9/3/20**	
2			CCR Rule Effective Date	0 days	Mon 10/19/15	Mon 10/19/15	
3			Structural Integrity - Initial Assessment(s	0 days	Mon 10/17/16	Mon 10/17/16	
4			Groundwater - Background Analysis	0 days	Tue 10/17/17	Tue 10/17/17	
5			Groundwater - Detection Analysis	0 days	Tue 4/17/18	Tue 4/17/18	
6			Groundwater - Assessment Analysis	0 days	Wed 10/17/18	Wed 10/17/18	
7			Groundwater Corrective Action	0 days	Tue 1/1/19	Tue 1/1/19	
8			Divert water to Concrete pond	0 days	Thu 9/3/20	Thu 9/3/20	67FF
9			**Engineering Phase**	**460 days**	**Fri 1/1/16**	**Thu 10/5/17**	
10			Preliminary Design	100 days	Fri 1/1/16	Thu 5/19/16	
11			Final Design	120 days	Fri 5/20/16	Thu 11/3/16	10
12			KY DEP Permitting	150 days	Fri 11/4/16	Thu 6/1/17	11
13			KY PSC Rate Approval	90 days	Fri 6/2/17	Thu 10/5/17	12
14			Procurement of Contractor	70 days	Fri 6/2/17	Thu 9/7/17	12
15			Issue NtP	0 days	Thu 10/5/17	Thu 10/5/17	14,13
16			**ATB**	**2070 days**	**Fri 1/1/16**	**Thu 12/7/23**	
17			**LG&E Activities**	**1600 days**	**Fri 1/1/16**	**Thu 2/17/22**	
18			Remove and Discharge surface water	900 days	Fri 1/1/16	Thu 6/13/19	10SS
19			Accumulate CCR in 2016-2018	725 days	Wed 1/6/16	Wed 10/17/18	6FF
20			Place Beneficial Use CCR to achieve final grades	300 days	Fri 12/25/20	Thu 2/17/22	19,27
21			**Contractor Activities**	**1170 days**	**Thu 6/13/19**	**Thu 12/7/23**	**9,18**
22			Mobilize	0 days	Thu 6/13/19	Thu 6/13/19	
23			Install Sediment and Erosion Control	20 days	Fri 6/14/19	Thu 7/11/19	22
24			Site Preparation	40 days	Fri 7/12/19	Thu 9/5/19	23
25			Roads	20 days	Fri 9/6/19	Thu 10/3/19	24
26			On Site Impoundments	20 days	Fri 10/4/19	Thu 10/31/19	25
27			**Preclosure Activities**	**300 days**	**Fri 11/1/19**	**Thu 12/24/20**	**26**
28			Stabilize upper CCR surface	150 days	Fri 11/1/19	Thu 5/28/20	
29			Dewater during stabilization	100 days	Fri 11/1/19	Thu 3/19/20	28SS
30			Cut/regrade for cover subgrade/dit	150 days	Fri 5/29/20	Thu 12/24/20	28
31			**Closure Activities**	**450 days**	**Fri 2/18/22**	**Thu 11/9/23**	**27,20**
32			Shape Cover Subgrade	80 days	Fri 2/18/22	Thu 6/9/22	
33			Place FML and Geocomposite	80 days	Fri 6/10/22	Thu 9/29/22	32
34			Cover soil	240 days	Fri 8/5/22	Thu 7/6/23	33SS+40 days
35			Vegetated Cover	90 days	Fri 7/7/23	Thu 11/9/23	34
36			**Surface Water Features**	**770 days**	**Fri 12/25/20**	**Thu 12/7/23**	**27**
37			Primary Outlet Structure	20 days	Fri 12/25/20	Thu 1/21/21	
38			Emergency Outlet Structure	20 days	Fri 1/22/21	Thu 2/18/21	37
39			Surface Restoration	20 days	Fri 11/10/23	Thu 12/7/23	31,38
40			**Construction Management Services**	**1241 days**	**Fri 6/14/19**	**Fri 3/15/24**	**21SS**
41			CQA and OE services	1241 days	Fri 6/14/19	Fri 3/15/24	
42							
43			**Gypsum Storage**	**1380 days**	**Fri 1/1/16**	**Thu 4/15/21**	
44			**LG&E Activities**	**728 days**	**Fri 1/1/16**	**Wed 10/17/18**	
45			Remove and Discharge surface water	600 days	Fri 1/1/16	Thu 4/19/18	10SS
46			Accumulate CCR in 2016-2018	725 days	Wed 1/6/16	Wed 10/17/18	6FF
47			**Contractor Activities**	**780 days**	**Thu 4/19/18**	**Thu 4/15/21**	**45,9**
48			Mobilize	0 days	Thu 4/19/18	Thu 4/19/18	
49			Install Sediment and Erosion Control	20 days	Fri 4/20/18	Thu 5/17/18	48
50			Site Preparation	40 days	Fri 5/18/18	Thu 7/12/18	49
51			Roads	20 days	Fri 7/13/18	Thu 8/9/18	50
52			On Site Impoundments	20 days	Fri 8/10/18	Thu 9/6/18	51
53			**Preclosure Activities**	**230 days**	**Fri 9/7/18**	**Thu 7/25/19**	**52**
54			Diversion Dike	60 days	Fri 9/7/18	Thu 11/29/18	
55			Stabilize upper CCR surface	80 days	Fri 9/7/18	Thu 12/27/18	
56			Dewater during stabilization	80 days	Fri 9/7/18	Thu 12/27/18	55SS
57			Cut/regrade for cover subgrade/dit	150 days	Fri 12/28/18	Thu 7/25/19	55
58			**Closure Activities**	**430 days**	**Fri 7/26/19**	**Thu 3/18/21**	**53**
59			Shape Cover Subgrade	60 days	Fri 7/26/19	Thu 10/17/19	
60			Place FML and Geocomposite	80 days	Fri 10/18/19	Thu 2/6/20	59
61			Cover soil	240 days	Fri 12/13/19	Thu 11/12/20	60SS+40 days
62			Vegetated Cover	90 days	Fri 11/13/20	Thu 3/18/21	61
63			**Surface Water Features**	**450 days**	**Fri 7/26/19**	**Thu 4/15/21**	**53**
64			Primary Outlet Structure	20 days	Fri 7/26/19	Thu 8/22/19	
65			Emergency Outlet Structure	20 days	Fri 8/23/19	Thu 9/19/19	64
66			Surface Restoration	20 days	Fri 3/19/21	Thu 4/15/21	58,65
67			**Concrete Process Tank**	**600 days**	**Fri 11/30/18**	**Thu 3/18/21**	**9**
68			Construct concrete CCR process tank	600 days	Fri 11/30/18	Thu 3/18/21	54
69			**Construction Management Services**	**1280 days**	**Fri 4/20/18**	**Thu 3/16/23**	**47SS**
70			CQA and OE services	1280 days	Fri 4/20/18	Thu 3/16/23	



Project: Brown rev11
Date: Tue 9/22/15

Task | Split | Milestone | Summary | Project Summary | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | External Tasks | External Milestone | Deadline | Progress | Manual Progress

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF LOUISVILLE GAS AND	**)**	
ELECTRIC COMPANY FOR CERTIFICATES OF	**)**	
PUBLIC CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00027**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
R. SCOTT STRAIGHT
DIRECTOR, PROJECT ENGINEERING
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is R. Scott Straight. I am the Director of Project Engineering for LG&E and KU Services Company, which provides services to Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. I have not testified at a Commission hearing, but have sponsored discovery responses in numerous cases regarding projects the Companies have undertaken, as well as having presented in numerous quarterly update meetings associated with the Commission's Construction Monitoring Review of the Companies' 2011 ECR Plans. In addition, I have provided testimony in the most recent KU rate case in Virginia.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain the need for Project 28 in the 2016 ECR Plan ("2016 Plan"), which is the addition of mercury injection systems at the Mill Creek and Trimble County generating systems. I am also sponsoring exhibits related to this Project, as well. The other proposed Projects for LG&E in the 2016 Plan are described in the testimony of John N. Voyles, Jr.

Q. What exhibits are you sponsoring?

A. I am sponsoring one exhibit related to Project 28:

Exhibit RSS-1: MATS Rule – Mercury Control Injection Project Summary

Q. Please provide a summary of Project 28.

A. Project 28 involves the installation of low-cost and economical control technologies to reduce mercury re-emissions that will keep the Mill Creek and Trimble County Unit 1 units in compliance, and provide operational flexibility in maintaining compliance with the Mercury and Air Toxics Standards ("MATS Rule") for mercury. First, LG&E is proposing supplemental injection control technology to inject an organo-sulfide chemical additive into the wet flue gas desulfurization ("WFGD") reaction tanks for all units at Mill Creek and Trimble County Unit 1. Second, LG&E plans to inject a halogenated chemical additive into the coal feeders on Mill Creek Units 1 and 2 to increase mercury oxidation in the coal combustion zone, which will improve the amount of mercury captured by the pulse jet fabric filters ("PJFFs") and the WFGDs. Exhibit RSS-1 provides a further description of Project 28, as well as an overview of the mercury control systems LG&E has installed to date at Mill Creek and Trimble County.

Q. What environmental regulation necessitates the installation of these technologies?

A. As explained in the testimony of Gary H. Revlett, the MATS Rule requires the Companies to further reduce the mercury emissions associated with the production of electricity from coal. The MATS Rule requires the use of maximum achievable control technology within the electric utility industry. Although the Mill Creek and Trimble County units are presently in compliance, due to mercury re-emissions, the units have the potential to emit mercury above the allowable limits in the MATS Rule absent installation of the supplemental injection control technologies proposed in Project 28.

Q. Has LG&E previously installed mercury-related control equipment on certain units at Mill Creek and Trimble County?

A. Yes, it has. Through Project 26 and Project 27, which were part of the 2011 ECR Plan, LG&E installed mercury-related control equipment on all four units at Mill Creek and on Trimble County Unit 1.[1] Trimble County Unit 2 did not require additional mercury related equipment. In order to comply with the federal Clean Air Act as amended, the Cross-State Air Pollution Rule (successor to the proposed Clean Air Transport Rule), the then-proposed National Emission Standards for Hazardous Air Pollutants ("HAPS Rule"), and the National Ambient Air Quality Standard, LG&E obtained approval of Project 26 (as modified) to construct three new WFGDs (one to serve both Mill Creek Units 1 and 2, one to serve Mill Creek Unit 3, and one to serve Mill Creek Unit 4), including the demolition of the four existing WFGDs.

Project 26 also included the construction of Particulate Matter Control Systems to serve each of the four Mill Creek units that are comprised of a PJFF to capture particulate matter, a powdered activated carbon injection system to capture mercury, a lime injection system to protect the PJFF from the corrosive effects of sulfuric acid mist and to increase the activated carbon's capture of

[1] *In the Matter of: The Application of Louisville Gas and Electric Company for Certificates of Public Convenience and Necessity of Its 2011 Compliance Plan for Recovery by Environmental Surcharge* (Case No. 2011-00162).

mercury (sulfuric acid mist can blind activated carbon from capturing mercury), as well as other balance-of-plant support system changes.

Q. Have there been other projects related to reducing mercury emissions on LG&E's coal fired units?

A. Yes, Project 27, which was also approved in the 2011 ECR Plan, was likewise related to reducing mercury emissions. That Project consisted of adding a Particulate Matter Control System to Trimble County Unit 1 in order to meet the mercury and particulate emissions reduction requirements contained in the then proposed HAPS Rule.

Q. You stated that Project 28, which is proposed in this case, is needed to ensure continuing compliance with the MATS Rule. How is that different from the HAPS Rule that was proposed when the 2011 Plan proceeding was pending?

A. As explained in Mr. Revlett's testimony, the MATS Rule is the final version of the proposed HAPS Rule. The MATS Rule sets emissions limitation standards for mercury and other air pollutants, reflecting levels achieved by the best-performing sources currently in operation. While the addition of the mercury related control equipment that was part of the 2011 ECR Plan reduced mercury emissions at the Mill Creek units and Trimble County Unit 1, these units will be better equipped, and provide operating flexibility, to satisfy the mercury emission standards established in the MATS Rule in the most cost-effective manner than without the addition of these two supplemental low-capital cost control technologies proposed in Project 28.

Q. Please explain mercury re-emission and how it is related to WFGDs.

A. LG&E, like many other utilities that generate electricity from coal, utilizes WFGD technologies as part of its existing Air Quality Control Systems. These wet scrubber systems allow for the capture of sulfur dioxide emissions and also capture a large percent of oxidized mercury that is in the flue gas stream.

Because oxidized mercury is water soluble, oxidized mercury is captured in the wet scrubber; thereby reducing the generating unit's mercury emissions. Oxidized mercury can likewise be captured in LG&E's PJFFs through the injection of powdered activated carbon, as well. At times, however, the oxidized mercury in the wet scrubber slurry can de-oxidize and be released back into the flue gas stream as elemental mercury. This phenomenon, which is known as mercury re-emission, causes lower net mercury capture efficiency in the WFGD because the elemental mercury is reemitted into the flue gas stream and then emitted through the chimney.

Q. Please explain how Project 28 seeks to address this concern.

A. The Companies conducted studies in 2013 through 2015 regarding how to best address mercury re-emission from the WFGDs. The Companies' investigation indicated that by injecting an organo-sulfide chemical additive into the WFGD reaction tank, less oxidized mercury would be reduced to elemental mercury. This allows the wet scrubber to hold the captured mercury that otherwise could be re-emitted so it could be removed through the gypsum dewatering systems. LG&E is proposing to have the ability to inject this additive on all units at Mill Creek, as well as at Trimble County Unit 1 either as a total substitute for powdered activated carbon or in combination with the carbon injection, depending on the price and effectiveness of each.

Relatedly, LG&E is proposing, with respect to Mill Creek Units 1 and 2, to inject a halogenated chemical additive into the coal feeders. Injecting this additive before the coal is combusted increases the mercury oxidation during the combustion of coal, thus making the powdered activated carbon and WFGD removals of mercury more effective, especially on Unit 1 and Unit 2 that do not have Selective Catalytic Reduction ("SCR") systems which contain catalyst that oxidizes the mercury in the flue gas. As with the injections in the WFGD reaction tank, this will result in increased mercury capture and overall reduced mercury emissions.

Q. Are there other benefits to this Project, as well?

A. Yes. Another significant benefit to installing this supplemental injection technology is that it allows the Companies to balance the cost of powdered activated carbon against the price of the liquid chemical WFGD and coal additives, while also providing the station flexibility to use either powdered activated carbon, liquid injection or a combination of both. And lastly, the use of this supplemental technology can reduce or avoid the contamination of fly ash caused by the powdered activated carbon, thus potentially increasing each station's offsite beneficial use or reuse opportunities of CCR.

Q. How does LG&E plan to implement Project 28?

A. Successfully controlling mercury in an environmentally compliant manner will depend on the consistent and regulated delivery of the organo-sulfide and halogenated chemical additives. The rate at which the additives will be injected at each unit will be determined based on that unit's measured mercury emissions and WFGD process conditions, along with how much activated carbon and hydrated lime is used prior to the PJFFs.

The injection systems will require components such as long-term product storage vessels, metering pumps, piping, valves and instrumentation, electrical and control wiring, programmable logic controllers, and an enclosed climate controlled shelter for the pump skids and instrumentation and controls.

Q. When does LG&E propose to install the injection systems?

A. The Company proposes to fully construct and install the injection systems on all affected units during 2016.

Q. Are the costs of the injection system economical?

A. Yes. First, it should be noted that the injection systems are a low-cost manner of helping LG&E comply with the mercury emission standards in the MATS Rule, as the expected capital cost of the systems at Mill Creek and Trimble County 1 totals $4.9 million. As discussed in the testimony of Charles R. Schram, it is economical to install the systems because the current pricing of the liquid additives is favorable to the cost of powdered activated carbon.

Q. What is your recommendation to the Commission?

A. My recommendation is that the Commission approve Project 28 as part of the 2016 Plan because it is a low-cost economical means for LG&E's coal fired units to comply with the mercury emission standards established by the MATS Rule.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **R. Scott Straight**, being duly sworn, deposes and says that he is Director – Project Engineering for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

R. Scott Straight

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler
Notary Public (SEAL)

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

R. Scott Straight
Director, Project Engineering
LG&E and KU Services Company
220 West Main Street
Louisville, KY 40202
(502) 627-2701

Professional Memberships & Achievements:
KY Professional Engineer
IN Professional Engineer
Pinnacle Honor Society for Masters Degrees
Beta Sigma Gamma (National Honor Society for Business Graduates)
Member of SCOAR (Southeastern Construction Owners & Assoc. Roundtable)

Education:
B.S. Mechanical Engineering – Purdue University (1983)
M.B.A. – Indiana University (*with honors* 1993)
Steven Covey's Lessons in Leadership (1996)

Recent Responsibilities (Director of Project Engineering):
2011 ECR Program (LG&E and KU) including:
- PJFFs on Ghent 1-4, E.W. Brown 3, Mill Creek 1-4 and Trimble County 1
- WFGDs on Mill Creek 1-4

2009 ECR Program (LG&E and KU)
- E.W. Brown, Trimble County and Ghent Landfills; Brown 3 SCR

2004 ECR Program (LG&E and KU)
- Ghent 1, 3 and 4 WFGD, Brown Station WFGD

2002 ECR Program
- Ghent 1, 3 and 4 SCRs, Mill Creek 3 and 4 SCRs, Trimble County 1 SCR

2010 Trimble County Unit 2 810 MW Supercritical Coal Unit
2015 Cane Run 7 640 MW Natural Gas Combined Cycle Unit
2016 E.W. Brown 10 MWe Solar Station
Ohio Falls Hydro-Station Units 1-8 Rehabilitation

History of Positions:
Director, Project Engineering (2004-present)
Manager, NOx Compliance Program Manager (2001-2004)
Manager, Generation Services (1998-2001)
Manager, Technical Services (1995-1998)
Sr. Engineer, Environmental Affairs (focused on CAA) (1990-1995)
Mechanical Engineer, Special Construction Department (1984-1990)
Design Engineer, Boeing Military Airplane Company (1983-1984)

Project Engineering – LG&E and KU

MATS Rule – Mercury Control Injection Project Summary

January 2016

Background

LG&E and KU (collectively, the "Companies") must comply with the Mercury and Air Toxics Standards ("MATS") Rule beginning April 16, 2016 (with a 1-year extension). The MATS Rule regulates mercury and other hazardous air pollutants from fossil fuel fired steam generating units. For the Companies, this includes the Ghent, Mill Creek, Trimble County and E.W. Brown Stations. The Rule also requires the maximum achievable control technology be utilized.

Included in the Companies' 2011 Environmental Cost Recovery ("ECR") filing was the engineering and construction of pulse jet fabric filters ("PJFF") for particulate, including a powdered activated carbon injection ("PAC") system and dry sorbent injection ("DSI") of hydrated lime system prior to each PJFF for mercury and sulfuric acid control, respectively. The 2011 ECR filing included new PJFFs on the four Mill Creek units, the four Ghent Units, Trimble County Unit 1 and E.W. Brown Unit 3. A PJFF is already installed on Trimble County Unit 2. E.W. Brown Units 1 and 2 were excluded from requiring a PJFF in the 2011 ECR filing.[1] The 2011 ECR filing also included new wet flue gas desulfurization systems ("WFGD") for the four Mill Creek coal fired units.

Since the 2011 ECR filing, the Companies have continued with the construction and commissioning of the ten PJFFs in the plan and have placed nine of them into operation. These PJFFs are operating as designed relative to capturing particulate, mercury and acid gases. While the PJFFs capture up to 90-plus percent of the mercury, mercury still exist in the flue gas stream as it leaves the PJFFs. The remaining mercury exiting the PJFFs is in both the elemental and oxidized form. A large percentage of the remaining oxidized mercury that exits the PJFFs is captured in the WFGD downstream of the PJFF.

Over time, the Companies have seen episodes where the oxidized mercury that has been accumulated in the WFGD slurry can be released back into the flue gas stream through a chemical process that converts the captured oxidized mercury into elemental mercury. These intermittent episodes have the potential, under the MATS Rule, to place a coal-fired generating unit in a noncompliance period for mercury. Given this re-emission risk, the Companies have continued the testing of chemical solution injections on coal and in the WFGD wet slurry to determine their viability for capturing mercury. The details of the chemistry and process for each mercury injection system is described below. These mercury injection technologies were in their infancy at the time of the 2011 ECR filing and since have continued to gain industry experience, including the Companies' testing program on its coal-fired units, through the operation of a permanent WFGD injection system on Trimble County Unit 2, as well as testing experience from other coal-fired generators in the United States.

[1] The 2011 ECR Plan filing originally included a shared-PJFF for E.W. Brown Units 1 and 2. The parties to the unanimous stipulation approved by the PSC agreed to remove the shared-PJFF for E.W. Brown Units 1 and 2 from the 2011 ECR Plan.

To date, the Companies' testing has shown very good results of holding on to the mercury captured by the WFGD to avoid the periods of mercury re-emissions. These tests have also been described in summary form in the Companies' 2011 ECR quarterly reports to the KPSC Staff and its consultant. The Companies' latest IRP filing also included several documents describing the Companies' experience in testing these injection technologies.

Need

Due to this mercury re-emission process, the coal-fired units across the Companies' fleet have the potential to exceed current and future mercury emission limits under the MATS Rule, even with their PJFFs and WFGDs operating as designed. Mercury re-emission occurs when the Oxidation-Reduction Potential ("ORP") of a WFGD reaction tank slurry exceeds the optimal range which then converts oxidized mercury back into its elemental state. The water solubility of elemental mercury is much lower than oxidized mercury and the elemental mercury is re-emitted into the flue gas from the WFGD and then emitted out of the chimney. Studies conducted by the Companies in 2013 and 2014 indicated that injecting an organo-sulfide chemical additive into the WFGD reaction tank for a particular unit reduces ORP, mitigating mercury re-emission. The LG&E and KU units that will require WFGD chemical injection systems are Ghent Units 1-4, Mill Creek Units 1&2 combined WFGD tank, Mill Creek Unit 3, Mill Creek Unit 4, and Trimble County Unit 1. It should be noted that the Companies' newest coal-fired unit, Trimble County Unit 2, already employs this technology to remain in compliance. Process Flow Diagrams ("PFD") are shown below for the Ghent, Mill Creek, and Trimble County units in Figures 1, 2 and 3 respectively, along with a common flow diagram showing more details of the injection technologies in Figures 4 and 5.

In addition to the WFGD injection system for enhanced mercury control, an injection technology to spray on the coal prior to combustion is needed on several of the coal-fired units in the fleet. Several coal-fired units will improve their mercury capture efficiency from the coal supplemental injection technologies based on their combustion systems and air pollution control equipment configurations. In particular, the Companies coal-fired units without Selective Catalytic Reduction ("SCR") systems do not oxidize mercury to the extent that units with SCRs do. While there is some oxidation of mercury in the combustion process, the SCR catalyst is a very good oxidizer of mercury. Oxidized mercury is more water soluble than elemental mercury and is therefore captured in WFGDs whereas the remaining elemental mercury is not captured by the WFGD. Studies conducted by the Companies indicated that injecting a halogenated chemical additive into the coal feeders for a particular unit will increase mercury oxidation thus improving mercury capture. The Companies' units that will require coal feeder chemical injection systems are Ghent Units 1-4, Mill Creek Unit 1 and Mill Creek Unit 2. PFDs for Ghent and Mill Creek are shown below in Figure 1 and Figure 2, respectfully.

Scope

Mercury control is dependent on the consistent and regulated delivery of chemical additives. The chemical injection feed rate for each unit will be controlled based on measured mercury emissions and WFGD process conditions. The equipment and layout of each system will be designed by a hired engineering firm who will also have involvement in equipment procurement and will interface with a third party construction contractor. Each injection system will require the following:

- Long-term storage vessels
- Pump skids
- Stainless Steel Piping
- Valves and Instrumentation
- Electrical and Control Wiring
- Programmable Logic Controller ("PLC")
- Enclosed climate controlled shelter for pump skid and PLC

Example Piping and Instrumentation Diagrams ("P&ID") for the organo-sulfide systems and halogenated liquid systems are respectively shown in Figure 4 and Figure 5 below. The P&IDs are generic; thus the actual installed systems may vary slightly but will be similar in layout and design.

Timing

The anticipated project timeline is:

- High-Level Engineering and Cost Estimates: 4th quarter 2015
- Detailed Engineering and Construction Drawings/Technical Specs: 1st quarter 2016
- Equipment Procurement: 1st quarter 2016
- Equipment Delivery: 2nd - 4th quarter 2016
- Installation: 2nd – 4th quarter 2016

Cash Flow

The estimated costs of the Mercury Control Injection Systems Projects are $4.9 million for LG&E and $10.1 million for KU, for a total of $15 million between the Companies.

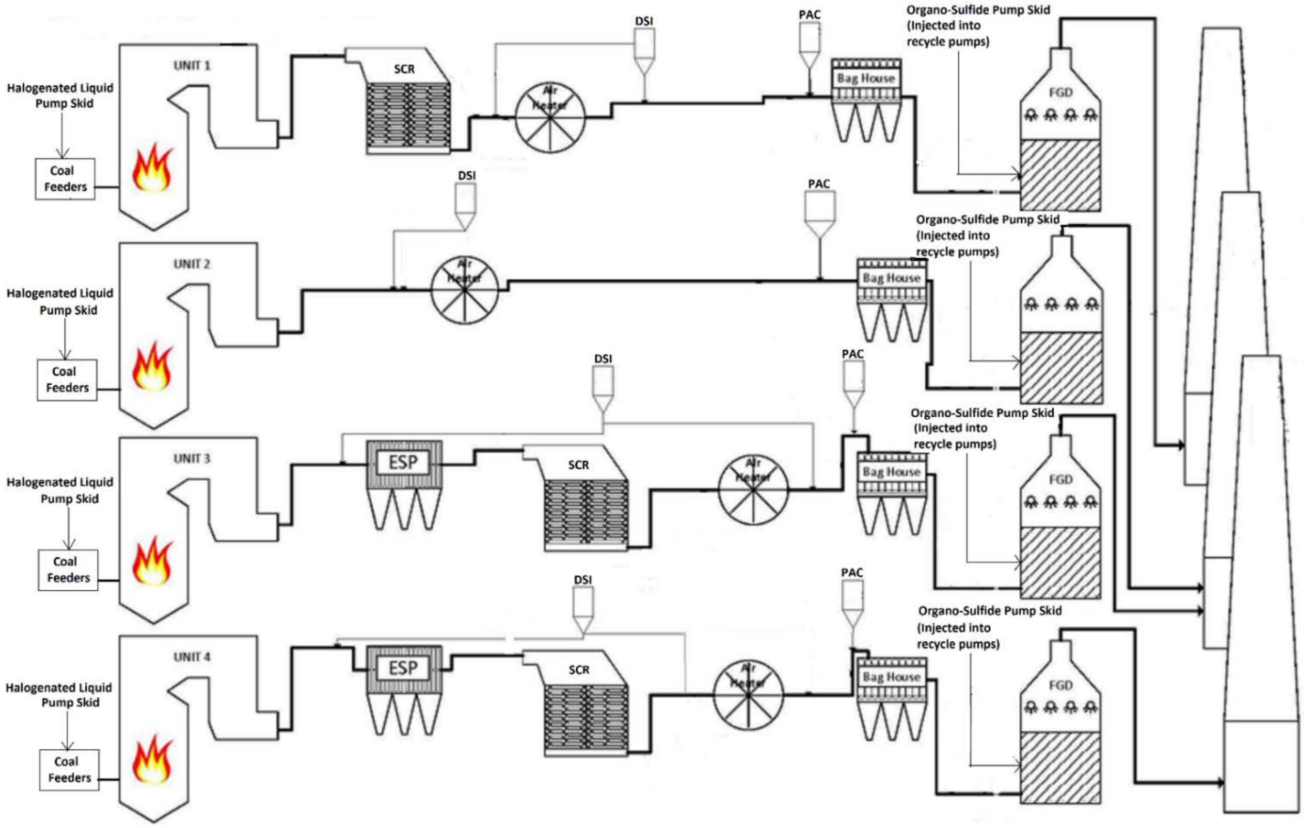


Figure 1- Ghent PFD

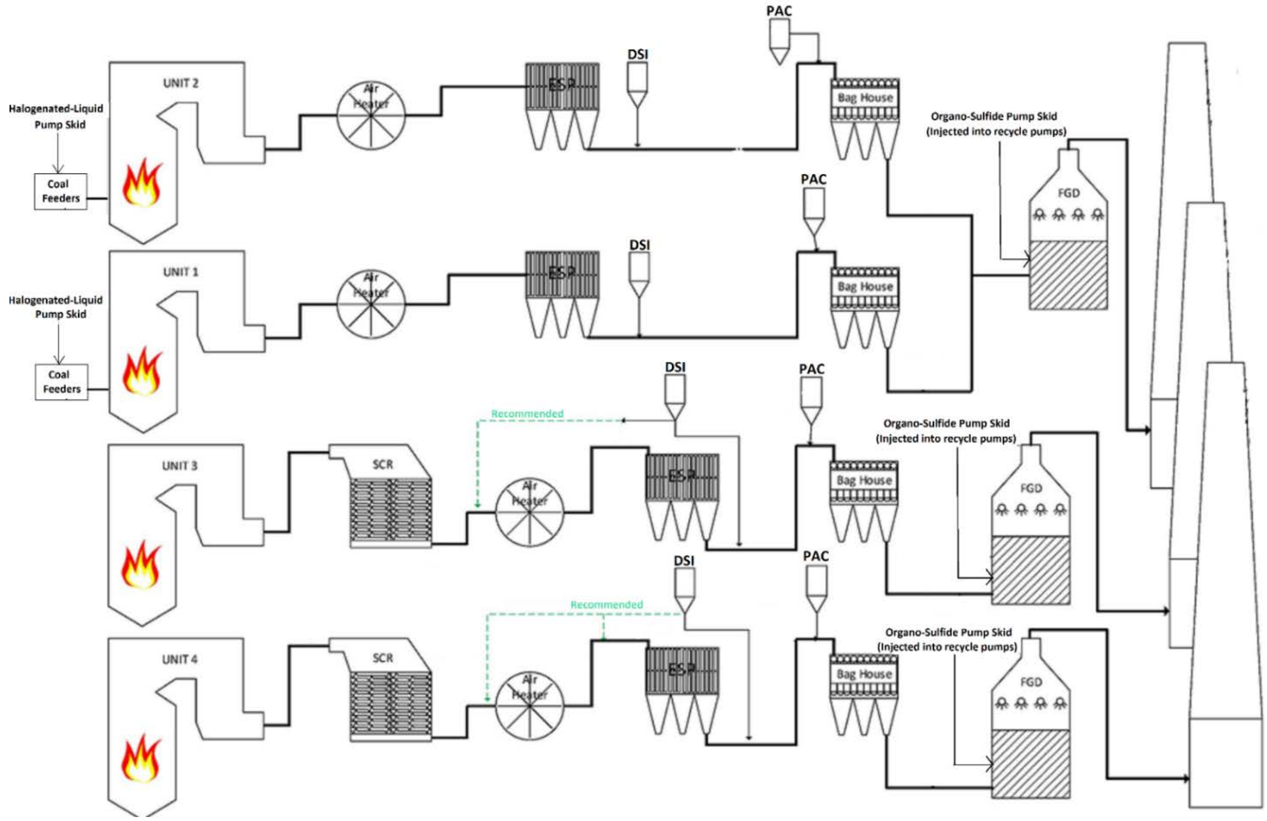


Figure 2- Mill Creek PFD

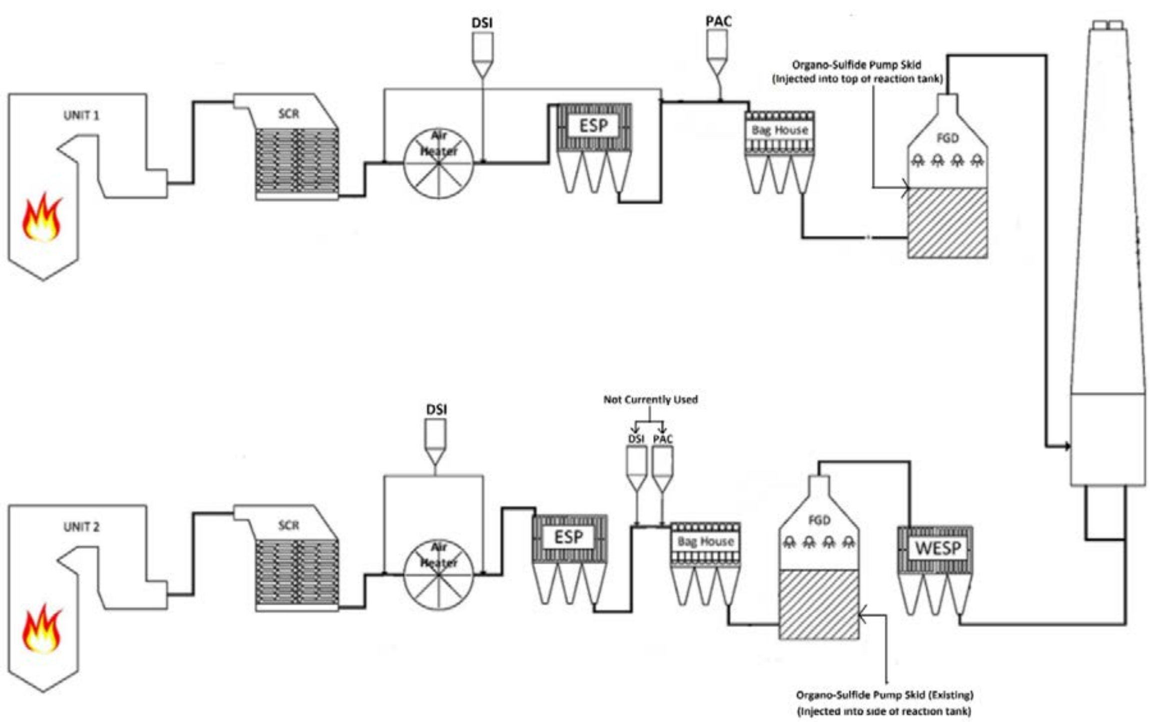


Figure 3- Trimble County PFD

NOTE: Trimble County Unit 2 is not included in the 2016 ECR Filing

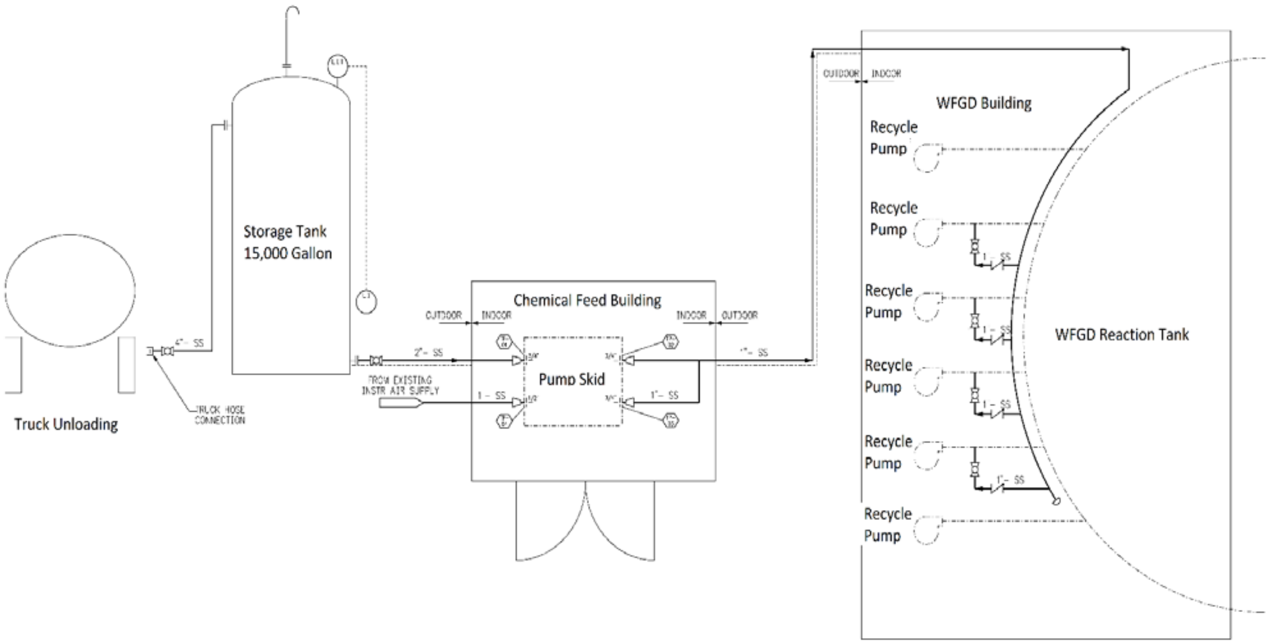


Figure 4- Example Organo-Sulfide System P&ID

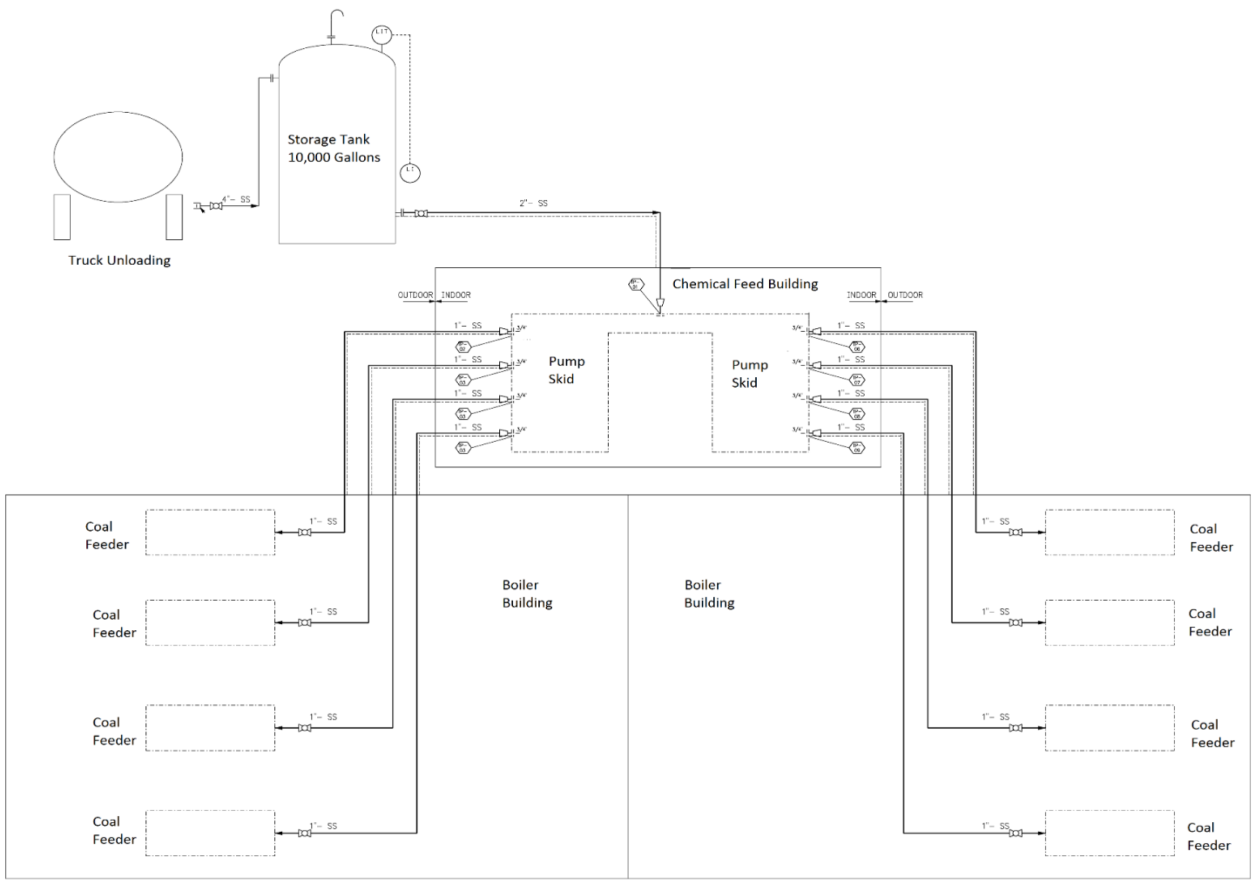


Figure 5- Example Halogenated Liquid P&ID

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF LOUISVILLE GAS AND	**)**	
ELECTRIC COMPANY FOR CERTIFICATES OF	**)**	
PUBLIC CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00027**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
GARY H. REVLETT
DIRECTOR, ENVIRONMENTAL AFFAIRS
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is Gary H. Revlett. I am the Director of Environmental Affairs for LG&E and KU Services Company, which provides services to Louisville Gas and Electric Company ("LG&E") and Kentucky Utilities Company ("KU") (collectively "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes, I testified before the Commission during the proceedings in the Companies' 2006 Environmental Compliance Plans (Case Nos. 2006-00206[1] (KU) and 2006-00208[2] (LG&E)). I testified in the Companies' 2011 Environmental Compliance Plans cases (Case Nos. 2011-00161[3] (KU) and 2011-00162[4] (LG&E)). I testified in Case No. 2011-00375[5] in which the Commission issued a Certificate of Public Convenience and Necessity ("CPCN") for the construction of a combined cycle combustion turbine at the Cane Run Generating Station. I testified in Case No. 2014-00002[6] in which the Commission issued a CPCN for the construction of a solar

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[1] *Application of Kentucky Utilities Company for Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*, Case No. 2006-00206.

[2] *Application of Louisville Gas and Electric Company for Approval of Its 2006 Compliance Plan for Recovery by Environmental Surcharge*, Case No. 2006-00208.

[3] *Application of Kentucky Utilities for Certificates for Public Convenience and Necessity and Approval of its 2011 Compliance Plan for Recovery by Environmental Surcharge*, Case Nos. 2011-00161.

[4] *Application of Louisville Gas and Electric Company for Certificates for Public Convenience and Necessity and Approval of its 2011 Compliance Plan for Recovery by Environmental Surcharge*, Case Nos. 2011-00162.

[5] *Joint Application of Louisville Gas and Electric Company and Kentucky Utilities Company for a Certificate of Public Convenience and Necessity and Site Compatibility Certificate for the Construction of a Combined Cycle Combustion Turbine at the Cane Run Generating Station and the Purchase of Existing Simple Cycle Combustion Turbine Facilities From Bluegrass Generation Company, LLC in Lexington, Kentucky*.

[6] *In re the Matter of: Joint Application Of Louisville Gas And Electric Company And Kentucky Utilities Company For Certificates Of Public Convenience And Necessity For The Construction Of A Combined Cycle Combustion Turbine At The Green River Generating Station And A Solar Photovoltaic Facility At The E.W. Brown Generating Station*, Case No. 2014-00002.

photovoltaic facility at the E.W. Brown Generating Station. Finally, I testified in Case No. 2015-00194[7] in which the Commission issued its decision on December 15, 2015. In addition to testifying, I have been the responsible witness for many of the data responses the Companies have filed with the Commission in those proceedings.

Q. Are you sponsoring any exhibits?

A. Yes, I am sponsoring the following exhibits:

Exhibit GHR-1 **–** Groundwater monitoring reports

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to identify the environmental regulatory requirements that cause the need for the pollution control projects in LG&E's 2016 Environmental Compliance Plan ("2016 Plan") and demonstrate how those projects will allow LG&E to comply with these environmental regulations. (A copy of the 2016 Plan is presented in Exhibit JNV-1 to the testimony of John N. Voyles, Jr.) The projects identified in the 2016 Plan are necessary for LG&E's compliance with the requirements of the Clean Air Act as amended ("CAA"), Coal Combustion Residuals Final Rule ("CCR Rule"), the Mercury and Air Toxics Standards ("MATS Rule"), and other environmental regulations that apply to LG&E's facilities used for the production of electricity from coal, including state administrative regulations set forth in 401 KAR Chapter 45.

Q. Please describe environmental regulation as it exists today.

A. Environmental regulation and compliance is and always has been an ongoing, everyday activity at our facilities and for our operations. The passage of the initial

[7] *Investigation of Kentucky Utilities Company's and Louisville Gas and Electric Company's Respective Need for and Cost of Multiphase Landfills at the Trimble County and Ghent Generating Stations*, Case No. 2015-00194.

CAA, the Clean Water Act ("CWA"), and the Resource Conservation and Recovery Act ("RCRA), and all subsequent amendments to and revisions of these and other environmental laws and regulations have significantly increased LG&E's environmental compliance obligations over time. Environmental regulation has experienced even more significant change over the past several years. During this time, the number and breadth of environmental regulations has expanded such that today, environmental compliance is a complex and costly endeavor. Nonetheless, the Companies continue their culture of compliance on an everyday basis.

As a starting point, the CAA, the CWA, and the RCRA (and their amendments) are the core laws from which almost all environmental regulations have originated. The original CAA, passed in 1970, established regulatory programs to control air pollution. One such program is the National Ambient Air Quality Standards. ("NAAQS"). NAAQS sets the maximum concentration of certain pollutants allowed in ambient air. Another such program is the National Emissions Standards for Hazardous Air Pollutants ("NESHAP").[8] The NESHAP regulations establish standards for hazardous air pollutants ("HAPs") issued by stationary sources. Around the same time the CAA was passed, Congress established the United States Environmental Protection Agency ("EPA") to implement the requirements found in many of these programs.

In 1990, Congress amended the CAA in significant respects. As part of the amendments, Congress established a procedure that the EPA must follow before it determines whether to regulate power plants pursuant to the NESHAP program. Over time, the EPA has proposed and adopted a number of rules and regulations that

[8] 42 U.S.C. § 7412.

have increased the environmental compliance requirements on the Companies and all other electric utilities that generate power. The specifics of several of these rules and regulations are discussed below.

Since the Companies' 2011 Environmental Compliance Plan cases, a significant development occurred when the EPA finalized the CCR Rule. That regulation has significant impacts on the Companies' handling and storage of coal combustion residuals ("CCR").[9] EPA's development of the MATS Rule is another significant development impacting the Companies' operations and environmental compliance requirements. The CCR Rule and the MATS Rule are the main reasons behind the need for the projects at issue in this case. They create a need for significant investments to both manage the Companies' CCR and to maintain environmental pollution control equipment and facilities.

Q. Please describe the CCR Rule.

A. On April 17, 2015, the EPA published the CCR Rule in the Federal Register. The CCR Rule finalized national regulations to provide a comprehensive set of self-implementing requirements for the safe disposal of CCR from coal-fired power plants such as LG&E's Mill Creek and Trimble power plants. The CCR Rule was the culmination of extensive study of the effects of coal combustion residuals on the environment and public health. It establishes self-implementing technical requirements for CCR landfills and surface impoundments under subtitle D of the

[9] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.

RCRA, the nation's primary law for regulating solid waste.[10] The effective date of the rule is October 19, 2015.

Q. What are some of the specific risks the CCR Rule addresses?

A. The CCR Rule establishes detailed and more stringent design, monitoring, operating, corrective action, closure, and post-closure requirements for CCR landfills and surface impoundments in order to manage environmental and safety risks associated with CCR disposal, including risks to groundwater, surface water, and ambient air, as well as to enhance the integrity of CCR impoundments. Across the industry, the CCR Rule's new performance standards for surface impoundments is expected to result in the closure of many CCR impoundments and replacement of those impoundments with landfills – a move from wet to dry handling and storage of CCR. Additionally, the rule sets out recordkeeping and reporting requirements as well as the requirement for each facility to establish and post specific information to a publicly-accessible website. Finally, the CCR Rule also supports the responsible recycling of CCR by distinguishing safe, beneficial use of CCR from actual disposal of it.[11]

Q. To what types of facilities does the CCR Rule apply?

A. The rule applies to new and existing CCR surface impoundments and new and existing CCR landfills. Inactive impoundments at active generation sites that are closed in accordance with applicable closure requirements within three years of the rule's promulgation (i.e., by April 17, 2018) are otherwise exempt from the rule. The rule also does not apply to impoundments and landfills that have already closed or inactive impoundments at plants no longer producing electricity. As to surface

[10] http://www2.epa.gov/coalash/coal-ash-rule
[11] Id.

impoundments, the CCR Rule applies to new surface impoundments that are designed to hold an accumulation of CCR and liquids for purposes of treatment, storage, or disposal. The rule requires corrective action for surface impoundments that are affecting groundwater at unacceptable levels. The Companies' ash ponds are just the type of surface impoundments governed by the CCR Rule.

Q. Please summarize the key operating requirements of the new CCR Rule.

A. The key operating requirements of the CCR Rule are divided into four areas. They are: 1) structural integrity; 2) hydrologic, hydraulic and air criteria; 3) groundwater monitoring and corrective action; and 4) location standards.

The structural integrity requirements include evaluating the hazard potential classification of the dam, performing a structural stability assessment and analyzing other, new and more stringent structural Factors of Safety.

The hydrologic, hydraulic and air operating requirements include developing a Fugitive Dust Control Plan, stormwater run-on and run-off controls and an assessment of the hydrologic and hydraulic capacities.

Under the groundwater monitoring and corrective action requirements, groundwater monitoring wells must be installed around the perimeter of the CCR management facility or unit to determine if constituents attributable to CCR are present in the groundwater. The determination of whether a release has occurred is based on a statistical analysis, using first detection monitoring, then assessment monitoring if necessary. Following assessment monitoring, if CCR constituents are confirmed to be present in the groundwater at statistically significant levels exceeding groundwater protection standards established for the facility, the owner or operator must undertake corrective measures. As discussed further below, in the case of an existing unlined CCR impoundment, the detection of CCR constituents above the groundwater protection standards as a result of the groundwater monitoring required by the CCR Rule will trigger a requirement to cease placement of CCR wastestreams within six months thereafter and initiate closure of the impoundment.

The final set of key operating requirements consists of restrictions on the location of regulated management facilities.

Q. Are there dates that apply to these key operating requirements?

A. Yes. Each of the key operating requirements has an associated compliance demonstration date. For existing CCR management facilities, the structural integrity criteria must be demonstrated to be satisfied by October 17, 2016. By that same date, the Companies must prepare the initial run-on and run-off control system plan for each existing CCR landfill, demonstrate compliance with the required hydrologic and hydraulic capacities during extraordinary rainfall events for each CCR surface impoundment, and prepare an initial written closure plan for all existing CCR management facilities. The required Fugitive Dust Control Plans were completed by the rule's effective date (October 19, 2015).

For those units requiring the development of Emergency Action Plans, these plans must be finalized and ready to implement by April 17, 2017. By October 17, 2017, each regulated CCR management unit must have developed a groundwater monitoring plan, installed the groundwater monitoring wells and collected at least 8 rounds of samples for statistical comparison to background or the up-gradient wells.

Finally, the CCR Rule requires all CCR management facilities at active generating stations to be evaluated for compliance with the location criteria by October 17, 2018. Therefore, the demonstration of acceptable operation of each management facility or unit under the new CCR Rule is determined over a 3-year period.

Q. Does the CCR Rule require groundwater monitoring of areas in close proximity to surface impoundments?

A. Yes. As summarized above, the rule requires operators of affected surface impoundments to install a groundwater monitoring system (via a system of monitoring wells), initiate a groundwater detection monitoring program, and evaluate the groundwater data to determine if statistically significant increases of CCR constituents have occurred. The operator must comply with stringent record keeping requirements for the collected data and post the data to a publicly available website titled "CCR Rule Compliance Data and Information." The installation of monitoring wells and the collection of sufficient set of samples for statistical analysis must be completed no later than October 17, 2017.[12] If, on the basis of this analysis, an unlined surface impoundment is determined to cause concentrations of CCR constituents in the groundwater that exceed groundwater protection standards, the owner or operator of the impoundment must cease placing CCR wastestreams into the impoundment and initiate closure of the impoundment within a very short time period – a mere six months. This single provision is a primary driver for the timing of the Companies' closure plans.

[12] 40 CFR 257.90(b).

Q. If groundwater monitoring triggers a closure of a surface impoundment, what are the key requirements for closure and post-closure?

A. As mentioned above, the CCR Rule requires that owners or operators cease placing CCR wastestreams in, and initiate closure of, a surface impoundment within 6 months after the analysis of data shows CCR constituents at statistically significant levels above groundwater protections standards. The rule also requires the closure process to be completed within 60 months after it is initiated. Finally, closure and post-closure plans must be prepared. Major closure options under the CCR Rule include cap and closure, clean and closure, or cleaning and lining. Post-closure cover maintenance and groundwater monitoring is required for at least 30 years.

Q. Of the closure options you list above, which is lowest reasonable cost?

A. That is a final determination the Companies will make by evaluating each surface impoundment in the context of all the surface impoundments at each generating station and the CCR Rule's specific requirements for each closure option. As Mr. Voyles describes in greater detail, the Companies currently have a plan for closing surface impoundments on a lowest-reasonable-cost basis for each generating station. That plan includes capping and closing most existing surface impoundments at generating stations with ongoing coal-fired generation by beneficially using CCR to the extent feasible in the closure process, which is lower cost than using other fill material; some remaining surface impoundments are proposed to be cleaned and closed as part of the current overall lowest-reasonable-cost plan for each generating station. But as engineering proceeds and matures for each proposed closure and the assessments of the CCR Rule's criterion for each surface impoundment's circumstances becomes clearer, the closure approach and costs for a given surface impoundment could change, perhaps significantly as described by Mr. Voyles. That is why the Companies are requesting CPCNs for their CCR Rule-related projects that authorize the construction necessary to comply with the CCR Rule, not for specific surface-impoundment-closure plans, as discussed in the testimony of Robert M. Conroy.

Q. Does the CCR Rule contemplate permits for the operation of impoundments or landfills?

A. No. The CCR Rule is "self-implementing." This means that the facilities within purview of the CCR Rule must be in compliance with the rule's standards on the dates set forth in the rule, irrespective of any state requirements or rules. If they are not in compliance, the operator of the facility is subject to citizen suits (including states acting as citizens) to enforce compliance with the rule. In those suits, the Court may award the costs of litigation, including attorney fees and expert witness fees, to the prevailing or substantially prevailing party.[13]

Q. Please describe the MATS Rule.

A. The MATS Rule regulates the emission of mercury and other HAPs from coal- and oil-fired electric utility steam generating units. The MATS Rule requires the use of maximum achievable control technology within the electric-utility industry. The MATS Rule compliance date is April 16, 2015, though state agencies were authorized to grant a one-year extension of time for compliance in certain circumstances.

Q. Please describe the history of the MATS Rule.

[13] 42 U.S.C. § 6972(e).

A. Like many other environmental regulations, the MATS Rule finds its genesis in the CAA. On December 20, 2000, the EPA decided that it was appropriate and necessary to regulate coal- and oil-fired power plants pursuant to the NESHAP program. The EPA's initial efforts at regulation were known as the Clean Air Mercury Rule ("CAMR"). EPA promulgated CAMR in 2005, but the rule was struck down in 2008 by the United States Court of Appeals for the District of Columbia.[14]

In 2011, the EPA revisited its 2000 decision that it was "necessary and appropriate" to regulate certain power plants under the NESHAP program. The EPA reaffirmed its 2000 decision and proposed new regulations that would govern emissions from coal- and oil-fired power plants. These final regulations—the MATS Rule—were published on February 16, 2012.[15] Shortly thereafter, the MATS Rule was challenged in court. In June 2015, the United States Supreme Court ruled that the EPA acted erroneously when it issued the final MATS Rule without consideration of compliance costs.

Q. What is the current status of the MATS Rule?

A. While the Supreme Court held that the EPA erred by not considering cost in its "necessary and appropriate" finding, the MATS Rule remains in place pending EPA's response to the Supreme Court's decision.[16] In fact, the EPA has begun to address the Supreme Court's holding by publishing a proposed supplemental finding that the

[14] *See New Jersey v. EPA*, 517 F.3d 574 (D.C. Cir. 2008).

[15] *See* 77 Fed. Reg. 9,304 (Feb. 16, 2012), available at: https://www.gpo.gov/fdsys/pkg/FR-2012-02-16/pdf/2012-806.pdf.

[16] The Supreme Court remanded the case to the United States Court of Appeals for the District of Columbia. On December 4, 2015, that court heard argument on whether the MATS Rule should be vacated until the EPA has fully considered cost. No ruling has been made.

MATS Rule remains "necessary and appropriate" even after cost is considered.[17] This proposed supplemental finding was published on December 1, 2015, and the EPA established January 15, 2016, as the deadline for comments. The EPA expects to finalize its proposed supplemental finding by April 2016.

Q. Do other environmental regulations exist that may affect the Companies' future operations?

A. Yes. The Companies deal on a daily basis with a complex suite of environmental regulations that affect their core business of generating safe and reliable energy for their customers. Of particular importance, the Companies anticipate that the Cross-State Air Pollution Rule ("CSAPR"), NAAQS related to ambient ozone levels, the Clean Power Plan ("CPP"), and the Effluent Limitations Guidelines ("ELG") may have an impact on future operations, and, therefore, may necessitate the addition of other environmental-control equipment.

Q. What is CSAPR?

A. CSAPR is an EPA regulation that requires significant reductions in sulfur dioxide ("SO_2") and nitrogen oxides ("NO_X") emissions. CSAPR was promulgated under the Good Neighbor Provision of the CAA, which "instructs States to prohibit in-state sources 'from emitting any air pollutant in amounts which will . . . contribute significantly' to downwind States' 'nonattainment . . . , or interfere with maintenance,' of any EPA-promulgated national air quality standard."[18] CSAPR is an attempt to bring a number of states and regions into compliance with the NAAQS

[17] 80 Fed. Reg. 75,025 (Dec. 1, 2015), available at: https://www.gpo.gov/fdsys/pkg/FR-2015-12-01/pdf/2015-30360.pdf.
[18] *EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584, 1593 (2014) (quoting 42 U.S.C. § 7410(a)(2)(D)(i).

for 2.5-micron particulate matter (“$PM_{2.5}$”) and 2008 eight-hour ozone (smog).[19] (SO_2 is a precursor of $PM_{2.5}$, and NO_X is a precursor of $PM_{2.5}$ and ozone.) In other words, CSAPR’s goal is to reduce air pollution that is naturally transported from one state or area to another.

Q. Please describe the history of CSAPR.

A. CSAPR is the successor to the Clean Air Interstate Rule (“CAIR”). CAIR was an EPA regulation that was focused on the same environmental goals as CSAPR.[20] CAIR was finalized in 2005, but in 2008, the United States Court of Appeals for the District of Columbia held that CAIR was not properly promulgated.[21] The court initially vacated the entire rule, but on rehearing, it amended its decision to allow CAIR to remain in place while the EPA went about correcting the rule’s deficiencies.[22]

Following the court’s decision, the EPA began work on a new rule. The result of that work—CSAPR—was proposed on July 6, 2010, and finalized one year later. CSAPR was immediately challenged in court. On August 21, 2012, the U.S. Court of Appeals for the D.C. Circuit vacated CSAPR and temporarily reinstated CAIR. That decision was reversed by the Supreme Court on April 29, 2014.[23] The D.C. Circuit then held further proceedings to address issues that had not been resolved in its earlier decision.

Q. Is CSAPR currently in effect?

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[19] *See id.* at 1594, 1596 n.3.
[20] *See id.* at 1596–97.
[21] *See North Carolina v. EPA*, 531 F.3d 896 (D.C. Cir. 2008).
[22] *North Carolina v. EPA*, 550 F.3d 1176 (D.C. Cir. 2008).
[23] *See EPA v. EME Homer City Generation, L.P.*, 134 S. Ct. 1584 (2014).

A. Yes, for most states, including Kentucky. Following the Supreme Court decision reversing the lower court's decision, the D.C. Circuit issued a new decision that left CSAPR in place for most states. EPA then established the effective date for Phase I of CSAPR as January 1, 2015. The EPA also established the effective date for Phase II of CSAPR as January 1, 2017. The primary difference between Phase I and Phase II of CSAPR is that Phase II lowers even further the maximum permissible level of NO_X and SO_2 emissions.

Q. Has the EPA proposed updates to CSAPR related to ozone requirements?

A. Yes. On November 16, 2015, the EPA proposed the CSAPR Update Rule. The proposed CSAPR Update Rule calls for reducing the summertime emissions of NOx from power plants in the eastern half of the United States, including Kentucky. The CSAPR Update Rule has been proposed to assist with meeting the 2008 ozone standard established under NAAQs.

Q. What is the current ozone regulation under NAAQS?

A. On October 1, 2015, the EPA lowered the maximum allowable ground-level ozone concentration from 75 parts per billion to 70 parts per billion.[24] (Before March 2008, the standard was 80 parts per billion.) Several states, including Kentucky, have appealed the EPA's decision to the United States Court of Appeals for the District of Columbia.[25] A decision is not expected until at least the fall of 2016.

Q. What is the CPP?

A. The CPP is a new EPA regulation that, for the first time, establishes greenhouse gas emission guidelines for states to achieve a carbon dioxide ("CO_2") emission limit

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[24] 80 Fed. Reg. 65,292 (Oct. 26, 2015), available at https://www.gpo.gov/fdsys/pkg/FR-2015-10-26/pdf/2015-26594.pdf.
[25] *Murray Energy Corp. v. EPA*, Case No. 15-1385 (D.C. Cir.).

from existing power plants. The CPP is meant to reduce the emission of CO_2 from power plants. States are authorized to develop their own plans to comply with their specified emission reduction requirements using EPA issued CPP guidelines.

Under the CPP, the EPA has established CO_2 emission requirements emanating from existing fossil-fired units statewide (rather than each power plant). These requirements are expressed in two ways, a rate-based requirement and a mass-based requirement, based on the "best system of emission reduction." The CPP requires Kentucky to reduce its CO_2 emission rate from 2,166 pounds per net MWh in 2012 to 1,286 pounds per net MWh in 2030 under the rate-based requirement or from 91,372,076 short tons in 2012 to 63,126,121 short tons in 2030 under the mass-based requirement. The CPP provides for the submittal and approval of a state plan by all states, Kentucky included, that will define how the CO_2 emission reductions will be achieved. If the state does not submit an approvable plan, the CAA provides the authority to the EPA to impose a Federal Plan that will define how the state emissions will be reduced to meet the emission requirement.

Q. What is the contemplated timing of the CPP?

A. The CPP was published on October 23, 2015, and became effective on December 22, 2015.[26] The CPP will be phased in over time. The EPA has established three interim periods within the years ranging from 2022 - 2029. Each interim period has an average performance rate or maximum emission level that must be met. The EPA has established 2030 as the first year of implementation for the final CO_2 emission requirement from existing units. The CPP has been challenged in the United States

[26] 80 Fed. Reg. 64,662 (Oct. 23, 2015), available at https://www.gpo.gov/fdsys/pkg/FR-2015-10-23/pdf/2015-22842.pdf.

Court of Appeals for the District of Columbia by over half the states (including Kentucky), several utilities (including LG&E and KU), and numerous trade groups.[27]

Q. Has the EPA adopted final Effluent Limitations Guidelines ("ELG") regulations?

A. Yes. Pursuant to the CWA, the EPA finalized new ELG regulations on September 30, 2015. The final ELG regulations became effective on January 4, 2016.[28] The previous ELG regulations were last revised in 1982.

Q. Please describe the new ELG regulations.

A. The new ELG regulations are extremely complex and lengthy. Speaking at a high level, the ELG regulations establish new limits for arsenic, mercury, selenium, and nitrates in flue-gas desulfurization wastewater. The ELG regulations also provide that bottom-ash transport water and fly-ash transport water cannot be discharged except for very narrow exceptions and water cannot be used to transport flue-gas mercury control waste. These new regulations are significant and are anticipated to result in additional compliance-related expenditures over the next several years.

Q. When must generating facilities begin to comply with the ELG regulations?

A. Power plants must begin to comply with the ELG regulations "as soon as possible beginning November 1, 2018, but no later than December 31, 2023."[29] Practically speaking, this means that plants must begin to comply between 2018 and 2023 depending on when the plant needs a new or renewed Kentucky Pollutant Discharge Elimination System permit under the CWA.

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[27] *West Virginia v. United States EPA*, Case No. 15-1363 (D.C. Cir.). The Petition for Review was filed on October 23, 2015.
[28] 80 Fed. Reg. 67,838 (Nov. 3, 2015), available at https://www.gpo.gov/fdsys/pkg/FR-2015-11-03/pdf/2015-25663.pdf.
[29] 40 CFR 423.13.

PROPOSED CCR RULE PROJECTS

Q. Please identify the projects LG&E proposes for compliance with the CCR Rule.

A. Projects 29 and 30 (CCR Rule compliance construction and construction of new process water systems at Mill Creek and Trimble, respectively) allow for compliance with the CCR Rule.

Q. Please describe Projects 29 and 30.

A. Projects 29 and 30 are for the closure of surface impoundments at the Mill Creek and Trimble stations, respectively, as required by the CCR Rule. As describe above, the CCR Rule requires that CCR surface impoundments that do not meet the new structural, groundwater, and location requirements must close as set forth in the rule. LG&E proposes the closure of five surface impoundments at Mill Creek and two surface impoundments at Trimble by 2023.

Q. Do the surface impoundments at Mill Creek and Trimble trigger closure requirements under the CCR Rule?

A. At this time, no surface impoundments at those two stations have been determined to trigger closure because of failure to meet structural, groundwater, or location requirements in the CCR Rule.

Q. If the surface impoundments at Mill Creek and Trimble have not triggered any closure requirement, why is LG&E proposing closure?

A. Although LG&E has not yet implemented the new groundwater monitoring and data evaluation procedures specified in the CCR Rule, existing sampling data from Mill Creek and Trimble suggest that the statistical thresholds that trigger closure for unlined surface impoundments may be exceeded for the impoundments for each of these facilities. Groundwater reports containing existing sampling data have been submitted to the Kentucky Division of Waste Management ("KDWM") and are attached as Exhibit GHR-1.[30] Therefore, there is a high probability that closure requirements could be triggered for surface impoundments at those stations once the groundwater monitoring program required by the CCR Rule is implemented. It is also possible that certain surface impoundments could implicate the location requirements, which are required to be evaluated after the groundwater assessment evaluation.

Prudent utility planning requires that LG&E start planning for the closure of those surface impoundments now. In light of the extremely short amount of time (a mere six months) the CCR Rule allows between a "triggering" event requiring the initiation of closure of a CCR surface impoundment (analysis of CCR Rule monitoring data showing CCR constituents at statistically significant levels above groundwater protection standards) and the initiation of such closure. It is prudent for LG&E to move forward now with its plans to close these surface impoundments and arrange for alternate means to manage CCR. Failing to do so would pose an unacceptable risk of having to cease generation at those stations due to a lack of adequate means to manage CCR.

Additionally, as part of LG&E's closure analysis, LG&E must consider the effects of other environmental regulations, including ELG, as described above. Indeed, EPA has spoken directly to the interaction between the CCR Rule and ELG:

> The proposed ELG would strengthen the existing controls on discharges to surface waters and the publicly owned treatment works from steam electric power plants including from coal

[30] The data shown in Exhibit GHR-1 was filed with KDWM at various times from 2011-2015.

> ash ponds. Because these two rules affect similar units and may be met with similar compliance strategies, common sense implementation time frames were established in the CCR Rule so that utilities would not be required to make major decisions about CCR units without first understanding the implications that such decisions would have for meeting the surface water protection requirements of the final ELG rule. . . . Thus, utilities will be able to make appropriate business decisions to meet both sets of requirements.[31]

While closure of surface impoundments will be required under the CCR Rule, LG&E's plans take into account ELG requirements and will better position LG&E to comply, just as EPA contemplated.

PROPOSED MATS RULE PROJECT

Q. Please identify the projects LG&E proposes for compliance with the MATS Rule.

A. LG&E proposes Project 28 for compliance and to achieve cost efficiencies under the CAA and the MATS Rule.

Q. Please describe Project 28.

A. Project 28 involves the installation of low-cost and economical supplemental control technologies to reduce mercury emissions that will keep Mill Creek Units 1 – 4 and Trimble County 1 in compliance with the MATS Rule as efficiently as possible. The project entails injecting an organosulfide chemical additive into the wet flue gas desulfurization reaction tank for all units at Mill Creek and Trimble County 1. It also includes injecting a halogenated chemical additive into the coal feeders at the units to increase mercury oxidation, which will improve the amount of mercury captured. The testimony of R. Scott Straight describes Project 28 in more detail.

[31] http://www.epa.gov/coalash/frequent-questions-about-coal-ash-disposal-rule

Q. How does MATS Rule require the improved technologies that Project 28 provides?

A. The MATS Rule requires LG&E to further reduce the mercury emissions associated with the production of electricity from coal. The MATS Rule requires the use of maximum achievable control technology within the electric-utility industry. Project 28 represents just such maximum achievable technology, providing LG&E with cost effective, supplemental control technology.

Q. How is compliance with the MATS Rule different than the HAPs Rule referenced above and in LG&E's 2011 ECR case?

A. The MATS Rule is the final version of the HAPs Rule. The MATS Rule sets emissions limitation standards for mercury and other hazardous air pollutants, reflecting levels achieved by the best-performing sources currently in operation. While the addition of the mercury-related control equipment that was part of the 2011 Plan reduced mercury emissions at the Mill Creek and Trimble 1 units, these supplemental technologies will provide operational flexibility when compared to the use of powdered activated carbon prior to the baghouses. Mr. Straight's testimony discusses these benefits in more detail.

Q. Given the state of legal proceedings surrounding the MATS Rule (the U.S. Supreme Court's holding that EPA did not properly consider cost of implementation and the resulting remand process), why would LG&E move forward with Project 28 to comply with the rule?

A. The D.C. Circuit decided to remand MATS to EPA without vacating it, so the Rule remains in place and the Companies must comply with it. Moreover, prudent utility planning requires it and it also affords greater operational flexibility. There is no doubt about EPA's commitment to the MATS Rule. As described above, EPA addressed the Supreme Court's holding by publishing a proposed supplemental finding that the MATS Rule remains "necessary and appropriate" even after cost is considered.[32] This proposed supplemental finding was published on December 1, 2015, and the EPA has established January 15, 2016, as the deadline for comments. The EPA expects to finalize its proposed supplemental finding by April 2016. There is every reason to believe that EPA will affirm the MATS Rule and that it will continue to be final and binding. To assume the contrary would be an imprudent utility business practice.

Q. You have indicated that the CCR Rule, MATS Rule, and ELG require the projects being proposed in this case. Do the other regulations you discussed above (CSAPR, NAAQS, and the CPP) require any of the proposed projects?

A. Not directly, but it is important to understand that all of the regulations I have discussed, when taken together, result in an increasingly complex, stringent, and expensive environmental compliance situation for LG&E and its customers. LG&E's environmental compliance efforts require prudent business planning and expertise on a daily basis. The projects proposed in this case are a result of that planning and expertise.

Q. Do you have a recommendation for the Commission?

A. Yes. I recommend approval of all projects proposed by LG&E in this case.

Q. Does this conclude your testimony?

[32] 80 Fed. Reg. 75,025 (Dec. 1, 2015), available at: https://www.gpo.gov/fdsys/pkg/FR-2015-12-01/pdf/2015-30360.pdf.

A. Yes it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Gary H. Revlett**, being duly sworn, deposes and says he is the Director, Environmental Affairs for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

Gary H. Revlett
Gary H. Revlett

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler
Notary Public (SEAL)

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Gary H. Revlett
Director, Environmental Affairs
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-4621

Education

University of Louisville, Ph.D. Analytical/Environmental Chemistry - May 1976

Murray State University, B.S. Chemistry - June 1971

OSHA Hazardous Waste Worker Training and 8-hour Refresher Courses

Previous Positions

E.ON U.S. Services Inc.

2006-2010 - Air Manager - Environmental Affairs

Tetra Tech EMI, Louisville, Kentucky

2005-2006 - Senior Air Quality Manager

Kenvirons, Inc., Frankfort, Kentucky

1994-2005 - Vice President and Treasurer
(Director of Air Services and Laboratory Services)

1985-1994 - Associate
(Manager of Testing and Air Services)

1978- 1984 - Senior Environmental Scientist
(Manager of Emission Testing and Air Modeling)

Kentucky Division of Pollution Control, Frankfort, KY

1976-1977 - Principal Chemist - Air Modeling Team

Mill Creek Station Groundwater Reports

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 2nd 2011

Please check only ONE of the following:

___Characterization ___Quarterly _X_Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler 5-6-11
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 4/13/2011 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department - E.ON U.S. (LG&E)

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: Kevin Allen/Ted Hart (P. Cook-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services Laboratories, Ghent, KY Lab ID No.:

Contact Person: Ed Raker Phone No.: (502) 347-4191

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford/Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT: KYD000827469 /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	1	6	2	7
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/13/11 8:47	4/13/11 11:56	4/13/11 9:18	4/21/11 13:41
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/13-22/11	4/13-22/11	4/13-22/11	4/21-28/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	395.24		403.13		409.85		403.74	
S0145- -	1	Temperature		°C	Fld. Meas.	15.4		16.3		15.5		15.9	
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	771	A	810	A	652	A	892	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	3.0	A	<3.0	A	<3.0	A	3.5	A
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0	A	<1.0	A	<1.0	A	<1.0	A
16887-00-6	2	Chloride(s)	T	MG/L	325.3	24.7	A	23.5	A	18.1	A	22.1	A
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	449	A	495	A	398	A	310	A
S0296- -	0	pH	T	units	Fld. Meas.	7.45	A	7.65	A	7.28	A	7.36	A
7440-50-8	0	Copper	D	MG/L	7210	0.007	A	0.008	A	0.008	A	0.010	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	D	MG/L	7140	91.9		107		85		149.9	
7440-23-5	0	Sodium	D	MG/L	7770	37.9		25.5		24.1		19.3	
	0	Sulfate	T	MG/L	375.4	49.3		92.1		60.1		171	

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	3	5	4	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	4/13/11 10:15	4/13/11 11:20	4/13/11 10:43	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	4/13-22/11	4/13-22/11	4/13-22/11	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	400.91		408.19		404.23			
S0145- -	1	Temperature		°C	Fld. Meas.	14.8		18.3		15.6			
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	517	A	1928	A	821	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	6.0	A	3.0	A	<3.0	A		
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0	A	1.1	A	<1.0	A		
16887-00-6	2	Chloride(s)	T	MG/L	325.3	10.1	A	194.0	A	38.6	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	310	A	1346	A	469	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.38	A	7.30	A	7.27	A		
7440-50-8	0	Copper	D	MG/L	7210	0.006	A	0.015	A	0.005	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	D	MG/L	7140	68.8		204		95.3			
7440-23-5	0	Sodium	D	MG/L	7770	12.7		90.5		27.7			
	0	Sulfate	T	MG/L	375.4	31.4		570		90.0			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 4th 2011

Please check only ONE of the following:

___Characterization ___Quarterly _X_Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler 2-13-12
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 10/25/2011 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department - E.ON U.S. (LG&E)

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: Kevin Allen/Ted Hart (P. Cook-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services Laboratories, Ghent, KY Lab ID No.:

Contact Person: Ed Raker Phone No.: (502) 347-4191

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford/Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL

Facility: LG&E Mill Creek Special Waste Landfill

Permit Number:056-00029

FINDS/UNIT: KYD000827469 /

LAB ID:

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	5	4	6	3
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	10/25/11 12:28	10/25/11 11:20	10/25/11 13:04	10/25/11 10:07
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	10/25-12/8/11	10/25-12/8/11	10/25-12/8/11	10/25-12/8/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	392.24		397.13		406.51		398.91	
S0145- -	1	Temperature		°C	Fld. Meas.	15.7		15.6		16.9		15.0	
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	749	A	826	A	668	A	892	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	3.6	A	<3.0	A	<3.0	A	<3.0	A
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0	A	<1.0	A	<1.0	A	<1.0	A
16887-00-6	2	Chloride(s)	T	MG/L	325.3	29.6	A	23.1	A	19.1	A	33.5	A
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	442	A	507	A	401	A	584	A
S0296- -	0	pH	T	units	Fld. Meas.	7.63	A	7.60	A	7.56	A	7.57	A
7440-50-8	0	Copper	T	MG/L	7210	0.006	A	<0.001	A	<0.001	A	0.001	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: Exhibit CHR-1 / 1

LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	93.1		117.7		93.8		103	
7440-23-5	0	Sodium	T	MG/L	7770	40.1		30		25.1		22.3	
	0	Sulfate	T	MG/L	375.4	52.4		81.5		60.2		171	

FINDS/UNIT:KYD000827469
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	7	1	2	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	10/25/11 13:40	10/25/11 08:41	10/25/11 09:47	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	10/25-12/8/11	10/25-12/8/11	10/25-12/8/11	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	400.33		393.77		398.73			
S0145- -	1	Temperature		°C	Fld. Meas.	16.1		16.6		14.3			
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	550	A	1964	A	954	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	3.0	A	9.5	A	<3.0	A		
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0	A	<1.0	A	<1.0	A		
16887-00-6	2	Chloride(s)	T	MG/L	325.3	13.1	A	194.0	A	39.1	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	302	A	1318	A	954	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.75	A	7.31	A	7.37	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	0.003	A	<0.001	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL

Facility: LG&E Mill Creek Special Waste Landfill

Permit Number: 056-00029

FINDS/UNIT: Exhibit GHR-1 / 1

LAB ID:

For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	80.1		202.9		118.3			
7440-23-5	0	Sodium	T	MG/L	7770	15.4		106.5		42.7			
14808-79-8	0	Sulfate	T	MG/L	375.4	39.2		540.4		151.4			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 2nd 2012

Please check only ONE of the following:

___Characterization ___Quarterly _X_Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler
SIGNATURE

9-13-12
DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 5/17/2012 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: Kevin Allen (P. Cook-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services Laboratories, Ghent, KY Lab ID No.: ______

Contact Person: Ed Raker Phone No.: (502) 347-4191

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.: ______

Contact Person: Mr. Ken Ford/Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT: KYD000827469 /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	7	1	6	2
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	5/17/12 14:21	5/17/12 8:56	5/17/12 14:00	5/17/12 9:45
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	5/17-6/4/12	5/17-6/4/12	5/17-6/4/12	5/17-6/4/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	393.99		401.46		407.18		400.91	
S0145- -	1	Temperature		°C	Fld. Meas.	16.5		15.7		17.1		15.5	
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	737.5	A	853.3	A	639.0	A	706.8	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7.0	A	<7.0	A	<7.0	A	<7.0	A
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0	A	<1.0	A	<1.0	A	<1.0	A
16887-00-6	2	Chloride(s)	T	MG/L	325.3	31.2	A	25.9	A	18.6	A	33.6	A
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	426	A	524	A	398	A	405	A
S0296- -	0	pH	T	units	Fld. Meas.	7.66	A	7.28	A	7.56	A	7.52	A
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	<0.001	A	<0.001	A	<0.001	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: [illegible] / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	69.7		106		80.9		81.1	
7440-23-5	0	Sodium	T	MG/L	7770	30.8		27.5		22.9		19.8	
	0	Sulfate	T	MG/L	375.4	47.9		98.2		56.2		47.1	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	5	4	3	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	5/17/12 13:10	5/17/12 11:18	5/17/12 10:58	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	5/17-6/4/12	5/17-6/4/12	5/17-6/4/12	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	401.16		397.52		411.82			
S0145- -	1	Temperature		°C	Fld. Meas.	15.7		19.4		16.4			
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	584.8	A	328.0	A	1,248	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7.0	A	7.1	A	<7.0	A		
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0	A	<1.0	A	<1.0	A		
16887-00-6	2	Chloride(s)	T	MG/L	325.3	15.4	A	23.7	A	57.0	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	333.5	A	167.5	A	889.5	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.65	A	7.67	A	7.21	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	<0.001	A	<0.001	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	69.8		137.2		165.0			
7440-23-5	0	Sodium	T	MG/L	7770	13.5		70.6		53.6			
14808-79-8	0	Sulfate	T	MG/L	375.4	41.1		58.2		313			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 3rd 2012

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** X **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler 10-30-12
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 9/19/2012 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: D. Dierson (P. Cook-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services Laboratories, Ghent, KY Lab ID No.:

Contact Person: Ed Raker Phone No.: (502) 347-4191

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford/Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

FINDS/UNIT: KYD000827469 /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	6	2	5	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	9/19/12 11:45	9/19/12 8:57	9/19/12 11:25	9/19/12 10:58
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	9/19-21/12	9/19-21/12	9/19-21/12	9/19-21/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	390.24		394.55		402.18		394.08	
S0145- -	1	Temperature		°C	Fld. Meas.	15.5		14.6		16.4		16.2	
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	721.3	A	801.8	A	692.0	A	622.8	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<3.0	A	<3.0	A	<3.0	A	<3.0	A
S0268- -	0	Organic Carbon	T	MG/L	415.1	1.1	A	<1.0	A	<1.0	A	<1.0	A
16887-00-6	2	Chloride(s)	T	MG/L	325.3	22.5	A	26.2	A	18.6	A	26.4	A
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	443	A	490	A	449	A	391	A
S0296- -	0	pH	T	units	Fld. Meas.	7.64	A	7.43	A	7.53	A	7.50	A
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	<0.001	A	<0.001	A	<0.001	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827489 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	79.4		103		88.9		76.6	
7440-23-5	0	Sodium	T	MG/L	7770	33.4		31.0		26.5		19.1	
	0	Sulfate	T	MG/L	375.4	56.6		80.2		68.8		34.1	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029 FINDS/UNIT: KYD000827469
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	7	3	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	9/19/12 13:30	9/19/12 10:27	9/19/12 8:26	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	9/19-21/12	9/19-21/12	9/19-21/12	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	396.91		393.36		397.23			
S0145- -	1	Temperature		°C	Fld. Meas.	16.4		17.5		15.6			
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	543.0	A	2,078	A	1,260	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<3.0	A	3.3	A	<3.0	A		
S0268- -	0	Organic Carbon	T	MG/L	415.1	1.1	A	1.0	A	<1.0	A		
16887-00-6	2	Chloride(s)	T	MG/L	325.3	11.4	A	243	A	62.3	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	316.0	A	1,437	A	888.0	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.73	A	7.37	A	7.28	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	<0.001	A	<0.001	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: [illegible] / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	70.2		195		160			
7440-23-5	0	Sodium	T	MG/L	7770	14.5		105		37.1			
14808-79-8	0	Sulfate	T	MG/L	375.4	33.9		562		344			

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 2nd 2013

Please check only ONE of the following:

___Characterization ___Quarterly _X_Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler 5-13-13
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 4/17/2013 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: D. Dierson (P. Cook-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services Laboratories, Ghent, KY Lab ID No.: ____________

Contact Person: Ed Raker Phone No.: (502) 347-4191

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.: ____________

Contact Person: Mr. Ken Ford/Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

FINDS/UNIT: KYD000827469 /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	5	4	6	3
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/17/13 11:45	4/17/13 11:07	4/17/13 11:57	4/17/13 10:15
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/17-5/7/13	4/17-5/7/13	4/17-5/7/13	4/17-5/7/13
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	392.49		398.38		405.93		398.91	
S0145- -	1	Temperature		°C	Fld. Meas.	16.1		16.3		16.8		16.2	
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	720.3	A	775.0	A	660.5	A	656.0	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7.0	A	<7.0	A	<7.0	A	<7.0	A
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.61	A	1.38	A	1.04	A	0.50	A
16887-00-6	2	Chloride(s)	T	MG/L	325.3	16.7	A	25.4	A	17.9	A	20.7	A
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	412	A	449	A	410	A	415	A
S0296- -	0	pH	T	units	Fld. Meas.	8.08	A	8.04	A	8.14	A	8.01	A
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	<0.001	A	<0.001	A	<0.001	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	82.6		101		86.4		88.7	
7440-23-5	0	Sodium	T	MG/L	7770	31.1		28.6		31.1		27.2	
	0	Sulfate	T	MG/L	375.4	53.4		77.0		57.5		77.4	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL

Facility: LG&E Mill Creek Special Waste Landfill

Permit Number: 056-00029

FINDS/UNIT: KYD000827469

LAB ID:

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	7	1	2	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	4/17/13 12:40	4/17/13 9:28	4/17/13 10:03	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	4/17-5/7/13	4/17-5/7/13	4/17-5/7/13	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	398.91		397.02		400.90			
S0145- -	1	Temperature		°C	Fld. Meas.	17.0		18.4		16.4			
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	476.3	A	1,993	A	1,301	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7.0	A	13.3	A	<7.0	A		
S0268- -	0	Organic Carbon	T	MG/L	415.1	1.95	A	1.13	A	0.50	A		
16887-00-6	2	Chloride(s)	T	MG/L	325.3	8.53	A	220	A	60.0	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	280.0	A	1,379	A	971.5	A		
S0296- -	0	pH	T	units	Fld. Meas.	8.21	A	7.78	A	7.69	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	<0.001	A	<0.001	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	60.7		194		156			
7440-23-5	0	Sodium	T	MG/L	7770	15.2		104		55.7			
14808-79-8	0	Sulfate	T	MG/L	375.4	33.6		529		354			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 4th 2013

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** X **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

SIGNATURE DATE 3-13-14

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 11/21/2013 (Resample MW-4, 2/5/14) County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: D. Dierson (P. Cook-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services Laboratories, Ghent, KY Lab ID No.: ____

Contact Person: Ed Raker Phone No.: (502) 347-4191

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.: ____

Contact Person: Mr. Ken Ford/Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT: KYD000827469 /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	6	3	5	7
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/11/13 13:52	12/11/13 11:09	12/11/13 13:29	2/5/14 13:42
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/21/13-1/23/14	11/21/13-1/23/14	11/21/13-1/23/14	2/5-2/14/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	390.57		395.46		405.35		399.41	
S0145- -	1	Temperature		°C	Fld. Meas.	15.7		15.2		16.2		12.4	
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	739.3	A	838.5	A	680.5	A	720.0	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7.0	A	<7.0	A	<7.0	A	<7.0	A
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.69	A	1.23	A	1.05	A	0.88	A
16887-00-6	2	Chloride(s)	T	MG/L	325.3	16.9	A	27.7	A	17.9	A	11.0	A
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	428	A	527	A	418	A	460	A
S0296- -	0	pH	T	units	Fld. Meas.	7.58	A	7.41	A	7.49	A	7.53	A
7440-50-8	0	Copper	T	MG/L	7210	0.004	A	<0.001	A	<0.001	A	<0.001	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	82.8		107		81.8		110	
7440-23-5	0	Sodium	T	MG/L	7770	24.5		28.5		23.6		19.0	
	0	Sulfate	T	MG/L	375.4	57		102.0		61.8		86.0	

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	4	1	2	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	12/11/13 12:55	12/11/13 9:50	12/11/13 10:25	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	11/21/13-1/23/14	11/21/13-1/23/14	11/21/13-1/23/14	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	385.16		392.52		397.73			
S0145- -	1	Temperature		°C	Fld. Meas.	15.4		16.8		15.6			
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	484.0	A	2,072	A	1,302	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7.0	A	<7.0	A	<7.0	A		
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.65	A	1.04	A	<0.50	A		
16887-00-6	2	Chloride(s)	T	MG/L	325.3	10.2	A	252	A	67.3	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	223.5	A	1,390	A	993.0	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.64	A	7.37	A	7.31	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.001	A	0.007	A	0.001	A		

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[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	66.7		190		182			
7440-23-5	0	Sodium	T	MG/L	7770	10.0		93.7		37.8			
14808-79-8	0	Sulfate	T	MG/L	375.4	32.0		552		415			

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 2[nd] 2014

Please check only ONE of the following:

___Characterization ___Quarterly _X_Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

SIGNATURE 10-10-14
DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 6/16 /2014 (R/S @ MW-6: 9/23/14) County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: D. Dierson (D. Barnes-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services Laboratories, Ghent, KY Lab ID No.:

Contact Person: Ed Raker Phone No.: (502) 347-4191

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT: KYD000827469 /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	1	6	2	5
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/16/14 11:35	6/16/14 14:18	6/16/14 12:07	6/16/14 14:04
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/18-7/2/14	6/18-7/2/14	6/18-7/2/14	6/18-7/2/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	394.41		400.13		408.43		400.66	
S0145- -	1	Temperature		°C	Fld. Meas.	17.4		17.9		18.0		17.8	
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	751		826		696		661	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0	A	<8.0	A	<8.0	A	<8.0	A
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.67	A	0.83	A	1.2	A	0.72	A
16887-00-6	2	Chloride(s)	T	MG/L	325.3	16.8		29.9		18.9		14.9	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	424		498		390		392	
S0296- -	0	pH	T	units	Fld. Meas.	7.49	A	7.57	A	7.29		7.60	A
7440-50-8	0	Copper	T	MG/L	7210	0.003		0.004		0.002		<0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	67.0		78.0		73.0		82.0	
7440-23-5	0	Sodium	T	MG/L	7770	18.0		25.0		19.0		17.0	
	0	Sulfate	T	MG/L	375.4	56.2		103		65.6		70.9	

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	4	7	3	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	6/16/14 13:43	9/23/14 11:03	6/16/14 13:19	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	6/18-7/2/14	9/23-10/4/14	6/18-7/2/14	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	399.91		390.11		402.32			
S0145- -	1	Temperature		°C	Fld. Meas.	17.3		19.0		18.1			
S0145- -	1	Specific Conductance	T	UHMS/CM	Fld. Meas.	505		2,500	A	1,539			
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0	A	<8.0	A	<8.0	A		
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.64	A	1.0	A	0.58	A		
16887-00-6	2	Chloride(s)	T	MG/L	325.3	12.7		295	A	84.0			
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	262		1,600	A	1,186			
S0296- -	0	pH	T	units	Fld. Meas.	7.72	A	7.41	A	7.34	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.001		<0.020	A	0.004			

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-70-2	0	Calcium	T	MG/L	7140	55.0		218	A	164			
7440-23-5	0	Sodium	T	MG/L	7770	10.0		99.5	A	49.0			
14808-79-8	0	Sulfate	T	MG/L	375.4	32.9		618	A	568			

LG&E KU
PPL companies

Generation Services Laboratory

P.O. Box 437, 8815 Hwy 42, Ghent, KY 41045

Analysis Report

8/11/2014

Sample of: Mill Creek Groundwater Monitoring Well #1

Date Sampled: 6/16/2014 **Time:** 11:35 **Analyst:** DD/KA

PARAMETER	RESULT ALIQUOT 1	UNITS	DATE ANALYZED	ANALYST
pH		Std. Units		
Sp. Conductance	751	umhos/cm	6/18/2014	MP
Copper	0.003	mg/L	7/1/2014	MW
TDS	424	mg/L	6/23/2014	MP
Chloride	16.8	mg/L	6/25/2014	MP
Sulfate	56.2	mg/L	6/25/2014	MP
Calcium	67.0	mg/L	7/2/2014	MW
Sodium	18.0	mg/L	7/2/2014	MW

Respectfully submitted,

Edgar Laber

System Laboratory Supervisor

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 4^{th} 2014

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** X **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

SIGNATURE 1-16-15
DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 12/8 /2014 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway Louisville 40272
Street City Zip

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 Louisville 40232
Street City Zip

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: K. Allen & D. Dierson (D. Barnes-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway Louisville 40272
Street City Zip

LABORATORY RECORD #1

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard Louisville 40213
Street City Zip

LABORATORY RECORD #2

Laboratory: Lab ID No.:

Contact Person: Phone No.: ( )

Mailing Address:
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT: KYD000827469
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
Sample Sequence #						6		4		5		3	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment						Not Applicable		Not Applicable		Not Applicable		Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)						12/8/14 13:18		12/8/14 11:40		12/8/14 12:52		12/8/14 11:04	
Duplicate ("Y" or "N")[2]						No		No		No		No	
Split ("Y" or "N")[3]						No		No		No		No	
Facility Sample ID Number (if applicable)						Not Applicable		Not Applicable		Not Applicable		Not Applicable	
Laboratory Sample ID Number (if applicable)						Not Applicable		Not Applicable		Not Applicable		Not Applicable	
Date of Analysis (Month/Day/Year)						12/8-18/14		12/8-18/14		12/8-18/14		12/8-18/14	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)						Up		Down		Up		Up	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	390.66		395.88		404.93		397.99	
S0145- -	1	Temperature		°C	Fld. Meas.	14.0		14.3		14.5		14.1	
S0145- -	1	Specific Conductance	T	UHMS/CM	2510B	720	A	800	A	690	A	678	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<25	A	<25	A	<25	A	<25	A
S0268- -	0	Organic Carbon	T	MG/L	5310C	1.02	A	0.97	A	1.2	A	0.87	A
16887-00-6	2	Chloride(s)	T	MG/L	300	12.8	A	31.3	A	15.8	A	13.5	A
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	405	A	493	A	423	A	408	A
S0296- -	0	pH	T	units	Fld. Meas.	7.52	A	7.53	A	7.51	A	7.68	A
7440-50-8	0	Copper	T	MG/L	7210	<0.020	A	<0.020	A	<0.020	A	<0.020	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
07440-42-8	0	Boron	T	MG/L	6010C	<0.50		<0.50		<0.50		<0.50	
7440-70-2	0	Calcium	T	MG/L	6010C	96		120		100		100	
7440-23-5	0	Sodium	T	MG/L	6010C	21		25		22		21	
14808-79-8	0	Sulfate	T	MG/L	300.0	52		58		45		53	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL

Facility: LG&E Mill Creek Special Waste Landfill

Permit Number:056-00029

FINDS/UNIT:KYD000827469

LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	4	7	3	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	6/16/14 13:43	9/23/14 11:03	6/16/14 13:19	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	6/18-7/2/14	9/23-10/4/14	6/18-7/2/14	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	397.99		396.61		398.73			
S0145- -	1	Temperature		°C	Fld. Meas.	13.8		16.3		13.9			
S0145- -	1	Specific Conductance	T	UHMS/CM	2510B	520	A	2,700	A	1,700	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<25	A	<25	A	<25	A		
S0268- -	0	Organic Carbon	T	MG/L	5310C	0.76	A	1.2	A	0.65	A		
16887-00-6	2	Chloride(s)	T	MG/L	300	13.5	A	257.5	A	68.5	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	308	A	1,675	A	1,225	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.75	A	7.54	A	7.40	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.020	A	<0.020	A	<0.020	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
07440-42-8	0	Boron	T	MG/L	6010C	<0.50		0.54		4.8			
7440-70-2	0	Calcium	T	MG/L	6010C	79		270		200			
7440-23-5	0	Sodium	T	MG/L	6010C	11		130		63			
14808-79-8	0	Sulfate	T	MG/L	300.0	35		540		460			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 2nd 2015

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** X **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler — 6-15-15
SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 4/23/2015 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: K. Allen & D. Dierson (D. Barnes-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Microbac Laboratories, Inc. Lab ID No.: ______

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

LABORATORY RECORD #2

Laboratory: ______ Lab ID No.: ______

Contact Person: ______ Phone No.: ( )

Mailing Address: ______
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT: KYD000827469
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	2	6	1	7
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/23/15 9:50	4/23/15 13:00	4/23/15 9:19	4/23/15 13:31
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/23-5/13/15	4/23-5/13/15	4/23-5/13/15	4/23-5/13/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	397.57		405.96		412.43		406.58	
S0145- -	1	Temperature		°C	Fld. Meas.	14.6		16.0		14.7		16.8	
S0145- -	1	Specific Conductance	T	UHMS/CM	2510B	780	A	885	A	758	A	1,925	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<4.4	A	<4.4	A	4.9	A	14.3	A
S0268- -	0	Organic Carbon	T	MG/L	5310C	0.655	A	1.31	A	0.778	A	1.25	A
16887-00-6	2	Chloride(s)	T	MG/L	300	17.5	A	45.0	A	16.0	A	44.8	A
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	440	A	508	A	430	A	1,700	A
S0296- -	0	pH	T	units	Fld. Meas.	7.50	A	7.63	A	7.40	A	7.44	A
7440-50-8	0	Copper	T	MG/L	7210	<0.020	A	<0.020	A	<0.020	A	<0.020	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
07440-42-8	0	Boron	T	MG/L	6010C	<0.50		<0.50		<0.50		1.7	
7440-70-2	0	Calcium	T	MG/L	6010C	89		100		89		400	
7440-23-5	0	Sodium	T	MG/L	6010C	23		30		23		16	
14808-79-8	0	Sulfate	T	MG/L	300.0	73		95		48		680	

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL

Facility: LG&E Mill Creek Special Waste Landfill

Permit Number:056-00029

FINDS/UNIT:KYD000827469

LAB ID:

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	5	3	4	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	4/23/15 11:47	4/23/15 10:35	4/23/15 11:15	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	4/23-5/13/15	4/23-5/13/15	4/23-5/13/15	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	402.83		396.69		407.32			
S0145- -	1	Temperature		°C	Fld. Meas.	15.0		17.9		16.4			
S0145- -	1	Specific Conductance	T	UHMS/CM	2510B	585	A	2,600	A	1,700	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<4.4	A	<4.4	A	<4.4	A		
S0268- -	0	Organic Carbon	T	MG/L	5310C	1.05	A	1.14	A	0.918	A		
16887-00-6	2	Chloride(s)	T	MG/L	300	22	A	150	A	62	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	330	A	1,825	A	1,225	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.69	A	7.33	A	7.43	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.020	A	<0.020	A	<0.020	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: KYD000827469 / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
07440-42-8	0	Boron	T	MG/L	6010C	<0.50		<0.50		5.8			
7440-70-2	0	Calcium	T	MG/L	6010C	72		270		200			
7440-23-5	0	Sodium	T	MG/L	6010C	11		99		64			
14808-79-8	0	Sulfate	T	MG/L	300.0	40		630		460			

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Mill Creek Station **Activity** Special Waste Landfill
(As officially shown on DWM Permit Face)

Permit No. 056-00029 **Finds/Unit No.** KYD000827469 **Quarter & Year** 4th 2015

Please check only ONE of the following:

___Characterization ___Quarterly _X_ Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_ Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler 1-7-16

SIGNATURE DATE

W. Michael Winkler – Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 11/20 & 11/23/2015 County: Jefferson Permit No.: 056-00029

Facility Name: Louisville Gas & Electric Company Mill Creek Station Laboratory
(As officially shown on DWM Permit Face)

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 2' 13.5" Longitude W 85° 54' 37.25"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Sr. Engineer, Environmental Affairs Department LG&E and KU Energy

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40232 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Company Mill Creek Station Laboratory

Contact Person: K. Allen & D. Dierson (D. Barnes-Supervisor) Phone No.: (502) 933-6878

Mailing Address: 14660 Dixie Highway (Street) Louisville (City) 40272 (Zip)

LABORATORY RECORD #1

Laboratory: Microbac Laboratories, Inc. Lab ID No.: ______

Contact Person: Ms. Laura Revlett/Mr. Ralph Rabish Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville (City) 40213 (Zip)

LABORATORY RECORD #2

Laboratory: ______ Lab ID No.: ______

Contact Person: ______ Phone No.: ( )

Mailing Address: ______
Street City Zip

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT: KYD000827469 /1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6521	8001-6518	8001-6520	8001-6516
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	3	7	2	6
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/20/15 11:26	11/23/15 11:10	11/20/15 11:00	11/23/15 10:40
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/20-12/2/2015	11/23-12/2/2015	11/20-12/2/2015	11/23-12/2/2015
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Up	Up

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation		Ft. MSL	Fld. Meas.	392.16		396.46		405.93		397.33	
S0145- -	1	Temperature		°C	Fld. Meas.	14.9		14.3		14.4		14.3	
S0145- -	1	Specific Conductance	T	UHMS/CM	2510B	720	A	800	A	720	A	1,100	A
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<4.4	A	<4.4	A	<4.4	A	<4.4	A
S0268- -	0	Organic Carbon	T	MG/L	5310C	0.70	A	2.8	A	1.0	A	0.95	A
16887-00-6	2	Chloride(s)	T	MG/L	300	16	A	44	A	19	A	19	A
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	415	A	483	A	440	A	773	A
S0296- -	0	pH	T	units	Fld. Meas.	7.37	A	7.42	A	7.04	A	7.27	A
7440-50-8	0	Copper	T	MG/L	7210	<0.020	A	<0.020	A	<0.020	A	<0.020	A

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: [illegible] / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6521		8001-6518		8001-6520		8001-6516	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
07440-42-8	0	Boron	T	MG/L	6010C	<0.50		<0.50		<0.50		0.52	
7440-70-2	0	Calcium	T	MG/L	6010C	94		110		89		220	
7440-23-5	0	Sodium	T	MG/L	6010C	21		30		23		21	
14808-79-8	0	Sulfate	T	MG/L	300.0	52		62		48		280	

Division of Waste Management
Solid Waste Branch
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number:056-00029

FINDS/UNIT:KYD000827469
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6519	8001-6517	8004-1441	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-11	
Sample Sequence #	5	4	1	
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	
Sample Date and Time (Month/Day/Year hour:minutes)	11/20/15 13:35	11/20/15 12:52	11/20/15 8:30	
Duplicate ("Y" or "N")[2]	No	No	No	
Split ("Y" or "N")[3]	No	No	No	
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	
Date of Analysis (Month/Day/Year)	11/20-12/2/2015	11/20-12/2/2015	11/20-12/2/2015	
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	399.91		391.52		398.15			
S0145- -	1	Temperature		°C	Fld. Meas.	14.8		18.3		14.1			
S0145- -	1	Specific Conductance	T	UHMS/CM	2510B	600	A	2,200	A	1,400	A		
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<4.4	A	<4.4	A	<4.4	A		
S0268- -	0	Organic Carbon	T	MG/L	5310C	0.84	A	1.3	A	0.64	A		
16887-00-6	2	Chloride(s)	T	MG/L	300	25	A	200	A	55	A		
S0266- -	0	Total Dissolved Solids	T	MG/L	2540C	360	A	1,500	A	1,100	A		
S0296- -	0	pH	T	units	Fld. Meas.	7.47	A	7.21	A	7.18	A		
7440-50-8	0	Copper	T	MG/L	7210	<0.020	A	<0.020	A	<0.020	A		

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - SEMI-ANNUAL
Facility: LG&E Mill Creek Special Waste Landfill
Permit Number: 056-00029

FINDS/UNIT: [illegible] / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6519		8001-6517		8004-1441			
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-11			
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
07440-42-8	0	Boron	T	MG/L	6010C	<0.50		<0.50		5.0			
7440-70-2	0	Calcium	T	MG/L	6010C	85		240		200			
7440-23-5	0	Sodium	T	MG/L	6010C	13		120		66			
14808-79-8	0	Sulfate	T	MG/L	300.0	35		480		380			

Trimble County Station Groundwater Reports

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
14 REILLY ROAD
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 1st 2011

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** X **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler — 8-8-11
SIGNATURE — DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 6/14-16/2011 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Diana Freibert Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: Generation Services System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-8481

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	1	2	4	3
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/14/11 14:28	6/14/11 15:26	6/14/11 18:04	6/14/11 17:27
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.90		413.11		421.75		420.69	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<3.0		8.0		<3.0		26	
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	<1.0		3.4		1.3		1.1	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	17.3		7.40		9.70		511	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	472		370		478		4,658	
S0296- -	0	pH	T	units	150.1	7.10		6.59		6.60		6.59	
7440-50-8	0	Copper	T	MG/L	200.7	<0.001		0.002		<0.001		0.027	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-39-3		Boron	T	MG/L	200.7	0.038		0.042		0.066		51.0	
7440-70-2		Calcium	T	MG/L	200.7	130		102		139		769	
7440-23-5	0	Sodium	T	MG/L	200.7	5.98		9.48		7.71		20.4	
18785-72-3	0	Sulfate	T	MG/L	300.0	31.8		48.7		67.9		2,154	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	6	7	8
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/16/11 8:51	6/16/11 9:25	6/16/11 9:52	6/16/11 10:13
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.54		420.42		422.19		422.16	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	3.0		<3.0		<3.0		<3.0	
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	1.8		1.8		1.9		2.2	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	129		56.4		25.2		258	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,126		528		612		2,390	
S0296- -	0	pH	T	units	150.1	6.97		7.02		7.09		6.87	
7440-50-8	0	Copper	T	MG/L	200.7	0.012		0.006		0.015		0.014	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-39-3		Boron	T	MG/L	200.7	11.9		0.590		0.350		22.9	
7440-70-2		Calcium	T	MG/L	200.7	228		146		156		445	
7440-23-5	0	Sodium	T	MG/L	200.7	34.4		5.50		9.16		9.61	
18785-72-3	0	Sulfate	T	MG/L	300.0	344		62.6		111		979	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	9	10	11	13
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	6/16/11 11:35	6/16/11 13:34	6/16/11 14:24	6/16/11 16:40
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	423.89		424.02		423.57		424.06	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	5220D	<3.0		<3.0		<3.0		<3.0	
S0268- -	1	Total Organic Carbon	T	MG/L	5310C	2.2		2.1		2.3		1.8	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	5.6		31.8		35.7		28.7	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	392		520		1,280		676	
S0296- -	0	pH	T	units	150.1	7.24		7.17		7.07		7.00	
7440-50-8	0	Copper	T	MG/L	200.7	0.006		0.013		0.007		0.004	

STANDARD FLAGS:

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B = Analyte found in blank
A = Average value
N = Presumptive ID
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GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-39-3		Boron	T	MG/L	200.7	0.790		0.760		2.02		1.78	
7440-70-2		Calcium	T	MG/L	200.7	108		151		279		170	
7440-23-5	0	Sodium	T	MG/L	200.7	4.31		9.93		31.9		11.4	
18785-72-3	0	Sulfate	T	MG/L	300.0	43.5		84.7		550		175	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
14 REILLY ROAD
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 2nd 2011

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: X Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler 1-13-12
SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 12/7-8/2011 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	12	11	10	9
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/8/11 12:33	12/8/11 11:03	12/8/11 10:36	12/8/11 9:55
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11	6/14-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	431.73		434.27		431.96		431.94	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		11		<7		9	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		2.2		1.2		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	26.2		8.40		11.9		548	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	416		384		508		4,750	
S0296- -	0	pH	T	units	150.1	7.53		7.16		7.36		6.81	
7440-50-8	0	Copper	D	MG/L	200.7	<0.001		0.005		<0.001		0.001	

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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.275		0.704		2.20		56.5	
7440-70-2	0	Calcium	T	MG/L	200.7	104		98		118		666	
7440-23-5	0	Sodium	T	MG/L	200.7	9.92		8.51		5.96		98.2	
	0	Sulfate	T	MG/L	300.0	35.8		58.6		74.3		2,006	

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	13	4	6	7
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/8/11 13:04	12/7/11 13:26	12/7/11 13:50	12/7/11 14:14
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	432.82		432.36		431.69		431.61	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	12		<7		<7		8	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	142		108.3		42.0		335	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,028		640		658		2,848	
S0296- -	0	pH	T	units	150.1	7.22		7.10		7.14		6.80	
7440-50-8	0	Copper	D	MG/L	200.7	0.003		0.004		0.015		0.003	

[1]AKGWA # is 0000-0000 for any type of blank.
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[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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STANDARD FLAGS:
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B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	12.2		0.937		0.627		27.6	
7440-70-2	0	Calcium	T	MG/L	200.7	196		154		165		415	
7440-23-5	0	Sodium	T	MG/L	200.7	30.9		5.46		9.01		46.3	
	0	Sulfate	T	MG/L	300.0	396		94.4		139		1,222	

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	8	3	2	5
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/7/11 14:35	12/7/11 10:35	12/7/11 9:46	12/7/11 13:45
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11	6/16-7/25/11
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	430.42		427.97		430.26		428.65	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		<7		<7		<7	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	7.4		51.6		61.6		24.4	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	422		756		1,700		688	
S0296- -	0	pH	T	units	150.1	7.30		7.08		6.84		6.78	
7440-50-8	0	Copper	D	MG/L	200.7	0.004		0.015		0.004		0.004	

STANDARD FLAGS:

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GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.854		1.98		2.99		1.86	
7440-70-2	0	Calcium	T	MG/L	200.7	105		174		336		152	
7440-23-5	0	Sodium	T	MG/L	200.7	3.62		10.5		33.7		9.51	
	0	Sulfate	T	MG/L	300.0	48.9		162		851		163	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
14 REILLY ROAD
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 2nd 2012

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: X Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler — 9-10-12
SIGNATURE — DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 4/10-12/2012 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	1	2	3	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/10/12 14:38	4/10/12 15:06	4/10/12 15:46	4/10/12 16:11
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/10-5/22/12	4/10-5/22/12	4/10-5/22/11	4/10-5/22/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.63		423.76		421.85		421.97	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	7		<7		<7		14.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		2.2		1.2		1.1	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	21.4		5.20		14.8		721	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	446		378		496		4,708	
S0296- -	0	pH	T	units	150.1	7.39		7.13		7.26		7.11	
7440-50-8	0	Copper	D	MG/L	200.7	0.006		0.013		0.006		0.009	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.039		<0.001		2.264		100	
7440-70-2	0	Calcium	T	MG/L	200.7	123		35.6		42.1		790	
7440-23-5	0	Sodium	T	MG/L	200.7	8.85		11.2		9.43		125	
	0	Sulfate	T	MG/L	300.0	36.4		12.0		64.8		2,219	

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	6	7	8
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/11/12 10:44	4/11/12 11:12	4/11/12 13:08	4/11/12 13:27
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/11-5/22/12	4/11-5/22/12	4/11-5/22/12	4/11-5/22/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	422.20		422.45		423.26		423.25	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		<7		<7		<7	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	138		49.9		62.1		341	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,104		544		754		2,694	
S0296- -	0	pH	T	units	150.1	7.27		7.54		7.56		7.27	
7440-50-8	0	Copper	D	MG/L	200.7	0.012		0.011		0.019		0.009	

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GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	19.7		1.70		0.989		41.73	
7440-70-2	0	Calcium	T	MG/L	200.7	195		53.4		117		417	
7440-23-5	0	Sodium	T	MG/L	200.7	39.1		7.66		13.8		57.6	
	0	Sulfate	T	MG/L	300.0	419		82.3		196		1,355	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	9	10	11	12
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	4/11/12 13:50	4/11/12 14:17	4/12/12 10:50	4/12/12 11:19
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	4/11-5/22/12	4/11-5/22/12	4/12-5/22/12	4/12-5/22/12
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	424.58		424.88		423.56		425.73	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<7		<7		<7		15	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	7.30		34.6		50.2		23.5	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	414		520		1,656		656	
S0296- -	0	pH	T	units	150.1	7.55		7.44		7.11		7.27	
7440-50-8	0	Copper	D	MG/L	200.7	0.013		0.037		0.021		0.013	

STANDARD FLAGS:

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B = Analyte found in blank
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GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	1.26		1.39		2.68		2.31	
7440-70-2	0	Calcium	T	MG/L	200.7	29.9		45.9		264		63.5	
7440-23-5	0	Sodium	T	MG/L	200.7	5.82		13.2		38.7		12.5	
	0	Sulfate	T	MG/L	300.0	54.6		77.7		839		152	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.** ________ **Quarter & Year** 4th 2012

Please check only ONE of the following:

___Characterization ___Quarterly _X_Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler _______________ 1-24-13
SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 11/13-14/2012 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2	MW-3	MW-4
Sample Sequence #	6	8	10	11
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/14/12 9:13	11/14/12 9:33	11/14/12 10:02	11/14/12 10:15
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/14/12-1/2/13	11/14/12-1/2/13	11/14/12-1/2/13	11/14/12-1/2/13
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	420.98		422.50		421.05		421.12	
S0145- -	1	Specific Conductance	T	MG/L	120.1	606		616		597		4,110	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<3.0		<3.0		<3.0		8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		2.2		1.1		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	22.4		5.20		10.5		593	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	452		428		460		4,772	
S0296- -	0	pH	T	units	150.1	7.06		6.97		6.95		6.65	
7440-50-8	0	Copper	D	MG/L	200.7	<0.001		<0.001		<0.001		<0.001	

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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.233		0.238		2.32		83.7	
7440-70-2	0	Calcium	T	MG/L	200.7	126		110		71.7		779	
7440-23-5	0	Sodium	T	MG/L	200.7	16.9		15.2		10.6		170	
	0	Sulfate	T	MG/L	300.0	36.8		21.7		65.0		2,325	

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	9	3	4	5
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/14/12 9:45	11/13/12 10:09	11/13/12 10:35	11/13/12 10:51
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/14/12-1/2/13	11/13/12-1/2/13	11/13/12-1/2/13	11/13/12-1/2/13
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.55		421.15		416.47		419.45	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,248		664		964		2,630	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	9.0		<3.0		4.0		<3.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	135		30.6		78.1		338	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,136		506		870		2,946	
S0296- -	0	pH	T	units	150.1	6.98		7.11		7.01		6.75	
7440-50-8	0	Copper	D	MG/L	200.7	0.006		<0.001		0.008		<0.001	

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[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
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N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	14.8		1.57		1.86		44.7	
7440-70-2	0	Calcium	T	MG/L	200.7	216		81.9		184		473	
7440-23-5	0	Sodium	T	MG/L	200.7	47.0		9.60		20.6		87.6	
	0	Sulfate	T	MG/L	300.0	353		64.0		252		1,271	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable /

LAB ID:

For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	1	2	12	6
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/13/12 1:07	11/13/12 1:34	11/14/12 10:42	11/14/12 9:13
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/13/12-1/2/13	11/13/12-1/2/13	11/14/12-1/2/13	11/14/12-1/2/13
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.40		421.23		421.00		421.23	
S0145- -	1	Specific Conductance	T	MG/L	120.1	644		924		1,610		768	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<3.0		<3.0		<3.0		<3.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	<1.0		<1.0		<1.0		<1.0	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	10.6		47.0		57.0		22.0	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	436		696		1,622		572	
S0296- -	0	pH	T	units	150.1	7.51		6.92		6.87		7.12	
7440-50-8	0	Copper	D	MG/L	200.7	0.004		0.007		<0.001		<0.001	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	1.54		1.22		3.19		1.65	
7440-70-2	0	Calcium	T	MG/L	200.7	120		141		338		120	
7440-23-5	0	Sodium	T	MG/L	200.7	8.40		18.8		50.0		14.6	
	0	Sulfate	T	MG/L	300.0	75.6		115		697		131	

GROUNDWATER ASSESSMENT REPORT

PPL companies

LOUISVILLE GAS & ELECTRIC

TRIMBLE COUNTY GENERATING STATION
BEDFORD, TRIMBLE COUNTY, KENTUCKY

Prepared for:

LG&E and KU Services Company

October 31, 2013

Prepared by:

Linebach • Funkhouser, Inc.
environmental compliance & consulting

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification / Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-1	05/19/09	—	—	—	84.60	0.0020	—	—	—	—	—	—	—	6.46	—
	10/01/09	—	—	—	92.80	0.0030	—	—	—	—	—	—	—	7.19	—
	06/21/10	—	—	—	75.60	0.0030	—	—	—	—	—	—	—	2.73	—
	10/12/10	—	—	—	82.60	0.0050	—	—	—	—	—	—	—	5.39	—
	06/14/11	—	—	—	130.00	<0.00100	—	—	—	—	—	—	—	5.98	—
	12/08/11	—	—	—	104.00	<0.00100	—	—	—	—	—	—	—	9.92	—
	04/10/12	—	—	—	123.00	0.0060	—	—	—	—	—	—	—	8.85	—
	11/14/12	—	—	—	126.00	<0.00100	—	—	—	—	—	—	—	16.90	—
	06/25/13	26.0	0.00044(J)	<0.00016	110.00	0.00110(J)	0.200	0.00077(J)	29.000	<0.000049	<0.0049	4.30	0.00081(J)	9.50	<0.0026
	08/28/13	26.0	<0.00025	<0.00016	91.00	0.00073(J)	0.310	0.00032(J)	24.000	<0.000049	<0.0049	1.50	<0.00038	6.60	<0.0026
	Statistical Computations	Minimum	<0.00025	<0.00016	75.60	<0.00100	0.200	0.00032	24.000	<0.000049	<0.0049	1.50	<0.00038	2.73	<0.0026
		Maximum	0.00044	<0.00016	130.00	0.0060	0.310	0.00077	29.000	<0.000049	<0.0049	4.30	0.00081	16.90	<0.0026
		Median	0.00028	<0.00016	98.40	0.0016	0.255	0.00055	26.500	<0.000049	<0.0049	2.90	0.00050	6.90	<0.0026
		Average	0.00028	<0.00016	101.96	0.0022	0.255	0.00055	26.500	<0.000049	<0.0049	2.90	0.00050	7.95	<0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-2	05/19/09	—	—	—	222.00	0.0020	—	—	—	—	—	—	—	14.20	—
	10/01/09	—	—	—	205.00	0.0020	—	—	—	—	—	—	—	15.20	—
	06/21/10	—	—	—	160.70	0.0050	—	—	—	—	—	—	—	13.60	—
MW-2R	10/15/10	—	—	—	81.50	0.0050	—	—	—	—	—	—	—	9.10	—
	06/14/11	—	—	—	102.34	0.0020	—	—	—	—	—	—	—	9.48	—
	12/08/11	—	—	—	98.00	0.0050	—	—	—	—	—	—	—	8.51	—
	04/10/12	—	—	—	35.60	0.0130	—	—	—	—	—	—	—	11.20	—
	11/14/12	—	—	—	110.00	<0.00100	—	—	—	—	—	—	—	15.20	—
	06/26/13	35.0	0.02400	<0.00016	93.00	<0.00052	11.000	0.00037(J)	35.000	<0.000049	<0.0049	0.81	0.00120	8.20	<0.0026
	08/29/13	29.2	0.02200	<0.00016	88.00	0.00160(J)	11.000	0.00089(J)	34.000	<0.000049	<0.0049	0.70	<0.00038	7.80	0.0028(J)
MW-2/MW-2R	Statistical Computations	Minimum	0.02200	<0.00016	35.60	<0.00052	11.000	0.00037	34.000	<0.000049	<0.0049	0.70	<0.00038	7.80	<0.0026
		Maximum	0.02400	<0.00016	222.00	0.01300	11.000	0.00089	35.000	<0.000049	<0.0049	0.81	0.00120	15.20	0.0028
		Median	0.02300	<0.00016	100.17	0.00200	11.000	0.00063	34.500	<0.000049	<0.0049	0.76	0.00070	10.34	0.0021
		Average	0.02300	<0.00016	119.61	0.00364	11.000	0.00063	34.500	<0.000049	<0.0049	0.76	0.00070	11.25	0.0021

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			**0.01000**	**0.005**	**—**	**1.3**	**—**	**0.015**	**—**	**0.002**	**0.10**	**—**	**0.050**	**—**	**—**
MW-3	05/19/09	—	—	—	149.00	0.0040	—	—	—	—	—	—	—	7.65	—
	10/01/09	—	—	—	110.00	0.0020	—	—	—	—	—	—	—	7.40	—
	06/21/10	—	—	—	121.20	0.0080	—	—	—	—	—	—	—	5.82	—
	10/12/10	—	—	—	100.90	0.0070	—	—	—	—	—	—	—	7.71	—
	06/14/11	—	—	—	138.83	<0.00100	—	—	—	—	—	—	—	7.71	—
	12/08/11	—	—	—	118.00	<0.00100	—	—	—	—	—	—	—	5.96	—
	04/10/12	—	—	—	42.10	0.0060	—	—	—	—	—	—	—	9.43	—
	11/14/12	—	—	—	71.70	<0.00100	—	—	—	—	—	—	—	10.60	—
	06/25/13	31.0	0.00082(J)	<0.00016	140.00	0.0028	0.290	0.00260	35.000	<0.000049	<0.0049	1.60	0.00130	5.90	0.0043(J)
	06/25/13(DUP)	31.0	0.00150	<0.00016	140.00	0.0210	1.600	0.01600	36.000	<0.000049	<0.0049	1.40	0.00120	5.90	0.0200
	08/29/13	31.0	0.00060(J)	<0.00016	130.00	0.0120	0.650	0.00740	33.000	<0.000049	<0.0049	1.20	<0.00038	6.20	0.0049(J)
	08/29/13(DUP)*	31.0	0.00084(J)	<0.00016	140.00	0.00130(J)	0.260	0.00031(J)	34.000	<0.000049	0.0110(J)	1.10	0.00120	6.40	0.0036(J)
	Statistical Computations	Minimum	0.00060	<0.00016	42.10	<0.0010	0.260	0.00031	33.000	<0.000049	<0.0049	1.10	<0.00038	5.82	0.0036
		Maximum	0.00150	<0.00016	149.00	0.0210	1.600	0.01600	36.000	<0.000049	0.0110	1.60	0.00130	10.60	0.0200
		Median	0.00083	<0.00016	125.60	0.0034	0.470	0.00500	34.500	<0.000049	0.0025	1.30	0.00120	6.90	0.0046
		Average	0.00094	<0.00016	116.81	0.0055	0.700	0.00658	34.500	<0.000049	0.0046	1.33	0.00097	7.22	0.0082

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-4	05/19/09	—	—	—	668.00	0.0030	—	—	—	—	—	—	—	72.60	—
	10/01/09	—	—	—	699.80	0.0130	—	—	—	—	—	—	—	86.20	—
	06/21/10	—	—	—	590.00	0.0040	—	—	—	—	—	—	—	87.70	—
	10/12/10	—	—	—	694.50	0.0050	—	—	—	—	—	—	—	85.70	—
	06/14/11	—	—	—	768.66	0.0270	—	—	—	—	—	—	—	20.39	—
	12/08/11	—	—	—	666.00	0.0010	—	—	—	—	—	—	—	98.20	—
	04/10/12	—	—	—	790.00	0.0090	—	—	—	—	—	—	—	125.00	—
	11/14/12	—	—	—	779.00	<0.00100	—	—	—	—	—	—	—	170.00	—
	06/25/13	66.0	0.00230	<0.00016	640.00	0.00140(J)	<0.014	0.00024(J)	370.000	<0.000049	<0.0049	12.00	0.01200	95.00	<0.0026
	06/25/13(DUP)*		0.00160	<0.00016	600.00	0.00140(J)	0.032	<0.00024	380.000	<0.000049	<0.0049	11.00	0.00890	93.00	<0.0026
	08/29/13	66.0	0.00520	<0.00016	600.00	0.0022	0.025(J)	<0.00024	360.000	<0.000049	<0.0049	10.00	0.01900	93.00	<0.0026
	08/29/13(DUP)	66.0	0.00870	<0.00016	600.00	0.00120(J)	0.290	0.00280	360.000	<0.000049	0.0050(J)	10.00	0.02100	91.00	0.0039(J)
	Statistical Computations	Minimum	0.00160	<0.00016	590.00	<0.00100	<0.014	<0.00024	360.000	<0.000049	<0.0049	10.00	0.00890	20.39	<0.0026
		Maximum	0.00870	<0.00016	790.00	0.0270	0.290	0.00280	380.000	<0.000049	0.0050	12.00	0.02100	170.00	0.0039
		Median	0.00375	<0.00016	667.00	0.0026	0.029	0.00018	365.000	<0.000049	0.0025	10.50	0.01550	92.00	0.0013
		Average	0.00445	<0.00016	674.66	0.0057	0.089	0.00082	367.500	<0.000049	0.0031	10.75	0.01523	93.15	0.0020

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-5	05/19/09	—	—	—	189.00	0.0050	—	—	—	—	—	—	—	25.400	—
	10/01/09	—	—	—	194.40	0.0060	—	—	—	—	—	—	—	31.800	—
	06/22/10	—	—	—	164.20	0.0080	—	—	—	—	—	—	—	29.200	—
	10/12/10	—	—	—	186.80	0.0080	—	—	—	—	—	—	—	27.740	—
	06/16/11	—	—	—	227.71	0.0120	—	—	—	—	—	—	—	34.428	—
	12/07/11	—	—	—	196.00	0.0030	—	—	—	—	—	—	—	30.900	—
	04/11/13	—	—	—	195.00	0.0120	—	—	—	—	—	—	—	39.100	—
	11/14/12	—	—	—	216.00	0.0060	—	—	—	—	—	—	—	47.000	—
	06/25/13	58.0	0.00120	<0.00016	210.00	0.00970(J)	<0.014	0.00055(J)	73.000	<0.000049	<0.0049	5.30	0.00500	28.000	0.0066(J)
	08/29/13	58.0	0.00190	<0.00016	190.00	0.0100	0.019(J)	0.00029(J)	71.000	<0.000049	<0.0049	4.60	0.00250	26.000	0.0064(J)
	Statistical Computations	Minimum	0.00120	<0.00016	164.20	0.0030	<0.014	0.00029	71.000	<0.000049	<0.0049	4.60	0.00250	25.400	0.0064
		Maximum	0.00190	<0.00016	227.71	0.0120	0.019	0.00055	73.000	<0.000049	<0.0049	5.30	0.00500	47.000	0.0066
		Median	0.00155	<0.00016	194.70	0.0080	0.013	0.00042	72.000	<0.000049	<0.0049	4.95	0.00375	30.050	0.0065
		Average	0.00155	<0.00016	196.91	0.0080	0.013	0.00042	72.000	<0.000049	<0.0049	4.95	0.00375	31.957	0.0065

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-6	05/19/09	—	—	—	104.00	0.0050	—	—	—	—	—	—	—	3.37	—
	10/01/09	—	—	—	104.00	0.0030	—	—	—	—	—	—	—	4.25	—
	06/22/10	—	—	—	91.30	0.0190	—	—	—	—	—	—	—	2.28	—
	10/12/10	—	—	—	82.40	0.0040	—	—	—	—	—	—	—	4.84	—
	06/16/11	—	—	—	145.60	0.0060	—	—	—	—	—	—	—	5.50	—
	12/07/11	—	—	—	154.00	0.0040	—	—	—	—	—	—	—	5.46	—
	04/10/13	—	—	—	53.40	0.0110	—	—	—	—	—	—	—	7.66	—
	11/13/12	—	—	—	81.90	<0.00100	—	—	—	—	—	—	—	9.60	—
	06/25/13	58.0	0.00050(J)	<0.00016	120.00	0.0070	<0.014	0.00084(J)	37.000	<0.000049	<0.0049	2.00	0.00160	4.80	0.0066(J)
	08/30/13	58.0	0.00071(J)	<0.00016	110.00	0.0058	<0.014	0.00037(J)	34.000	<0.000049	<0.0049	1.60	0.00180	4.60	0.0048(J)
	Statistical Computations	Minimum	0.00050	<0.00016	53.40	<0.00100	0.007	0.00037	34.000	<0.000049	<0.0049	1.60	0.00160	2.28	0.0048
		Maximum	0.00071	<0.00016	154.00	0.0190	0.007	0.00084	37.000	<0.000049	<0.0049	2.00	0.00180	9.60	0.0066
		Median	0.00061	<0.00016	104.00	0.0054	0.007	0.00061	35.500	<0.000049	<0.0049	1.80	0.00170	4.82	0.0057
		Average	0.00061	<0.00016	104.66	0.0065	0.007	0.00061	35.500	<0.000049	<0.0049	1.80	0.00170	5.24	0.0057

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION   487 CORN CREEK ROAD   BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-7	05/19/09	—	—	—	121.00	0.0170	—	—	—	—	—	—	—	6.85	—
	10/02/09	—	—	—	78.10	0.0010	—	—	—	—	—	—	—	5.90	—
	06/22/10	—	—	—	115.00	0.0330	—	—	—	—	—	—	—	6.46	—
	10/12/10	—	—	—	125.40	0.0060	—	—	—	—	—	—	—	8.62	—
	06/16/11	—	—	—	155.53	0.0150	—	—	—	—	—	—	—	9.16	—
	12/07/11	—	—	—	165.00	0.0150	—	—	—	—	—	—	—	9.01	—
	04/11/12	—	—	—	117.00	0.0190	—	—	—	—	—	—	—	13.80	—
	11/13/12	—	—	—	184.00	0.0080	—	—	—	—	—	—	—	20.60	—
	06/26/13	62.0	0.00150	0.00048(J)	240.00	0.0280	0.017(J)	0.00072(J)	56.000	<0.000049	<0.0049	4.10	0.00670	14.00	0.0300
	06/26/13(DUP)*		0.00180	<0.00016	250.00	0.0270	<0.014	0.00031(J)	60.000	<0.000049	<0.0049	3.50	0.00920	14.00	0.0310
	08/30/13	62.0	0.00300	<0.00016	250.00	0.0270	<0.014	<0.00024	59.000	<0.000049	<0.0049	3.60	0.00700	15.00	0.0340
	08/30/13(DUP)	62.0	0.00320	<0.00016	250.00	0.0290	<0.014	0.00041(J)	60.000	<0.000049	<0.0049	3.80	0.00780	15.00	0.0380
	Statistical Computations	Minimum	0.00150	<0.00016	78.10	0.0010	0.007	<0.00024	56.000	<0.000049	<0.0049	3.50	0.00670	5.90	0.0300
		Maximum	0.00320	0.00048	250.00	0.0330	0.017	0.00072	60.000	<0.000049	<0.0049	4.10	0.00920	20.60	0.0380
		Median	0.00240	0.00008	160.26	0.0180	0.007	0.00036	59.500	<0.000049	<0.0049	3.70	0.00740	11.48	0.0325
		Average	0.00238	0.00018	170.92	0.0188	0.010	0.00039	58.750	<0.000049	<0.0049	3.75	0.00768	11.53	0.0333

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-8	05/19/09	—	—	—	586.00	0.0050	—	—	—	—	—	—	—	47.90	—
	10/02/09	—	—	—	546.00	0.0100	—	—	—	—	—	—	—	53.80	—
	06/22/10	—	—	—	443.60	0.0050	—	—	—	—	—	—	—	46.70	—
	10/12/10	—	—	—	493.70	0.0050	—	—	—	—	—	—	—	54.96	—
	06/16/11	—	—	—	445.17	0.0140	—	—	—	—	—	—	—	9.61	—
	12/07/11	—	—	—	415.00	0.0030	—	—	—	—	—	—	—	46.30	—
	04/11/12	—	—	—	417.00	0.0090	—	—	—	—	—	—	—	57.60	—
	11/13/12	—	—	—	473.00	<0.00100	—	—	—	—	—	—	—	87.60	—
	06/24/13	96.0	0.00260	<0.00016	410.00	0.0025	<0.014	0.00031	240.000	<0.000049	<0.0049	5.60	0.01000	49.00	<0.0026
	06/24/13(DUP)	96.0	0.00220	<0.00016	400.00	0.0029	0.230	0.00160	230.000	<0.000049	<0.0049	5.60	0.01100	49.00	0.0028
	08/30/13	96.0	0.00680	<0.00016	390.00	0.0028	<0.014	<0.00024	240.000	<0.000049	<0.0049	4.90	0.01200	48.00	0.0038(J)
	08/30/13(DUP*)		0.00510	<0.00016	410.00	0.0029	<0.014	<0.00024	250.000	<0.000049	0.0140(J)	5.10	0.00900	48.00	0.0038(J)
	Statistical Computations	Minimum	0.00220	<0.00016	390.00	<0.0010	0.007	0.00012	230.000	<0.000049	0.0025	4.90	0.00900	9.61	<0.0026
		Maximum	0.00680	<0.00016	586.00	0.0140	0.230	0.00160	250.000	<0.000049	0.0140	5.60	0.01200	87.60	0.0038
		Median	0.00385	<0.00016	430.30	0.0040	0.007	0.00022	240.000	<0.000049	0.0025	5.35	0.01050	48.50	0.0033
		Average	0.00418	<0.00016	452.46	0.0052	0.063	0.00054	240.000	<0.000049	0.0053	5.30	0.01050	49.87	0.0029

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-9	05/20/09	—	—	—	106.00	0.0070	—	—	—	—	—	—	—	3.29	—
	10/02/09	—	—	—	102.60	0.0020	—	—	—	—	—	—	—	3.05	—
	06/22/10	—	—	—	97.20	0.0150	—	—	—	—	—	—	—	2.01	—
	10/12/10	—	—	—	100.60	0.0060	—	—	—	—	—	—	—	4.90	—
	06/16/11	—	—	—	108.21	0.0060	—	—	—	—	—	—	—	4.31	—
	12/07/11	—	—	—	105.00	0.0040	—	—	—	—	—	—	—	3.62	—
	04/11/12	—	—	—	29.90	0.0130	—	—	—	—	—	—	—	5.82	—
	11/13/12	—	—	—	120.00	0.0040	—	—	—	—	—	—	—	8.40	—
	06/26/13	96.0	0.00058	<0.00016	120.00	0.0069	0.037	0.00140	35.000	<0.000049	<0.0049	2.10	0.00074	4.00	0.0062
	08/30/13	96.0	0.00068(J)	<0.00016	110.00	0.0076	<0.014	0.00048(J)	34.000	<0.000049	<0.0049	1.70	0.00130	3.80	0.0057(J)
	Statistical Computations	Minimum	0.00058	<0.00016	29.90	0.0020	<0.014	0.00048	34.000	<0.000049	<0.0049	1.70	0.00074	2.01	0.0057
		Maximum	0.00068	<0.00016	120.00	0.0150	0.037	0.00140	35.000	<0.000049	<0.0049	2.10	0.00130	8.40	0.0062
		Median	0.00063	<0.00016	105.50	0.0065	0.022	0.00094	34.500	<0.000049	<0.0049	1.90	0.00102	3.90	0.0060
		Average	0.00063	<0.00016	99.95	0.0072	0.022	0.00094	34.500	<0.000049	<0.0049	1.90	0.00102	4.32	0.0060

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-10	05/20/09	—	—	—	173.00	0.0200	—	—	—	—	—	—	—	9.42	—
	10/02/09	—	—	—	120.00	0.0030	—	—	—	—	—	—	—	6.57	—
	06/22/10	—	—	—	103.60	0.0340	—	—	—	—	—	—	—	6.73	—
	10/13/10	—	—	—	108.70	0.0090	—	—	—	—	—	—	—	9.43	—
	06/16/11	—	—	—	151.38	0.0130	—	—	—	—	—	—	—	9.93	—
	12/07/13	—	—	—	174.00	0.0150	—	—	—	—	—	—	—	10.50	—
	04/11/12	—	—	—	45.90	0.0370	—	—	—	—	—	—	—	13.20	—
	11/13/12	—	—	—	141.00	0.0070	—	—	—	—	—	—	—	18.80	—
	06/26/13	71.0	<0.00025	<0.00016	130.00	0.0240	0.036	0.00130	35.000	<0.000049	<0.0049	2.20	0.00042	9.60	0.0210
	08/29/13	71.0	<0.00025	<0.00016	120.00	0.0240	<0.014	0.00071(J)	33.000	<0.000049	<0.0049	1.50	0.00120	9.30	0.0230
	Statistical Computations	Minimum	<0.00025	<0.00016	45.90	0.0030	<0.014	0.00071	33.000	<0.000049	<0.0049	1.50	0.00042	6.57	0.0210
		Maximum	<0.00025	<0.00016	174.00	0.0370	0.036	0.00130	35.000	<0.000049	<0.0049	2.20	0.00120	18.80	0.0230
		Median	<0.00025	<0.00016	125.00	0.0175	0.022	0.00101	34.000	<0.000049	<0.0049	1.85	0.00081	9.52	0.0220
		Average	<0.00025	<0.00016	126.76	0.0186	0.022	0.00101	34.000	<0.000049	<0.0049	1.85	0.00081	10.35	0.0220

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	---	1.3	---	0.015	---	0.002	0.10	---	0.050	---	---
MW-11	05/20/09	---	---	---	296.00	0.0060	---	---	---	---	---	---	---	16.40	---
	10/02/09	---	---	---	261.60	0.0070	---	---	---	---	---	---	---	17.50	---
	06/22/10	---	---	---	249.00	0.0100	---	---	---	---	---	---	---	26.20	---
	10/13/10	---	---	---	275.10	0.0050	---	---	---	---	---	---	---	24.97	---
	06/16/11	---	---	---	279.43	0.0070	---	---	---	---	---	---	---	31.86	---
	12/07/13	---	---	---	336.00	0.0040	---	---	---	---	---	---	---	33.70	---
	04/12/12	---	---	---	264.00	0.0210	---	---	---	---	---	---	---	38.70	---
	11/14/12	---	---	---	338.00	<0.00100	---	---	---	---	---	---	---	50.00	---
	06/27/13	66.0	0.00067	<0.00016	300.00	0.0039	0.021	0.00065	93.000	<0.000049	<0.0049	3.90	0.00740	27.00	0.0050
	08/28/13	66.0	0.00096(J)	<0.00016	290.00	0.0044	<0.014	0.00047(J)	93.000	<0.000049	<0.0049	3.30	0.00750	28.00	0.0078(J)
	Statistical Computations	Minimum	0.00067	<0.00016	249.00	<0.0010	<0.014	0.00047	93.000	<0.000049	<0.0049	3.30	0.00740	16.40	0.0050
		Maximum	0.00096	<0.00016	338.00	0.0210	0.021	0.00065	93.000	<0.000049	<0.0049	3.90	0.00750	50.00	0.0078
		Median	0.00082	<0.00016	284.72	0.0055	0.014	0.00056	93.000	<0.000049	<0.0049	3.60	0.00745	27.50	0.0064
		Average	0.00082	<0.00016	288.91	0.0069	0.014	0.00056	93.000	<0.000049	<0.0049	3.60	0.00745	29.43	0.0064

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION   487 CORN CREEK ROAD   BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------ Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-12	05/20/09	—	—	—	243.00	0.0100	—	—	—	—	—	—	—	6.15	—
	10/02/09	—	—	—	218.00	0.0010	—	—	—	—	—	—	—	6.91	—
	06/22/10	—	—	—	189.00	0.0160	—	—	—	—	—	—	—	8.50	—
	10/13/10	—	—	—	187.00	0.0040	—	—	—	—	—	—	—	7.92	—
	06/14/11	—	—	—	170.00	0.0040	—	—	—	—	—	—	—	11.43	—
	12/07/11	—	—	—	152.00	0.0040	—	—	—	—	—	—	—	9.51	—
	04/12/12	—	—	—	63.50	0.0130	—	—	—	—	—	—	—	12.50	—
	11/14/12	—	—	—	120.00	<0.0010	—	—	—	—	—	—	—	14.60	—
	06/27/13	67.0	<0.00025	<0.00016	140.00	0.0035	0.031	0.00450	41.000	<0.000049	<0.0049	1.90	<0.00038	7.40	0.0055
	08/29/13	67.0	<0.00025	<0.00016	130.00	0.0046	<0.014	0.00079(J)	42.000	<0.000049	<0.0049	1.10	0.00085(J)	6.60	0.0028(J)
	Statistical Computations	Minimum	<0.00025	<0.00016	63.50	<0.00100	<0.014	0.00079	41.000	<0.000049	<0.0049	1.10	<0.00038	6.15	0.0028
		Maximum	<0.00025	<0.00016	243.00	0.0160	0.031	0.00450	42.000	<0.000049	<0.0049	1.90	0.00085	14.60	0.0055
		Median	<0.00025	<0.00016	161.00	0.0040	0.019	0.00265	41.500	<0.000049	<0.0049	1.50	0.00052	8.21	0.0042
		Average	<0.00025	<0.00016	161.25	0.0061	0.019	0.00265	41.500	<0.000049	<0.0049	1.50	0.00052	9.15	0.0042

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-13	09/29/09	—	—	—	122.00	—	—	—	—	—	—	—	—	4.91	—
	06/23/10	—	—	—	114.80	—	—	—	—	—	—	—	—	2.44	—
	06/14/11	—	—	—	130.38	—	—	—	—	—	—	—	—	5.24	—
	04/10/12	—	—	—	29.20	0.0060	—	—	—	—	—	—	—	6.54	—
	06/24/13	105.5	<0.00025	<0.00016	140.00	0.0016	0.067	0.00082	43.000	<0.000049	<0.0049	2.10	<0.00038	4.60	<0.0026
	08/28/13	105.5	<0.00025	<0.00016	130.00	<0.00052	0.014(J)	<0.00024	42.000	<0.000049	<0.0049	1.10	0.00048(J)	3.80	<0.0026
	Statistical Computations	Minimum	<0.00025	<0.00016	29.20	<0.00052	0.014	<0.00024	42.000	<0.000049	<0.0049	1.10	<0.00038	2.44	<0.0026
		Maximum	<0.00025	<0.00016	140.00	0.0060	0.067	0.00082	43.000	<0.000049	<0.0049	2.10	0.00048	6.54	<0.0026
		Median	<0.00025	<0.00016	126.00	0.0016	0.041	0.00047	42.500	<0.000049	<0.0049	1.60	0.00034	4.76	<0.0026
		Average	<0.00025	<0.00016	111.06	0.0026	0.041	0.00047	42.500	<0.000049	<0.0049	1.60	0.00034	4.59	<0.0026
MW-14	09/30/09	—	—	—	129.00	—	—	—	—	—	—	—	—	3.85	—
	06/23/10	—	—	—	116.20	—	—	—	—	—	—	—	—	2.58	—
	06/14/11	—	—	—	149.23	—	—	—	—	—	—	—	—	4.95	—
	04/10/12	—	—	—	31.80	0.0050	—	—	—	—	—	—	—	6.60	—
	06/24/13	95.5	0.00025	<0.00016	140.00	<0.00052	0.080	<0.00024	42.000	<0.000049	<0.0049	1.90	<0.00038	4.40	<0.0026
	08/28/13	95.5	<0.00025	<0.00016	130.00	<0.00052	0.037(J)	<0.00024	41.000	<0.000049	<0.0049	1.00	<0.00038	3.70	<0.0026
	Statistical Computations	Minimum	<0.00025	<0.00016	31.80	<0.00052	0.037	<0.00024	41.000	<0.000049	<0.0049	1.00	<0.00038	2.58	<0.0026
		Maximum	0.00250	<0.00016	149.23	0.0050	0.080	<0.00024	42.000	<0.000049	<0.0049	1.90	<0.00038	6.60	<0.0026
		Median	0.00131	<0.00016	129.50	0.0003	0.059	<0.00024	41.500	<0.000049	<0.0049	1.45	<0.00038	4.13	<0.0026
		Average	0.00131	<0.00016	116.04	0.0018	0.059	<0.00024	41.500	<0.000049	<0.0049	1.45	<0.00038	4.35	<0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	—	1.3	—	0.015	—	0.002	0.10	—	0.050	—	—
MW-15	09/30/09	—	—	—	750.00	—	—	—	—	—	—	—	—	64.40	—
	06/23/10	—	—	—	400.10	—	—	—	—	—	—	—	—	40.60	—
	06/14/11	—	—	—	873.08	—	—	—	—	—	—	—	—	15.35	—
	04/10/12	—	—	—	710.00	0.0060	—	—	—	—	—	—	—	68.80	—
	06/25/13	120.5	0.00270	<0.00016	720.00	0.0013	0.046	0.00049	360.000	<0.000049	<0.0049	7.60	0.01200	72.00	<0.0026
	08/28/13	120.5	0.00940	0.00037(J)	720.00	0.00140(J)	0.092(J)	0.00077(J)	380.000	<0.000049	<0.0049	6.60	0.01400	73.00	0.0033(J)
	Statistical Computations	Minimum	0.00270	<0.00016	400.10	0.0013	0.046	0.00049	360.000	<0.000049	<0.0049	6.60	0.01200	15.35	<0.0026
		Maximum	0.00940	0.00037	873.08	0.0060	0.092	0.00077	380.000	<0.000049	<0.0049	7.60	0.01400	73.00	0.0033
		Median	0.00605	0.00023	720.00	0.0014	0.069	0.00063	370.000	<0.000049	<0.0049	7.10	0.01300	66.60	0.0023
		Average	0.00605	0.00023	695.53	0.0029	0.069	0.00063	370.000	<0.000049	<0.0049	7.10	0.01300	55.69	0.0023
MW-16	09/30/09	—	—	—	266.40	—	—	—	—	—	—	—	—	8.27	—
	06/23/10	—	—	—	273.30	—	—	—	—	—	—	—	—	8.27	—
	06/14/11	—	—	—	430.29	—	—	—	—	—	—	—	—	12.63	—
	04/11/12	—	—	—	447.00	0.0070	—	—	—	—	—	—	—	17.50	—
	06/26/13	105.5	0.00170	<0.00016	440.00	<0.00052	0.072	<0.00024	120.000	<0.000049	<0.0049	2.70	0.00590	13.00	<0.0026
	08/28/13	105.5	0.00230	0.00035(J)	430.00	0.00053(J)	<0.014	0.00050(J)	110.000	<0.000049	<0.0049	2.30	0.00510	13.00	0.0039(J)
	Statistical Computations	Minimum	0.00170	<0.00016	266.40	<0.00052	<0.014	<0.00024	110.000	<0.000049	<0.0049	2.30	0.00510	8.27	<0.0026
		Maximum	0.00230	0.00035	447.00	0.0070	0.072	0.00050	120.000	<0.000049	<0.0049	2.70	0.00590	17.50	0.0039
		Median	0.00200	0.00022	430.14	0.0005	0.040	0.00031	115.000	<0.000049	<0.0049	2.50	0.00550	12.81	0.0026
		Average	0.00200	0.00022	381.16	0.0026	0.040	0.00031	115.000	<0.000049	<0.0049	2.50	0.00550	12.11	0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification ------- Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	---	1.3	---	0.015	---	0.002	0.10	---	0.050	---	---
MW-17	09/30/09	---	---	---	386.90	---	---	---	---	---	---	---	---	28.00	---
	06/23/10	---	---	---	339.60	---	---	---	---	---	---	---	---	28.40	---
	06/16/11	---	---	---	532.50	---	---	---	---	---	---	---	---	9.30	---
	04/12/12	---	---	---	377.00	0.0110	---	---	---	---	---	---	---	49.20	---
	06/26/13	139.9	0.00090	<0.00016	390.00	0.0013	0.810	0.00053	120.000	<0.000049	0.0093	2.80	0.00540	37.00	0.0038
	08/28/13	139.9	0.00150	0.00039(J)	380.00	0.00075(J)	0.600	0.00050(J)	120.000	<0.000049	<0.0049	2.70	0.00460	38.00	0.0049(J)
	Statistical Computations	Minimum	0.00090	<0.00016	339.60	0.0008	0.600	0.00050	120.000	<0.000049	<0.0049	2.70	0.00460	9.30	0.0038
		Maximum	0.00150	0.00039	532.50	0.0110	0.810	0.00053	120.000	<0.000049	0.0093	2.80	0.00540	49.20	0.0049
		Median	0.00120	0.00024	383.45	0.0013	0.705	0.00052	120.000	<0.000049	0.0059	2.75	0.00500	32.70	0.0044
		Average	0.00120	0.00024	401.00	0.0044	0.705	0.00052	120.000	<0.000049	0.0059	2.75	0.00500	31.65	0.0044
MW-18	09/30/09	---	---	---	82.00	---	---	---	---	---	---	---	---	9.93	---
	06/23/10	---	---	---	70.40	---	---	---	---	---	---	---	---	6.16	---
	06/16/11	---	---	---	96.20	---	---	---	---	---	---	---	---	9.95	---
	04/12/12	---	---	---	49.00	0.0080	---	---	---	---	---	---	---	13.70	---
	06/26/13	127.5	0.00063	<0.00016	76.00	<0.00052	0.750	<0.00024	18.000	<0.000049	<0.0049	1.40	0.00056	7.60	<0.0026
	08/29/13	127.5	0.00090(J)	0.00038(J)	74.00	0.00057(J)	0.680	0.00047(J)	18.000	<0.000049	<0.0049	1.10	0.00100	7.40	<0.0026
	Statistical Computations	Minimum	0.00063	<0.00016	49.00	<0.00052	0.680	<0.00024	18.000	<0.000049	<0.0049	1.10	0.00056	6.16	<0.0026
		Maximum	0.00090	0.00038	96.20	0.0080	0.750	0.00047	18.000	<0.000049	<0.0049	1.40	0.00100	13.70	<0.0026
		Median	0.00077	0.00023	75.00	0.0006	0.715	0.00030	18.000	<0.000049	<0.0049	1.25	0.00078	8.77	<0.0026
		Average	0.00077	0.00023	74.60	0.0029	0.715	0.00030	18.000	<0.000049	<0.0049	1.25	0.00078	9.12	<0.0026

TABLE 3: SUMMARY OF DETECTED CONSTITUENTS IN GROUNDWATER: METALS (TOTAL INORGANICS)

TRIMBLE COUNTY GENERATING STATION 487 CORN CREEK ROAD BEDFORD, KENTUCKY

ANALYTICAL METHOD			SW846 6020		SW846 6010B	SW846 6020	SW846 6010B	SW846 6020	SW846 6010B	SW846 7470A	SW846 6010B		SW846 6020 Mod	SW846 6010B	SW846 6020
ANALYTICAL PARAMETER			Total Inorganics												
Sample Identification — Location	Date	Collection Depth (ft btoc)	Arsenic	Cadmium	Calcium	Copper	Iron	Lead	Magnesium	Mercury	Nickel	Potassium	Selenium	Sodium	Zinc
USEPA MCLs (mg/L)			0.01000	0.005	---	1.3	---	0.015	---	0.002	0.10	---	0.050	---	---
MW-19	09/30/09	---	---	---	66.20	---	---	---	---	---	---	---	---	5.04	---
	06/23/10	---	---	---	59.50	---	---	---	---	---	---	---	---	3.00	---
	06/16/11	---	---	---	82.46	---	---	---	---	---	---	---	---	6.31	---
	04/12/12	---	---	---	38.20	0.0070	---	---	---	---	---	---	---	8.67	---
	06/25/13	119.0	0.00044(J)	<0.00016	69.00	0.00100(J)	0.090(J)	0.00066(J)	21.000	<0.000049	<0.0049	2.20	<0.00038	5.30	<0.0026
	08/29/13	119.0	0.00072(J)	0.00036(J)	68.00	0.00110(J)	0.041(J)	0.00063(J)	20.000	<0.000049	<0.0049	1.90	0.00077(J)	5.50	<0.0026
	Statistical Computations	Minimum	0.00044	<0.00016	38.20	0.0010	0.041	0.00063	20.000	<0.000049	<0.0049	1.90	<0.00038	3.00	<0.0026
		Maximum	0.00072	0.00036	82.46	0.0070	0.090	0.00066	21.000	<0.000049	<0.0049	2.20	0.00077	8.67	<0.0026
		Median	0.00058	0.00022	67.10	0.0011	0.066	0.00065	20.500	<0.000049	<0.0049	2.05	0.00048	5.40	<0.0026
		Average	0.00058	0.00022	63.89	0.0030	0.066	0.00065	20.500	<0.000049	<0.0049	2.05	0.00048	5.64	<0.0026

Notes:

All units reported as milligrams per liter (mg/L), unless otherwise noted.

--- = No Data or value reported

USEPA MCLs = USEPA Maximum Contaminant Levels for Drinking Water.

ft btoc = feet below top of casing.

DUP = Duplicate sample.

SW846 6010B = USEPA SW846 Method 6010B laboratory analyses for metals.

SW846 6020 = USEPA SW846 Method 6020 laboratory analyses for metals.

SW846 7470A = USEPA SW846 Method 7470A laboratory analyses for Mercury.

Sample collection depth varied per well per sampling event due to changes in water table elevation relative to the screened interval of each well.

(J) = Estimated value. Result is > than Method Detection Limit (MDL) but < Reporting Detection Limit (RDL).

(*) Denotes field filtered sample analyzed for dissolved fraction constituents.

Bold and Highlighted values exceed USEPA MCLs

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.** ______ **Quarter & Year** 2nd 2014

Please check only ONE of the following:

___Characterization ___Quarterly _X_ Semi-Annual ___Annual ___Assessment

Please check applicable submittal: _X_ Groundwater ___Surface Water

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

______________________ SIGNATURE

11-12-14
DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 7/15-17, 8/15/2014 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road Bedford 40006
Street City Zip

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 Louisville 40032
Street City Zip

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road Bedford 40006
Street City Zip

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East Ghent 41045
Street City Zip

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Mr. Ken Ford Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard Louisville, KY 40213
Street City Zip

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	1	2	3	13
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	7/15/14 11:11	7/15/14 13:09	7/15/14 13:41	8/6/14 11:12
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	7/15-28/14	7/15-28/14	7/15-28/14	8/6-9/15/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	420.68		421.90		420.95		420.92	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<25		<25		<25		DNS	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.7		2.1		1.7		DNS	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	25.4		6.70		29.9		726	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	436		350		608		4,517	
S0296- -	0	pH	T	units	150.1	7.19		7.13		7.09		7.04	
7440-50-8	0	Copper	D	MG/L	200.7	0.001		0.001		0.006		<0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	0.038		0.386		1.24		113	
7440-70-2	0	Calcium	T	MG/L	200.7	99.7		91.7		164		663	
7440-23-5	0	Sodium	T	MG/L	200.7	9.0		7.6		5.9		104	
	0	Sulfate	T	MG/L	300.0	33.3		20.0		141		2,011	

Division of Waste Management
Solid Waste Branch
14 Reilly Road
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	4	5	6	7
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	7/16/14 10:56	7/16/14 11:20	7/16/14 13:13	7/16/14 13:33
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	7/16-28/14	7/16-28/14	7/16-28/14	7/16-28/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.30		421.10		421.58		421.75	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<25		<25		<25		<25	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.6		0.6		0.7		0.6	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	191		27.6		143		324	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,216		504		1,052		2,496	
S0296- -	0	pH	T	units	150.1	7.43		7.24		7.23		7.09	
7440-50-8	0	Copper	D	MG/L	200.7	0.007		0.007		0.016		0.003	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	10.8		0.660		5.20		21.7	
7440-70-2	0	Calcium	T	MG/L	200.7	202		105		203		393	
7440-23-5	0	Sodium	T	MG/L	200.7	26.8		5.30		12.5		38.3	
	0	Sulfate	T	MG/L	300.0	391		65.5		250		1,136	

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	8	9	10	11
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	7/16/14 13:56	7/17/14 9:57	7/17/14 10:31	7/17/14 11:04
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	7/16-28/14	7/17-28/14	7/17-28/14	7/17-28/14
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	422.18		422.53		421.90		422.53	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<25		<25		<25		<25	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.8		0.6		0.7		0.6	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	52.8		69.2		55.4		33.3	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	468		583		1,404		560	
S0296- -	0	pH	T	units	150.1	7.42		7.12		7.09		7.26	
7440-50-8	0	Copper	D	MG/L	200.7	0.010		0.011		0.003		0.004	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
	0	Boron	T	MG/L	200.7	1.11		0.363		1.7		0.720	
7440-70-2	0	Calcium	T	MG/L	200.7	130		133		254		124	
7440-23-5	0	Sodium	T	MG/L	200.7	4.9		9.1		21.4		6.9	
	0	Sulfate	T	MG/L	300.0	141		82.9		629		127	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** ~~2nd~~ 4TH QTR 2014

Please check only ONE of the following:

___Characterization ___Quarterly X Semi-Annual ___Annual ___Assessment

Please check applicable submittal: **X Groundwater ___Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

SIGNATURE 3-27-15
DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 7/15-17, 8/15/2014 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	9	7	8	13
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/10/14 10:00	12/9/14 13:05	12/9/14 13:30	12/11/14 13:15
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	12/10/14-3/17/15	12/9/14-3/17/15	12/9/14-3/17/15	12/11/14-3/17/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	426.99		428.79		426.74		426.77	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0		<8.0		<8.0		<8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.69		2.2		1.4		0.76	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	26.7		5.50		29.8		655	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	418		412		652		4,452	
S0296- -	0	pH	T	units	150.1	7.34		7.09		7.09		7.09	
7440-50-8	0	Copper	D	MG/L	200.8	0.001		<0.001		0.003		0.001	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2R		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	<0.001		0.014		0.002		0.018	
7440-42-8	0	Boron	T	MG/L	200.8	0.053		0.062		1.87		3.80	
7440-70-2	0	Calcium	T	MG/L	200.8	75.0		83.0		122		592	
7440-23-5	0	Sodium	T	MG/L	200.8	12.0		9.00		6.00		80.0	
	0	Sulfate	T	MG/L	300.0	40.90		13.80		155.3		2,260	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	4	3	2
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/9/14 10:55	12/9/14 10:35	12/9/14 10:10	12/9/14 9:50
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	12/9/14-3/17/15	12/9/14-3/17/15	12/9/14-3/17/15	12/9/14-3/17/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	425.04		424.15		423.10		423.24	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0		<8.0		<8.0		<8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	1.0		1.3		1.0		0.73	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	212		206		193		422	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,232		1,284		1,071		2,880	
S0296- -	0	pH	T	units	150.1	7.17		7.07		7.10		7.00	
7440-50-8	0	Copper	D	MG/L	200.8	0.006		0.009		0.012		0.002	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.010		0.007		0.007		0.011	
7440-42-8	0	Boron	T	MG/L	200.8	9.70		11.5		9.80		25.1	
7440-70-2	0	Calcium	T	MG/L	200.8	201		170		161		358	
7440-23-5	0	Sodium	T	MG/L	200.8	30.0		26.0		18.0		44.0	
	0	Sulfate	T	MG/L	300.0	432.8		411.6		295.7		1,313	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	1	10	11	6
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	12/9/14 8:55	12/10/14 10:40	12/10/14 13:20	12/9/14 11:25
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	12/9/14-3/17/15	12/10/14-3/17/15	12/10/14-3/17/15	12/9/14-3/17/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	422.30		421.67		424.28		422.27	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<8.0		<8.0		<8.0		<8.0	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.69		0.77		0.72		0.62	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	67.3		91.1		69.2		38.6	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	720		710		1,542		656	
S0296- -	0	pH	T	units	150.1	7.21		7.38		7.04		7.18	
7440-50-8	0	Copper	D	MG/L	200.8	0.004		0.009		0.002		0.002	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.006		0.006		0.004		0.001	
7440-42-8	0	Boron	T	MG/L	200.8	2.10		1.40		2.20		1.00	
7440-70-2	0	Calcium	T	MG/L	200.8	124		130		242		96.0	
7440-23-5	0	Sodium	T	MG/L	200.8	5.00		13.0		29.0		8.00	
	0	Sulfate	T	MG/L	300.0	200.9		110.4		707.8		149.7	

GROUNDWATER
AND
SURFACE WATER MONITORING
SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 3^{rd} 2015

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** X **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler — 9-24-15
SIGNATURE — DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 8/6/2015 County: Trimble Permit No.: 112-00003

Facility Name: Louisville Gas & Electric Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: Louisville Gas and Electric Company Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: Louisville Gas & Electric Co. - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	3	4	1	2
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	8/5/15 8:16	8/5/15 8:40	8/4/15 13:28	8/4/15 13:49
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	8/5-20/15	8/5-20/15	8/4-20/15	8/4-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.05		422.53		421.41		421.41	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		5.6		<4.4		10	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.81		2.0		1.3		1.2	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	29.4		6.40		22.1		715	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	406		380		556		4,556	
S0296- -	0	pH	T	units	150.1	7.31		7.10		7.04		7.03	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2R		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	<0.001		0.015		<0.001		0.003	
7440-42-8	0	Boron	T	MG/L	200.8	<0.500		<0.500		1.60		96	
7440-70-2	0	Calcium	T	MG/L	200.8	120		100		150		700	
7440-23-5	0	Sodium	T	MG/L	200.8	8.7		7.5		4.8		84	
	0	Sulfate	T	MG/L	300.0	36.9		4.10		127		2,216	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	6	7	8	9
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	8/5/15 10:39	8/5/15 11:00	8/5/15 11:20	8/5/15 11:41
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	8/5-20/15	8/5-20/15	8/5-20/15	8/5-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.98		422.21		423.29		423.35	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		<4.4		10		<4.4	
S0268- -	0	Organic Carbon	T	MG/L	415.1	2.3		1.0		0.71		0.73	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	240		168.9		67.1		294	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,346		1,090		866		2,280	
S0296- -	0	pH	T	units	150.1	7.14		7.08		7.13		7.05	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0025		0.0023		<0.001		0.0024	
7440-42-8	0	Boron	T	MG/L	200.8	49		14		8.0		22	
7440-70-2	0	Calcium	T	MG/L	200.8	260		230		200		270	
7440-23-5	0	Sodium	T	MG/L	200.8	25		13		11		25	
	0	Sulfate	T	MG/L	300.0	442		353		243		982	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	10	5	11	12
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	8/6/15 8:40	8/5/15 9:41	8/6/15 10:04	8/6/15 10:21
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	8/6-20/15	8/5-20/15	8/6-15/20	8/6-20/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	424.39		426.13		423.86		426.30	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	11		<4.4		6.3		4.9	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.76		0.58		0.57		<0.50	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	136		81.2		60.4		43.8	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	869		678		1,346		626	
S0296- -	0	pH	T	units	150.1	7.18		7.08		7.08		7.30	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

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B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number:

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0013		<0.001		<0.001		<0.001	
7440-42-8	0	Boron	T	MG/L	200.8	2.1		1.2		6.2		1.1	
7440-70-2	0	Calcium	T	MG/L	200.8	200		170		300		150	
7440-23-5	0	Sodium	T	MG/L	200.8	5.6		8.9		22		6.5	
	0	Sulfate	T	MG/L	300.0	233		128		1,290		151	

GROUNDWATER AND SURFACE WATER MONITORING SAMPLE DATA REPORTING FORM

NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
DIVISION OF WASTE MANAGEMENT
SOLID WASTE BRANCH
200 FAIR OAKS LANE
FRANKFORT, KY 40601

Facility Name Trimble County Station **Activity** Ash Pond
(As officially shown on DWM Permit Face)

Permit No. 112-00003 **Finds/Unit No.**________ **Quarter & Year** 4^{th} 2015

Please check only ONE of the following:

___ **Characterization** ___ **Quarterly** X **Semi-Annual** ___ **Annual** ___ **Assessment**

Please check applicable submittal: X **Groundwater** ___ **Surface Water**

This form is to be utilized by those sites required by regulation (Kentucky Waste Management Regulations - 401 KAR 48:300 and 45:160) or by statue (Kentucky Revised Statues Chapter 224) to conduct groundwater and surface water monitoring under the jurisdiction of the Division of Waste Management. **You must report any indication of contamination within forty-eight (48) hours of making the determination using statistical analyses, direct comparison, or other similar techniques. Submitting the lab report is NOT considered notification.** Instructions for completing the form are attached. Do not submit the instruction pages.

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for such violations.

W. Michael Winkler 12-9-15
SIGNATURE DATE

W. Michael Winkler-Manager of Environmental Programs
NAME AND TITLE - PLEASE PRINT

FACILITY INFORMATION SHEET

Sampling Date: 11/11-12/2015 County: Trimble Permit No.: 112-00003

Facility Name: LG&E - Trimble County Station
(As officially shown on DWM Permit Face)

Site Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

Phone No.: (502) 627-4659 Latitude N 38° 35' 30" Longitude W 85° 25' 00"

OWNER INFORMATION

Facility Owner: LG&E Phone No.: (502) 627-4659

Contact Person: W. Paul Puckett Phone No.: (502) 627-4659

Contact Person Title: Senior Engineer, LG&E & KU Environmental Affairs Department

Mailing Address: P.O.Box 32010 (Street) Louisville (City) 40032 (Zip)

SAMPLING PERSONNEL

(IF OTHER THAN LANDFILL OR LABORATORY)

Company: LG&E - Trimble County Station Laboratory

Contact Person: Adam Raker Phone No.: (502) 627-6204

Mailing Address: 487 Corn Creek Road (Street) Bedford (City) 40006 (Zip)

LABORATORY RECORD #1

Laboratory: LG&E/KU System Laboratory Lab ID No.:

Contact Person: Ed Raker, Laboratory Supervisor Phone No.: (502) 347-4187

Mailing Address: 8815 Highway 42 East (Street) Ghent (City) 41045 (Zip)

LABORATORY RECORD #2

Laboratory: Microbac Laboratories, Inc. Lab ID No.:

Contact Person: Ms. Laura Revlett Phone No.: (502) 962-6400

Mailing Address: 3323 Gilmore Industrial Boulevard (Street) Louisville, KY (City) 40213 (Zip)

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6326	8001-6327	8001-6334	8001-6335
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-1	MW-2R	MW-3	MW-4
Sample Sequence #	1	2	3	4
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/11/15 14:03	11/11/15 14:21	11/11/15 14:45	11/11/15 15:00
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/11-30/15	11/11-30/15	11/11-30/15	11/11-30/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Up	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.05		422.50		421.06		420.84	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,333		858		2,067	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		7.7		6.0		6.3	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.63		1.8		1.1		2.9	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	26.8		4.90		20.2		733	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	380		326		526		4,724	
S0296- -	0	pH	T	units	150.1	7.32		6.98		7.10		7.05	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

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[2]Respond "Y" if the sample was a duplicate of another sample in this report.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6326		8001-6327		8001-6334		8001-6335	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-1		MW-2R		MW-3		MW-4	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	<0.001		0.021		<0.001		0.008	
7440-42-8	0	Boron	T	MG/L	200.8	<0.50		<0.50		2.0		65	
7440-70-2	0	Calcium	T	MG/L	200.8	110		97		140		700	
7440-23-5	0	Sodium	T	MG/L	200.8	9.5		8.6		6.5		100	
	0	Sulfate	T	MG/L	300.0	33.1		5.70		113		2,261	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable / 1
LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6333	8001-6332	8001-6330	8001-6331
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-5	MW-6	MW-7	MW-8
Sample Sequence #	5	6	7	8
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/11/15 15:20	11/12/15 8:05	11/12/15 8:30	11/12/15 8:45
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/11-30/15	11/12-30/15	11/12-12/2/15	11/12-12/2/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Down	Down	Down

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	420.72		420.82		421.22		421.16	
S0145- -	1	Specific Conductance	T	MG/L	120.1	1,146		657		659		3,340	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		<4.4		<4.4		<4.4	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.96		0.58		0.74		0.98	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	226		76.1		126		352	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	1,346		526		1,032		2,604	
S0296- -	0	pH	T	units	150.1	7.16		7.18		7.06		7.01	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		<0.020		<0.020	

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[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
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STANDARD FLAGS:
J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6333		8001-6332		8001-6330		8001-6331	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-5		MW-6		MW-7		MW-8	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0030		<0.001		<0.001		0.0040	
7440-42-8	0	Boron	T	MG/L	200.8	13		2.1		7.3		50	
7440-70-2	0	Calcium	T	MG/L	200.8	270		160		240		360	
7440-23-5	0	Sodium	T	MG/L	200.8	27		8.0		14		35	
	0	Sulfate	T	MG/L	300.0	418		116		338		1,134	

Division of Waste Management
Solid Waste Branch, 2nd Floor
200 Fair Oaks Lane
/ 1
Frankfort, KY 40601 (502)564-6716

SP. WASTE/COAL COMBUSTION-QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable

LAB ID:
For Official Use Only

GROUNDWATER SAMPLE ANALYSIS (S)

AKGWA NUMBER[1], Facility Well/Spring Number	8001-6329	8001-6328	8001-6336	8001-6337
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)	MW-9	MW-10	MW-11	MW-12
Sample Sequence #	9	10	11	12
If sample is a Blank, specify Type: (F)ield, (T)rip, (M)ethod, or (E)quipment	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Sample Date and Time (Month/Day/Year hour:minutes)	11/12/15 10:05	11/12/15 10:32	11/12/15 10:54	11/12/15 13:18
Duplicate ("Y" or "N")[2]	No	No	No	No
Split ("Y" or "N")[3]	No	No	No	No
Facility Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Laboratory Sample ID Number (if applicable)	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Date of Analysis (Month/Day/Year)	11/12-12/2/15	11/12-12/2/15	11/12-12/2/15	11/12-12/2/15
Gradient with respect to Monitored Unit (UP, DOWN, SIDE, UNKNOWN)	Down	Side	Side	Side

CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
S0906 - -	0	Static Water Level Elevation	T	Ft. MSL	Fld. Meas.	421.40		421.14		421.11		421.38	
S0145- -	1	Specific Conductance	T	MG/L	120.1	654		1,045		1,617		1,314	
S0130- -	0	Chemical Oxygen Demand	T	MG/L	410.1	<4.4		<4.4		<4.4		<4.4	
S0268- -	0	Organic Carbon	T	MG/L	415.1	0.60		0.50		<0.50		4.6	
16887-00-6	2	Chloride(s)	T	MG/L	300.0	90.8		57.0		42.8		34.0	
S0266- -	0	Total Dissolved Solids	T	MG/L	160.1	778		578		1,214		577	
S0296- -	0	pH	T	units	150.1	7.16		7.07		6.89		7.09	
7440-50-8	0	Copper	D	MG/L	200.8	<0.020		<0.020		0.021		<0.020	

STANDARD FLAGS:

[1]AKGWA # is 0000-0000 for any type of blank.
[2]Respond "Y" if the sample was a duplicate of another sample in this report.
[3]Respond "Y" if the sample was split and analyzed by separate laboratories.
[4]Chemical Abstracts Service Registry Number or unique identifier number assigned by agency.
[5]"T" = Total; "D" = Dissolved
[6]"<" indicates a non-detect; do not use "ND" or "BDL". Value then shown is Practical Quantification Limit

J = Estimated Value
B = Analyte found in blank
A = Average value
N = Presumptive ID
D = Concentration from analysis of a secondary dilution factor

SP. WASTE/COAL COMBUSTION - QUARTERLY
Facility: LG&E Trimble County Station
Permit Number: 112-00003

FINDS/UNIT: Not Applicable / 1
LAB ID:
For official Use only

GROUNDWATER SAMPLE ANALYSIS - (Cont.)

AKGWA NUMBER[1], Facility Well/Spring Number						8001-6329		8001-6328		8001-6336		8001-6337	
Facility's Local Well or Spring Number (e.g. MW-1, MW-2, etc.)						MW-9		MW-10		MW-11		MW-12	
CAS RN[4]		CONSTITUENT	T D[5]	Unit OF MEASURE	METHOD	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS	DETECTED VALUE OR PQL[6]	FLAGS
7440-38-2	0	Arsenic	T	MG/L	6020A	0.0010		<0.001		<0.001		<0.001	
7440-42-8	0	Boron	T	MG/L	200.8	2.0		1.1		2.5		1.3	
7440-70-2	0	Calcium	T	MG/L	200.8	170		140		250		130	
7440-23-5	0	Sodium	T	MG/L	200.8	5.7		11		18		7.6	
	0	Sulfate	T	MG/L	300.0	202		78.7		482		130	

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY FOR CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY AND APPROVAL OF ITS 2016 COMPLIANCE PLAN FOR RECOVERY BY ENVIRONMENTAL SURCHARGE	**))))))**	**CASE NO. 2016-00027**

DIRECT TESTIMONY OF
CHARLES R. SCHRAM
DIRECTOR, ENERGY PLANNING, ANALYSIS, AND FORECASTING
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is Charles R. Schram. I am the Director – Energy Planning, Analysis & Forecasting for Louisville Gas and Electric Company ("LG&E" or "Company") and an employee of LG&E and KU Services Company, which provides services to LG&E and Kentucky Utilities Company ("KU") (collectively "Companies"). My business address is 220 West Main Street, Louisville, Kentucky 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Please describe your current job responsibilities.

A. I am responsible for developing the Companies' load forecast, market analysis, and long-term planning of utility generation. As it pertains to this proceeding, the Generation Planning & Analysis group performed the analyses discussed below under my direction.

Q. Have you previously testified this Commission?

A. Yes. I have previously testified before this Commission on several occasions, including in the Companies' most recent environmental cost recovery proceedings (Case Nos. 2011-00161 (KU) and 2011-00162 (LG&E)).

Q. What are the purposes of your testimony?

A. The purposes of my testimony are to explain the methods by which LG&E analyzed the projects included in its 2016 Environmental Compliance Plan ("2016 Plan"), present the analyses, and recommend Commission approval of the 2016 Plan and related certificates of public convenience and necessity ("CPCNs") and environmental cost recovery ("ECR") because the projects in the 2016 Plan are the most economical methods of complying with applicable environmental laws and regulations.

Q. What is the nature of the projects in LG&E's 2016 Plan?

A. LG&E's 2016 Plan consists of (1) adding supplemental mercury-control equipment to serve all four of the Mill Creek and one of the Trimble County coal-fired generating units; and (2) closing coal combustion residuals ("CCR") surface impoundments at the Mill Creek and Trimble County Generating Stations, along with related construction of process-water systems at Mill Creek and Trimble County.[1] These projects are explained in more detail in the testimonies of John N. Voyles, Jr. and R. Scott Straight. The testimony of Gary H. Revlett explains the various environmental requirements that necessitate these projects.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring the following exhibits:

- Exhibit CRS-1: Analysis of 2016 ECR Projects Trimble County Generating Station
- Exhibit CRS-2: Analysis of 2016 ECR Projects Mill Creek Generating Station

Analytical Approach

Q. What are the goals of the Companies' resource planning activities?

A. Resource planning starts with reliability as its objective and seeks to ensure reliability at the lowest reasonable cost and risk. Decisions about unit retirements require both compelling economics and a clear understanding of how reliability will be ensured.

[1] The CCR Rule defines CCR as "fly ash, bottom ash, boiler slag, and flue gas desulfurization materials generated from burning coal for the purpose of generating electricity by electric utilities and independent power producers." 40 CFR 257.53. This definition includes what is commonly referred to as gypsum.

Q. Please describe the analytical approach the Companies used to evaluate the projects in LG&E's 2016 Plan.

A. As Mr. Revlett explains in his testimony, there are two recently finalized federal environmental regulations that could significantly affect the Companies' coal-fired generating fleet beginning in 2022, namely the Clean Power Plan ("CPP") and the Effluent Limit Guidelines ("ELG").[2] The Companies will continue to work to understand the cost of complying with these regulations over the next 1-2 years, but today the precise means and costs of complying with the CPP and ELG are unknown.

What is known, as Mr. Revlett further explains, is that it is prudent for LG&E to begin to close all of its currently active surface impoundments (i.e., those at Mill Creek and Trimble County), and to complete those closures by the end of the year 2023, to comply with the federal Coal Combustion Residuals Final Rule ("CCR Rule"), even though no surface impoundments at Mill Creek or Trimble County have been determined to trigger closure requirements under the CCR Rule.[3] Furthermore, for the coal-fired units to continue to operate at the generating stations in which LG&E has an ownership interest (Mill Creek and Trimble County) beginning in 2019, the Companies will have to construct process-water systems at those stations for the reasons Mr. Voyles describes in his testimony.[4]

For the Mill Creek station, to avoid speculation regarding CPP and ELG compliance costs, as well as to account for the known need for process-water systems to be in place by 2019, the Companies chose to perform the cost-benefit analyses presented in this proceeding to determine if the proposed projects were economical

[2] Revlett Testimony at 14-16.
[3] Revlett Testimony at 17-18.
[4] Voyles Testimony at 16-19.

through 2021. If the Companies determine that complying with the CPP and ELG is more costly than retiring the coal units and replacing the capacity, they can likely operate the units through 2021 without incurring any CPP and ELG compliance costs. This approach differs from the Companies' typical approach of evaluating whether proposed investments are economical over a longer period, usually 30 years. In other words, the Companies' analyses show that constructing the proposed projects—even if the affected coal-fired units were retired in 2022—is economically superior to retiring the affected coal-fired units in 2019 and replacing their capacity through the end of 2021.

For Trimble County, the analysis of the process-water system is considered in the context of the longer-term outlook for the station. The Companies are planning to invest $277 million from 2016 through 2021 for a new special waste landfill, including a coal combustion residuals treatment facility ("CCRT"), in addition to the investments required for the 2016 Plan projects. While the relative benefits of these long-term investments will greatly exceed their cost, the point at which their benefits exceed their cost will occur after 2021. As a result, the Companies evaluated these projects over the Companies' standard 30-year analysis period with high-level estimates for CPP and ELG compliance costs. As discussed below, the cost of environmental compliance at Trimble County is clearly justified by the significant benefits of continuing to operate the Trimble County coal units, even when facing uncertainty about the cost of future environmental compliance.

Q. For the 30-year analysis of the Trimble County ECR projects, how did you assess CPP compliance costs?

A. For the reasons discussed in Exhibit CRS-1, the Trimble County coal units would be the last coal units the Companies would retire in a CPP compliance plan. If – at a cost of more than $3.5 billion – the Companies' Brown, Ghent, and Mill Creek coal units were retired and replaced with renewable or new natural gas-fired generation with CO_2 emissions ranging from 0 lb/MWh to approximately 1,000 lb/MWh, the Companies' generating portfolio would over-comply with any interpretation of the CPP – even if the Trimble County coal units operated at full capacity.[5] For this reason, the 30-year retirement analysis assumed no incremental cost for CPP compliance at Trimble County.

Q. When analyzing projects for which a retirement analysis was necessary, how did the Companies choose a replacement capacity cost?

A. Because the Companies could not design and construct suitable replacement capacity for any of its coal-fired units prior to 2021 or 2022, the analysis includes the purchase of replacement capacity based on the estimated cost of applicable replacement units, for the period 2019-2021. For each station, the replacement capacity portfolios were developed using resources evaluated in the Companies' 2014 Integrated Resource Plan ("IRP") to meet the Companies' target reserve margin range (16% to 21%) in 2019 through 2021. In addition, the costs of the IRP resources were used to develop the cost of the power purchase agreement for each portfolio. The analysis also includes costs for firm transmission and firm gas transportation services.

After purchasing replacement capacity through 2021, the retirement alternative in the 30-year Trimble County analysis assumes natural gas combined-

[5] The federal new source performance standard for carbon-dioxide emissions from natural-gas fired electric generating units is 1,000 lb/MWh. 80 Fed. Reg. 64,658 (Oct. 23, 2015).

cycle ("NGCC") capacity is commissioned at Trimble County in 2022 as a lowest reasonable cost resource for capacity and energy. The cost of this capacity is also taken from the Companies' 2014 IRP.

Q. For your analysis of the 2016 Plan projects for Mill Creek, why was it appropriate to analyze the projects through the end of 2021 rather than over a longer timeframe, as you did when analyzing the projects for Trimble County?

A. It was actually conservative to evaluate the 2016 Plan projects for Mill Creek only through the end of 2021. Analyzing these long-lived investments over a short timeframe ensures that the investments are economical by the end of 2021 (relative to the cost of retiring the coal-fired units in 2019). The Companies characterize this as a "no-regrets" approach because it ensures that even if LG&E determines in the next 1-2 years that retiring the Mill Creek units in 2022 is a lower cost alternative than the costs of ELG and CPP compliance, the investments proposed for Mill Creek in the 2016 Plan will have been economical relative to having retired the units in 2019.

To be clear, using this analytical approach is neither a commitment nor a prediction that LG&E will retire any or all of the coal-fired units at Mill Creek in early 2022 or later; indeed, at this time, LG&E does not have sufficient information about ELG and CPP compliance options and costs to make definitive decisions about whether or when LG&E might retire any or all of the coal-fired units at Mill Creek. But one of the advantages of this analytical approach is that it provides assurance to the Commission, LG&E, and its customers that investments in the 2016 Plan projects for Mill Creek will be money well spent regardless of whether the coal-fired units ultimately retire in 2022 or later.

Q. When analyzing the projects through 2021, are any revenue requirements considered after 2021?

A. Yes. The revenue requirements for capital costs incurred through 2021 extend through the remaining book life of the generating unit. These revenue requirements are included in the calculation of the present value of revenue requirements ("PVRR") in determining whether the projects are economical for operation of the units through 2021. However, no other production costs or other investments subsequent to 2021 are considered in the evaluation.

Q. You note in your analysis of the 2016 Plan projects for Mill Creek that all of the scenarios you analyzed involved retiring the coal-fired units, regardless of whether those retirements occurred in 2019 or 2022. You further noted that your analysis reduced capital and O&M spending at Mill Creek in anticipation of those unit retirements beginning in 2017 for 2019 retirements and beginning in 2018 for 2022 retirements. If LG&E isn't willing to commit to retire any of these units in 2022, why is your analysis valid when it assumes they will indeed retire and tapers capital and O&M spending accordingly?

A. The validity of the approach hinges on LG&E's ability to make better-informed retire-or-continue-operation decisions after completing ongoing efforts to gather information and understand the costs of ELG and CPP compliance in the next 1-2 years. As the question indicates, at first glance the analytical approach might appear to undervalue retiring the units in 2019 because the other scenarios taper off capital and O&M spending beginning in 2018 on the assumption the units will retire in 2022. But if the units do not retire in 2022, presumably LG&E would continue to make the capital and O&M expenditures necessary for ongoing operations, which would increase the cost of any non-2019-retirement scenario, in turn increasing the relative value of retiring the units in 2019. One might therefore object that LG&E's analysis is invalid for not taking into account the full amount of capital and O&M costs necessary for the units to operate in 2022 and beyond.

In fairness, that would be a valid objection to this analytical approach if LG&E were not going to have better information about ELG and CPP compliance options and costs before 2018, when the modeled capital and O&M tapering begins. But LG&E will indeed have more information about such options and costs by 2018, and should be in a better position to determine whether or when to retire the coal-fired units. Therefore, if LG&E's analyses over the next 1-2 years show that retiring any or all of the coal-fired units in early 2022 would be more economical than incurring the costs of ELG and CPP compliance, then LG&E would be able to begin tapering capital and O&M spending as this analysis reflects. On the other hand, if LG&E's analyses over the next 1-2 years show it would be more economical to incur ELG and CPP compliance costs—in addition to ongoing capital and O&M spending at non-tapered levels—to keep the units operating beyond 2021, then LG&E would continue to operate the units, seeking any necessary Commission approvals for ongoing coal-fired operations (e.g., for any additional ECR projects). Therefore, the analytical approach for Mill Creek truly is a no-regrets approach, and accords all due value to the option of retiring units in 2019.

<u>Mill Creek Projects</u>

Q. What projects are included in the 2016 Plan for Mill Creek?

A. The 2016 Plan includes the following projects for the Mill Creek Station:

- Project 28 – Mill Creek & Trimble County 1 Supplemental Mercury Control Injection Systems
- Project 29 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Mill Creek

Q. Please describe Project 28 as it relates to Mill Creek.

A. Each of the four Mill Creek units uses a baghouse and powdered activated carbon ("PAC") to reduce mercury to comply with the federal Mercury and Air Toxics Standards ("MATS"). As a supplemental alternative to using PAC for capturing mercury in the baghouse, coal and flue-gas desulfurization ("FGD") additives can be used to capture mercury in the station's gypsum. This alternative approach would require approximately a $1 million investment in equipment to store and inject the additives ("mercury control injection system"). Based on the Companies' experience at the Trimble County Station, the cost of these additives is lower than the cost of PAC.

Q. How did you analyze the economics of Project 28?

A. Based on the Companies' test results at Trimble County Unit 1, the cost of the coal and FGD additives for mercury control will be approximately $0.30/MWh lower than the cost of PAC. The analysis compared the capital investment required to implement this lower O&M cost solution to the continued cost of PAC.

Q. Based on a $0.30/MWh lower cost compared to PAC, what is the result of your analysis?

A. As seen below in Table 1, the O&M savings associated with the coal and FGD additives more than offset the revenue requirements associated with the cost of the mercury control injection system. Making the capital investment to enable the use of coal and FGD additives reduces revenue requirements by approximately $9 million over the 2016-2021 period. The payback period for the project is approximately three years or less.

Table 1 – Mercury Control System (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

	PVRR ($M)	**Payback Period (years)**
Mill Creek Units 1 & 2	(2.8)	3.2
Mill Creek Unit 3	(2.6)	1.8
Mill Creek Unit 4	(3.9)	1.3
Total	(9.3)	

Q. Please describe Project 29.

A. For the purposes of the analysis, LG&E assumed that the Mill Creek surface impoundments must be capped and closed to comply with the CCR Rule. Based on that assumption, it would be necessary to install a new process-water system at Mill Creek. Project 29 includes the costs associated with these activities.

Q. How did you evaluate the costs of Project 29?

LG&E evaluated the costs of Project 29 along with the costs of Project 28. The alternative to each of these projects is retiring the Mill Creek units in 2019 and replacing the capacity. Table 2 contains a summary of the costs in Projects 28 and 29.

Table 2 – LG&E ECR Project Costs ($M, As-Spent Dollars)

	2015	2016	2017	2018	2019	2020	Total
Cap and Closure							
Ash Pond Capping	1.6	7.1	0.5	0.1	14.3	27.4	51.0
Clearwell Pond Cleanout	0.0	0.6	4.7	0.0	0.0	0.0	5.4
Construction Pond Cleanout	0.0	0.5	0.3	6.5	0.0	0.0	7.3
Dead Storage Pond Cleanout	0.0	0.7	5.7	0.0	0.0	0.0	6.4
Emergency Pond Cleanout	0.0	0.5	0.3	4.7	0.0	0.0	5.5
Total Cap and Closure	1.6	9.5	11.5	11.3	14.3	27.4	75.6
Process-Water System	0.0	20.7	38.6	62.0	0.0	0.0	121.4
Total CCR Ruling Compliance	1.6	30.2	50.1	73.4	14.3	27.4	196.9
Mercury Control System	0.1	4.3	0.0	0.0	0.0	0.0	4.4
Total Mill Creek ECR Projects	1.7	34.5	50.1	73.4	14.3	27.4	201.3

Q. What are the results of your analysis?

A. The results of the analysis are summarized in Table 3. Each alternative was evaluated over three gas price scenarios. Compared to the retirement alternative, the PVRR associated with operating the Mill Creek units with the proposed capital projects through 2021 is $225 million to $450 million lower. In other words, even if the Mill Creek units are assumed to cease operation after 2021, the proposed capital projects are the lowest reasonable cost. A complete summary of this analysis is included in the attached Exhibit CRS-2.

Table 3 – Mill Creek Retirement Results (PVRR, 2016-2021, $M, 2016 Dollars)*

Gas Price	Alternative	Production Costs	Other Capital and FOM	ECR Project Costs	Replace-ment Capacity Costs	Total
Low	Retire in 2019	4,961	360	81	527	5,929
	Operate through 2021	4,896	581	227	0	5,704
	Operate through 2021 Less Retire in 2019	(65)	222	145	(527)	(225)
Mid	Retire in 2019	5,152	360	81	527	6,120
	Operate through 2021	4,993	581	227	0	5,801
	Operate through 2021 Less Retire in 2019	(159)	222	145	(527)	(319)
High	Retire in 2019	5,421	360	81	527	6,389
	Operate through 2021	5,131	581	227	0	5,939
	Operate through 2021 Less Retire in 2019	(290)	222	145	(527)	(450)

*The mercury control system and process-water systems in the 2016 Plan are included in the "Operate through 2021" alternative.

Trimble County Projects

Q. What projects are included in the 2016 Plan for Trimble County?

A. The 2016 Plan includes the following projects for the Trimble County Station:

- Project 28 – Mill Creek & Trimble County 1 Supplemental Mercury Control Injection Systems
- Project 30 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County

Q. Please describe Project 28 as it relates to Trimble County.

A. Trimble County Unit 1 uses a baghouse and PAC to reduce mercury to comply with MATS. As a supplemental alternative to using PAC for capturing mercury in the baghouse, coal and FGD additives can be used to capture mercury in the station's gypsum. This alternative approach would require a $554 thousand investment in a supplemental mercury control injection system. Based on the Companies' experience at Trimble County, the cost of these additives is lower than the cost of PAC.

Q. How did you analyze the economics of Project 28?

A. Based on the Companies' test results at Trimble County Unit 1, the cost of the coal and FGD additives for mercury control will be approximately $0.30/MWh lower than the cost of PAC. The analysis compared the capital investment required to implement this lower O&M cost solution to the continued cost of PAC.

Q. Based on a $0.30/MWh lower cost compared to PAC, what is the result of your analysis?

A. As seen below in Table 4, the O&M savings associated with the coal and FGD additives more than offset the revenue requirements associated with the cost of the mercury control injection system. Making the capital investment to enable the use of coal and FGD additives reduces revenue requirements by approximately $3.4 million over the 2016-2021 period. Furthermore, the payback period for the project is only one year.

Table 4 – Mercury Control System (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

	PVRR ($M)	**Payback Period (years)**
Trimble County 1	(3.4)	1.0

Q. Please describe Project 30.

A. For the purposes of the analysis, LG&E assumed that the cap and closure of the Trimble County surface impoundments must begin by 2019. Based on that assumption, it would be necessary to install a new process-water system at Trimble

County. LG&E Project 30 and KU Project 41 include the costs associated with these activities.

Q. How did you analyze LG&E Project 30 and KU Project 41?

A. The Companies evaluated the costs of these projects along with the cost of LG&E Project 28 over a 30-year analysis period. Table 5 contains a summary of the Trimble County ECR project costs.

Table 5 – Trimble County ECR Project Costs ($M, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**Total**
Cap and Closure										
Ash Pond	1.7	1.0	2.2	6.8	7.7	20.1	15.3	24.8	22.1	101.7
Gypsum Pond	0.0	0.9	1.4	2.9	16.4	7.3	0.0	0.0	0.0	28.9
Total Cap and Closure	1.7	1.9	3.6	9.7	24.1	27.4	15.3	24.8	22.1	130.6
Process-Water System	0.0	0.0	43.7	45.0	0.0	0.0	0.0	0.0	0.0	88.7
Total CCR Ruling Compliance	1.7	1.9	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.4
Mercury Control System	0.02	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Total Trimble County ECR Projects	1.7	2.5	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.9

Q. What alternatives did you consider in your analysis of the Trimble County projects?

A. The Companies evaluated the following alternatives:

1. Continue operating the Trimble County coal units ("Long Term Operation").
2. Retire the Trimble County coal units in 2019 and replace the capacity ("Retire TC Coal Units").
3. Convert the Trimble County coal units to operate on natural gas ("Natural Gas Conversion").

Q. What costs did you assume for the Trimble County landfill and ELG compliance in the alternative to continue operating the Trimble County coal units?

A. Over the 30-year analysis period, the analysis includes $414 million for the Trimble County landfill and $143 million for ELG compliance. Both values are quoted in as-spent dollars. A complete summary of cost assumptions for the 30-year analysis is included in Appendix A of Exhibit CRS-1.

Q. What are the results of your analysis?

A. The results of the analysis are summarized in Table 6. Each alternative was evaluated over three gas price scenarios. Clearly, continuing to operating the Trimble County coal units with the proposed investments is least-cost. The PVRR of continuing to operate the Trimble County coal units is $495 million to $2.9 billion favorable to retiring the units and replacing the capacity. Furthermore, even with no cost included for modifying the Trimble County burners and building a new gas pipeline, continuing to operate the Trimble County coal units is $478 million to $4.0 billion favorable to converting the units to burn natural gas.

Table 6 – Trimble County Retirement Analysis Results (PVRR, 2016-2045, $M, Reflecting Companies' 75% Ownership Share, 2016 Dollars)*

Gas Price	Alternative	Prod Costs	Landfill and CCRT	Other Capital and FOM	ECR Project Costs	Replace-ment Capacity Costs	NGCC Capital	NGCC FOM	NG Convers-ion	Total	Diff from Best
Low	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	2,946	116	141	116	367	944	364	0	4,994	495
	Natural Gas Conversion	3,796	116	949	116	0	0	0	0	4,976	478
Mid	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	4,112	116	141	116	367	944	364	0	6,160	1,661
	Natural Gas Conversion	5,546	116	949	116	0	0	0	0	6,727	2,228
High	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	5,312	116	141	116	367	944	364	0	7,360	2,861
	Natural Gas Conversion	7,346	116	949	116	0	0	0	0	8,527	4,028

*The mercury control system and process-water systems in the 2016 Plan are included in the "Long Term Operation" alternative.

Q. How would you assess the uncertainty in CPP and ELG Compliance costs?

A. Because (a) the Trimble County coal units would be the last coal units that the Companies would retire in a CPP compliance plan and (b) the Companies' generating portfolio would over-comply with any interpretation of the CPP if the Companies' Brown, Ghent, and Mill Creek coal units were retired and replaced with renewable or natural gas-fired generation, it is appropriate to assume no cost for Trimble County's CPP compliance when evaluating the retirement of the Trimble County coal units. Therefore, the Companies would associate little to no uncertainty associated with the CPP as it relates specifically to the Trimble County coal units.

As it relates to the ELG, the analysis includes $143 million for ELG compliance. Even in the Low gas price scenario, if ELG compliance is two to three times this amount, continuing to operating the Trimble County coal units with the proposed investments is least-cost. With a full suite of emissions reduction equipment, the Trimble County coal units are well positioned to operate economically past 2030. It would be difficult to envision the retirement of the Trimble County coal units in the absence of a mandate to retire all coal units.

Q. What is your conclusion about the cost-effectiveness of the projects proposed in LG&E's 2016 Plan?

A. Based on the Companies' analyses, I conclude the projects LG&E proposes in its 2016 Plan are economical. I therefore recommend that the Commission approve the proposed projects and LG&E's requested CPCNs and cost recovery.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Charles R. Schram**, being duly sworn, deposes and says that he is Director – Energy Planning, Analysis and Forecasting for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Charles R Schram
Charles R. Schram

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
~~My commission expires July 11, 2018~~
Notary ID # 512743

APPENDIX A

Charles R. Schram

Director, Energy Planning, Analysis and Forecasting
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-3250

Education

Master of Business Administration
University of Louisville, 1995
Bachelor of Science – Electrical Engineering
University of Louisville, 1984
E.ON Academy General Management Program: 2002-2003
Center for Creative Leadership, Leadership Development Program: 1998

Professional Experience

LG&E and KU

Director, Energy Planning, Analysis & Forecasting	2008 – Present
Manager, Transmission Protection & Substations	2006 – 2008
Manager, Business Development	2005 – 2006
Manager, Strategic Planning	2001 – 2005
Manager, Distribution System Planning & Eng.	2000 – 2001
Manager, Electric Metering	1997 – 2000
Information Technology Analyst	1995 – 1997

U.S. Department of Defense – Naval Ordnance Station

Manager, Software Integration	1993 – 1995
Electronics Engineer	1984 – 1993

Analysis of 2016 ECR Projects
Trimble County Generating Station

PPL companies

Generation Planning & Analysis
January 2016

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1 Introduction

The 2016 Environmental Compliance Plans ("2016 Plans") for Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, "Companies") include the following projects for the Trimble County Generating Station ("Trimble County"):

1. LG&E Project 28 – Mill Creek & Trimble County Unit 1 Supplemental Mercury Control Injection Systems
2. LG&E Project 30 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County
3. KU Project 41 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County

This analysis evaluates these projects along with alternatives to these projects and ultimately demonstrates the following:

1. Based on the projected O&M savings, the proposed supplemental mercury control injection system for Trimble County Unit 1 has a favorable impact on revenue requirements.
2. The Trimble County ECR projects are least-cost.

2 Analysis Methodology

In October 2015 and November 2015, respectively, the U.S. Environmental Protection Agency ("EPA") promulgated the final versions of the Clean Power Plan ("CPP") and Effluent Limitation Guidelines ("ELG"). Much uncertainty exists regarding the costs to comply with these regulations; the Companies must comply with the CPP and ELG by 2022 and will be working to understand these costs over the next 1-2 years.

The estimated cost of the projects proposed for Trimble County in the 2016 Plans is $220 million.[1] An alternative to proceeding with these projects is retiring the Trimble County coal units in 2019 and replacing the capacity. Based on the uncertainty of CPP and ELG compliance costs, projects in the 2016 Plans at other generating stations were evaluated based only on costs incurred through 2021.[2] However, at Trimble County, in addition to the investments required for the 2016 Plan projects, the Companies are already proceeding with spending $277 million from 2016 through 2021 for a new landfill and coal combustion residuals treatment facility ("CCRT"). While the relative benefits from these significant long-term investments will greatly exceed their cost, the point at which their benefits exceed their cost will occur after 2021. As a result, the Companies evaluated the retirement of the Trimble County coal units over the Companies' standard 30-year analysis period with high-level estimates for CPP and ELG compliance costs.

In the 30-year analysis, ELG capital costs for Trimble County are assumed to be $143 million. For the reasons discussed below, the incremental cost associated with CPP compliance—specifically for the Trimble County Station—was assumed to be zero.

Table 1 includes the emission controls, commissioning date, summer net capacity, summer net heat rate, CO_2 emission rate, and dispatch cost for each of the Companies' coal units. Compared to the average age of the Trimble County coal units (15 years), the average age of coal units at other stations is 22 to 37 years older. Considering the units with flue-gas desulfurization ("FGD"), selective catalytic

[1] All cost estimates reflect the Companies' 75% ownership share of Trimble County Units 1 and 2.

[2] This analysis period is consistent with the assumed 2022 CPP and ELG compliance deadline.

reduction ("SCR"), and baghouses, the Trimble County coal units have among the lowest dispatch costs. Trimble County Unit 2 has the lowest CO_2 emissions rate among the Companies' coal units, about 10% below the next unit. Assuming an 80% capacity factor, Trimble County Unit 2's annual CO_2 emissions would be approximately 400,000 tons lower than CO_2 emissions from an equal amount of capacity from the Companies' other coal units. The favorable efficiency would also result in an annual coal expense about $10 million less than other units. For these reasons, the Trimble County coal units would likely be the last coal units to retire as part of a potential CPP compliance plan.

Table 1 – LG&E and KU Coal Units

Emission Controls as of June 2016	Coal Unit	Commission Date	Net Summer Capacity (MW)	Summer Net Heat Rate (Max Load, mmBtu/MWh)	CO_2 Emission Rate (Max Load, lb/MWh)	Average Dispatch Cost ($/MWh)
FGD	Brown 1	5/1/1957	106	10.4	2,128	[redacted]
	Brown 2	6/1/1963	166	10.3	2,110	
FGD, Baghouse	Ghent 2	4/20/1977	493	10.7	2,187	
	Mill Creek 1	7/11/1972	300	10.4	2,142	
	Mill Creek 2	6/11/1974	297	10.6	2,177	
FGD, SCR, Baghouse	Brown 3	7/19/1971	407	10.9	2,241	
	Ghent 1	2/19/1974	474	10.9	2,228	
	Ghent 3	5/31/1981	485	11.0	2,263	
	Ghent 4	8/18/1984	465	11.0	2,248	
	Mill Creek 3	6/28/1978	385	10.7	2,195	
	Mill Creek 4	7/15/1982	477	10.7	2,203	
	Trimble 1	12/23/1990	379	10.7	2,195	
	Trimble 2	1/22/2011	549	9.3	1,899	

If the Trimble County coal units were the last coal units considered for retirement and – at a cost of more than $3.5 billion[3] – the Companies' Brown, Ghent, and Mill Creek coal units were already retired and replaced with renewable or natural gas-fired generation with CO_2 emissions ranging from 0 lb/MWh to approximately 1,000 lb/MWh, the Companies' generating portfolio would already over-comply with the CPP – even if the Trimble County coal units operated at full capacity.[4] Therefore, the 30-year retirement analysis assumed no incremental cost for future CPP compliance for Trimble County.

The analyses supporting these projects are discussed in the following sections.

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[3] Assuming a replacement capacity cost of [redacted], the total cost to replace the Brown, Ghent, and Mill Creek coal units (4,051 MW) is [redacted].

[4] Over the next 30 years, the Trimble County coal units are expected to operate at 70-80% capacity factors and produce 5,900-6,400 GWh per year. From 2022 to 2030, the Companies' total energy requirements are approximately 35,000 GWh per year. If the Companies' other coal units were replaced with natural gas combined-cycle ("NGCC") units with CO_2 emissions of approximately 900 lb/MWh, the average CO_2 emission rate for the balance of the fleet – after factoring in the 1,200 lb/MWh emission rate of the Companies' simple-cycle combustion turbines – would be less than 950 lb/MWh. Even if the Trimble County coal units operated at a 90% capacity factor and produced 7,400 GWh per year, the Companies' system CO_2 emission rate would be less than 1,200 lb/MWh ([7,400 GWh * 2,050 lb CO_2/MWh + 27,600 GWh * 950 lb CO_2/MWh]/[7,400 GWh+27,600 GWh] = 1,183 lb/MWh).

3 Project 28 – Supplemental Mercury Control Injection Systems for Trimble County Unit 1

3.1 Background

The Companies installed a baghouse at Trimble County Unit 1 to limit particulate emissions and comply with the National Ambient Air Quality Standards for 2.5 micron particulate matter and the Mercury and Air Toxics Standards ("MATS Rule") for mercury emissions. To comply with the MATS Rule for mercury emissions, the station is planning to use powdered activated carbon ("PAC") to oxidize mercury in the flue gas so that it can be captured by the baghouse in the station's fly ash. As an alternative to this approach for capturing mercury and to minimize the risk of mercury reemission that can occur in wet FGDs, coal and FGD additives can be used to capture mercury in the station's gypsum. This alternative approach would require an investment in equipment to store and inject the additives ("mercury control system"), but the cost of these additives is lower than the cost of PAC.

In addition to potential cost reductions, the addition of a mercury control injection system will support the Companies' beneficial use initiatives for CCR. The option to use PAC or coal and FGD additives will enable the Companies' to have greater control over where mercury is captured – either in the unit's fly ash or gypsum. As a result, the Companies will be better able to serve beneficial use markets that are sensitive to mercury levels.

Also, LG&E is planning to spend approximately $3-4 million per year on PAC for the Trimble County Unit 1. Small changes in the cost of PAC will have a significant impact on production costs. The option to use PAC or the coal and FGD additives could potentially improve the Companies' bargaining position in procuring these commodities and better enable the Companies to control these costs.

The Companies' 75% share of the cost of the supplemental mercury control injection system is summarized by unit in Table 2.

Table 2 – Trimble County Unit 1 Supplemental Mercury Control Injection System (Capital Cost, $000s, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

Unit	2015	2016	Total
Trimble County Unit 1	22.9	531.3	554.2

3.2 Analysis

Based on test results at Trimble County Unit 1, the cost of the coal and FGD additives for mercury control is approximately $0.30/MWh lower than the cost of PAC. Table 3 summarizes the PVRR of this project based on costs incurred through 2021.[5]

Table 3 – Trimble County Unit 1 Supplemental Mercury Control Injection System (PVRR of Costs Incurred from 2016 to 2021, $M, Reflecting Companies' 75% Ownership Share, 2016 Dollars)

	PVRR ($M)	Payback Period (years)
Trimble County Unit 1	(3.0)	1.0

[5] This analysis period is consistent with the analysis period used to evaluate supplemental mercury control injection systems at other stations.

Based on the results in Table 3, the O&M savings associated with the coal and FGD additives more than offset the revenue requirements associated with the cost of the mercury control system. At the current spread between the cost of PAC and the cost of coal and FGD additives ($0.30/MWh), the payback period for this project is only one year.[6]

4 LG&E Project 30 and KU Project 41 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Trimble County

4.1 Background

In April 2015, the EPA issued its final rule concerning disposal of CCR from electric utilities ("CCR Rule"). To comply with this rule at Trimble County, our analysis assumes the Companies will have to (a) begin cap and closure of the Bottom Ash Pond ("BAP") and the Gypsum Storage Pond ("GSP") in 2016 under LG&E Project 30 and KU Project 41. Whatever the Companies ultimately must do to comply with the CCR Rule, the costs of such compliance will be unavoidable; retiring the Trimble County units – even retiring them today – would not allow the Companies to avoid those costs. A new process-water system is required only if the Trimble County coal units continue to operate past 2018. Table 4 summarizes the costs for these projects along with the cost of the supplemental mercury control injection system.

Table 4 – Trimble County 2016 ECR Capital Costs ($M, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Cap and Closure										
BAP	1.7	1.0	2.2	6.8	7.7	20.1	15.3	24.8	22.1	101.7
GSP	0.0	0.9	1.4	2.9	16.4	7.3	0.0	0.0	0.0	28.9
Total Cap and Closure	1.7	1.9	3.6	9.7	24.1	27.4	15.3	24.8	22.1	130.6
Process-Water System	0.0	0.0	43.7	45.0	0.0	0.0	0.0	0.0	0.0	88.7
Total CCR Rule Compliance	1.7	1.9	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.4
Mercury Control System	0.02	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Total Trimble County ECR Projects	1.7	2.5	47.3	54.8	24.1	27.4	15.3	24.8	22.1	219.9

4.2 Alternatives

As an alternative to constructing the process-water system and supplemental mercury control injection system, the Companies evaluated the following alternatives:

1. Retire the Trimble County coal units in 2019 and purchase replacement capacity ("Retire TC Coal Units").
2. Convert the Trimble County coal units to operate on natural gas ("Natural Gas Conversion").

A complete summary of costs for this analysis is included in Appendix A – Cost Assumptions. All alternatives include the costs in Table 4 to cap and close the ponds. In addition to costs for the process-water system and supplemental mercury control injection system, the "Long Term Operation" alternative includes costs for the landfill and CCRT as well as an estimated $143 million cost for ELG compliance. In the Retire TC Coal Units and Natural Gas Conversion alternatives, all costs for the

[6] The payback period is the time required for the present value of the O&M savings to fully offset the PVRR associated with the capital cost of the mercury control injection system.

process-water system and the supplemental mercury control injection system are avoided and all costs after 2016 for the landfill/CCRT and ELG compliance are avoided. These alternatives are discussed further in the following sections.

4.2.1 Retire Trimble County Coal Units and Replace Capacity

In the "Retire TC Coal Units" alternative, the Trimble County coal units are retired at the beginning of 2019 and replaced by purchased NGCC capacity through 2021.[7] Then, the retirement alternative assumes that NGCC capacity commissioned at Trimble County in 2022 will be a least-cost resource. The amount of capacity purchased in 2019 and commissioned at Trimble County in 2022 is equal to the capacity of Trimble County Units 1 and 2. In addition to cost savings associated with the process-water system, mercury control system, landfill, CCRT, and ELG compliance, a decision to retire the Trimble County coal units in 2019 would result in reduced maintenance spending in the years prior to retirement.

4.2.2 Convert the Trimble County Coal Units to Burn Natural Gas

In the Natural Gas Conversion alternative, the cost savings associated with the process-water system, mercury control system, landfill, CCRT, and ELG compliance are assumed to be the same as these savings in the Retire TC Coal Units alternative. In addition, if the Trimble County units are converted to burn natural gas, the Companies can avoid the cost of replacing the capacity of the Trimble County coal units. This project would require burner modifications to the units as well as an additional natural gas pipeline to the station. Because cost estimates have not been developed for this project, the analysis was conducted to determine the project's maximum cost for it to be economical.

4.3 Analysis

The results of this analysis are summarized in Table 5. Each alternative was evaluated over three gas price scenarios.[8] For the reasons discussed in Section 2, the analysis assumed no incremental cost for CPP compliance for Trimble County. The PVRR of continuing to operate the Trimble County coal units is $495 million to $2.9 billion favorable to retiring the units and replacing the capacity. Furthermore, even with no cost included for the modifying the Trimble County burners and building a new gas pipeline, continuing to operate the Trimble County coal units is $478 million to $4.0 billion favorable to converting the units to burn natural gas.

[7] The Retirement alternative does not account for the cost of transmission system upgrades that would likely be required to account for the 932 MW reduction in generating capacity at Trimble County between 2019 and 2021.

[8] Tables of the gas prices and financial inputs are included in Appendix B – Other Inputs.

Table 5 – Trimble County Retirement Analysis Results (PVRR, 2016-2045, $M, Reflecting Companies' 75% Ownership Share)

Gas Price	Alternative	Prod Costs	Landfill and CCRT	Other Capital and FOM	ECR Project Costs	Replace-ment Capacity Costs	NGCC Capital	NGCC FOM	NG Conversion	Total	Diff from Best
Low	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	2,946	116	141	116	367	944	364	0	4,994	495
	Natural Gas Conversion	3,796	116	949	116	0	0	0	0	4,976	478
Mid	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	4,112	116	141	116	367	944	364	0	6,160	1,661
	Natural Gas Conversion	5,546	116	949	116	0	0	0	0	6,727	2,228
High	Long Term Operation	2,692	367	1,229	210	0	0	0	0	4,499	0
	Retire TC Coal Units	5,312	116	141	116	367	944	364	0	7,360	2,861
	Natural Gas Conversion	7,346	116	949	116	0	0	0	0	8,527	4,028

5 Conclusion

The analyses summarized in Sections 3 and 4 result in the following conclusions:

1. The Trimble County Unit 1 mercury control system reduces revenue requirements. At the current spread between the cost of PAC and the cost of coal and FGD additives ($0.30/MWh), the payback period for the supplemental mercury control injection system is only one year.
2. Continuing to operating the Trimble County coal units with the proposed investments for process-water systems and supplemental mercury control injection is least-cost.

6 Appendix A – Cost Assumptions

Table 6 – Capital and Fixed O&M Cost Assumptions for Retirement Analysis ($000s, As-Spent Dollars, Reflecting Companies' 75% Ownership Share)

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	Total
2016 Plan with Updated ECR Costs (Long Term Operation)																															
Coal Unit Fixed O&M	30	35	40	39	40	45	47	47	49	54	56	52	53	54	55	57	58	67	68	62	64	65	67	68	70	80	81	75	77	78	1,733
On-Going Capital	29	28	25	17	14	26	72	20	10	37	25	19	19	20	20	21	21	54	30	22	23	23	24	24	25	63	35	26	27	27	825
CCR Treatment Facility	47	49	33	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	128
CCR Transport Facility	5	6	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
Landfill	43	30	38	9	13	1	21	6	7	1	1	0	0	0	34	8	1	1	1	1	1	1	1	44	2	1	1	1	1	1	271
Cap and Closure Costs	4	4	10	24	27	15	25	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131
Process-Water System	0	44	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89
Mercury Control System	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
ELG Costs	2	0	18	66	34	23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	143
Total	161	195	213	155	128	110	165	95	66	92	83	71	72	74	109	85	80	122	98	85	87	89	91	136	97	144	117	102	104	106	3,335
Retire TC Coal Units																															
Coal Unit Fixed O&M[9]	30	29	33	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	94
On-Going Capital[9]	29	7	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
CCR Treatment Facility	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
CCR Transport Facility	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Landfill	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Cap and Closure Costs	4	4	10	24	27	15	25	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131
Process-Water System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury Control System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Replacement Capacity Cost[10]	0	0	0	151	152	153	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	455
ELG Costs	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
NGCC Capital	0	0	0	192	700	123	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,029
NGCC Fixed O&M	0	0	0	0	0	0	35	35	36	37	38	38	39	40	41	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	1,059
Total	161	40	49	368	879	292	73	58	36	37	38	38	39	40	41	42	42	43	44	45	46	47	48	49	50	51	52	53	54	55	2,907
Natural Gas Conversion																															
Fixed O&M	30	35	39	37	37	36	38	38	39	45	47	42	43	44	45	46	47	56	57	51	52	53	54	56	57	68	68	61	63	65	1,450
On-Going Capital	29	28	25	17	14	26	22	20	10	37	25	19	19	20	20	21	21	54	30	22	23	23	24	24	25	63	35	26	27	27	775
CCR Treatment Facility	47	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
CCR Transport Facility	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
Landfill	43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
Cap and Closure Costs	4	4	10	24	27	15	25	22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	131
Process-Water System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury Control System	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ELG Costs	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
New Pipeline and Burner Mods	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	161	67	74	78	79	78	85	81	49	82	72	61	62	64	65	67	68	110	86	73	75	76	78	80	82	130	103	88	90	92	2,453

[9] Reduced capital and O&M expenditures in the years leading up to a unit's retirement are consistent with the Companies' recent experience at the Cane Run Generating Station.
[10] See Table 7 for a summary of the costs included in Replacement Capacity Cost.

Table 7 – Replacement Capacity Costs

Cost Item	1x1 NGCC
Replacement Capacity ($/kW, 2013 Dollars)[11]	[redacted]
Fixed Charge Rate	9.5%
Book Life (Years)	40
Fixed O&M ($/kW-year, 2013 Dollars)	[redacted]
Firm Gas Transport ($/kW-year, 2013 Dollars)[12]	20.3
Firm Transmission Service ($/kW-year, 2015 Dollars)[13]	22.5
Escalation Rate	2.0%

6.1 PPA Financing Costs

When rating agencies assess a utility's debt rating, they impute debt on the utility's balance sheet to reflect the fixed financial obligations associated with PPAs. As a result, when utilities enter into a PPA, they must increase the equity share of their capital structure to offset the imputed debt and maintain their debt rating.[14]

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[11] Replacement capacity costs reflect capacity costs from the Companies' 2014 Integrated Resource Plan.
[12] Firm gas transportation costs were taken from the 2014 Integrated Resource Plan and are based on the firm gas transportation rates for Cane Run 7.
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[15] A complete summary of the methodology Standard & Poor's uses to calculate imputed debt for U.S. utilities' PPAs is available at http://www.psc.utah.gov/utilities/electric/09docs/0903523/062309ExhibitE.pdf.

7 Appendix B – Other Inputs

The Henry Hub ("HH") natural gas price scenarios considered in this analysis are listed in Table 8. The Mid natural gas price forecast is based on market prices for the short term and the Energy Information Administration's ("EIA") 2015 Annual Energy Outlook ("AEO") for the long term.[16] Prices in 2016-2017 were taken from the Companies' 2016 Business Plan and reflect NYMEX HH monthly forward prices as of 6/18/2015. Prices in 2018-2020 reflect a blend of market prices and a midpoint average curve between the annual HH prices from two EIA AEO 2015 scenarios: "High Oil Price" (a proxy for high gas price) and "High Oil and Gas Resource" (a proxy for low gas price). Blending is 75% market in 2018, 50% market in 2019, and 25% market in 2020. Prices in 2021-2037 reflect the midpoint average curve between the annual HH prices from the "High Oil Price" and "High Oil-Gas Resource" scenarios ("Midpoint"). Prices in 2038-2045 are escalated annually at the 2027-2037 compound annual growth rate of the Midpoint forecast (4.4%) from the 2037 Midpoint forecast prices. Monthly prices after 2017 are calculated using average monthly shape indices derived from the market forwards for 2016-2020. The Low natural gas price forecast is based on EIA's 2015 AEO "High Oil and Gas Resource" scenario. To maintain a consistent spread between the Low and Mid natural gas price scenarios, years 2016-2018 in the Low scenario were adjusted to reflect the 2019 percentage difference between the Low and Mid scenarios. The High natural gas price forecast is based on EIA's 2015 AEO "High Oil Price" scenario.

[16] The EIA's 2015 AEO was published in April 2015. For the AEO data tables, see http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2015&subject=0-AEO2015&table=1-AEO2015&region=0-0&cases=ref2015-d021915a. For the AEO report, see http://www.eia.gov/forecasts/aeo/.

Table 8 – Natural Gas Prices (Nominal Henry Hub $/MMBtu)

Year	Low	Mid	High
2016	2.93	3.17	3.53
2017	3.08	3.34	3.89
2018	3.27	3.54	4.30
2019	3.49	3.78	4.67
2020	3.51	4.16	5.18
2021	3.69	4.72	5.76
2022	3.75	5.01	6.26
2023	3.89	5.49	7.09
2024	3.96	5.81	7.66
2025	4.09	6.14	8.19
2026	4.21	6.51	8.80
2027	4.39	6.78	9.18
2028	4.61	7.04	9.47
2029	4.67	7.38	10.09
2030	4.76	7.74	10.72
2031	4.94	8.23	11.52
2032	5.18	8.62	12.07
2033	5.42	8.86	12.31
2034	5.69	9.24	12.79
2035	5.94	9.58	13.22
2036	6.14	9.97	13.80
2037	6.42	10.45	14.49
2038	6.67	10.91	15.16
2039	6.92	11.40	15.87
2040	7.19	11.90	16.62
2041	7.47	12.43	17.39
2042	7.76	12.98	18.20
2043	8.06	13.55	19.06
2044	8.37	14.15	19.95
2045	8.70	14.77	20.88

Table 9 – Financial Inputs

Input	Value
Return on Equity	10.0%
Cost of Debt	4.21%
Capital Structure	
Debt	47.0%
Equity	53.0%
Tax Rate	38.9%
Revenue Requirement Discount Rate	6.51%

Analysis of 2016 ECR Projects
Mill Creek Generating Station

PPL companies

Generation Planning & Analysis
January 2016

Table of Contents

1 Introduction

The 2016 Environmental Compliance Plan ("2016 Plan") for Louisville Gas and Electric Company ("LG&E") includes the following projects for the Mill Creek Generating Station ("Mill Creek"):

1. Project 28 – Mill Creek & Trimble County Unit 1 Supplemental Mercury Control Injection Systems
2. Project 29 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Mill Creek

This analysis evaluates these projects along with alternatives to these projects and ultimately concludes the following:

1. Based on the projected O&M savings, the proposed supplemental mercury control injection systems have a favorable impact on revenue requirements.
2. The Mill Creek ECR projects are least-cost – even if the Mill Creek units only operate through 2021.

2 Analysis Methodology

In October 2015 and November 2015, respectively, the U.S. Environmental Protection Agency ("EPA") promulgated the final versions of the Clean Power Plan ("CPP") and Effluent Limitation Guidelines ("ELG"). Much uncertainty exists regarding the costs to comply with these regulations; LG&E and its sister utility, Kentucky Utilities Company (collectively, "Companies") must comply with the CPP and ELG by 2022 and will be working to understand these costs over the next 1-2 years. If the Companies determine that complying with these regulations is more costly than retiring the Mill Creek units and replacing their capacity, they can likely operate the units through 2021 without incurring any CPP and ELG compliance costs.

To avoid speculation regarding CPP and ELG compliance costs, Projects 28 and 29 were evaluated based only on costs incurred and benefits produced through 2021. This analysis period is consistent with the assumed 2022 CPP and ELG compliance timelines. In doing this, the analysis ensures that the investments associated with the proposed projects are lowest reasonable cost even if the Mill Creek units cease to operate after 2021. Revenue requirements for capital costs incurred through 2021 extend through the remaining book life of the generating unit. These revenue requirements are included in the calculation of the present value of revenue requirements ("PVRR") to ensure that the full impact of any capital costs incurred through 2021 is considered in determining whether the proposed projects are economical for operation of the units through 2021.

It is important to note that choosing this analytical approach does not reflect a decision to retire the Mill Creek units or any judgment on the likelihood of retiring the units. Instead, the Companies have adopted this analytical methodology to eliminate any potential concerns due to the uncertainty associated with the CPP and ELG rules and their cost, as well as any other future environmental regulations not yet promulgated.

The analyses supporting these projects are discussed in the following sections.

3 Project 28 – Supplemental Mercury Control Injection Systems for Mill Creek

3.1 Background

The Companies installed baghouses on Mill Creek Units 1, 2, and 4 to limit particulate emissions and comply with the National Ambient Air Quality Standards for 2.5 micron particulate matter and the Mercury and Air Toxics Standards ("MATS Rule") for mercury emissions; a baghouse will be installed on Mill Creek Unit 3 later in 2016. To comply with the MATS Rule for mercury emissions, the station is planning to use powdered activated carbon ("PAC") to oxidize mercury in the flue gas so that it can be captured by the baghouse in the station's fly ash. As an alternative to this approach for capturing mercury and to minimize the risk of mercury reemission that can occur in wet FGDs, coal and flue-gas desulfurization ("FGD") additives can be used to capture mercury in the station's gypsum. This alternative approach would require a $4.4 million investment in equipment to store and inject the additives ("mercury control system"), but based on the Companies' experience at the Trimble County Generating Station, the cost of these additives is lower than the cost of PAC.

In addition to potential cost reductions, the addition of a mercury control injection system will support the Companies' beneficial use initiatives for CCR. The option to use PAC or coal and FGD additives will enable the Companies' to have greater control over where mercury is captured – either in the unit's fly ash or gypsum. As a result, the Companies will be better able to serve beneficial use markets that are sensitive to mercury levels.

Also, LG&E is planning to spend $4-6 million per year on PAC for the Mill Creek units. Small changes in the cost of PAC will have a significant impact on production costs. The option to use PAC or the coal and FGD additives could potentially improve the Companies' bargaining position in procuring these commodities and better enable the Companies to control these costs.

The cost of the supplemental mercury control system is summarized by unit in Table 1.

Table 1 – Supplemental Mill Creek Mercury Control Systems (Capital Cost, $000s, As-Spent Dollars)

Unit	2015	2016	Total
Mill Creek Units 1 & 2	47.6	2,572.2	2,619.8
Mill Creek Unit 3	11.9	865.6	877.5
Mill Creek Unit 4	11.9	865.6	877.5
Total	71.4	4,303.4	4,374.8

3.2 Analysis

Based on test results at Trimble County Unit 1, the cost of the coal and FGD additives for mercury control is approximately $0.30/MWh lower than the cost of PAC. Table 2 summarizes the PVRR of this project.

Table 2 – Supplemental Mill Creek Mercury Control System (PVRR of Costs Incurred from 2016 to 2021, 2016 Dollars)

	PVRR ($M)	Payback Period (years)
Mill Creek Units 1 & 2	(2.8)	3.2
Mill Creek Unit 3	(2.6)	1.8
Mill Creek Unit 4	(3.9)	1.3
Total	(9.3)	

Based on the results in Table 2, the O&M savings associated with the coal and FGD additives more than offset the revenue requirements associated with the cost of the mercury control systems. In fact, at the current spread between the cost of PAC and the cost of coal and FGD additives ($0.30/MWh), the payback periods for these systems are approximately three years or less.[1]

4 Project 29 – CCR Rule Compliance Construction and Construction of New Process-Water Systems for Mill Creek

4.1 Background

In April 2015, the EPA issued its final rule concerning disposal of CCR from electric utilities ("CCR Rule"). To comply with this rule at Mill Creek, the analysis assumes LG&E will have to cap and close the Dead Storage Pond, the Clearwell Pond, the Emergency Pond, the Construction Runoff Pond, and the Ash Treatment Basin under Project 29. Whatever LG&E ultimately must do to comply with the CCR Rule, the costs of such compliance will be unavoidable; retiring the Mill Creek units – even retiring them today – would not allow LG&E to avoid those costs. A new process-water system is required if the Mill Creek units continue to operate past 2018. Table 3 summarizes the costs for these projects along with the cost of the supplemental mercury control injection system.

Table 3 – Mill Creek 2016 ECR Capital Costs ($M, As-Spent Dollars)

	2015	2016	2017	2018	2019	2020	Total
Cap and Closure							
Ash Pond Capping	1.6	7.1	0.5	0.1	14.3	27.4	51.0
Clearwell Pond Cleanout	0.0	0.6	4.7	0.0	0.0	0.0	5.4
Construction Pond Cleanout	0.0	0.5	0.3	6.5	0.0	0.0	7.3
Dead Storage Pond Cleanout	0.0	0.7	5.7	0.0	0.0	0.0	6.4
Emergency Pond Cleanout	0.0	0.5	0.3	4.7	0.0	0.0	5.5
Total Cap and Closure	1.6	9.5	11.5	11.3	14.3	27.4	75.6
Process-Water System	0.0	20.7	38.6	62.0	0.0	0.0	121.4
Total CCR Ruling Compliance	1.6	30.2	50.1	73.4	14.3	27.4	196.9
Mercury Control System	0.1	4.3	0.0	0.0	0.0	0.0	4.4
Total Mill Creek ECR Projects	1.7	34.5	50.1	73.4	14.3	27.4	201.3

[1] The payback period is the number of months required for the present value of the O&M savings to fully offset the PVRR associated with the capital cost of the mercury control injection system.

4.2 Analysis

An alternative to the process-water system and supplemental mercury control system is retiring the Mill Creek units and purchasing replacement capacity. Therefore, this analysis compares the costs of continuing to operate the Mill Creek units through 2021 ("Operate through 2021") to the cost of retiring the Mill Creek units in 2019 and purchasing replacement capacity ("Retire in 2019").[2] Both alternatives include the costs in Table 3 to cap and close the ponds. The costs of the process-water system and the supplemental mercury control injection system are excluded from the Retire in 2019 alternative. A complete summary of costs for each alternative is included in Appendix A – Cost Assumptions.

In the "Retire in 2019" alternative, the Mill Creek units (1,459 MW) are assumed to be retired at the beginning of 2019 and replaced by a three-year power purchase agreement for three 368 MW natural gas combined cycle ("NGCC") units and one 201 MW simple cycle combustion turbine ("SCCT") unit (1,305 MW in total). The replacement capacity portfolio was developed using resources evaluated in the Companies' 2014 Integrated Resource Plan ("IRP") to minimally comply with the Companies' target reserve margin range (16% to 21%) in 2019 through 2021. In addition, the costs of the IRP resources were used to develop the cost of the power purchase agreement for each portfolio.[3] Table 4 summarizes the impact of the replacement capacity portfolio on the Companies' reserve margin. With the Mill Creek units, the Companies' reserve margin in 2019 to 2021 ranges from 19% to 20%. With the replacement capacity, the reserve margin ranges from 17% to 18%. This analysis does not account for the additional reliability risks and costs associated with operating at a lower reserve margin.

[2] Only the cost of the water process system is included in this analysis for Project 39. The remaining costs must be incurred to close ponds regardless of whether the units continue to operate.

[3] The 368 MW NGCC unit evaluated in the IRP is a G- or H-class NGCC unit with a 1x1 configuration. The 201 MW SCCT unit is an F-class SCCT unit. Additional information regarding replacement capacity costs is included in Appendix A – Cost Assumptions.

Table 4 – LG&E/KU Resource Summary (MW)

	2016	2017	2018	2019	2020	2021
Forecasted Peak Load	7,314	7,395	7,448	7,225	7,244	7,266
Demand Side Management	(366)	(407)	(444)	(481)	(490)	(480)
Net Peak Load	6,948	6,988	7,004	6,744	6,754	6,786
Operate through 2021						
Existing Resources	7,974	7,976	7,986	7,821	7,822	7,823
Firm Purchases (OVEC)	152	152	152	152	152	152
Curtailable Load	136	136	136	136	136	136
Total Supply	8,262	8,264	8,274	8,109	8,110	8,111
Reserve Margin	18.9%	18.3%	18.1%	20.2%	20.1%	19.5%
Retire in 2019						
Existing Resources	7,974	7,976	7,986	7,821	7,822	7,823
Firm Purchases (OVEC)	152	152	152	152	152	152
Curtailable Load	136	136	136	136	136	136
Mill Creek Units 1-4 Retirement	0	0	0	(1,459)	(1,459)	(1,459)
Replacement Capacity	0	0	0	1,305	1,305	1,305
Total Supply	8,262	8,264	8,274	7,955	7,956	7,957
Reserve Margin	18.9%	18.3%	18.1%	18.0%	17.8%	17.2%

In the "Operate through 2021" alternative, for the purpose of this analysis, the Mill Creek units are assumed to retire at the beginning of 2022.[4] This analytical approach—comparing retiring the coal-fired units at the beginning of 2019 versus retiring the units at the beginning of 2022—is a conservative approach to evaluating whether it is economical to proceed with the proposed projects and keep the units operating through the end of 2021. Analyzing the 2016 Plan's long-lived investments over a short timeframe requires the investments to be economical by the end of 2021 (relative to the cost of retiring the units in 2019). In other words, this no-regrets analytical approach ensures that even if LG&E determines in the next 1-2 years that retiring the units in 2022 is more economical than incurring the costs of ELG or CPP compliance, the investments proposed for Mill Creek in the 2016 Plan will have been economical relative to having retired the units in 2019.

A decision to retire the Mill Creek units in either 2019 or 2022 would result in reduced maintenance spending in the years prior to retirement. By recognizing this fact, it is important to note that this approach—again, comparing retiring the units in 2019 to retiring the units in 2022—does not undervalue retiring the units in 2019 even though LG&E is not committing to retire the units in 2022 or later. At first glance, this approach might appear to undervalue the 2019 retirement scenario because the 2022 retirement scenario reduces capital and O&M spending for the units beginning in 2018 as the units prepare for retirement; but if the units do not retire in 2022, presumably LG&E would continue to make the capital and O&M expenditures necessary for ongoing operations, which would relatively increase the value of retiring the units in 2019. This would be a valid analytical concern if LG&E were

[4] As stated previously, using this analytical approach is neither a commitment nor a prediction that LG&E will retire any or all of the units at Mill Creek in early 2022 or at any other time.

not going to have better information about ELG and CPP compliance options and costs before 2018, when the modeled capital and O&M tapering begins. But LG&E will indeed have more information about such options and costs by 2018 and will be better positioned to determine whether or when to retire any coal-fired units.

If LG&E's analyses over the next 1-2 years show that retiring Mill Creek's coal-fired units in early 2022 would be more economical than incurring the costs of ELG and CPP compliance, then LG&E would be able to begin tapering capital and O&M spending at Mill Creek as this analysis reflects. On the other hand, if LG&E's analyses over the next 1-2 years show it would be more economical to incur ELG and CPP compliance costs—in addition to ongoing capital and O&M spending at non-tapered levels—to keep the units operating beyond 2021, then LG&E would seek any necessary Commission approvals for ongoing coal-fired operations. Therefore, this analytical approach is indeed a no-regrets approach.

The results of this analysis are summarized in Table 5. Each alternative was evaluated over three gas price scenarios.[5] Even if the Mill Creek units are assumed to cease operation after 2021, the proposed capital projects are least-cost.

Table 5 – Mill Creek Retirement Analysis Results (PVRR of Costs Incurred from 2016 to 2021, $M, 2016 Dollars)

Gas Price	Alternative	System Production Costs	Other Capital and FOM	ECR Project Costs	Replacement Capacity Costs	Total
Low	Retire in 2019	4,961	360	81	527	5,929
	Operate through 2021	4,896	581	227	0	5,704
	Operate through 2021 Less Retire in 2019	(65)	222	145	(527)	(225)
Mid	Retire in 2019	5,152	360	81	527	6,120
	Operate through 2021	4,993	581	227	0	5,801
	Operate through 2021 Less Retire in 2019	(159)	222	145	(527)	(319)
High	Retire in 2019	5,421	360	81	527	6,389
	Operate through 2021	5,131	581	227	0	5,939
	Operate through 2021 Less Retire in 2019	(290)	222	145	(527)	(450)

5 Conclusion

The analyses summarized in Sections 3 and 4 result in the following conclusions:

1. The Mill Creek supplemental mercury control injection systems reduce revenue requirements. At the current spread between the cost of PAC and the cost of coal and FGD additives ($0.30/MWh), the payback periods for the mercury control systems are approximately three years or less.
2. Even if the Mill Creek units cease operation after 2021, the process water system and the supplemental mercury control injection system are least-cost.

[5] Tables of the gas prices and financial inputs are included in Appendix B – Other Inputs.

6 Appendix A – Cost Assumptions

Table 6 – Capital and Fixed O&M Cost Assumptions for Retirement Analysis ($M, As-Spent Dollars)

	2016	2017	2018	2019	2020	2021	Total
2016 Plan with Updated ECR Costs							
Coal Unit Fixed O&M	65	63	63	69	71	65	395
On-Going Capital	136	23	33	58	65	119	434
Cap and Closure Costs	11	11	11	14	27	0	76
Process-Water System	21	39	62	0	0	0	121
Mercury Control System	4	0	0	0	0	0	4
ELG Costs	3	0	11	112	90	46	263
Total	240	136	181	254	253	230	1,293
Operate through 2021							
Coal Unit Fixed O&M[6]	65	63	58	62	60	60	368
On-Going Capital[6]	136	23	16	14	11	19	219
Cap and Closure Costs	11	11	11	14	27	0	76
Process-Water System	21	39	62	0	0	0	121
Mercury Control System	4	0	0	0	0	0	4
ELG Costs	3	0	0	0	0	0	3
Total	240	136	148	91	98	78	792
Retire in 2019							
Coal Unit Fixed O&M[6]	65	55	56	2	0	0	178
On-Going Capital[6]	136	6	8	0	0	0	150
Cap and Closure Costs	11	11	11	14	27	0	76
Process-Water System	0	0	0	0	0	0	0
Mercury Control System	0	0	0	0	0	0	0
Replacement Capacity Cost[7]	0	0	0	216	218	219	653
ELG Costs	3	0	0	0	0	0	3
Total	215	72	75	233	245	219	1,060

[6] Reduced capital and O&M expenditures in the years leading up to a unit's retirement are consistent with the Companies' recent experience at the Cane Run Generating Station.
[7] See Table 7 for a summary of the costs included in Replacement Capacity Cost.

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Table 7 – Replacement Capacity Costs

Cost Item	**1x1 NGCC**	**SCCT**
Replacement Capacity ($/kW, 2013 Dollars)[8]	[redacted]	
Average Annual Capacity (MW)	398	211
Fixed Charge Rate	9.5%	9.2%
Book Life (Years)	40	30
Fixed O&M ($/kW-year, 2013 Dollars)	[redacted]	
Firm Gas Transport ($/kW-year, 2013 Dollars)[9]	20.3	20.7
Firm Transmission Service ($/kW-year, 2015 Dollars)[10]	22.5	22.5
Escalation Rate	2.0%	2.0%

6.1 PPA Financing Costs

When rating agencies assess a utility's debt rating, they impute debt on the utility's balance sheet to reflect the fixed financial obligations associated with PPAs. As a result, when utilities enter into a PPA, they must increase the equity share of their capital structure to offset the imputed debt and maintain their debt rating.[11]

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Table 8 – Natural Gas Prices (Nominal Henry Hub $/MMBtu)

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2020	3.51	4.16	5.18
2021	3.69	4.72	5.76

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COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF LOUISVILLE GAS AND	**)**	
ELECTRIC COMPANY FOR CERTIFICATES OF	**)**	
PUBLIC CONVENIENCE AND NECESSITY AND	**)**	**CASE NO. 2016-00027**
APPROVAL OF ITS 2016 COMPLIANCE PLAN	**)**	
FOR RECOVERY BY ENVIRONMENTAL	**)**	
SURCHARGE	**)**	

DIRECT TESTIMONY OF
DEREK A. RAHN
MANAGER, REVENUE REQUIREMENT
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

Q. Please state your name, position, and business address.

A. My name is Derek A. Rahn. I am the Manager, Revenue Requirement for Louisville Gas and Electric Company ("LG&E" or "Company") Kentucky Utilities Company ("KU") and an employee of LG&E and KU Services Company, which provides services to LG&E and KU (collectively "Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A complete statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I testified before this Commission in the Companies' most recent environmental cost recovery six-month review proceedings (Case Nos. 2015-00411 (KU) and 2015-00412 (LG&E)).

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring five exhibits, identified as Exhibits DAR-1, DAR-2, DAR-3, DAR-4, and DAR-5. These exhibits are:

Exhibit DAR-1	Proposed ECR Tariff
Exhibit DAR-2	Proposed ECR Tariff - Redline
Exhibit DAR-3	Current LG&E Environmental Surcharge Monthly Reports
Exhibit DAR-4	Proposed LG&E Environmental Surcharge Monthly Reports
Exhibit DAR-5	2016 Plan Customer Bill Impact

Q. What are the purposes of your testimony?

A. My testimony addresses how the environmental surcharge under LG&E's Environmental Cost Recovery ("ECR") Surcharge tariff provisions will be calculated to include the costs of LG&E's 2016 Environmental Compliance Plan ("2016 Plan"), presents the revisions to the monthly ECR reporting forms ("ES Forms") that LG&E

proposes and explains why the revisions to the forms are appropriate, and discusses the bill impact on LG&E's customers.

Q. Is LG&E proposing any changes to its Environmental Cost Recovery Surcharge tariff sheets?

A. LG&E is not proposing to make any changes to its Environmental Cost Recovery Surcharge tariff sheets other than to change their issue and effective dates to reflect LG&E's Application in this proceeding. The proposed ECR Tariff is attached as Exhibit DAR-1 and a redline version comparing the proposed ECR Tariff to the existing tariff is attached as Exhibit DAR-2. The ECR tariff has an issue date of January 29, 2016, and is proposed to be effective on July 29, 2016. Therefore, bills reflecting the expense month of July 2016 will reflect the revised environmental surcharge.

Q. Will the methodologies for calculating the environmental surcharge change if the Commission approves recovery of LG&E's 2016 Plan?

A. No. LG&E will use the currently approved methodologies for calculating the environmental surcharge, including the revenue allocation discussed in Robert M. Conroy's testimony. The proposed calculation of the monthly Environmental Surcharge billing factor will continue to consolidate the 2009 Plan and the 2011 Plan and will add the proposed 2016 Plan.

Q. Will the monthly reporting forms used for calculating the environmental surcharge change if the Commission approves recovery of LG&E's 2016 Plan?

A. Yes. LG&E is proposing to revise several of its monthly reporting forms to reflect the recovery of the costs associated with the 2016 Plan. Exhibit DAR-3 contains

LG&E's current monthly ES Forms; Exhibit DAR-4 contains LG&E's proposed monthly ES Forms.

Q. Please describe the monthly-reporting-form modifications that LG&E is proposing as a result of the 2016 Plan.

A. The calculation of the monthly billing factor for recovery of the cost of LG&E's 2016 Plan will be consistent with the current methodology approved by the Commission and used to calculate the recovery of the cost of LG&E's current Environmental Compliance Plans. ES Form 1.00 will continue to show the calculation of the Jurisdictional Environmental Surcharge Billing Factor using the same methodology previously approved by the Commission.

Determination of the Environmental Compliance Rate Base is based on combining all ECR-approved expenditures and calculating the rate base according to the methodologies ordered in the previous Compliance Plan cases.

LG&E proposes to modify ES Form 2.00 (Revenue Requirements of Environmental Compliance Costs) to account for the impact on environmental compliance rate base of construction related to compliance with the federal Coal Combustion Residuals ("CCR") Rule and to change various references to other ES Forms to track the proposed ES Form changes discussed below.

The plant, construction work in progress, and depreciation expenses for the 2009 and 2011 Plans are currently reported on ES Form 2.10. This form is being expanded to include the 2016 Plan projects for which LG&E is seeking cost recovery, including two rows for each of Projects 29 and 30 to show separately the costs of CCR Rule compliance construction and the costs of process water system construction for each project. Also, LG&E proposes to add a column called "CCR

Rule Compliance Construction Costs" to ES Form 2.10, which will apply to Projects 29 and 30.

LG&E proposes to modify current ES Forms 2.30 through 2.33 to reflect changes associated with the implementation of the Cross-State Air Pollution Rule ("CSAPR") in January 2015. As LG&E noted in its February 20, 2015 submittal letter to the Commission providing LG&E's Monthly Environmental Surcharge Report for the expense month of January 2015, it was necessary at that time to provide the Commission supplemental schedules to ES Form 2.31 to differentiate between SO_2 allowances under the Clean Air Interstate Rule ("CAIR") and CSAPR. LG&E now proposes to make those supplemental forms a permanent part of LG&E's monthly reporting by modifying ES Forms 2.30 through 2.33 as follows:

- ES Form 2.30 will be modified to allow for the differentiation of SO_2 allowances between CAIR and CSAPR allowances. This is being done by including two additional columns to display the differentiation.
- Current ES Form 2.31 will be removed as redundant relative to the renamed ES Forms 2.31 and 2.32 (currently Supplemental ES Form 2.31 CAIR and Supplemental ES Form 2.31 CSAPR).
- The current Supplemental ES Form 2.31 CAIR will be renamed ES Form 2.31 – Inventory of CAIR Emission Allowances (SO_2) - Current Vintage Year.
- The current Supplemental ES Form 2.31 CSAPR will be renamed ES Form 2.32 - Inventory of CSAPR Emission Allowances (SO_2) - Current Vintage Year.
- The current ES Form 2.32 will be renamed ES Form 2.33 - Inventory of Emission Allowances (NOx) - Ozone Season Allowance Allocation.

- The current ES Form 2.33 will be renamed ES Form 2.34 - Inventory of Emission Allowances (NOx) - Annual Allowance Allocation.

The pollution control equipment operating and maintenance ("O&M") expenses for the 2009 and 2011 Plans are currently reported on ES Form 2.50. This form is being expanded to include the O&M expenses associated with Project 28. LG&E is not proposing to recover O&M expenses through the ECR mechanism for the other projects in the 2016 Plan.

ES Form 3.00 will be modified to change the name of column (4) from "Fuel Clause Revenues," to "Fuel Clause Revenues Including Off-System Sales Tracker." Similarly, ES Form 3.10 Item (2) "Fuel Adjustment Clause" is being renamed "Fuel Adjustment Clause including Off System Sales Tracker." These changes reflect the settlement agreement in LG&E's 2014 base-rate case (Case No. 2014-00372), which implemented the off-system sales adjustment clause factor as a credit to customers through the Fuel Adjustment Clause.

Q. Has LG&E estimated the impact of the new projects on the Environmental Cost Recovery Surcharge?

A. Yes. The table below shows the estimated annual impact on Total E(m), Jurisdictional E(m), and the incremental billing factor associated with the projects contained in the 2016 Plan. As shown in the table, the estimated impact on a customer is an increase of 0.80% initially in 2016 and increasing to a maximum of 2.49% in 2020. For a residential customer using an average of 976 kWh per month, the initial monthly increase is expected to be $0.73 in 2016, upon approval by the Commission. It is estimated that this amount will increase to a maximum of $2.26

per month in 2020. Exhibit DAR-5 shows the details of the impact on the calculation of the environmental surcharge and a residential customer for 2016 through 2024.

Environmental Cost Recovery Surcharge Summary

	2016	2017	2018	2019	2020
Total E(m) - ($000)	$8,184	$14,705	$21,465	$26,346	$28,058
12 Month Average Jurisdictional Ratio	94.24%	94.24%	94.24%	94.24%	94.24%
Jurisdictional E(m) - ($000)	$7,713	$13,858	$20,229	$24,830	$26,443
Forecasted Jurisdictional R(m) - (million)	967	994	1,029	1,051	1,063
Incremental Billing Factor	0.80%	1.39%	1.97%	2.36%	2.49%
Residential Customer Impact					
Monthly bill (976 kWh per month)	$0.73	$1.27	$1.79	$2.15	$2.26

<u>Conclusion and Recommendation</u>

Q. What are your conclusion and recommendation to the Commission?

A. I recommend that the Commission approve LG&E's 2016 Plan and application for cost recovery of its compliance costs through the Rate Schedule ECR tariff, as well as the proposed changes to LG&E's Rate Schedule ECR tariff and monthly ES Forms beginning with the expense month of July 2016.

Q. Does this conclude your testimony?

A. Yes, it does.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Derek A. Rahn**, being duly sworn, deposes and says that he is Manager - Revenue Requirement for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Derek A. Rahn

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
My commission expires July 11, 2018
Notary ID # 512743

APPENDIX A

Derek A. Rahn
Manager, Revenue Requirement
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-4127

Education

Masters of Business Administration,
Bellarmine University, July 2010.
Bachelor of Science in Electrical Engineering,
University of Kentucky, December 2003.

Training: Managing People & Processes (2014), IUS Leadership Program (2007-2008), Professional Development Program (2007-2008), Global Leadership Summit (2013 & 2015), Mentoring Program (2008, 2014, & 2015), Project Management (2006), Microsoft Project (2005), Advanced Operator (2008), Basic Shaft Alignment (2006).

Previous Positions

Manager, Transmission Policy & Tariffs	Sept. 2010 – Oct. 2015
Group Leader, Transmission Operations Engineering	Dec. 2008 – Sept. 2010
Supervisor, Operations (Ghent Power Station)	Dec. 2007 – Dec. 2008
Electrical Engineer II (Ghent Power Station)	Jul. 2005 – Dec. 2007
Project Engineer (TubeMaster, Inc.)	Dec 2003 – Jul. 2005

Louisville Gas and Electric Company

P.S.C. Electric No. 10, Second Revision of Original Sheet No. 87
Canceling P.S.C. Electric No. 10, First Revision of Original Sheet No. 87

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

APPLICABLE

In all territory served.

AVAILABILITY OF SERVICE

This schedule is mandatory to all Standard Electric Rate Schedules listed in Section 1 of the General Index except CTAC and Special Charges, all Pilot Programs listed in Section 3 of the General Index, and the FAC (including the Off-System Sales Tracker) and DSM Adjustment Clauses. Standard Electric Rate Schedules subject to this schedule are divided into Group 1 or Group 2 as follows:

Group 1: Rate Schedules RS; RTOD-Energy; RTOD-Demand; VFD; LS; RLS; LE; and TE.
Group 2: Rate Schedules GS; PS; TODS; TODP; RTS; and FLS.

RATE

The monthly billing amount under each of the schedules to which this mechanism is applicable, shall be increased or decreased by a percentage factor calculated in accordance with the following formula.

Group Environmental Surcharge Billing Factor = Group E(m) / Group R(m)

As set forth below, Group E(m) is the sum of Jurisdictional E(m) of each approved environmental compliance plan revenue requirement of environmental compliance costs for the current expense month allocated to each of Group 1 and Group 2. Group R(m) for Group 1 is the 12-month average revenue for the current expense month and for Group 2 it is the 12-month average non-fuel revenue for the current expense month.

DEFINITIONS

1) For all Plans, E(m) = [(RB/12) (ROR + (ROR – DR) (TR / (1 – TR))] + OE – EAS + BR
   a) RB is the Total Environmental Compliance Rate Base.
   b) ROR is the Rate of Return on Environmental Compliance Rate Base, designated as the overall rate of return [cost of short-term debt, long-term debt, preferred stock, and common equity].
   c) DR is the Debt Rate [cost of short-term debt and long-term debt].
   d) TR is the Composite Federal and State Income Tax Rate.
   e) OE is the Operating Expenses. OE includes operation and maintenance expense recovery authorized by the K.P.S.C. in all approved ECR Plan proceedings.
   f) EAS is the total proceeds from emission allowance sales.
   g) BR is the operation and maintenance expenses, and/or revenues if applicable, associated with Beneficial Reuse.
   h) Plans are the environmental surcharge compliance plans submitted to and approved by the Kentucky Public Service Commission pursuant to KRS 278.183.

DATE OF ISSUE: January 29, 2016

DATE EFFECTIVE: July 29, 2016

ISSUED BY: /s/ Edwin R. Staton, Vice President
State Regulation and Rates
Louisville, Kentucky

Issued by Authority of an Order of the Public Service Commission in Case No. 2016-00027 dated ________, 20___

Louisville Gas and Electric Company

P.S.C. Electric No. 10, First Revision of Original Sheet No. 87.1
Canceling P.S.C. Electric No. 10, Original Sheet No. 87.1

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

DEFINITIONS (continued)

2) Total E(m) (sum of each approved environmental compliance plan revenue requirement) is multiplied by the Jurisdictional Allocation Factor. Jurisdictional E(m) is adjusted for any (Over)/Under collection or prior period adjustment and by the subtraction of the Revenue Collected through Base Rates for the Current Expense month to arrive at Adjusted Net Jurisdictional E(m). Adjusted Net Jurisdictional E(m) is allocated to Group 1 and Group 2 on the basis of Revenue as a Percentage of Total Revenue for the 12 months ending with the Current Month to arrive at Group 1 E(m) and Group 2 E(m).

3) The Group 1 R(m) is the average of total Group 1 monthly base revenue for the 12 months ending with the current expense month. Base revenue includes the customer, energy, and lighting charges for each rate schedule included in Group 1 to which this mechanism is applicable and automatic adjustment clause revenues for the Fuel Adjustment Clause and the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 1.

4) The Group 2 R(m) is the average of total Group 2 monthly base non-fuel revenue for the 12 months ending with the current expense month. Base non-fuel revenue includes the customer, non-fuel energy, and demand charges for each rate schedule included in Group 2 to which this mechanism is applicable and automatic adjustment clause revenues for the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 2. Non-fuel energy is equal to the tariff energy rate for each rate schedule included in Group 2 less the base fuel factor as defined on Sheet No. 85.1, Paragraph 6.

5) Current expense month (m) shall be the second month preceding the month in which the Environmental Surcharge is billed.

DATE OF ISSUE: January 29, 2016

DATE EFFECTIVE: July 29, 2016

ISSUED BY: ***/s/*** Edwin R. Staton, Vice President
State Regulation and Rates
Louisville, Kentucky

Issued by Authority of an Order of the Public Service Commission in Case No. 2016-00027 dated _________, 20____

Louisville Gas and Electric Company

P.S.C. Electric No. 10, Second~~First~~ Revision of Original Sheet No. 87
Canceling P.S.C. Electric No. 10, First Revision of Original Sheet No. 87

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

APPLICABLE
In all territory served.

AVAILABILITY OF SERVICE
This schedule is mandatory to all Standard Electric Rate Schedules listed in Section 1 of the General Index except CTAC and Special Charges, all Pilot Programs listed in Section 3 of the General Index, and the FAC (including the Off-System Sales Tracker) and DSM Adjustment Clauses. Standard Electric Rate Schedules subject to this schedule are divided into Group 1 or Group 2 as follows:

Group 1: Rate Schedules RS; RTOD-Energy; RTOD-Demand; VFD; LS; RLS; LE; and TE.
Group 2: Rate Schedules GS; PS; TODS; TODP; RTS; and FLS.

RATE
The monthly billing amount under each of the schedules to which this mechanism is applicable, shall be increased or decreased by a percentage factor calculated in accordance with the following formula.

Group Environmental Surcharge Billing Factor = Group E(m) / Group R(m)

As set forth below, Group E(m) is the sum of Jurisdictional E(m) of each approved environmental compliance plan revenue requirement of environmental compliance costs for the current expense month allocated to each of Group 1 and Group 2. Group R(m) for Group 1 is the 12-month average revenue for the current expense month and for Group 2 it is the 12-month average non-fuel revenue for the current expense month.

DEFINITIONS
1) For all Plans, E(m) = [(RB/12) (ROR + (ROR – DR) (TR / (1 – TR))] + OE – EAS + BR
   a) RB is the Total Environmental Compliance Rate Base.
   b) ROR is the Rate of Return on Environmental Compliance Rate Base, designated as the overall rate of return [cost of short-term debt, long-term debt, preferred stock, and common equity].
   c) DR is the Debt Rate [cost of short-term debt and long-term debt].
   d) TR is the Composite Federal and State Income Tax Rate.
   e) OE is the Operating Expenses. OE includes operation and maintenance expense recovery authorized by the K.P.S.C. in all approved ECR Plan proceedings.
   f) EAS is the total proceeds from emission allowance sales.
   g) BR is the operation and maintenance expenses, and/or revenues if applicable, associated with Beneficial Reuse.
   h) Plans are the environmental surcharge compliance plans submitted to and approved by the Kentucky Public Service Commission pursuant to KRS 278.183.

DATE OF ISSUE: January 29, 2016~~December 16, 2015~~

DATE EFFECTIVE: July 29, 2016~~December 7, 2015~~

ISSUED BY: /s/ Edwin R. Staton, Vice President
State Regulation and Rates
Louisville, Kentucky

Issued by Authority of an Order of the
Public Service Commission in Case No.
2016-00027~~2015-00222~~ dated ________, 20___~~December 7, 2015~~

Louisville Gas and Electric Company

P.S.C. Electric No. 10, First Revision of Original Sheet No. 87.1
Canceling P.S.C. Electric No. 10, Original Sheet No. 87.1

Adjustment Clause **ECR**
Environmental Cost Recovery Surcharge

DEFINITIONS (continued)

2) Total E(m) (sum of each approved environmental compliance plan revenue requirement) is multiplied by the Jurisdictional Allocation Factor. Jurisdictional E(m) is adjusted for any (Over)/Under collection or prior period adjustment and by the subtraction of the Revenue Collected through Base Rates for the Current Expense month to arrive at Adjusted Net Jurisdictional E(m). Adjusted Net Jurisdictional E(m) is allocated to Group 1 and Group 2 on the basis of Revenue as a Percentage of Total Revenue for the 12 months ending with the Current Month to arrive at Group 1 E(m) and Group 2 E(m).

3) The Group 1 R(m) is the average of total Group 1 monthly base revenue for the 12 months ending with the current expense month. Base revenue includes the customer, energy, and lighting charges for each rate schedule included in Group 1 to which this mechanism is applicable and automatic adjustment clause revenues for the Fuel Adjustment Clause and the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 1.

4) The Group 2 R(m) is the average of total Group 2 monthly base non-fuel revenue for the 12 months ending with the current expense month. Base non-fuel revenue includes the customer, non-fuel energy, and demand charges for each rate schedule included in Group 2 to which this mechanism is applicable and automatic adjustment clause revenues for the Demand-Side Management Cost Recovery Mechanism as applicable for each rate schedule in Group 2. Non-fuel energy is equal to the tariff energy rate for each rate schedule included in Group 2 less the base fuel factor as defined on Sheet No. 85.1, Paragraph 6.

5) Current expense month (m) shall be the second month preceding the month in which the Environmental Surcharge is billed.

DATE OF ISSUE: January 29, 2016~~July 10, 2015~~

DATE EFFECTIVE: July 29, 2016~~July 1, 2015~~

ISSUED BY: ***/s/*** Edwin R. Staton, Vice President
State Regulation and Rates
Louisville, Kentucky

Issued by Authority of an Order of the
Public Service Commission in Case No.
2016-00027~~2014-00372~~ dated _________, 20____ ~~June 30, 2015~~

ES FORM 1.00

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Net Group E(m) and
Group Environmental Surcharge Billing Factors
For the Expense Month of

GROUP 1 (Total Revenue)

Group 1 E(m) -- ES Form 1.10, line 15	=
Group 1 ES Billing Factor -- ES Form 1.10, line 17	=

GROUP 2 (Net Revenue)

Group 2 E(m) -- ES Form 1.10, line 15	=
Group 2 ES Billing Factor -- ES Form 1.10, line 17	=

Effective Date for Billing:

Submitted by: ______________________________

Title: Manager - Revenue Requirement

Date Submitted: January 22, 2016

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Calculation of Total E(m) and
Group Surcharge Billing Factors

For the Expense Month of

Calculation of Total E(m)

E(m) = [(RB / 12) (ROR+(ROR -DR)(TR/(1-TR)))] + OE - BAS + BR, where

RB	=	Environmental Compliance Rate Base
ROR	=	Rate of Return on the Environmental Compliance Rate Base
DR	=	Debt Rate (both short-term and long-term debt)
TR	=	Composite Federal & State Income Tax Rate
OE	=	Pollution Control Operating Expenses
BAS	=	Total Proceeds from By-Product and Allowance Sales
BR	=	Beneficial Reuse Operating Expenses

				Environmental Compliance Plans
(1)	RB		=	
(2)	RB / 12		=	
(3)	(ROR + (ROR - DR) (TR / (1 - TR)))		=	
(4)	OE		=	
(5)	BAS		=	
(6)	BR		=	
(7)	E(m)	(2) x (3) + (4) - (5) + (6)	=	

Calculation of Adjusted Net Jurisdictional E(m)

(8)	Jurisdictional Allocation Ratio for Expense Month -- ES Form 3.10	=	
(9)	Jurisdictional E(m) = Total E(m) x Jurisdictional Allocation Ratio [(7) x (8)]	=	
(10)	Adjustment for (Over)/Under-collection pursuant to Case No. 2015-00021	=	
(11)	Prior Period Adjustment (if necessary)	=	
(12)	Revenue Collected through Base Rates	=	
(13)	Adjusted Net Jurisdictional E(m) [(9) + (10) + (11) - (12)]	=	

Calculation of Group Environmental Surcharge Billing Factors

			GROUP 1 (Total Revenue)	GROUP 2 (Net Revenue)
(14)	Revenue as a Percentage of 12-month Total Revenue ending with the Current Month -- ES Form 3.00	=		
(15)	Group E(m) [(13) x (14)]	=		
(16)	Group R(m) = Average Monthly Group Revenue for the 12 Months Ending with the Current Expense Month -- ES Form 3.00	=		
(17)	Group Environmental Surcharge Billing Factors [(15) ÷ (16)]	=		

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Revenue Requirements of Environmental Compliance Costs
For the Expense Month of

Determination of Environmental Compliance Rate Base

	Enviromental Compliance Plan	
Eligible Pollution Control Plant		
Eligible Pollution CWIP Excluding AFUDC		
Subtotal		
Additions:		
Inventory - Emission Allowances per ES Form 2.31, 2.32 and 2.33		
Cash Working Capital Allowance		
Subtotal		
Deductions:		
Accumulated Depreciation on Eligible Pollution Control Plant		
Pollution Control Deferred Income Taxes		
Subtotal		
Environmental Compliance Rate Base		

Determination of Pollution Control Operating Expenses

	Environmental Compliance Plan
Monthly Operations & Maintenance Expense	
Monthly Depreciation & Amortization Expense	
less investment tax credit amortization	
Monthly Taxes Other Than Income Taxes	
Monthly Emission Allowance Expense from ES Form 2.31, 2.32 and 2.33	
Monthly Surcharge Consulting Fees	
Construction Monitoring Consultant Fee	
Total Pollution Control Operations Expense	

Determination of Beneficial Reuse Operating Expenses

	Environmental Compliance Plan
Total Monthly Beneficial Reuse Expense	
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)	
Net Beneficial Reuse Operations Expense	

Proceeds From By-Product and Allowance Sales

	Total Proceeds	Amount in Base Rates	Net Proceeds
	(1)	(2)	(1) - (2)
Allowance Sales			
Scrubber By-Products Sales			
Total Proceeds from Sales			

ES FORM 2.10

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Plant, CWIP & Depreciation Expense

For the Month Ended:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Description	Eligible Plant In Service	Eligible Accumulated Depreciation	CWIP Amount Excluding AFUDC	Eligible Net Plant In Service	Deferred Tax Balance as of 12/31/2015	Monthly ITC Amortization Credit	Monthly Depreciation Expense	Monthly Property Tax Expense
				(2)-(3)+(4)				
2009 Plan:								
Project 22 - Cane Run CCP Storage (Landfill - Phase I) [CANCELLED]								
Project 23 - Trimble County Ash Treatment Basin (BAP/GSP)								
Project 24 - Trimble County CCP Storage (Landfill - Phase 1)								
Project 25 - Beneficial Reuse								
Subtotal								
Less Retirements and Replacement resulting from implementation of 2009 Plan								
Net Total - 2009 Plan:								
2011 Plan:								
Project 26 - Mill Creek Station Air Compliance								
Project 27 - Trimble County Unit 1 Air Compliance								
Subtotal								
Less Retirements and Replacement resulting from implementation of 2011 Plan								
Net Total - 2011 Plan:								
Net Total - All Plans:								

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.
Note 2: Effective with the September 2012 expense month, Project 22 is cancelled and the previous CWIP balance is included on ES Form 2.50 as an expense for the September 2012 expense month.

ES FORM 2.30

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances

For the Month Ended:

Vintage Year	Number of Allowances			Total Dollar Value Of Vintage Year			Comments and Explanations
	SO_2 (Note 1)	NOx Annual	NOx Ozone Season	SO_2 (Note 2)	NOx Annual	NOx Ozone Season	
Current Year							
2017							
2018							
2019							
2020							
2021							
2022							
2023							
2024							
2025							
2026							
2027							
2028							
2029							
2030							
2031							
2032							
2033							
2034							
2035							
2036 - 2045							

Note 1: Includes CAIR allowances of 102,369 for the current year and 62,379 for years 2016 through 2044.
Note 2: Total Dollar Value of Vintage Year for SO_2 allowances are associated with CAIR allowances only. EPA allotment of CSAPR allowances have $0 value when received.

In the "Comments and Explanation" Column, describe any allowance inventory adjustment other than the assignment of allowances by EPA. Inventory adjustments include, but are not limited to, purchases, allowances acquired as part of other purchases, and the sale of allowances.

ES FORM 2.31

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

SUPPLEMENTAL ES FORM 2.31 - SUPPORT SCHEDULE

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of CAIR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

SUPPLEMENTAL ES FORM 2.31 - SUPPORT SCHEDULE

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Inventory of CSAPR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

ES FORM 2.32

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (NOx) - Ozone Season Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.33

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances (NOx) - Annual Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.40

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
O&M Expenses and Determination of Cash Working Capital Allowance

For the Month Ended:

Environmental Compliance Plan	
O&M Expenses	Amount
11th Previous Month	
10th Previous Month	
9th Previous Month	
8th Previous Month	
7th Previous Month	
6th Previous Month	
5th Previous Month	
4th Previous Month	
3rd Previous Month	
2nd Previous Month	
Previous Month	
Current Month	
Total 12 Month O&M	

Determination of Working Capital Allowance	
12 Months O&M Expenses	
One Eighth (1/8) of 12 Month O&M Expenses	1/8
Pollution Control Cash Working Capital Allowance	

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Pollution Control - Operations & Maintenance Expenses
For the Month Ended:

O&M Expense Account	Mill Creek	Trimble County	Total
2009 Plan			
502013 - ECR Landfill Operations	[redacted]		
512107 - ECR Landfill Maintenance			
Adjustment for CCP Disposal in Base Rates (ES Form 2.51)			
Net 2009 Plan O&M Expenses			
2011 Plan			
502056 - ECR Scrubber Operations		[redacted]	
512055 - ECR Scrubber Maintenance			
506159 - ECR Sorbent Injection Operation			
506152 - ECR Sorbent Reactant - Reagent Only			
512152 - ECR Sorbent Injection Maintenance			
506156 - ECR Baghouse Operations			
512156 - ECR Baghouse Maintenance			
506151 - ECR Activated Carbon			
Adjustment for Base Rates Baseline Amounts		[redacted]	
Total 2011 Plan O&M Expenses			
Current Month O&M Expense for All Plans			

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

ES FORM 2.51

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
CCP Disposal Facilities Expenses
For the Month Ended:

	On-Site CCP Disposal O&M Expense	Trimble County
	Existing CCP Disposal Facilities (Pre 2009 Plan Project)	
(1)	12 Months Ending with Expense Month	
(2)	Monthly Amount [(1) / 12]	
	2009 Plan Project	
(3)	Monthly Expense	
	Total Generating Station	
(4)	Monthly Expense [(2) + (3)]	
	Base Rates	
(5)	Annual Expense Amount (12 Mo Ending with Last Test Year)	
(6)	Monthly Expense Amount [(5) / 12]	
(7)	Total Generating Station Less Base Rates [(4) - (6)]	
(8)	Less 2009 Plan Project [(7) - (3)]	
	If Line (8) Greater than Zero, No Adjustment	
	If Line (8) Less than Zero, Adjustment for Base Rates	
Adjustment for Base Rate Amount (to ES Form 2.50)		

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

Note 2: ES Form 2.51 will not be utilized until O&M costs associated with the 2009 Plan are incurred.

ES FORM 2.60

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Beneficial Reuse - Operations & Maintenance Expenses
For the Month Ended:

Third Party	O&M Expense Account	Plant	Total O&M
Total Monthly Beneficial Reuse Expense			
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)			
Net Beneficial Reuse O&M Expense			

ES FORM 2.61

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Beneficial Reuse Opportunities
For the Month Ended:

	On-Site CCP Disposal O&M Expense	Mill Creek	Trimble County	Total
	Existing Beneficial Reuse Opportunities (Pre 2009 Plan Project)			
(1)	12 Months Ending with Expense Month			
(2)	Monthly Amount [(1) / 12]			
	2009 Plan Project 25			
(3)	Monthly Amount (Expense/Revenue)			
	Total Beneficial Reuse - Generating Station			
(4)	Monthly Expense [(2) + (3)]			
	Beneficial Reuse in Base Rates			
(5)	Annual Expense Amount (12 Mo Ending with Last Test Year)			
(6)	Monthly Expense Amount [(5) / 12]			
(7)	Total Generating Station Less Base Rates [(4) - (6)]			
(8)	Less 2009 Plan Project 25 [(7) - (3)]			
	If Line (8) Greater than Zero, No Adjustment			
	If Line (8) Less than Zero, Adjustment for Base Rates			
Adjustment for Base Rate Amount (to ES Form 2.60)				

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Monthly Average Revenue Computation of R (m) for GROUP 1 AND GROUP 2

For the Month Ended:

	GROUP 1 (Total Revenues) - Kentucky Jurisdictional Revenues						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge, for 12 Months Ending Current Expense Month.							
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =							
GROUP 1 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month							

	GROUP 2 (Net Revenues) - Kentucky Jurisdictional Revenues							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)	Total Non-Fuel Revenues plus DSM (2)+(5)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge and Fuel, for 12 Months Ending Current Expense Month.								
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =								
GROUP 2 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month								

ES FORM 3.10

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Reconciliation of Reported Revenues

For the Month Ended:

		Revenues per Form 3.00	Revenues per Income Statement
Kentucky Retail Revenues			
(1)	Base Rates (Customer Charge, Energy Charge, Demand Charge)		
(2)	Fuel Adjustment Clause		
(3)	DSM		
(4)	Environmental Surcharge		
(5)	CSR Credits		
(6)	Total Kentucky Jurisdictional Revenues for Environmental Surcharge Purposes =		
Non -Jurisdictional Revenues			
(7)	InterSystem (Total Less Transmission Portion Booked in Account 447)		
(8)	Total Non-Jurisdictional Revenues for Environmental Surcharge Purposes =		
(9)	Total Company Revenues for Environmental Surcharge Purposes =		
	Jurisdictional Allocation Ratio for Current Month [(5) / (8)] =		
Reconciling Revenues			
(10)	Brokered		
(11)	InterSystem (Transmission Portion Booked in Account 447)		
(12)	Unbilled		
(13)	Miscellaneous		
(14)	Total Company Revenues per Income Statement =		

ES FORM 1.00

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Net Group E(m) and
Group Environmental Surcharge Billing Factors
For the Expense Month of

GROUP 1 (Total Revenue)

Group 1 E(m) -- ES Form 1.10, line 15 =

Group 1 ES Billing Factor -- ES Form 1.10, line 17 =

GROUP 2 (Net Revenue)

Group 2 E(m) -- ES Form 1.10, line 15 =

Group 2 ES Billing Factor -- ES Form 1.10, line 17 =

Effective Date for Billing:

Submitted by: ______________________________

Title: Manager, Revenue Requirements

Date Submitted:

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Calculation of Total E(m) and
Group Surcharge Billing Factors

For the Expense Month of

Calculation of Total E(m)

E(m) = [(RB / 12) (ROR+(ROR -DR)(TR/(1-TR)))] + OE - BAS + BR, where

RB	=	Environmental Compliance Rate Base
ROR	=	Rate of Return on the Environmental Compliance Rate Base
DR	=	Debt Rate (both short-term and long-term debt)
TR	=	Composite Federal & State Income Tax Rate
OE	=	Pollution Control Operating Expenses
BAS	=	Total Proceeds from By-Product and Allowance Sales
BR	=	Beneficial Reuse Operating Expenses

				Environmental Compliance Plans
(1)	RB		=	
(2)	RB / 12		=	
(3)	(ROR + (ROR - DR) (TR / (1 - TR)))		=	
(4)	OE		=	
(5)	BAS		=	
(6)	BR		=	
(7)	E(m)	(2) x (3) + (4) - (5) + (6)	=	

Calculation of Adjusted Net Jurisdictional E(m)

(8)	Jurisdictional Allocation Ratio for Expense Month -- ES Form 3.10	=	
(9)	Jurisdictional E(m) = Total E(m) x Jurisdictional Allocation Ratio [(7) x (8)]	=	
(10)	Adjustment for (Over)/Under-collection pursuant to Case No.	=	
(11)	Prior Period Adjustment (if necessary)	=	
(12)	Revenue Collected through Base Rates	=	
(13)	Adjusted Net Jurisdictional E(m) [(9) + (10) + (11) - (12)]	=	

Calculation of Group Environmental Surcharge Billing Factors

			GROUP 1 (Total Revenue)	GROUP 2 (Net Revenue)
(14)	Revenue as a Percentage of 12-month Total Revenue ending with the Current Month -- ES Form 3.00	=		
(15)	Group E(m) [(13) x (14)]	=		
(16)	Group R(m) = Average Monthly Group Revenue for the 12 Months Ending with the Current Expense Month -- ES Form 3.00	=		
(17)	Group Environmental Surcharge Billing Factors [(15) ÷ (16)]	=		

ES FORM 2.00

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Revenue Requirements of Environmental Compliance Costs
For the Expense Month of

Determination of Environmental Compliance Rate Base

	Enviromental Compliance Plan	
Eligible Pollution Control Plant		
Eligible Pollution CWIP Excluding AFUDC		
Eligible CCR Rule Compliance Construction Costs		
Subtotal		
Additions:		
Inventory - Emission Allowances per ES Forms 2.31, 2.32, 2.33 and 2.34		
Cash Working Capital Allowance		
Subtotal		
Deductions:		
Accumulated Depreciation on Eligible Pollution Control Plant		
Pollution Control Deferred Income Taxes		
Subtotal		
Environmental Compliance Rate Base		

Determination of Pollution Control Operating Expenses

	Environmental Compliance Plan
Monthly Operations & Maintenance Expense	
Monthly Depreciation & Amortization Expense	
less investment tax credit amortization	
Monthly Taxes Other Than Income Taxes	
Monthly Emission Allowance Expense from ES Forms 2.31, 2.32, 2.33 amd 2.34	
Monthly Surcharge Consulting Fees	
Construction Monitoring Consultant Fee	
Total Pollution Control Operations Expense	

Determination of Beneficial Reuse Operating Expenses

	Environmental Compliance Plan
Total Monthly Beneficial Reuse Expense	
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)	
Net Beneficial Reuse Operations Expense	

Proceeds From By-Product and Allowance Sales

	Total Proceeds	Amount in Base Rates	Net Proceeds
	(1)	(2)	(1) - (2)
Allowance Sales			
Scrubber By-Products Sales			
Total Proceeds from Sales			

ES FORM 2.10

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Plant, CWIP & Depreciation Expense

For the Month Ended:

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Description	Eligible Plant In Service	Eligible Accumulated Depreciation	CWIP Amount Excluding AFUDC	CCR Rule Compliance Construction Costs	Eligible Net Plant In Service	Deferred Tax Balance as of	Monthly ITC Amortization Credit	Monthly Depreciation Expense	Monthly Property Tax Expense
					(2)-(3)+(4)+(5)				
2009 Plan:									
Project 22 - Cane Run CCP Storage (Landfill - Phase I) [CANCELLED]									
Project 23 - Trimble County Ash Treatment Basin (BAP/GSP)									
Project 24 - Trimble County CCP Storage (Landfill - Phase 1)									
Project 25 - Beneficial Reuse									
Subtotal									
Less Retirements and Replacement resulting from implementation of 2009 Plan									
Net Total - 2009 Plan:									
2011 Plan:									
Project 26 - Mill Creek Station Air Compliance									
Project 27 - Trimble County Unit 1 Air Compliance									
Subtotal									
Less Retirements and Replacement resulting from implementation of 2011 Plan									
Net Total - 2011 Plan:									
2016 Plan:									
Project 28 - Supplemental Mercury Control									
Project 29 - Mill Creek CCR Rule Compliance Construction									
Project 29 - Mill Creek New Process Water Systems									
Project 30 - Trimble County CCR Rule Compliance Construction									
Project 30 - Trimble County New Process Water Systems									
Subtotal									
Less Retirements and Replacement resulting from implementation of 2016 Plan									
Net Total - 2016 Plan:									
Net Total - All Plans:									

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.
Note 2: Effective with the September 2012 expense month, Project 22 is cancelled and the previous CWIP balance is included on ES Form 2.50 as an expense for the September 2012 expense month.

ES FORM 2.30

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of Emission Allowances

For the Month Ended:

Vintage Year	Number of Allowances				Total Dollar Value Of Vintage Year				Comments and Explanations
	SO_2 CAIR	SO_2 CSAPR	NOx Ozone Season	NOx Annual	SO_2 CAIR	SO_2 CSAPR	NOx Ozone Season	NOx Annual	
Current Year									
2017									
2018									
2019									
2020									
2021									
2022									
2023									
2024									
2025									
2026									
2027									
2028									
2029									
2030									
2031									
2032									
2033									
2034									
2035									
2036 - 2045									

In the "Comments and Explanation" Column, describe any allowance inventory adjustment other than the assignment of allowances by EPA. Inventory adjustments include, but are not limited to, purchases, allowances acquired as part of other purchases, and the sale of allowances.

ES FORM 2.31

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of CAIR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

ES FORM 2.32

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Inventory of CSAPR Emission Allowances (SO_2) - Current Vintage Year

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor

ES FORM 2.33

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Inventory of Emission Allowances (NOx) - Ozone Season Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.34

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Inventory of Emission Allowances (NOx) - Annual Allowance Allocation

For the Expense Month of

	Beginning Inventory	Allocations/ Purchases	Utilized (Coal Fuel)	Utilized (Other Fuels)	Sold	Ending Inventory	Allocation, Purchase, or Sale Date & Vintage Years
TOTAL EMISSION ALLOWANCES IN INVENTORY, ALL CLASSIFICATIONS							
Quantity							
Dollars							
$/Allowance							
ALLOCATED ALLOWANCES FROM EPA: COAL FUEL							
Quantity							
Dollars							
ALLOCATED ALLOWANCES FROM EPA: OTHER FUELS							
Quantity							
Dollars							
ALLOWANCES FROM PURCHASES:							
From Market:							
Quantity							
Dollars							
$/Allowance							
From KU:							
Quantity							
Dollars							
$/Allowance							

Emission Allowance Expense for Other Power Generation is excluded from expense reported on Form 2.00 for recovery through the monthly billing factor.

ES FORM 2.40

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
O&M Expenses and Determination of Cash Working Capital Allowance

For the Month Ended:

Environmental Compliance Plan	
O&M Expenses	Amount
11th Previous Month	
10th Previous Month	
9th Previous Month	
8th Previous Month	
7th Previous Month	
6th Previous Month	
5th Previous Month	
4th Previous Month	
3rd Previous Month	
2nd Previous Month	
Previous Month	
Current Month	
Total 12 Month O&M	

Determination of Working Capital Allowance	
12 Months O&M Expenses	
One Eighth (1/8) of 12 Month O&M Expenses	1/8
Pollution Control Cash Working Capital Allowance	

ES FORM 2.50

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Pollution Control - Operations & Maintenance Expenses
For the Month Ended:

O&M Expense Account	Mill Creek	Trimble County	Total
2009 Plan			
502013 - ECR Landfill Operations			
512107 - ECR Landfill Maintenance			
Adjustment for CCP Disposal in Base Rates (ES Form 2.51)			
Net 2009 Plan O&M Expenses			
2011 Plan			
502056 - ECR Scrubber Operations			
512055 - ECR Scrubber Maintenance			
506159 - ECR Sorbent Injection Operation			
506152 - ECR Sorbent Reactant - Reagent Only			
512152 - ECR Sorbent Injection Maintenance			
506156 - ECR Baghouse Operations			
512156 - ECR Baghouse Maintenance			
506151 - ECR Activated Carbon			
Adjustment for Base Rates Baseline Amounts			
Total 2011 Plan O&M Expenses			
2016 Plan			
506153 - ECR Liquid Injection - Reagent Only			
Total 2016 Plan O&M Expenses			
Current Month O&M Expense for All Plans			

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

ES FORM 2.51

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

CCP Disposal Facilities Expenses
For the Month Ended:

	On-Site CCP Disposal O&M Expense	Trimble County
	Existing CCP Disposal Facilities (Pre 2009 Plan Project)	
(1)	12 Months Ending with Expense Month	
(2)	Monthly Amount [(1) / 12]	
	2009 Plan Project	
(3)	Monthly Expense	
	Total Generating Station	
(4)	Monthly Expense [(2) + (3)]	
	Base Rates	
(5)	Annual Expense Amount (12 Mo Ending with Last Test Year)	
(6)	Monthly Expense Amount [(5) / 12]	
(7)	Total Generating Station Less Base Rates [(4) - (6)]	
(8)	Less 2009 Plan Project [(7) - (3)]	
	If Line (8) Greater than Zero, No Adjustment	
	If Line (8) Less than Zero, Adjustment for Base Rates	
Adjustment for Base Rate Amount (to ES Form 2.50)		

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

Note 2: ES Form 2.51 will not be utilized until O&M costs associated with the 2009 Plan are incurred.

ES FORM 2.60

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Beneficial Reuse - Operations & Maintenance Expenses
For the Month Ended:

Third Party	O&M Expense Account	Plant	Total O&M
Total Monthly Beneficial Reuse Expense			
Adjustment for Beneficial Reuse in Base Rates (from ES Form 2.61)			
Net Beneficial Reuse O&M Expense			

ES FORM 2.61

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Beneficial Reuse Opportunities
For the Month Ended:

On-Site CCP Disposal O&M Expense	Mill Creek	Trimble County	Total
Existing Beneficial Reuse Opportunities (Pre 2009 Plan Project)			
(1) 12 Months Ending with Expense Month			
(2) Monthly Amount [(1) / 12]			
2009 Plan Project 25			
(3) Monthly Amount (Expense/Revenue)			
Total Beneficial Reuse - Generating Station			
(4) Monthly Expense [(2) + (3)]			
Beneficial Reuse in Base Rates			
(5) Annual Expense Amount (12 Mo Ending with Last Test Year)			
(6) Monthly Expense Amount [(5) / 12]			
(7) Total Generating Station Less Base Rates [(4) - (6)]			
(8) Less 2009 Plan Project 25 [(7) - (3)]			
If Line (8) Greater than Zero, No Adjustment			
If Line (8) Less than Zero, Adjustment for Base Rates			
Adjustment for Base Rate Amount (to ES Form 2.60)			

Note 1: Trimble County projects for the 2009 Plan are proportionately shared by KU at 48% and LG&E at 52%.

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT

Monthly Average Revenue Computation of R (m) for GROUP 1 AND GROUP 2

For the Month Ended:

	GROUP 1 (Total Revenues) - Kentucky Jurisdictional Revenues						
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues Including Off-System Sales Tracker	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge, for 12 Months Ending Current Expense Month.							
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =							
GROUP 1 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month							

	GROUP 2 (Net Revenues) - Kentucky Jurisdictional Revenues							
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Month	Non-fuel Base Rate Revenues	Base Rate Fuel Component	Fuel Clause Revenues Including Off-System Sales Tracker	DSM Revenues	Environmental Surcharge Revenues	Total (2)+(3)+(4)+(5)+(6)	Total Excluding Environmental Surcharge (7)-(6)	Total Non-Fuel Revenues plus DSM (2)+(5)
Average Monthly Jurisdictional Revenues, Excluding Environmental Surcharge and Fuel, for 12 Months Ending Current Expense Month.								
Average Kentucky Jurisdictional Revenues excluding Environmental Surcharge for 12-months ending with Current Month =								
GROUP 2 Revenues as a Percentage of Total Revenues for 12-months ending with the Current Month								

ES FORM 3.10

LOUISVILLE GAS AND ELECTRIC COMPANY
ENVIRONMENTAL SURCHARGE REPORT
Reconciliation of Reported Revenues

For the Month Ended:

		Revenues per Form 3.00	Revenues per Income Statement
Kentucky Retail Revenues			
(1)	Base Rates (Customer Charge, Energy Charge, Demand Charge)		
(2)	Fuel Adjustment Clause including Off System Sales Tracker		
(3)	DSM		
(4)	Environmental Surcharge		
(5)	CSR Credits		
(6)	Total Kentucky Jurisdictional Revenues for Environmental Surcharge Purposes =		
Non -Jurisdictional Revenues			
(7)	InterSystem (Total Less Transmission Portion Booked in Account 447)		
(8)	Total Non-Jurisdictional Revenues for Environmental Surcharge Purposes =		
(9)	Total Company Revenues for Environmental Surcharge Purposes =		
	Jurisdictional Allocation Ratio for Current Month [(5) / (8)] =		
Reconciling Revenues			
(10)	Brokered		
(11)	InterSystem (Transmission Portion Booked in Account 447)		
(12)	Unbilled		
(13)	Miscellaneous		
(14)	Total Company Revenues per Income Statement =		

Louisville Gas and Electric Company

Environmental Cost Recovery Surcharge Summary

	2016	2017	2018	2019	2020	2021	2022	2023	2024
Total E(m) - ($000)	$8,184	$14,705	$21,465	$26,346	$28,058	$27,751	$27,713	$27,613	$26,822
12 Month Average Jurisdictional Ratio	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%
Jurisdictional E(m) - ($000)	$7,713	$13,858	$20,229	$24,830	$26,443	$26,154	$26,118	$26,024	$25,278
Forecasted Jurisdictional R(m) - (million)	967	994	1,029	1,051	1,063	1,103	1,128	1,178	1,211
Incremental Billing Factor	0.80%	1.39%	1.97%	2.36%	2.49%	2.37%	2.32%	2.21%	2.09%
Residential Customer Impact									
Monthly bill (976 kWh per month)	$0.73	$1.27	$1.79	$2.15	$2.26	$2.15	$2.10	$2.01	$1.90

Revenue Requirements Summary
2016 Amended Plan - LG&E

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 28	**Supplemental Mercury Control Systems**										
	Revenue Requirement										
	Eligible Plant	4,928,995	4,928,995	4,928,995	4,928,995	4,928,995	4,928,995	4,928,995	4,928,995	4,928,995	4,928,995
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(72,547)	(206,481)	(340,414)	(474,347)	(608,281)	(742,214)	(876,147)	(1,010,081)	(1,144,014)	(1,277,947)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	(960,606)	(977,611)	(989,451)	(996,526)	(999,180)	(997,755)	(992,548)	(983,852)	(974,585)	(965,308)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	3,895,842	3,744,904	3,599,130	3,458,122	3,321,535	3,189,026	3,060,300	2,935,063	2,810,397	2,685,740
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$389,247	$374,166	$359,601	$345,512	$331,866	$318,626	$305,765	$293,252	$280,796	$268,341
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	72,547	133,933	133,933	133,933	133,933	133,933	133,933	133,933	133,933	133,933
	Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Annual Property Tax expense	0	7,285	7,084	6,883	6,682	6,481	6,280	6,079	5,878	5,677
	Total OE	$72,547	$141,218	$141,017	$140,816	$140,615	$140,414	$140,213	$140,013	$139,812	$139,611
	Total E(m)	461,794	515,384	500,618	486,329	472,481	459,041	445,978	433,264	420,608	407,952

Revenue Requirements Summary
2016 Amended Plan - LG&E

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 29	**CCR Rule Compliance Construction and Construction of New Process Water Systems for Mill Creek**										
	Revenue Requirement										
	Eligible Plant	28,601,967	78,656,967	152,014,967	166,333,967	193,707,967	193,707,967	193,707,967	193,707,967	193,707,967	193,707,967
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(3,614,947)	(7,229,894)	(10,972,107)	(17,641,427)	(24,310,746)	(30,980,065)	(37,649,385)	(44,318,704)	(50,988,023)	(57,657,343)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	(2,069,075)	(5,098,963)	(27,684,075)	(32,655,837)	(42,524,240)	(41,668,723)	(40,683,761)	(39,579,397)	(38,364,278)	(37,047,054)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	22,917,945	66,328,109	113,358,784	116,036,703	126,872,981	121,059,178	115,374,821	109,809,866	104,355,665	99,003,570
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$2,289,808	$6,627,062	$11,326,054	$11,593,613	$12,676,302	$12,095,426	$11,527,483	$10,971,469	$10,426,522	$9,891,776
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	0	0	127,266	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372
	Annual Depreciation expense on CCR Project	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947
	Annual Property Tax expense	0	37,481	107,141	211,564	223,039	254,096	244,092	234,088	224,084	214,080
	Total OE	$3,614,947	$3,652,428	$3,849,353	$6,880,884	$6,892,358	$6,923,415	$6,913,411	$6,903,407	$6,893,403	$6,883,399
	Total E(m)	5,904,755	10,279,490	15,175,407	18,474,497	19,568,660	19,018,841	18,440,894	17,874,877	17,319,925	16,775,176

Revenue Requirements Summary
2016 Amended Plan - LG&E

		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Project 30	**CCR Rule Compliance Construction and Construction of New Process Water Systems for Trimble County (Net, 52%)**										
	Revenue Requirement										
	Eligible Plant	0	22,829,898	51,302,238	63,829,428	78,060,528	86,039,928	98,939,178	110,435,208	110,435,208	110,435,208
	Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
	Less: Accumulated Depreciation	(1,936,270)	(3,872,540)	(5,854,438)	(8,885,767)	(11,917,097)	(14,948,426)	(17,979,756)	(21,011,085)	(24,042,415)	(27,073,744)
	Plus: Accumulated Depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
	Less: Deferred Tax Balance	748,678	826,282	(7,632,905)	(12,050,096)	(17,070,147)	(19,621,280)	(24,026,804)	(27,845,558)	(27,178,258)	(26,473,161)
	Plus: Deferred Tax Balance on retired plant	0	0	0	0	0	0	0	0	0	0
	Environmental Compliance Rate Base	(1,187,592)	19,783,640	37,814,895	42,893,565	49,073,284	51,470,222	56,932,619	61,578,565	59,214,535	56,888,303
	Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
		$(118,656)	$1,976,649	$3,778,212	$4,285,639	$4,903,075	$5,142,561	$5,688,328	$6,152,519	$5,916,321	$5,683,900
	Operating expenses	0	0	0	0	0	0	0	0	0	0
	Annual Depreciation expense	0	0	45,627	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059
	Annual Depreciation expense on CCR Project	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270
	Annual Property Tax expense	0	(2,904)	28,436	68,172	82,415	99,215	106,637	121,439	134,136	129,589
	Total OE	$1,936,270	$1,933,366	$2,010,334	$3,099,501	$3,113,745	$3,130,545	$3,137,967	$3,152,769	$3,165,466	$3,160,919
	Total E(m)	1,817,614	3,910,015	5,788,546	7,385,140	8,016,820	8,273,106	8,826,294	9,305,288	9,081,787	8,844,818

Revenue Requirements Summary
2016 Amended Plan - LG&E

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Total E(m) - All LG&E Projects	8,184,163	14,704,889	21,464,571	26,345,966	28,057,961	27,750,987	27,713,166	27,613,429	26,822,320	26,027,946
Total Revenue Requirements										
Project 28	461,794	515,384	500,618	486,329	472,481	459,041	445,978	433,264	420,608	407,952
Project 29	5,904,755	10,279,490	15,175,407	18,474,497	19,568,660	19,018,841	18,440,894	17,874,877	17,319,925	16,775,176
Project 30	1,817,614	3,910,015	5,788,546	7,385,140	8,016,820	8,273,106	8,826,294	9,305,288	9,081,787	8,844,818
Total	8,184,163	14,704,889	21,464,571	26,345,966	28,057,961	27,750,987	27,713,166	27,613,429	26,822,320	26,027,946
12 Month Average Jurisdictional Ratio	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%	94.24%
Jurisdictional Allocation	7,713,096	13,858,500	20,229,106	24,829,536	26,442,992	26,153,687	26,118,043	26,024,046	25,278,472	24,529,821
Forecasted 12-Month Retail Revenue	966,529,936	994,289,535	1,028,976,071	1,051,306,174	1,062,855,612	1,103,067,656	1,128,065,031	1,178,376,609	1,211,200,390	1,254,922,288
Billing Factor	0.80%	1.39%	1.97%	2.36%	2.49%	2.37%	2.32%	2.21%	2.09%	1.95%
LGE Residential Bill Impact										
Customer Charge	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75	$10.75
976 Energy - 976 kWh @ $0.08082	$78.88	$78.88	$78.88	$78.88	$78.88	$78.88	$78.88	$78.88	$78.88	$78.88
FAC billings (Nov 15 factor - $-0.00271/kWh)	-$2.64	-$2.64	-$2.64	-$2.64	-$2.64	-$2.64	-$2.64	-$2.64	-$2.64	-$2.64
DSM billings (Nov 15 factor - $0.00397/kWh)	$3.87	$3.87	$3.87	$3.87	$3.87	$3.87	$3.87	$3.87	$3.87	$3.87
ECR billings (Nov 15 factor: 9.73%)	$8.84	$8.84	$8.84	$8.84	$8.84	$8.84	$8.84	$8.84	$8.84	$8.84
Additional ECR factor	$0.73	$1.27	$1.79	$2.15	$2.26	$2.15	$2.10	$2.01	$1.90	$1.78

Revenue Requirements
Project 28 - LG&E

	June									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek 2NPC										
Project 28 - Supplemental Mercury Control (Mill Creek 1 & 2)	$2,619,786	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$2,619,786	$2,619,786	$2,619,786	$2,619,786	$2,619,786	$2,619,786	$2,619,786	$2,619,786	$2,619,786	$2,619,786
Book Depreciation rate, per year	2.840%	2.840%	2.840%	2.840%	2.840%	2.840%	2.840%	2.840%	2.840%	2.840%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	509,894	517,688	522,738	525,255	525,422	523,422	519,410	513,545	507,376	501,202
Book Accumulated Depreciation Balance	40,301	114,703	189,105	263,507	337,909	412,311	486,713	561,115	635,516	709,918
Unrecovered Investment -- Book	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786
Book Depreciation	40,301	74,402	74,402	74,402	74,402	74,402	74,402	74,402	74,402	74,402
Unrecovered Investment -- Tax total	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786
Bonus Tax Depreciation	1,309,893	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	49,121	94,561	87,462	80,912	74,834	69,228	64,028	59,233	58,447	58,434
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	40,301	74,402	74,402	74,402	74,402	74,402	74,402	74,402	74,402	74,402
Tax expense total	1,359,014	94,561	87,462	80,912	74,834	69,228	64,028	59,233	58,447	58,434
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	509,894	7,795	5,050	2,517	167	(2,001)	(4,011)	(5,865)	(6,169)	(6,174)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786	2,619,786
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(40,301)	(114,703)	(189,105)	(263,507)	(337,909)	(412,311)	(486,713)	(561,115)	(635,516)	(709,918)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(509,894)	(517,688)	(522,738)	(525,255)	(525,422)	(523,422)	(519,410)	(513,545)	(507,376)	(501,202)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	2,069,592	1,987,395	1,907,943	1,831,024	1,756,455	1,684,054	1,613,663	1,545,126	1,476,893	1,408,665
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$206,780	$198,567	$190,629	$182,944	$175,493	$168,259	$161,226	$154,379	$147,561	$140,744
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	40,301	74,402	74,402	74,402	74,402	74,402	74,402	74,402	74,402	74,402
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	3,869	3,758	3,646	3,534	3,423	3,311	3,200	3,088	2,976
Total OE	$40,301	$78,271	$78,160	$78,048	$77,936	$77,825	$77,713	$77,602	$77,490	$77,378
Total E(m) - Project	247,081	276,838	268,789	260,992	253,430	246,084	238,940	231,980	225,051	218,123

Revenue Requirements
Project 28 - LG&E

	June 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek 3NPC										
Project 28 - Supplemental Mercury Control (Mill Creek 3)	$877,487	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487
Book Depreciation rate, per year	2.640%	2.640%	2.640%	2.640%	2.640%	2.640%	2.640%	2.640%	2.640%	2.640%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	171,154	174,444	176,814	178,335	179,070	179,078	178,413	177,128	175,740	174,350
Book Accumulated Depreciation Balance	12,548	35,714	58,879	82,045	105,211	128,376	151,542	174,708	197,873	221,039
Unrecovered Investment -- Book	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487
Book Depreciation	12,548	23,166	23,166	23,166	23,166	23,166	23,166	23,166	23,166	23,166
Unrecovered Investment -- Tax total	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487
Bonus Tax Depreciation	438,743	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	16,453	31,673	29,295	27,101	25,065	23,188	21,446	19,840	19,577	19,572
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	12,548	23,166	23,166	23,166	23,166	23,166	23,166	23,166	23,166	23,166
Tax expense total	455,196	31,673	29,295	27,101	25,065	23,188	21,446	19,840	19,577	19,572
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	171,154	3,289	2,370	1,522	735	8	(665)	(1,286)	(1,388)	(1,389)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(12,548)	(35,714)	(58,879)	(82,045)	(105,211)	(128,376)	(151,542)	(174,708)	(197,873)	(221,039)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(171,154)	(174,444)	(176,814)	(178,335)	(179,070)	(179,078)	(178,413)	(177,128)	(175,740)	(174,350)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	693,784	667,329	641,794	617,106	593,206	570,032	547,531	525,652	503,874	482,097
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$69,318	$66,675	$64,124	$61,657	$59,269	$56,954	$54,706	$52,520	$50,344	$48,168
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	12,548	23,166	23,166	23,166	23,166	23,166	23,166	23,166	23,166	23,166
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	1,297	1,263	1,228	1,193	1,158	1,124	1,089	1,054	1,019
Total OE	$12,548	$24,463	$24,428	$24,394	$24,359	$24,324	$24,289	$24,255	$24,220	$24,185
Total E(m) - Project	81,866	91,138	88,552	86,051	83,628	81,278	78,995	76,774	74,564	72,353

Revenue Requirements
Project 28 - LG&E

	June									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek 4NPC										
Project 28 - Supplemental Mercury Control (Mill Creek 4)	$877,487	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487	$877,487
Book Depreciation rate, per year	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	171,338	174,967	177,676	179,537	180,611	180,959	180,633	179,686	178,638	177,588
Book Accumulated Depreciation Balance	12,073	34,361	56,649	78,937	101,225	123,514	145,802	168,090	190,378	212,666
Unrecovered Investment -- Book	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487
Book Depreciation	12,073	22,288	22,288	22,288	22,288	22,288	22,288	22,288	22,288	22,288
Unrecovered Investment -- Tax total	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487
Bonus Tax Depreciation	438,743	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	16,453	31,673	29,295	27,101	25,065	23,188	21,446	19,840	19,577	19,572
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	12,073	22,288	22,288	22,288	22,288	22,288	22,288	22,288	22,288	22,288
Tax expense total	455,196	31,673	29,295	27,101	25,065	23,188	21,446	19,840	19,577	19,572
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	171,338	3,629	2,709	1,861	1,074	348	(326)	(947)	(1,048)	(1,050)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487	877,487
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(12,073)	(34,361)	(56,649)	(78,937)	(101,225)	(123,514)	(145,802)	(168,090)	(190,378)	(212,666)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(171,338)	(174,967)	(177,676)	(179,537)	(180,611)	(180,959)	(180,633)	(179,686)	(178,638)	(177,588)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	694,076	668,159	643,162	619,013	595,650	573,015	551,052	529,711	508,471	487,233
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$69,347	$66,758	$64,260	$61,848	$59,513	$57,252	$55,057	$52,925	$50,803	$48,681
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	12,073	22,288	22,288	22,288	22,288	22,288	22,288	22,288	22,288	22,288
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	1,298	1,265	1,231	1,198	1,164	1,131	1,098	1,064	1,031
Total OE	$12,073	$23,586	$23,553	$23,519	$23,486	$23,453	$23,419	$23,386	$23,352	$23,319
Total E(m) - Project	81,420	90,344	87,813	85,367	82,999	80,704	78,477	76,311	74,155	72,000

Revenue Requirements
Project 28 - LG&E

	June									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Trimble 1NPC										
Project 28 - Supplemental Mercury Control (Trimble County 1)	$554,235	$0	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$554,235	$554,235	$554,235	$554,235	$554,235	$554,235	$554,235	$554,235	$554,235	$554,235
Book Depreciation rate, per year	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%
Tax Depreciation rate, per year	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%	4.462%	4.461%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	108,220	110,512	112,223	113,399	114,077	114,297	114,091	113,493	112,831	112,167
Book Accumulated Depreciation Balance	7,625	21,703	35,781	49,858	63,936	78,013	92,091	106,168	120,246	134,324
Unrecovered Investment -- Book	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235
Book Depreciation	7,625	14,078	14,078	14,078	14,078	14,078	14,078	14,078	14,078	14,078
Unrecovered Investment -- Tax total	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235
Bonus Tax Depreciation	277,118	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation	10,392	20,005	18,503	17,118	15,832	14,646	13,546	12,531	12,365	12,362
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	7,625	14,078	14,078	14,078	14,078	14,078	14,078	14,078	14,078	14,078
Tax expense total	287,510	20,005	18,503	17,118	15,832	14,646	13,546	12,531	12,365	12,362
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	108,220	2,292	1,711	1,175	678	220	(206)	(598)	(662)	(663)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235	554,235
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(7,625)	(21,703)	(35,781)	(49,858)	(63,936)	(78,013)	(92,091)	(106,168)	(120,246)	(134,324)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(108,220)	(110,512)	(112,223)	(113,399)	(114,077)	(114,297)	(114,091)	(113,493)	(112,831)	(112,167)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	438,390	422,021	406,232	390,979	376,223	361,926	348,054	334,574	321,159	307,744
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Return on Environmental Compliance Rate Base	$43,801	$42,165	$40,588	$39,064	$37,590	$36,161	$34,775	$33,428	$32,088	$30,748
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	7,625	14,078	14,078	14,078	14,078	14,078	14,078	14,078	14,078	14,078
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	820	799	778	757	735	714	693	672	651
Total OE	$7,625	$14,897	$14,876	$14,855	$14,834	$14,813	$14,792	$14,771	$14,750	$14,729
Total E(m) - Project	51,426	57,063	55,464	53,919	52,424	50,974	49,567	48,199	46,838	45,476

Revenue Requirements
Project 29 - LG&E

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek CCR										
Project 29 - CCR Rule Compliance Construction (Ash Pond Capping)	$6,703,039	$458,000	$127,000	$14,319,000	$27,374,000	$0	$0	$0	$0	$0
Accumulated Expenditures	$6,703,039	$7,161,039	$7,288,039	$21,607,039	$48,981,039	$48,981,039	$48,981,039	$48,981,039	$48,981,039	$48,981,039
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	1,194,041	(26,624)	(1,375,273)	2,763,556	11,950,231	10,552,475	9,154,720	7,756,964	6,359,209	4,961,454
Book Accumulated Depreciation Balance	3,614,947	7,229,894	10,844,842	14,459,789	18,074,736	21,689,683	25,304,631	28,919,578	32,534,525	36,149,472
Unrecovered Investment -- Book										
Book Depreciation	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947
Unrecovered Investment -- Tax total	6,703,039	7,161,039	7,288,039	21,607,039	48,981,039	48,981,039	48,981,039	48,981,039	48,981,039	48,981,039
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947
Tax expense total	6,703,039	458,000	127,000	14,319,000	27,374,000	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	1,194,041	(1,220,665)	(1,348,650)	4,138,829	9,186,675	(1,397,755)	(1,397,755)	(1,397,755)	(1,397,755)	(1,397,755)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	6,703,039	7,161,039	7,288,039	21,607,039	48,981,039	48,981,039	48,981,039	48,981,039	48,981,039	48,981,039
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(3,614,947)	(7,229,894)	(10,844,842)	(14,459,789)	(18,074,736)	(21,689,683)	(25,304,631)	(28,919,578)	(32,534,525)	(36,149,472)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(1,194,041)	26,624	1,375,273	(2,763,556)	(11,950,231)	(10,552,475)	(9,154,720)	(7,756,964)	(6,359,209)	(4,961,454)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	1,894,050	(42,232)	(2,181,530)	4,383,694	18,956,072	16,738,880	14,521,688	12,304,496	10,087,305	7,870,113
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$189,241	$(4,220)	$(217,964)	$437,989	$1,893,964	$1,672,437	$1,450,910	$1,229,383	$1,007,856	$786,329
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947	3,614,947
Annual Property Tax expense	0	4,632	(103)	(5,335)	10,721	46,359	40,937	35,515	30,092	24,670
Total OE	$3,614,947	$3,619,579	$3,614,844	$3,609,612	$3,625,668	$3,661,307	$3,655,884	$3,650,462	$3,645,039	$3,639,617
Total E(m) - Project	3,804,188	3,615,360	3,396,880	4,047,602	5,519,632	5,333,744	5,106,794	4,879,845	4,652,896	4,425,946

Revenue Requirements
Project 29 - LG&E

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek CCR										
Project 29 - CCR Rule Compliance Construction (Clearwell Pond Cleanout)	$601,021	$4,734,000	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$601,021	$5,335,021	$5,335,021	$5,335,021	$5,335,021	$5,335,021	$5,335,021	$5,335,021	$5,335,021	$5,335,021
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	232,391	2,062,839	2,062,839	2,062,839	2,062,839	2,062,839	2,062,839	2,062,839	2,062,839	2,062,839
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	601,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	601,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	601,021	4,734,000	0	0	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	232,391	1,830,448	0	0	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	601,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021	5,335,021
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(232,391)	(2,062,839)	(2,062,839)	(2,062,839)	(2,062,839)	(2,062,839)	(2,062,839)	(2,062,839)	(2,062,839)	(2,062,839)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	368,630	3,272,182	3,272,182	3,272,182	3,272,182	3,272,182	3,272,182	3,272,182	3,272,182	3,272,182
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$36,831	$326,935	$326,935	$326,935	$326,935	$326,935	$326,935	$326,935	$326,935	$326,935
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	902	8,003	8,003	8,003	8,003	8,003	8,003	8,003	8,003
Total OE	$0	$902	$8,003	$8,003	$8,003	$8,003	$8,003	$8,003	$8,003	$8,003
Total E(m) - Project	36,831	327,836	334,937	334,937	334,937	334,937	334,937	334,937	334,937	334,937

Revenue Requirements
Project 29 - LG&E

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek CCR										
Project 29 - CCR Rule Compliance Construction (Construction Pond Cleanout	$499,746	$263,000	$6,492,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$499,746	$762,746	$7,254,746	$7,254,746	$7,254,746	$7,254,746	$7,254,746	$7,254,746	$7,254,746	$7,254,746
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	193,232	294,924	2,805,120	2,805,120	2,805,120	2,805,120	2,805,120	2,805,120	2,805,120	2,805,120
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	499,746	762,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	499,746	762,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	499,746	263,000	6,492,000	0	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	193,232	101,692	2,510,197	0	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	499,746	762,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746	7,254,746
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(193,232)	(294,924)	(2,805,120)	(2,805,120)	(2,805,120)	(2,805,120)	(2,805,120)	(2,805,120)	(2,805,120)	(2,805,120)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	306,514	467,823	4,449,626	4,449,626	4,449,626	4,449,626	4,449,626	4,449,626	4,449,626	4,449,626
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$30,625	$46,742	$444,577	$444,577	$444,577	$444,577	$444,577	$444,577	$444,577	$444,577
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	750	1,144	10,882	10,882	10,882	10,882	10,882	10,882	10,882
Total OE	$0	$750	$1,144	$10,882	$10,882	$10,882	$10,882	$10,882	$10,882	$10,882
Total E(m) - Project	30,625	47,491	445,721	455,459	455,459	455,459	455,459	455,459	455,459	455,459

Revenue Requirements
Project 29 - LG&E

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek CCR										
Project 29 - CCR Rule Compliance Construction (Dead Storage Pond Cleanou	$662,543	$5,733,000	$0	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$662,543	$6,395,543	$6,395,543	$6,395,543	$6,395,543	$6,395,543	$6,395,543	$6,395,543	$6,395,543	$6,395,543
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	256,179	2,472,901	2,472,901	2,472,901	2,472,901	2,472,901	2,472,901	2,472,901	2,472,901	2,472,901
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	662,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	662,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	662,543	5,733,000	0	0	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	256,179	2,216,722	0	0	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	662,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543	6,395,543
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(256,179)	(2,472,901)	(2,472,901)	(2,472,901)	(2,472,901)	(2,472,901)	(2,472,901)	(2,472,901)	(2,472,901)	(2,472,901)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	406,364	3,922,642	3,922,642	3,922,642	3,922,642	3,922,642	3,922,642	3,922,642	3,922,642	3,922,642
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$40,601	$391,924	$391,924	$391,924	$391,924	$391,924	$391,924	$391,924	$391,924	$391,924
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	994	9,593	9,593	9,593	9,593	9,593	9,593	9,593	9,593
Total OE	$0	$994	$9,593	$9,593	$9,593	$9,593	$9,593	$9,593	$9,593	$9,593
Total E(m) - Project	40,601	392,918	401,518	401,518	401,518	401,518	401,518	401,518	401,518	401,518

Revenue Requirements
Project 29 - LG&E

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Mill Creek CCR										
Project 29 - CCR Rule Compliance Construction (Emergency Pond Cleanout)	$499,746	$263,000	$4,728,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$499,746	$762,746	$5,490,746	$5,490,746	$5,490,746	$5,490,746	$5,490,746	$5,490,746	$5,490,746	$5,490,746
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	193,232	294,924	2,123,052	2,123,052	2,123,052	2,123,052	2,123,052	2,123,052	2,123,052	2,123,052
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	499,746	762,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	499,746	762,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	499,746	263,000	4,728,000	0	0	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	193,232	101,692	1,828,128	0	0	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	499,746	762,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746	5,490,746
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	(193,232)	(294,924)	(2,123,052)	(2,123,052)	(2,123,052)	(2,123,052)	(2,123,052)	(2,123,052)	(2,123,052)	(2,123,052)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	306,514	467,823	3,367,694	3,367,694	3,367,694	3,367,694	3,367,694	3,367,694	3,367,694	3,367,694
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$30,625	$46,742	$336,478	$336,478	$336,478	$336,478	$336,478	$336,478	$336,478	$336,478
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	750	1,144	8,236	8,236	8,236	8,236	8,236	8,236	8,236
Total OE	$0	$750	$1,144	$8,236	$8,236	$8,236	$8,236	$8,236	$8,236	$8,236
Total E(m) - Project	30,625	47,491	337,622	344,714	344,714	344,714	344,714	344,714	344,714	344,714

Revenue Requirements
Project 29 - LG&E

			December							
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service			1	2	3	4	5	6	7	8
Mill Creek 4NPC										
Project 29 - Construction of New Process Water Systems	$19,635,871	$38,604,000	$62,011,000	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$19,635,871	$58,239,871	$120,250,871	$120,250,871	$120,250,871	$120,250,871	$120,250,871	$120,250,871	$120,250,871	$120,250,871
Book Depreciation rate, per year	0.000%	0.000%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%	2.540%
Tax Depreciation rate, per year	0.000%	0.000%	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	0	19,595,437	20,428,370	21,110,097	21,652,336	22,065,129	22,358,520	22,541,157	22,621,689
Book Accumulated Depreciation Balance	0	0	127,266	3,181,638	6,236,010	9,290,382	12,344,754	15,399,126	18,453,498	21,507,870
Unrecovered Investment -- Book	19,635,871	58,239,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871
Book Depreciation	0	0	127,266	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372
Unrecovered Investment -- Tax total	19,635,871	58,239,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871
Bonus Tax Depreciation	0	0	48,100,349	0	0	0	0	0	0	0
MACRS Tax Depreciation	0	0	2,705,645	5,208,546	4,817,490	4,456,738	4,121,959	3,813,155	3,526,718	3,262,647
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	127,266	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372
Tax expense total	0	0	50,805,993	5,208,546	4,817,490	4,456,738	4,121,959	3,813,155	3,526,718	3,262,647
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	0	19,595,437	832,933	681,727	542,239	412,793	293,391	182,637	80,531
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	19,635,871	58,239,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871	120,250,871
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	(127,266)	(3,181,638)	(6,236,010)	(9,290,382)	(12,344,754)	(15,399,126)	(18,453,498)	(21,507,870)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	0	(19,595,437)	(20,428,370)	(21,110,097)	(21,652,336)	(22,065,129)	(22,358,520)	(22,541,157)	(22,621,689)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	19,635,871	58,239,871	100,528,169	96,640,864	92,904,765	89,308,154	85,840,988	82,493,225	79,256,216	76,121,312
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$1,961,885	$5,818,940	$10,044,104	$9,655,711	$9,282,424	$8,923,075	$8,576,659	$8,242,173	$7,918,752	$7,605,534
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	127,266	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372	3,054,372
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	29,454	87,360	180,185	175,604	171,022	166,441	161,859	157,278	152,696
Total OE	$0	$29,454	$214,625	$3,234,558	$3,229,976	$3,225,394	$3,220,813	$3,216,231	$3,211,650	$3,207,068
Total E(m) - Project	1,961,885	5,848,393	10,258,729	12,890,268	12,512,400	12,148,469	11,797,472	11,458,404	11,130,402	10,812,602

Revenue Requirements
Project 30 - LG&E

	January 2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Trimble CCR LGE										
Project 30 - CCR Rule Compliance Construction (Ash Pond Capping - Net, 52	$0	$1,060,744	$3,551,730	$4,018,560	$10,433,670	$7,979,400	$12,899,250	$11,496,030	$0	$0
Accumulated Expenditures	$0	$1,060,744	$4,612,474	$8,631,034	$19,064,704	$27,044,104	$39,943,354	$51,439,384	$51,439,384	$51,439,384
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	(748,678)	(1,087,209)	(462,575)	342,563	3,628,168	5,964,804	10,203,750	13,900,127	13,151,449	12,402,771
Book Accumulated Depreciation Balance	1,936,270	3,872,540	5,808,810	7,745,080	9,681,350	11,617,620	13,553,890	15,490,160	17,426,430	19,362,700
Unrecovered Investment -- Book										
Book Depreciation	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270
Unrecovered Investment -- Tax total	0	1,060,744	4,612,474	8,631,034	19,064,704	27,044,104	39,943,354	51,439,384	51,439,384	51,439,384
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270
Tax expense total	0	1,060,744	3,551,730	4,018,560	10,433,670	7,979,400	12,899,250	11,496,030	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	(748,678)	(338,531)	624,634	805,138	3,285,605	2,336,637	4,238,946	3,696,377	(748,678)	(748,678)
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	1,060,744	4,612,474	8,631,034	19,064,704	27,044,104	39,943,354	51,439,384	51,439,384	51,439,384
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	(1,936,270)	(3,872,540)	(5,808,810)	(7,745,080)	(9,681,350)	(11,617,620)	(13,553,890)	(15,490,160)	(17,426,430)	(19,362,700)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	748,678	1,087,209	462,575	(342,563)	(3,628,168)	(5,964,804)	(10,203,750)	(13,900,127)	(13,151,449)	(12,402,771)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	(1,187,592)	(1,724,587)	(733,761)	543,391	5,755,186	9,461,680	16,185,714	22,049,097	20,861,505	19,673,913
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$(118,656)	$(172,309)	$(73,312)	$54,292	$575,020	$945,348	$1,617,169	$2,202,999	$2,084,342	$1,965,686
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270	1,936,270
Annual Property Tax expense	0	(2,904)	(4,218)	(1,795)	1,329	14,075	23,140	39,584	53,924	51,019
Total OE	$1,936,270	$1,933,366	$1,932,052	$1,934,476	$1,937,599	$1,950,345	$1,959,410	$1,975,854	$1,990,194	$1,987,289
Total E(m) - Project	1,817,614	1,761,056	1,858,740	1,988,768	2,512,619	2,895,693	3,576,578	4,178,853	4,074,536	3,952,976

Revenue Requirements
Project 30 - LG&E

	January									
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service	1	2	3	4	5	6	7	8	9	10
Trimble CCR LGE										
Project 30 - CCR Rule Compliance Construction (Gypsum Pond Capping - Ne	$0	$674,822	$1,500,330	$8,508,630	$3,797,430	$0	$0	$0	$0	$0
Accumulated Expenditures	$0	$674,822	$2,175,152	$10,683,782	$14,481,212	$14,481,212	$14,481,212	$14,481,212	$14,481,212	$14,481,212
Book Depreciation rate, per year	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
Tax Depreciation rate, per year	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%	100.000%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	260,927	841,044	4,130,991	5,599,305	5,599,305	5,599,305	5,599,305	5,599,305	5,599,305
Book Accumulated Depreciation Balance	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Book	0	674,822	2,175,152	10,683,782	14,481,212	14,481,212	14,481,212	14,481,212	14,481,212	14,481,212
Book Depreciation	0	0	0	0	0	0	0	0	0	0
Unrecovered Investment -- Tax total	0	674,822	2,175,152	10,683,782	14,481,212	14,481,212	14,481,212	14,481,212	14,481,212	14,481,212
Bonus Tax Depreciation	0	0	0	0	0	0	0	0	0	0
MACRS Tax Depreciation										
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	0	0	0	0	0	0	0	0
Tax expense total	0	674,822	1,500,330	8,508,630	3,797,430	0	0	0	0	0
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	260,927	580,118	3,289,947	1,468,314	0	0	0	0	0
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	674,822	2,175,152	10,683,782	14,481,212	14,481,212	14,481,212	14,481,212	14,481,212	14,481,212
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	0	0	0	0	0	0	0	0
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	(260,927)	(841,044)	(4,130,991)	(5,599,305)	(5,599,305)	(5,599,305)	(5,599,305)	(5,599,305)	(5,599,305)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	0	413,895	1,334,108	6,552,791	8,881,906	8,881,906	8,881,906	8,881,906	8,881,906	8,881,906
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$0	$41,354	$133,295	$654,711	$887,421	$887,421	$887,421	$887,421	$887,421	$887,421
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense on CCR Project	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	0	1,012	3,263	16,026	21,722	21,722	21,722	21,722	21,722
Total OE	$0	$0	$1,012	$3,263	$16,026	$21,722	$21,722	$21,722	$21,722	$21,722
Total E(m) - Project	0	41,354	134,307	657,974	903,447	909,143	909,143	909,143	909,143	909,143

Revenue Requirements
Project 30 - LG&E

			December							
	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
In-Service			1	2	3	4	5	6	7	8
Trimble 2NPC LGE										
Project 30 - Construction of New Process Water Systems (Net, 52%)	$0	$21,094,332	$23,420,280	$0	$0	$0	$0	$0	$0	$0
Accumulated Expenditures	$0	$21,094,332	$44,514,612	$44,514,612	$44,514,612	$44,514,612	$44,514,612	$44,514,612	$44,514,612	$44,514,612
Book Depreciation rate, per year	0.000%	0.000%	2.460%	2.460%	2.460%	2.460%	2.460%	2.460%	2.460%	2.460%
Tax Depreciation rate, per year	0.000%	0.000%	3.750%	7.219%	6.677%	6.177%	5.713%	5.285%	4.888%	4.522%
Income tax rate	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%	38.67%
Deferred Tax Balance	0	0	7,254,436	7,576,542	7,842,674	8,057,170	8,223,748	8,346,126	8,427,504	8,471,085
Book Accumulated Depreciation Balance	0	0	45,627	1,140,687	2,235,746	3,330,806	4,425,865	5,520,925	6,615,984	7,711,044
Unrecovered Investment -- Book	0	21,094,332	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612
Book Depreciation	0	0	45,627	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059
Unrecovered Investment -- Tax total	0	21,094,332	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612
Bonus Tax Depreciation	0	0	17,805,845	0	0	0	0	0	0	0
MACRS Tax Depreciation	0	0	1,001,579	1,928,106	1,783,344	1,649,801	1,525,872	1,411,558	1,305,525	1,207,770
Allowed Rate of Return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
Book Depreciation expense total	0	0	45,627	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059
Tax expense total	0	0	18,807,424	1,928,106	1,783,344	1,649,801	1,525,872	1,411,558	1,305,525	1,207,770
Annual Property Tax Rate	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%	0.1500%
Deferred Tax Activity	0	0	7,254,436	322,106	266,132	214,496	166,578	122,377	81,378	43,581
Revenue Recovery on Capital Expenditure to date										
Eligible Plant, cumulative capital expenditures	0	21,094,332	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612	44,514,612
Less: Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Accumulated Depreciation	0	0	(45,627)	(1,140,687)	(2,235,746)	(3,330,806)	(4,425,865)	(5,520,925)	(6,615,984)	(7,711,044)
Plus: Accumulated Depreciation on Retired Plant	0	0	0	0	0	0	0	0	0	0
Less: Deferred Tax Balance	0	0	(7,254,436)	(7,576,542)	(7,842,674)	(8,057,170)	(8,223,748)	(8,346,126)	(8,427,504)	(8,471,085)
Plus: Deferred Tax Balance on Retired Plant	0	0	0	0	0	0	0	0	0	0
Environmental Compliance Rate Base	0	21,094,332	37,214,548	35,797,383	34,436,192	33,126,636	31,864,998	30,647,562	29,471,124	28,332,483
Rate of return	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%	9.99%
	$0	$2,107,605	$3,718,229	$3,576,636	$3,440,635	$3,309,793	$3,183,738	$3,062,100	$2,944,558	$2,830,793
Operating Expenses	0	0	0	0	0	0	0	0	0	0
Annual Depreciation expense	0	0	45,627	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059	1,095,059
Less depreciation on retired plant	0	0	0	0	0	0	0	0	0	0
Annual Property Tax expense	0	0	31,641	66,703	65,061	63,418	61,776	60,133	58,491	56,848
Total OE	$0	$0	$77,269	$1,161,763	$1,160,120	$1,158,478	$1,156,835	$1,155,193	$1,153,550	$1,151,907
Total E(m) - Project	0	2,107,605	3,795,498	4,738,399	4,600,755	4,468,270	4,340,573	4,217,293	4,098,108	3,982,700

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

APPLICATION OF LOUISVILLE GAS	**)**	
AND ELECTRIC COMPANY FOR	**)**	
CERTIFICATES OF PUBLIC	**)**	
CONVENIENCE AND NECESSITY	**)**	**CASE NO. 2016-00027**
APPROVAL OF ITS 2016 COMPLIANCE	**)**	
PLAN FOR RECOVERY BY	**)**	
ENVIRONMENTAL SURCHARGE	**)**	

DIRECT TESTIMONY OF

JOHN J. SPANOS

ON BEHALF OF

LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

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PAGE

I. INTRODUCTION AND PURPOSE

Q. PLEASE STATE YOUR NAME AND ADDRESS.

A. My name is John J. Spanos. My business address is 207 Senate Avenue, Camp Hill, Pennsylvania.

Q. ARE YOU ASSOCIATED WITH ANY FIRM?

A. Yes. I am associated with the firm of Gannett Fleming Valuation and Rate Consultants, LLC ("Gannett Fleming").

Q. HOW LONG HAVE YOU BEEN ASSOCIATED WITH GANNETT FLEMING?

A. I have been associated with the firm since college graduation in June, 1986.

Q. WHAT IS YOUR POSITION WITH THE FIRM?

A. I am a Senior Vice President.

Q. WHAT IS YOUR EDUCATIONAL BACKGROUND?

A. I have Bachelor of Science degrees in Industrial Management and Mathematics from Carnegie-Mellon University and a Master of Business Administration from York College.

Q. PLEASE OUTLINE YOUR EXPERIENCE IN THE FIELD OF DEPRECIATION.

A. I have extensive experience in the field of depreciation, including conducting depreciation studies for many utilities throughout the United States and submitting testimony to regulatory utility commissions on the subject of utility plant depreciation. My experience is more fully detailed in my curriculum vitae, which is attached to my testimony as Exhibit JJS-1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I sponsor the depreciation rates for ash ponds recovery for Louisville Gas and Electric Company ("LG&E") and to demonstrate that LG&E has recovered only a minimal amount of terminal net salvage cost in base rates for the ash ponds.

II. DEPRECIATION RATES FOR ASH PONDS

Q. PLEASE DEFINE THE CONCEPT OF DEPRECIATION.

A. Depreciation refers to the loss in service value not restored by current maintenance, incurred in connection with the consumption or prospective retirement of utility plant in the course of service from causes which can be reasonably anticipated or contemplated, against which the Company is not protected by insurance. Among the causes to be given consideration are wear and tear, decay, action of the elements, inadequacy, obsolescence, changes in the art, changes in demand and the requirements of public authorities.

Q. DID YOU DETERMINE THE DEPRECIATION RATES FILED BY LOUISVILLE GAS & ELECTRIC COMPANY IN THIS PROCEEDING?

A. Yes. I determined the depreciation rates for ash pond recovery by LG&E with its filing in this proceeding. My analyses set forth the depreciation rates to be utilized by LG&E in order to recover the costs to close the ash ponds at various generating sites.

Q. CAN YOU EXPLAIN THE DEVELOPMENT OF DEPRECIATION RATES FOR THE RECOVERY OF ASH PONDS?

A. Yes. There were two specific components of the analyses. The first phase was to determine the original cost and accumulated depreciation expense as of September 30, 2015 for each ash pond site. The second phase included recovering the remaining net plant as well as the future cost of removal for each site over its remaining life.

Q. PLEASE EXPLAIN THE FIRST PHASE OF THE CALCULATION.

A. The initial step included identification within the property records of the age and surviving original cost as of September 30, 2015 of each ash pond site. Additionally, the corresponding accumulated depreciation for each asset was based on the age and approved depreciation parameters for each ash pond by location.

Q. WERE THERE ANY OTHER COSTS TO BE DETERMINED?

A. Yes. In addition to the net plant (original cost minus accumulated depreciation as of September 30, 2015), there are future removal costs for each ash pond to be determined. These costs totaled $143,515,000 for all LG&E sites and were established by engineering studies. Each site was assigned a specific removal cost.

Q. PLEASE EXPLAIN THE SECOND PHASE OF THE CALCULATION.

A. Once the remaining net plant and future removal costs for each ash pond site were established, then depreciation rates and expense were determined to recover the full service value of the ash ponds over the remaining life. The remaining life for each site is the time from September 30, 2015 to the probable retirement date of the related generating facility which was approved in the 2012 base rate case[1].

Q. HAVE YOU PREPARED AN EXHIBIT THAT SETS FORTH RECOVERY OF THE ASH PONDS COSTS?

A. Yes. Exhibit JJS-2 sets forth the recovery of the remaining ash pond costs over the remaining life of each site.

Q. CAN YOU USE AN EXAMPLE TO ILLUSTRATE THE DEPRECIATION RECOVERY?

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[1] *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of its Electric and Gas Rates, a Certificate of Public Convenience and Necessity, Approval of Ownership of Gas Service Lines and Risers, and a Gas Line Surcharge*, Case No. 2012-00222, Order (Dec. 20, 2012).

A. Yes. I will use the ash pond for Mill Creek Unit 1 for LG&E. The ash pond for Mill Creek Unit 1 was placed in Account 311, in 1972. The surviving original cost as of September 30, 2015 is $411,750.29 with an associated accumulated depreciation of $409,203. This produces a net plant $2,547 ($411,750 minus $409,203) as of September 30, 2015. Based on the engineering study, the cost of removal for the Mill Creek Unit 1 ash pond is $18,895,000. Therefore, the full recovery of the Mill Creek Unit 1 ash pond over its remaining life is $18,897,768.

The remaining life is 16.7 years which is the time between September 30, 2015 and the probable retirement date (2032) of Mill Creek Unit 1, based on the 1972 vintage of the ash pond. The weighted remaining life is 16.7 years. Therefore, the future service value of $18,897,768 should be recovered equally over 16.7 years or $1,130,926 annually.

Q. IS IT REASONABLE TO RECOVER THE ASH POND COSTS THROUGH THE REMAINING LIFE OF THE FACILITY?

A. Yes. The overall costs of the ash ponds and their closure should be recovered over the life of the associated generating facility as the ash pond life is associated with the generating facilities. This is consistent with the concept of group depreciation.

Q. ARE THESE ADDED COSTS CONSIDERED TERMINAL NET SALVAGE?

A. Yes.

Q. HAS LG&E RECOVERED SOME OF THE TERMINAL NET SALVAGE COSTS PREVIOUSLY?

A. Only a very small amount. LG&E had not been approved to accrue for terminal net salvage until the 2012 base rate case,[2] which those rates went into effect on January 1, 2013. The approved terminal net salvage was 2 percent. Therefore, all generating facilities and associated ash ponds have accrued for terminal net salvage for 21 months at a 2 percent level of the associated plant value. The total accrued terminal net salvage for all plants is $5,348 and the amount for Mill Creek Unit 1 is $10. Therefore, only $10 of the $18,897,768 for Mill Creek Unit 1 has been recovered as of September 30, 2015 for the ash pond.

Q. HAVE YOU PREPARED AN EXHIBIT THAT SETS FORTH THE HISTORICAL TERMINAL NET SALVAGE RECOVERED TO DATE?

A. Yes. Exhibit JJS-3 sets forth the ash pond reserve into the two components as of September 30, 2015 and calculates the portion associated with terminal net salvage as recorded since January 1, 2013.

Q. WHY HAS LG&E NOT RECORDED MORE TERMINAL NET SALVAGE TO DATE?

A. The Public Service Commission of Kentucky had not approved recovery of a terminal net salvage component for any assets until the 2012 base rate case. Additionally, the level of required tasks to cap ash ponds was not specifically identified until the Coal Combustion Residual Rule ("CCR Rule") was established.

III. CONCLUSION

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes, it does.

[2] *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of its Electric and Gas Rates, a Certificate of Public Convenience and Necessity, Approval of Ownership of Gas Service Lines and Risers, and a Gas Line Surcharge*, Case No. 2012-00222, Order (Dec. 20, 2012).

VERIFICATION

COMMONWEALTH OF PENNSYLVANIA)
) **SS:**
COUNTY OF CUMBERLAND)

The undersigned, **John J. Spanos**, being duly sworn, deposes and says that he is Senior Vice President, for Gannett Fleming Valuation and Rate Consultants, LLC, that he has personal knowledge of the matters set forth in the foregoing testimony and exhibits, and the answers contained therein are true and correct to the best of his information, knowledge and belief.

John J. Spanos
John J. Spanos

Subscribed and sworn to before me, a Notary Public in and before said County and Commonwealth, this 26th day of January 2016.

________________(SEAL)
Notary Public

My Commission Expires:
February 20, 2019

COMMONWEALTH OF PENNSYLVANIA
NOTARIAL SEAL
Cheryl Ann Rutter, Notary Public
East Pennsboro Twp., Cumberland County
My Commission Expires Feb. 20, 2019
MEMBER, PENNSYLVANIA ASSOCIATION OF NOTARIES

JOHN SPANOS

DEPRECIATION EXPERIENCE

Q. Please state your name.

A. My name is John J. Spanos.

Q. What is your educational background?

A. I have Bachelor of Science degrees in Industrial Management and Mathematics from Carnegie-Mellon University and a Master of Business Administration from York College.

Q. Do you belong to any professional societies?

A. Yes. I am a member and past President of the Society of Depreciation Professionals and a member of the American Gas Association/Edison Electric Institute Industry Accounting Committee.

Q. Do you hold any special certification as a depreciation expert?

A. Yes. The Society of Depreciation Professionals has established national standards for depreciation professionals. The Society administers an examination to become certified in this field. I passed the certification exam in September 1997 and was recertified in August 2003, February 2008 and January 2013.

Q. Please outline your experience in the field of depreciation.

A. In June, 1986, I was employed by Gannett Fleming Valuation and Rate Consultants, Inc. as a Depreciation Analyst. During the period from June, 1986 through December, 1995, I helped prepare numerous depreciation and original cost studies for utility companies in various industries. I helped perform depreciation studies for the following telephone companies: United Telephone of Pennsylvania, United Telephone of New Jersey, and Anchorage Telephone Utility. I helped perform depreciation studies for the following companies in the railroad industry: Union Pacific Railroad, Burlington Northern Railroad, and Wisconsin Central Transportation Corporation.

I helped perform depreciation studies for the following organizations in the electric utility industry: Chugach Electric Association, The Cincinnati Gas and Electric Company (CG&E), The Union Light, Heat and Power Company (ULH&P), Northwest Territories Power Corporation, and the City of Calgary - Electric System.

I helped perform depreciation studies for the following pipeline companies: TransCanada Pipelines Limited, Trans Mountain Pipe Line Company Ltd., Interprovincial Pipe Line Inc., Nova Gas Transmission Limited and Lakehead Pipeline Company.

I helped perform depreciation studies for the following gas utility companies: Columbia Gas of Pennsylvania, Columbia Gas of Maryland, The Peoples Natural Gas Company, T. W. Phillips Gas & Oil Company, CG&E, ULH&P, Lawrenceburg Gas Company and Penn Fuel Gas, Inc.

I helped perform depreciation studies for the following water utility companies: Indiana-American Water Company, Consumers Pennsylvania Water Company and The York Water Company; and depreciation and original cost studies for Philadelphia Suburban Water Company and Pennsylvania-American Water Company.

In each of the above studies, I assembled and analyzed historical and simulated data, performed field reviews, developed preliminary estimates of service life and net salvage, calculated annual depreciation, and prepared reports for submission to state public utility commissions or federal regulatory agencies. I performed these studies under the general direction of William M. Stout, P.E.

In January, 1996, I was assigned to the position of Supervisor of Depreciation Studies. In July, 1999, I was promoted to the position of Manager, Depreciation and Valuation Studies. In December, 2000, I was promoted to the position as Vice-President of Gannett Fleming Valuation and Rate Consultants, Inc. and in April 2012, I was promoted to my present position as Senior Vice President of the Valuation and Rate Division of Gannett Fleming Inc. (now doing business as Gannett Fleming Valuation and Rate Consultants, LLC). In my current position I am responsible for conducting all depreciation, valuation and original cost studies, including the preparation of final exhibits and responses to data requests for submission to the appropriate regulatory bodies.

Since January 1996, I have conducted depreciation studies similar to those previously listed including assignments for Pennsylvania-American Water Company; Aqua Pennsylvania; Kentucky-American Water Company; Virginia-American Water Company; Indiana-American Water Company; Hampton Water Works Company; Omaha Public Power District; Enbridge Pipe Line Company; Inc.; Columbia Gas of Virginia, Inc.; Virginia Natural Gas Company National Fuel Gas Distribution Corporation - New York and Pennsylvania Divisions; The City of Bethlehem - Bureau of Water; The City of Coatesville Authority; The City of Lancaster - Bureau of Water; Peoples Energy Corporation; The York Water Company; Public Service Company of Colorado; Enbridge Pipelines; Enbridge Gas Distribution, Inc.; Reliant Energy-HLP; Massachusetts-American Water Company; St. Louis County Water Company; Missouri-American Water Company; Chugach Electric Association; Alliant Energy; Oklahoma Gas & Electric Company; Nevada Power Company; Dominion Virginia Power; NUI-Virginia Gas Companies; Pacific Gas & Electric Company; PSI Energy; NUI - Elizabethtown Gas

Company; Cinergy Corporation – CG&E; Cinergy Corporation – ULH&P; Columbia Gas of Kentucky; South Carolina Electric & Gas Company; Idaho Power Company; El Paso Electric Company; Aqua North Carolina; Aqua Ohio; Aqua Texas, Inc.; Ameren Missouri; Central Hudson Gas & Electric; Centennial Pipeline Company; CenterPoint Energy-Arkansas; CenterPoint Energy – Oklahoma; CenterPoint Energy – Entex; CenterPoint Energy - Louisiana; NSTAR – Boston Edison Company; Westar Energy, Inc.; United Water Pennsylvania; PPL Electric Utilities; PPL Gas Utilities; Wisconsin Power & Light Company; TransAlaska Pipeline; Avista Corporation; Northwest Natural Gas; Allegheny Energy Supply, Inc.; Public Service Company of North Carolina; South Jersey Gas Company; Duquesne Light Company; MidAmerican Energy Company; Laclede Gas; Duke Energy Company; E.ON U.S. Services Inc.; Elkton Gas Services; Anchorage Water and Wastewater Utility; Kansas City Power and Light; Duke Energy North Carolina; Duke Energy South Carolina; Monongahela Power Company; Potomac Edison Company; Duke Energy Ohio Gas; Duke Energy Kentucky; Duke Energy Indiana; Northern Indiana Public Service Company; Tennessee-American Water Company; Columbia Gas of Maryland; Bonneville Power Administration; NSTAR Electric and Gas Company; EPCOR Distribution, Inc.; B. C. Gas Utility, Ltd; Entergy Arkansas; Entergy Texas; Entergy Mississippi; Entergy Louisiana; Entergy Gulf States Louisiana; the Borough of Hanover; Louisville Gas and Electric Company; Kentucky Utilities Company; Madison Gas and Electric; Central Maine Power; PEPCO; PacifiCorp; Minnesota Energy Resource Group; Jersey Central Power & Light Company; Cheyenne Light, Fuel and Power Company; United Water Arkansas; Central Vermont Public Service Corporation; Green Mountain Power; Portland General Electric Company; Atlantic City Electric; Nicor Gas Company; Black Hills Power; Black Hills Colorado

Gas; Black Hills Kansas Gas; Black Hills Service Company; Black Hills Utility Holdings; Public Service Company of Oklahoma; City of Dubois; Peoples Gas Light and Coke Company; North Shore Gas Company; Connecticut Light and Power; New York State Electric and Gas Corporation; Rochester Gas and Electric Corporation and Greater Missouri Operations. My additional duties include determining final life and salvage estimates, conducting field reviews, presenting recommended depreciation rates to management for its consideration and supporting such rates before regulatory bodies.

Q. Have you submitted testimony to any state utility commission on the subject of utility plant depreciation?

A. Yes. I have submitted testimony to the Pennsylvania Public Utility Commission; the Commonwealth of Kentucky Public Service Commission; the Public Utilities Commission of Ohio; the Nevada Public Utility Commission; the Public Utilities Board of New Jersey; the Missouri Public Service Commission; the Massachusetts Department of Telecommunications and Energy; the Alberta Energy & Utility Board; the Idaho Public Utility Commission; the Louisiana Public Service Commission; the State Corporation Commission of Kansas; the Oklahoma Corporate Commission; the Public Service Commission of South Carolina; Railroad Commission of Texas – Gas Services Division; the New York Public Service Commission; Illinois Commerce Commission; the Indiana Utility Regulatory Commission; the California Public Utilities Commission; the Federal Energy Regulatory Commission ("FERC"); the Arkansas Public Service Commission; the Public Utility Commission of Texas; Maryland Public Service Commission; Washington Utilities and Transportation Commission; The Tennessee Regulatory Commission; the Regulatory Commission of Alaska; Minnesota Public Utility Commission; Utah Public Service Commission; District of Columbia Public Service

Commission; the Mississippi Public Service Commission; Delaware Public Service Commission; Virginia State Corporation Commission; Colorado Public Utility Commission; Oregon Public Utility Commission; South Dakota Public Utilities Commission; Wisconsin Public Service Commission; Wyoming Public Service Commission; Maine Public Utility Commission; Iowa Utility Board; Connecticut Public Utilities Regulatory Authority; New Mexico Public Regulation Commission and the North Carolina Utilities Commission.

Q. Have you had any additional education relating to utility plant depreciation?

A. Yes. I have completed the following courses conducted by Depreciation Programs, Inc.: "Techniques of Life Analysis," "Techniques of Salvage and Depreciation Analysis," "Forecasting Life and Salvage," "Modeling and Life Analysis Using Simulation," and "Managing a Depreciation Study." I have also completed the "Introduction to Public Utility Accounting" program conducted by the American Gas Association.

Q. Does this conclude your qualification statement?

A. Yes.

	Year	Jurisdiction	Docket No.	Client Utility	Subject
01.	1998	PA PUC	R-00984375	City of Bethlehem – Bureau of Water	Original Cost and Depreciation
02.	1998	PA PUC	R-00984567	City of Lancaster	Original Cost and Depreciation
03.	1999	PA PUC	R-00994605	The York Water Company	Depreciation
04.	2000	D.T.&E.	DTE 00-105	Massachusetts-American Water Company	Depreciation
05.	2001	PA PUC	R-00016114	City of Lancaster	Original Cost and Depreciation
06.	2001	PA PUC	R-00017236	The York Water Company	Depreciation
07.	2001	PA PUC	R-00016339	Pennsylvania-American Water Company	Depreciation
08.	2001	OH PUC	01-1228-GA-AIR	Cinergy Corp – Cincinnati Gas & Elect Co.	Depreciation
09.	2001	KY PSC	2001-092	Cinergy Corp – Union Light, Heat & Power Co.	Depreciation
10.	2002	PA PUC	R-00016750	Philadelphia Suburban Water Company	Depreciation
11.	2002	KY PSC	2002-00145	Columbia Gas of Kentucky	Depreciation
12.	2002	NJ BPU	GF02040245	NUI Corporation/Elizabethtown Gas Co.	Depreciation
13.	2002	ID PUC	IPC-E-03-7	Idaho Power Company	Depreciation
14.	2003	PA PUC	R-0027975	The York Water Company	Depreciation
15.	2003	IN URC	R-0027975	Cinergy Corp – PSI Energy, Inc.	Depreciation
16.	2003	PA PUC	R-00038304	Pennsylvania-American Water Co.	Depreciation
17.	2003	MO PSC	WR-2003-0500	Missouri-American Water Co.	Depreciation
18.	2003	FERC	ER-03-1274-000	NSTAR-Boston Edison Company	Depreciation
19.	2003	NJ BPU	BPU 03080683	South Jersey Gas Company	Depreciation
20.	2003	NV PUC	03-10001	Nevada Power Company	Depreciation
21.	2003	LA PSC	U-27676	CenterPoint Energy – Arkla	Depreciation
22.	2003	PA PUC	R-00038805	Pennsylvania Suburban Water Company	Depreciation
23.	2004	AB En/Util Bd	1306821	EPCOR Distribution, Inc.	Depreciation
24.	2004	PA PUC	R-00038168	National Fuel Gas Distribution Corp (PA)	Depreciation
25.	2004	PA PUC	R-00049255	PPL Electric Utilities	Depreciation
26.	2004	PA PUC	R-00049165	The York Water Company	Depreciation
27.	2004	OK Corp Cm	PUC 200400187	CenterPoint Energy – Arkla	Depreciation
28.	2004	OH PUC	04-680-El-AIR	Cinergy Corp. – Cincinnati Gas and Electric Company	Depreciation
29.	2004	RR Com of TX	GUD#	CenterPoint Energy – Entex Gas Services Div.	Depreciation
30.	2004	NY PUC	04-G-1047	National Fuel Gas Distribution Gas (NY)	Depreciation
31.	2004	AR PSC	04-121-U	CenterPoint Energy – Arkla	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
32.	2005	IL CC	05-	North Shore Gas Company	Depreciation
33.	2005	IL CC	05-	Peoples Gas Light and Coke Company	Depreciation
34.	2005	KY PSC	2005-00042	Union Light Heat & Power	Depreciation
35.	2005	IL CC	05-0308	MidAmerican Energy Company	Depreciation
36.	2005	MO PSC	GF-2005	Laclede Gas Company	Depreciation
37.	2005	KS CC	05-WSEE-981-RTS	Westar Energy	Depreciation
38.	2005	RR Com of TX	GUD #	CenterPoint Energy – Entex Gas Services Div.	Depreciation
39.	2005	FERC		Cinergy Corporation	Accounting
40.	2005	OK CC	PUD 200500151	Oklahoma Gas and Electric Co.	Depreciation
41.	2005	MA Dept Tele-com & Ergy	DTE 05-85	NSTAR	Depreciation
42.	2005	NY PUC	05-E-934/05-G-0935	Central Hudson Gas & Electric Co.	Depreciation
43.	2005	AK Reg Com	U-04-102	Chugach Electric Association	Depreciation
44.	2005	CA PUC	A05-12-002	Pacific Gas & Electric	Depreciation
45.	2006	PA PUC	R-00051030	Aqua Pennsylvania, Inc.	Depreciation
46.	2006	PA PUC	R-00051178	T.W. Phillips Gas and Oil Co.	Depreciation
47.	2006	NC Util Cm.		Pub. Service Co. of North Carolina	Depreciation
48.	2006	PA PUC	R-00051167	City of Lancaster	Depreciation
49.	2006	PA PUC	R00061346	Duquesne Light Company	Depreciation
50.	2006	PA PUC	R-00061322	The York Water Company	Depreciation
51.	2006	PA PUC	R-00051298	PPL GAS Utilities	Depreciation
52.	2006	PUC of TX	32093	CenterPoint Energy – Houston Electric	Depreciation
53.	2006	KY PSC	2006-00172	Duke Energy Kentucky	Depreciation
54.	2006	SC PSC		SCANA	
55.	2006	AK Reg Com	U-06-6	Municipal Light and Power	Depreciation
56.	2006	DE PSC	06-284	Delmarva Power and Light	Depreciation
57.	2006	IN URC	IURC43081	Indiana American Water Company	Depreciation
58.	2006	AK Reg Com	U-06-134	Chugach Electric Association	Depreciation
59.	2006	MO PSC	WR-2007-0216	Missouri American Water Company	Depreciation
60.	2006	FERC	ISO82, ETC. AL	TransAlaska Pipeline	Depreciation
61.	2006	PA PUC	R-00061493	National Fuel Gas Distribution Corp. (PA)	Depreciation
62.	2007	NC Util Com.	E-7 SUB 828	Duke Energy Carolinas, LLC	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
63.	2007	OH PSC	08-709-EL-AIR	Duke Energy Ohio Gas	Depreciation
64.	2007	PA PUC	R-00072155	PPL Electric Utilities Corporation	Depreciation
65.	2007	KY PSC	2007-00143	Kentucky American Water Company	Depreciation
66.	2007	PA PUC	R-00072229	Pennsylvania American Water Company	Depreciation
67.	2007	KY PSC	2007-0008	NiSource – Columbia Gas of Kentucky	Depreciation
68.	2007	NY PSC	07-G-0141	National Fuel Gas Distribution Corp (NY)	Depreciation
69.	2008	AK PSC	U-08-004	Anchorage Water & Wastewater Utility	Depreciation
70.	2008	TN Reg Auth	08-00039	Tennessee-American Water Company	Depreciation
71.	2008	DE PSC	08-96	Artesian Water Company	Depreciation
72.	2008	PA PUC	R-2008-2023067	The York Water Company	Depreciation
73.	2008	KS CC	08-WSEE1-RTS	Westar Energy	Depreciation
74.	2008	IN URC	43526	Northern Indiana Public Service Co.	Depreciation
75.	2008	IN URC	43501	Duke Energy Indiana	Depreciation
76.	2008	MD PSC	9159	NiSource – Columbia Gas of Maryland	Depreciation
77.	2008	KY PSC	2008-000251	Kentucky Utilities	Depreciation
78.	2008	KY PSC	2008-000252	Louisville Gas & Electric	Depreciation
79.	2008	PA PUC	2008-20322689	Pennsylvania American Water Co.-Wastewater	Depreciation
80.	2008	NY PSC	08-E887/08-00888	Central Hudson	Depreciation
81.	2008	WV TC	VE-080416/VG-8080417	Avista Corporation	Depreciation
82.	2008	IL CC	ICC-09-166	Peoples Gas, Light and Coke Co.	Depreciation
83.	2009	IL CC	ICC-09-167	North Shore Gas Company	Depreciation
84.	2009	DC PSC	1076	Potomac Electric Power Company	Depreciation
85.	2009	KY PSC	2009-00141	NiSource – Columbia Gas of Kentucky	Depreciation
86.	2009	FERC	ER08-1056-002	Entergy Services	Depreciation
87.	2009	PA PUC	R-2009-2097323	Pennsylvania American Water Co.	Depreciation
88.	2009	NC Util Cm	E-7, Sub 090	Duke Energy Carolinas, LLC	Depreciation
89.	2009	KY PSC	2009-00202	Duke Energy Kentucky	Depreciation
90.	2009	VA St. CC	PUE-2009-00059	Aqua Virginia, Inc.	Depreciation
91.	2009	PA PUC	2009-2132019	Aqua Pennsylvania, Inc.	Depreciation
92.	2009	MS PSC	09-	Entergy Mississippi	Depreciation
93.	2009	AK PSC	09-08-U	Entergy Arkansas	Depreciation
94.	2009	TX PUC	37744	Entergy Texas	Depreciation
95.	2009	TX PUC	37690	El Paso Electric Company	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
96.	2009	PA PUC	R-2009-2106908	The Borough of Hanover	Depreciation
97.	2009	KS CC	10-KCPE-415-RTS	Kansas City Power & Light	Depreciation
98.	2009	PA PUC	R-2009-	United Water Pennsylvania	Depreciation
99.	2009	OH PUC		Aqua Ohio Water Company	Depreciation
100.	2009	WI PSC	3270-DU-103	Madison Gas & Electric Co.	Depreciation
101.	2009	MO PSC	WR-2010	Missouri American Water Co.	Depreciation
102.	2009	AK Reg Cm	U-09-097	Chugach Electric Association	Depreciation
103.	2010	IN URC	43969	Northern Indiana Public Service Co.	Depreciation
104.	2010	WI PSC	6690-DU-104	Wisconsin Public Service Corp.	Depreciation
105.	2010	PA PUC	R-2010-2161694	PPL Electric Utilities Corp.	Depreciation
106.	2010	KY PSC	2010-00036	Kentucky American Water Company	Depreciation
107.	2010	PA PUC	R-2009-2149262	Columbia Gas of Pennsylvania	Depreciation
108.	2010	MO PSC	GR-2010-0171	Laclede Gas Company	Depreciation
109.	2010	SC PSC	2009-489-E	South Carolina Electric & Gas Co.	Depreciation
110.	2010	NJ BD OF PU	ER09080664	Atlantic City Electric	Depreciation
111.	2010	VA St. CC	PUE-2010-00001	Virginia American Water Company	Depreciation
112.	2010	PA PUC	R-2010-2157140	The York Water Company	Depreciation
113.	2010	MO PSC	ER-2010-0356	Greater Missouri Operations Co.	Depreciation
114.	2010	MO PSC	ER-2010-0355	Kansas City Power and Light	Depreciation
115.	2010	PA PUC	R-2010-2167797	T.W. Phillips Gas and Oil Co.	Depreciation
116.	2010	PSC SC	2009-489-E	SCANA – Electric	Depreciation
117.	2010	PA PUC	R-2010-22010702	Peoples Natural Gas, LLC	Depreciation
118.	2010	AK PSC	10-067-U	Oklahoma Gas and Electric Co.	Depreciation
119.	2010	IN URC		Northern Indiana Public Serv. Co. - NIFL	Depreciation
120.	2010	IN URC		Northern Indiana Public Serv. Co. - Kokomo	Depreciation
121.	2010	PA PUC	R-2010-2166212	Pennsylvania American Water Co - WW	Depreciation
122.	2010	NC Util Cn.	W-218,SUB310	Aqua North Carolina, Inc.	Depreciation
123.	2011	OH PUC	11-4161-WS-AIR	Ohio American Water Company	Depreciation
124.	2011	MS PSC	EC-123-0082-00	Entergy Mississippi	Depreciation
125.	2011	CO PUC	11AL-387E	Black Hills Colorado	Depreciation
126.	2011	PA PUC	R-2010-2215623	Columbia Gas of Pennsylvania	Depreciation
127.	2011	PA PUC	R-2010-2179103	Lancaster, City of – Bureau of Water	Depreciation
128.	2011	IN URC	43114 IGCC 4S	Duke Energy Indiana	Depreciation
129.	2011	FERC	IS11-146-000	Enbridge Pipelines (Southern Lights)	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
130.	2011	Il CC	11-0217	MidAmerican Energy Corporation	Depreciation
131.	2011	OK CC	201100087	Oklahoma Gas & Electric Co.	Depreciation
132.	2011	PA PUC	2011-2232243	Pennsylvania American Water Company	Depreciation
133.	2011	FERC	2011-2232243	Carolina Gas Transmission	Depreciation
134.	2012	WA UTC	UE-120436/UG-120437	Avista Corporation	Depreciation
135.	2012	AK Reg Cm	U-12-009	Chugach Electric Association	Depreciation
136.	2012	MA PUC	DPU 12-25	Columbia Gas of Massachusetts	Depreciation
137.	2012	TX PUC	40094	El Paso Electric Company	Depreciation
138.	2012	ID PUC	IPC-E-12	Idaho Power Company	Depreciation
139.	2012	PA PUC	R-2012-2290597	PPL Electric Utilities	Depreciation
140.	2012	PA PUC	R-2012-2311725	Hanover, Borough of – Bureau of Water	Depreciation
141.	2012	KY PSC	2012-00222	Louisville Gas and Electric Company	Depreciation
142.	2012	KY PSC	2012-00221	Kentucky Utilities Company	Depreciation
143.	2012	PA PUC	R-2012-2285985	Peoples Natural Gas Company	Depreciation
144.	2012	DC PSC	Case 1087	Potomac Electric Power Company	Depreciation
145.	2012	OH PSC	12-1682-EL-AIR	Duke Energy Ohio (Electric)	Depreciation
146.	2012	OH PSC	12-1685-GA-AIR	Duke Energy Ohio (Gas)	Depreciation
147.	2012	PA PUC	R-2012-2310366	Lancaster, City of – Sewer Fund	Depreciation
148.	2012	PA PUC	R-2012-2321748	Columbia Gas of Pennsylvania	Depreciation
149.	2012	FERC	ER-12-2681-000	ITC Holdings	Depreciation
150.	2012	MO PSC	ER-2012-0174	Kansas City Power and Light	Depreciation
151.	2012	MO PSC	ER-2012-0175	KCPL Greater Missouri Operations Co.	Depreciation
152.	2012	MO PSC	GO-2012-0363	Laclede Gas Company	Depreciation
153.	2012	MN PUC	G007,001/D-12-533	Integrys – MN Energy Resource Group	Depreciation
153.	2012	TX PUC		Aqua Texas	Depreciation
155.	2012	PA PUC	2012-2336379	York Water Company	Depreciation
156.	2013	NJ BPU	ER12121071	PHI Service Co.– Atlantic City Electric	Depreciation
157.	2013	KY PSC	2013-00167	Columbia Gas of Kentucky	Depreciation
158.	2013	VA St CC	2013-00020	Virginia Electric and Power Co.	Depreciation
159.	2013	IA Util Bd	2013-0004	MidAmerican Energy Corporation	Depreciation
160.	2013	PA PUC	2013-2355276	Pennsylvania American Water Co.	Depreciation
161.	2013	NY PSC	13-E-0030, 13-G-0031, 13-S-0032	Consolidated Edison of New York	Depreciation
162.	2013	PA PUC	2013-2355886	Peoples TWP LLC	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
163.	2013	TN Reg Auth	12-0504	Tennessee American Water	Depreciation
164.	2013	ME PUC	2013-168	Central Maine Power Company	Depreciation
165.	2013	DC PSC	Case 1103	PHI Service Co. – PEPCO	Depreciation
166.	2013	WY PSC	2003-ER-13	Cheyenne Light, Fuel and Power Co.	Depreciation
167.	2013	FERC	ER13- -0000	Kentucky Utilities	Depreciation
168.	2013	FERC	ER13- -0000	MidAmerican Energy Company	Depreciation
169.	2013	FERC	ER13- -0000	PPL Utilities	Depreciation
170.	2013	PA PUC	R-2013-2372129	Duquesne Light Company	Depreciation
171.	2013	NJ BPU	ER12111052	Jersey Central Power and Light Co.	Depreciation
172.	2013	PA PUC	R-2013-2390244	Bethlehem, City of – Bureau of Water	Depreciation
173.	2013	OK CC	UM 1679	Oklahoma, Public Service Company of	Depreciation
174.	2013	IL CC	13-0500	Nicor Gas Company	Depreciation
175.	2013	WY PSC	20000-427-EA-13	PacifiCorp	Depreciation
176.	2013	UT PSC	13-035-02	PacifiCorp	Depreciation
177.	2013	OR PUC	UM 1647	PacifiCorp	Depreciation
178.	2013	PA PUC	2013-2350509	Dubois, City of	Depreciation
179.	2014	IL CC	14-0224	North Shore Gas Company	Depreciation
180.	2014	FERC	ER14-	Duquesne Light Company	Depreciation
181.	2014	SD PUC	EL14-026	Black Hills Power Company	Depreciation
182.	2014	WY PSC	20002-91-ER-14	Black Hills Power Company	Depreciation
183.	2014	PA PUC	2014-2428304	Hanover, Borough of – Municipal Water Works	Depreciation
184.	2014	PA PUC	2014-2406274	Columbia Gas of Pennsylvania	Depreciation
185.	2014	IL CC	14-0225	Peoples Gas Light and Coke Company	Depreciation
186.	2014	MO PSC	ER-2014-0258	Ameren Missouri	Depreciation
187.	2014	KS CC	14-BHCG-502-RTS	Black Hills Service Company	Depreciation
188.	2014	KS CC	14-BHCG-502-RTS	Black Hills Utility Holdings	Depreciation
189.	2014	KS CC	14-BHCG-502-RTS	Black Hills Kansas Gas	Depreciation
190.	2014	PA PUC	2014-2418872	Lancaster, City of – Bureau of Water	Depreciation
191.	2014	WV PSC	14-0701-E-D	First Energy – MonPower/PotomacEdison	Depreciation
192	2014	VA St CC	PUC-2014-00045	Aqua Virginia	Depreciation
193.	2014	VA St CC	PUE-2013	Virginia American	Depreciation
194.	2014	OK CC	PUD201400229	Oklahoma Gas and Electric	Depreciation
195.	2014	OR PUC	UM1679	Portland General Electric	Depreciation
196.	2014	IN URC	Cause No. 44576	Indianapolis Power & Light	Depreciation

	Year	Jurisdiction	Docket No.	Client Utility	Subject
197.	2014	MA DPU	DPU. 14-150	NSTAR Gas	Depreciation
198.	2014	CT PURA	14-05-06	Connecticut Light and Power	Depreciation
199.	2014	MO PSC	ER-2014-0370	Kansas City Power & Light	Depreciation
200.	2014	KY PSC	2014-00371	Kentucky Utilities Company	Depreciation
201.	2014	KY PSC	2014-00372	Louisville Gas and Electric Company	Depreciation
202.	2015	PA PUC	R-2015-2462723	United Water Pennsylvania Inc.	Depreciation
203.	2015	PA PUC	R-2015-2468056	Columbia Gas of Pennsylvania	Depreciation
204.	2015	NY PSC	15-E-0283/15-G-0284	New York State Electric and Gas Corporation	Depreciation
205.	2015	NY PSC	15-E-0285/15-G-0286	Rochester Gas and Electric Corporation	Depreciation
206.	2015	MO PSC	WR-2015-0301/SR-2015-0302	Missouri American Water Company	Depreciation
207.	2015	OK CC	PUD 201500208	Oklahoma, Public Service Company of	Depreciation
208.	2015	WV PSC	15-0676-W-42T	West Virginia American Water Company	Depreciation
209.	2015	PA PUC	2015-2469275	PPL Electric Utilities	Depreciation
210.	2015	IN URC	Cause No. 44688	Northern Indiana Public Service Company	Depreciation
211.	2015	OH PSC	14-1929-EL-RDR	First Energy-Ohio Edison/Cleveland Electric/ Toledo Edison	Depreciation
212.	2015	NM PRC	15-00127-UT	El Paso Electric	Depreciation
213.	2015	TX PUC	PUC-44941; SOAH 473-15-5257	El Paso Electric	Depreciation
214.	2015	WI PSC	3370-DU-104	Madison Gas and Electric Company	Depreciation
215.	2015	OK CC	PUD 201500273	Oklahoma Gas and Electric	Depreciation

LOUISVILLE GAS AND ELECTRIC
ASH POND RECOVERY

SUMMARY OF FUTURE RECOVERY PARAMETERS CALCULATED
AS OF SEPTEMBER 30, 2015

	ACCOUNT	SURVIVOR CURVE		NET SALVAGE PERCENT	ORIGINAL COST	BOOK DEPRECIATION RESERVE	FUTURE ACCRUALS	CALCULATED ANNUAL ACCRUAL AMOUNT	CALCULATED ANNUAL ACCRUAL RATE	COMPOSITE REMAINING LIFE
	(1)	(2)		(3)	(4)	(5)	(6)	(7)	(8)=(7)/(4)	(9)=(6)/(7)
	DEPRECIABLE PLANT									
	STEAM PRODUCTION PLANT									
311.00	STRUCTURES AND IMPROVEMENTS									
	MILL CREEK UNIT 1	100-S4	*	**	411,750.29	409,203	18,897,768	1,130,926	274.66	16.7
	MILL CREEK UNIT 3	100-S4	*	**	1,263,768.52	1,143,318	56,800,469	2,500,021	197.82	22.7
	TRIMBLE COUNTY - UNIT 1	100-S4	*	**	4,942,817.00	2,913,165	35,294,810	1,016,848	20.57	34.7
	TOTAL ACCOUNT 311 - STRUCTURES AND IMPROVEMENTS				6,618,335.81	4,465,686	110,993,047	4,647,795	70.23	23.9
312.00	BOILER PLANT EQUIPMENT									
	TRIMBLE COUNTY - SO2 UNIT 1	100-S4	*	**	5,057,242.50	695,214	39,004,140	1,122,421	22.19	34.8
	TOTAL ACCOUNT 312 - BOILER PLANT EQUIPMENT				5,057,242.50	695,214	39,004,140	1,122,421	22.19	34.8
	TOTAL DEPRECIABLE PLANT				**11,675,578.31**	**5,160,900**	**149,997,187**	**5,770,216**	**49.42**	**26**

* LIFE SPAN PROCEDURE IS USED. CURVE SHOWN IS INTERIM SURVIVOR CURVE
** TERMINAL NET SALVAGE FACTOR WHICH IS BASED ON VINTAGE AND FUTURE COSTS

Louisville Gas and Electric

Ash Pond Recovery for ECR Filing

Account	Location	Ash Pond Original Cost (As of September 30, 2015)	Reserve For Ash Pond (As of September 30, 2015)	Life Reserve (As of September 30, 2015)	Cost of Removal Reserve (As of September 30, 2015)	COR Accruals Since Last Case was Approved	Terminal Net Salvage Since 1/1/2013
(1)	(2)	(3)	(4)	(5)	(6)	(7)*	(8)
311	Mill Creek 1	411,750.29	409,203	384,896	24,307	504	10
311	Mill Creek 3	1,263,768.52	1,143,318	1,092,097	51,221	1,548	31
311	Trimble County 1	4,942,817.00	2,913,165	2,783,820	129,345	13,840	277
312	Trimble County 2	5,057,242.50	695,214	620,131	75,083	25,666	513

* In the Matter of; Application of Louisville Gas and Electric Company for an Adjustment of its Electric and Gas Rates, a Certificate of Public Convenience and Necessity, Approval of Ownership of Gas Service Lines and Risers, and a Gas Line Surcharge, Case No. 2012-00222 (Dec. 20, 2012).

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

THE APPLICATION OF LOUISVILLE GAS AND ELECTRIC COMPANY FOR CERTIFICATES OF PUBLIC CONVENIENCE AND NECESSITY AND APPROVAL OF ITS 2016 COMPLIANCE PLAN FOR RECOVERY BY ENVIRONMENTAL SURCHARGE	**))))))**	**CASE NO. 2016-00027**

DIRECT TESTIMONY OF
CHRISTOPHER M. GARRETT
DIRECTOR, ACCOUNTING AND REGULATORY REPORTING
LOUISVILLE GAS AND ELECTRIC COMPANY

Filed: January 29, 2016

Q. Please state your name, position and business address.

A. My name is Christopher M. Garrett. I am the Director of Accounting and Regulatory Reporting for LG&E and KU Services Company, which provides services to Kentucky Utilities Company ("KU") and Louisville Gas and Electric Company ("LG&E") (collectively, "the Companies"). My business address is 220 West Main Street, Louisville, Kentucky, 40202. A statement of my education and work experience is attached to this testimony as Appendix A.

Q. Have you previously testified before this Commission?

A. Yes. I have submitted testimony to the Kentucky Public Service Commission ("KPSC") in LG&E's environmental surcharge mechanism review Case No. 2015-00021, answered requests for information on regulatory accounting issues in multiple and various proceedings before the KPSC, presented on regulatory accounting topics and informal conferences at the KPSC and otherwise have extensive work experience with regulatory accounting issues.

Q. Will you soon assume a new position with the Companies?

A. Yes. On February 1, 2016, I will assume the position of Director of Rates for the Companies. I will continue to be an employee of LG&E and KU Services Company in my new role. Also, I will continue to testify and participate in this proceeding, and do not anticipate having another witness adopt my testimony.

Q. Are you sponsoring any exhibits?

A. Yes. I am sponsoring one exhibit, identified as Exhibit CMG-1, CCR Closure Costs Journal Entries.

Q. What is the purpose of your testimony?

A. The purpose of my testimony is to explain the proposed regulatory accounting treatment for coal combustion residuals ("CCR") storage closure activities required as a result of the Coal Combustion Residual Rule ("CCR Rule") and state regulations applicable to LG&E's power plants and the disposal of CCR, to review LG&E's reporting and accounting for the operation and maintenance expenses associated with the pollution control projects in their 2016 Environmental Compliance Plan ("2016 Plan"), to demonstrate that the environmental compliance costs LG&E proposes to recover through its surcharge are not already included in existing base rates, and to discuss the deferred and property tax treatment included in the filing.

<u>Regulatory Accounting Treatment – CCR Rule and Related State Regulations</u>

Q. Briefly describe the proposed regulatory accounting treatment regarding CCR Rule and related state regulations closure costs.

A. LG&E adopted Standard of Financial Accounting Standard ("SFAS") No. 143, *Accounting for Asset Retirement Obligations as of January 1, 2003*.[1] Consistent with the accounting directives, LG&E has recognized asset retirement obligations of $157 million as of September 30, 2015.[2] Of this amount, $110 million is associated with CCR closure activities included in the 2016 Plan. These amounts will be updated as necessary on a quarterly basis in LG&E's Form 10-Qs or 10-Ks.

[1] The guidance in SFAS No. 143 is now contained in Financial Accounting Standards Board Accounting Standards Codification Topic 410, Asset Retirement and Environmental Obligations, effective September 15, 2009.

[2] PPL Corp., Quarterly Report (Form 10-Q) (Oct. 30, 2015) at 71 (available at http://www.sec.gov/Archives/edgar/data/55387/000092222415000089/form10q.htm).

Consistent with the ratemaking treatment in every LG&E base rate case since 2003,[3] the impact of the accounting for asset retirement obligations under SFAS No. 143 is being eliminated for ratemaking purposes in this case.[4]

Therefore, LG&E is proposing in this case that for ratemaking purposes the CCR storage closure costs are accounted for as cost of removal and charged to the accumulated provision for depreciation reserve. An example of the journal entries to be recorded for the proposed cost of removal ratemaking treatment along with the associated asset retirement obligation journal entries is shown in Exhibit CMG-1.

As discussed in the testimony of John N. Voyles, Jr., LG&E plans to close the CCR management facilities at Cane Run in 2016. The accounting treatment for these closure costs agrees with the approach described above. The costs to close the Cane Run storage facilities were included in the last base rate case; therefore, LG&E is not seeking recovery for any Cane Run costs in this proceeding.

The costs associated with constructing the new process water systems (e.g. tanks and basins) will be capitalized to Federal Energy Regulatory Commission's

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[3] *In the Matter of: An Adjustment of the Gas and Electric Rates, Terms, and Conditions of Louisville Gas and Electric Company*, Case No. 2003-00433, Order (June 30, 2004); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric Rates*, Case No. 2008-00252, Order (Feb. 5, 2009); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Electric and Gas Base Rates*, Case No. 2009-00548, Order (July 30, 2010); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of its Electric and Gas Rates, a Certificate of Public Convenience and Necessity, Approval of Ownership of Gas Service Lines and Risers, and a Gas Line Surcharge*, Case No. 2012-00222, Order (Dec. 20, 2012); *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of Its Electric and Gas Rates*, Case No. 2014-00372, Order (June 30, 2015).

[4] *In the Matter of: Application of Louisville Gas and Electric Company for an Order Approving an Accounting Adjustment to be Included in Earning Sharing Mechanism Calculations for 2003*, Case No. 2003-00426, Order (Dec. 23, 2003).

("FERC") Account No. 107, Construction work in progress as they will continue to serve on-going operations.

Q. Why is this accounting treatment for closure costs appropriate?

A. The assets being retired as a result of the issuance of the CCR Rule and related state regulations were utilized for the production of energy from coal at various electric generating plant sites. Accordingly, these closure costs should be considered costs of removal and accounted for in the manner prescribed by FERC's Electric Plant Instruction 10 of the Code of Federal Regulations 18 CFR. As such, the accounting treatment for the retirement of these assets should be handled in the same manner as all other generating assets.

Q. Will any changes to the monthly ECR Forms filed with the Commission be necessary to reflect the inclusion of removal costs?

A Yes. An additional column is proposed to be added to Environmental Surcharge Monthly Report, ES Form 2.10, "CCR Rule Compliance Construction Costs" to reflect the increase in rate base associated with the CCR storage facility closure expenditures. The ECR Forms are discussed in greater detail in the testimony of Derek A. Rahn.

<u>Costs Not Already Included in Existing Base Rates</u>

Q. Should LG&E be allowed to earn a return on closure costs charged to accumulated depreciation (cost of removal) in this proceeding?

A. Yes. Per KRS 278.183, LG&E is entitled to earn a return on the closure costs charged to accumulated depreciation. Recovery of the reasonable rate of return on compliance-related capital expenditures is clearly permissible through the ECR mechanism. In addition, under the FERC Uniform System of Accounts, costs incurred as a result of asset retirement obligations sustained during construction are recognized as a component of construction costs.[5] Robert M. Conroy's testimony discusses the reasonable rate of return for this ECR Plan. The costs to close the CCR storage facilities under the new CCR Rule and related state regulations will require both investment in and the associated carrying charge with the closures of these facilities.

It is LG&E's position that the costs of complying with the new CCR Rule and state regulations applicable to LG&E's power plants and the disposal of CCR were never considered in the development of LG&E's depreciation rates; and therefore, the vast majority of the closure costs are not already included in existing depreciation rates and thus existing base rates. The costs of complying with the new CCR Rule and related state regulations thus have not been recovered from customers.

Q. What is the accumulated cost of removal reserve for LG&E associated with the CCR storage facilities?

A. As shown in Exhibit JJS-3 of John J. Spanos' testimony, approximately $0.3 million for LG&E is associated with the retirement of these CCR storage facilities as of September 30, 2015. These amounts represent a reduction in utility capitalization and thus base rates.

Q. Why is the accumulated cost of removal reserve for these facilities so small given the expected magnitude of the closure costs as a result of the new CCR Rule and related state regulations?

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[5] The FERC Uniform System of Accounts, Electric Plant Instructions, *Asset retirement costs*, states: "The costs recognized as a result of asset retirement obligations incurred during the construction and testing of utility plant shall constitute a component of construction costs."

A. As discussed in the testimony of Mr. Spanos, a terminal net salvage rate was not recognized in the depreciation rates for LG&E until the 2012 base rate case.[6] The 2012 base rate case established through an approved settlement agreement a 2% terminal salvage rate, but this rate is not remotely adequate to address the costs associated with the retirement of the CCR storage facilities as supported by the amounts provided in Mr. Spanos' testimony.

Furthermore, because there was no legal requirement to close the facilities under the new CCR Rule, the previous depreciation rates did not factor in a closure or terminal net salvage component. Therefore, LG&E is proposing to implement new depreciation rates to address the current accumulated depreciation reserve shortfall in this case.

Q. To the extent that removal costs have been recovered from customers through existing base rates, have customers received a corresponding benefit?

A. Yes, customers have received a benefit from the collection of the net salvage (cost of removal) component of accumulated depreciation. The recovery of retirement costs through the cost of removal component of book depreciation discussed above has resulted in a lower utility capitalization which has resulted in lower base rates.

Q. Is LG&E proposing new depreciation rates for the closure of the CCR storage facilities under the CCR Rule and related state regulations?

[6] *In the Matter of: Application of Louisville Gas and Electric Company for an Adjustment of its Electric and Gas Rates, a Certificate of Public Convenience and Necessity, Approval of Ownership of Gas Service Lines and Risers, and a Gas Line Surcharge,* Case No. 2012-00222, Order (Dec. 20, 2012).

A. Yes. The testimony of Mr. Spanos presents his analysis and recommendations for specific depreciation rates associated with each of the ECR projects involving the CCR storage facilities. The existing depreciation rates approved in the 2012 base rate cases were not developed to address the costs associated with the closure of CCR storage facilities under the new CCR Rule and related state regulations and are not adequate for the recovery of this cost.

Q. Do you agree with Mr. Spanos' recommended depreciation rates?

A. Yes. LG&E has reviewed Mr. Spanos' recommended depreciation rates and has accepted them for purposes of this application.

In developing the revenue requirements for the 2016 Plan, LG&E has reduced the depreciation expense to be recovered from customers by the amounts included in base rates to avoid any form of double recovery.

Q. How will LG&E address an accumulated depreciation reserve imbalance should actual closure costs be higher or lower than expected, or a change in the closure timing occur?

A. LG&E proposes to address future accumulated depreciation reserve imbalances through either a base rate case or depreciation rate filing or a combination of both.

Q. Are any of the capital expenditures for the surface-impoundment-related construction projects, excluding the new process water systems, in the 2016 Plan already included in existing base rates?

A. The total capital expenditures for these projects included in the 2016 Plan filing have been reduced for the amounts included in the most recent base rate case. The calculation is shown on the following page:

LG&E ECR Projects[7]		Number of Projects	Total Estimated Capital	Spend in Base Rates	Estimated ECR Spend
29	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Mill Creek*	*5*	*$75.6 M*	*$3.2M*	*$72.3 M*
30	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Trimble County (Net, 52%)*	*2*	*$67.9 M*	*$3.6M*	*$64.3 M*

Q. Is LG&E proposing to recover the costs associated with the 30-year monitoring program of these projects discussed in Gary H. Revlett's testimony?

A. Yes. This cost will be charged to the accumulated depreciation reserve similarly to other closure costs discussed above.

<u>Other ECR Projects Including New Process Water Systems</u>

Q. Is LG&E seeking recovery of operation and maintenance expenses associated with some of the projects included in its proposed 2016 Plan?

A. Yes. As discussed in the testimony of R. Scott Straight, LG&E is seeking the ability to recover operating and maintenance ("O&M") expenses for new Project 28, which involves the installation of supplemental low-cost and economical control technologies to reduce mercury re-emissions that will keep the Mill Creek and Trimble County 1 units in compliance, and provide operational flexibility in maintaining compliance, with the Mercury and Air Toxics Standards ("MATS Rule") for mercury. As discussed in the testimony of Mr. Conroy, the projected annual O&M cost of these facilities presented on the second page of Exhibit JNV-1 is shown as zero for all years. That is not because the systems installed through

[7] Excludes new construction for process water systems. See the table at page 10 for those costs.

Project 28 will have no O&M cost, particularly with respect to the cost of the additives to be injected and applied; rather, the cost of such additives will correspondingly offset Powdered Activated Carbon ("PAC") costs currently being recovered through the O&M expense shown in LG&E's monthly ECR reports for Project 26 (approved as part of LG&E's 2011 Plan). Therefore, the zero-O&M costs shown in Exhibit JNV-1 represent the expectation that the O&M costs of Project 28 will be less than or equal to corresponding O&M costs currently being reported for Project 26.

Q. How will LG&E identify the O&M expenses associated with these projects in its 2016 Plan?

A. LG&E's accounting system permits the tracking of costs in accordance with FERC's Uniform System of Accounts. LG&E intends to use FERC Account No. 506, Miscellaneous steam power expenses, to identify and track the O&M expenses associated with these projects. LG&E will use subaccounts to track specific expenses (e.g. organo-sulfide and halogenated liquid chemicals vs. PAC) and location codes to track expenses by unit.

Q. Has similar accounting proven to be successful in previous ECR cases?

A. Yes, tracking the costs using this accounting methodology has proven to be successful in the past. The costs in these accounts will be clearly detailed in the Environmental Surcharge Monthly Report, ES Form 2.50. The ECR Forms are discussed in greater detail in the testimony of Mr. Rahn.

Q. What book depreciation rates will be used in the calculation of the depreciation expense for the new capital projects including new process water systems?

A. The book depreciation rates to be used for the new capital projects at all existing units will be the existing depreciation rates for that group of assets. The Commission approved these rates in the 2012 base rate cases.

Q. Are any of the capital expenditures for the other ECR Projects including new process water systems in the 2016 Plan already included in existing base rates?

A. No. This is shown below:

LG&E ECR Projects[8]		**Number of Projects**	**Total Estimated Capital**	**Spend in Base Rates**	**Estimated ECR Spend**
28	*Supplemental Mercury Related Control Systems*	*4*	*$4.9 M*	*$0*	*$4.9 M*
29	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Mill Creek*	*1*	*$121.4 M*	*$0*	*$121.4 M*
30	*CCR Rule Compliance Construction Costs and Construction of New Process Water Systems at Trimble County (Net, 52%)*	*1*	*$46.1 M*	*$0*	*$46.1 M*

Q. Are any of the O&M expenses associated with Project No. 28 in the 2016 Plan already included in existing base rates?

A. No, the O&M expenses associated with the use of organo-sulfide and halogenated liquid chemicals are not included in base rates.

Q. Will the installation of the new pollution control facilities in LG&E's 2016 Plan replace or cause existing facilities to be removed from service?

[8] Includes new construction for process water systems.

A. Yes. The additions of Project Nos. 29 and 30 to the Mill Creek and Trimble County generation stations will result in the removal from service of some existing facilities associated with the piping for the water treatment facilities. The exact amount cannot be readily identified with reasonable accuracy until construction is complete.

The process for accounting for and removal of such costs from the environmental surcharge, previously approved by the Commission in prior proceedings, will continue to be used by LG&E with the approval of the 2016 Plan.

Deferred and Property Tax Considerations

Q. What deferred income taxes are associated with these pollution control facilities?

A. Deferred income taxes are recorded for all book-versus-tax temporary timing differences. The new capital projects are eligible for accelerated tax depreciation and amortization. These assets will be eligible for bonus tax depreciation[9] and will also generally fall into a 20-year Modified Accelerated Cost Recovery System life. Some of these assets may also be considered pollution control equipment eligible for 5 year or 7 year rapid amortization treatment under section 169 of the Internal Revenue Code.

CCR closure costs charged to the accumulated depreciation reserve are deductible in the year incurred. This tax treatment results in the recording of a

[9] In December 2015, the "Protecting Americans from Tax Hikes Act of 2015" was passed into law. The new law extends the 50% bonus rate to the years 2015-17 and then phases the bonus rate down to 40% for 2018 and 30% for 2019.

deferred tax liability which serves as a reduction to rate base. This deferred tax liability will reverse through book depreciation once the closure costs are included in the new depreciation rates.

Q. Please explain how property taxes associated with the new facilities are calculated?

A. Pollution control facilities in Kentucky are generally categorized as manufacturing machinery. This class of property is exempt from local property tax and is taxed at the state property tax rate of $0.15 per $100 of assessed value.

Q. Will you please provide a summary of the conclusions in your testimony?

A. Yes. The conclusions to be drawn from my testimony are:

1. LG&E should be allowed for ratemaking purposes to account for the CCR closure costs as cost of removal and charged to the accumulated provision for depreciation.
2. LG&E should be allowed to earn a recovery of and a return on the CCR closure costs and other capital projects included in the 2016 Plan.
3. The depreciation rates for the CCR closure costs provided by Mr. Spanos should be approved for purposes of calculating the ECR beginning with the expense month of July 2016.
4. LG&E should be allowed to recover through the ECR surcharge the operating costs associated with the use of organo-sulfide and halogenated liquid chemicals.

Q. Does this conclude your testimony?

A. Yes.

VERIFICATION

COMMONWEALTH OF KENTUCKY)
) SS:
COUNTY OF JEFFERSON)

The undersigned, **Christopher M. Garrett**, being duly sworn, deposes and says that he is Director – Accounting and Regulatory Reporting for LG&E and KU Services Company, and that he has personal knowledge of the matters set forth in the foregoing testimony, and that the answers contained therein are true and correct to the best of his information, knowledge and belief.

Christopher M. Garrett
Christopher M. Garrett

Subscribed and sworn to before me, a Notary Public in and before said County and State, this 29th day of January 2016.

Judy Schooler (SEAL)
Notary Public

My Commission Expires:

JUDY SCHOOLER
Notary Public, State at Large, KY
~~My commission expires July 11, 2018~~
Notary ID # 512743

APPENDIX A

Christopher M. Garrett
Director, Accounting and Regulatory Reporting
LG&E and KU Services Company
220 West Main Street
Louisville, Kentucky 40202
(502) 627-3328

Previous Positions:

Director, Financial Planning & Controlling	Feb 2010 – Nov 2012
Manager, Financial Planning	Nov 2007 – Feb 2010
Manager, Corporate Accounting	Jan 2006 – Oct 2007
Manager, Utility Tax	May 2002 – Jan 2006
Tax Analyst, various positions	Aug 1995 – May 2002

Education:

Eastern Kentucky University, Bachelor of Business Administration - Accounting, 1995 Graduated Magna Cum Laude
Certified Public Accountant, Kentucky, 1999

Professional Memberships:

American Institute of Certified Public Accountants (AICPA)
Kentucky Society of Certified Public Accountants (KSCPA)

Civic Activities:

St. Joseph School Board Member

CCR Closure Costs Journal Entries

Proposed Regulatory Accounting Treatment for Ratemaking (e.g. Cost of Removal Accounting)				
	<u>Account No.</u>	<u>Description</u>	<u>DR</u>	<u>CR</u>
A	108	Accumulated provision for depreciation of electric utility plant	XXX	
	131	Cash		XXX
		Record capital expenditures for closure activities		
B	403	Depreciation expense	XXX	
	108	Accumulated provision for depreciation of electric utility plant		XXX
		Record depreciation expense associated with CCR closure activities		

ARO Accounting - Eliminated for Ratemaking				
	<u>Account No.</u>	<u>Description</u>	<u>DR</u>	<u>CR</u>
A	101	Electric Plant in Service	XXX	
	230	Asset retirement obligations		XXX
		To record the asset retirement obligation for the CCR closure activities		
B	403.1	Depreciation expense for asset retirement costs	XXX	
	108	Accumulated provision for depreciation of electric utility plant		XXX
		To record depreciation expense for the ARO asset through expected settlement date		
C	411.10	Accretion expense	XXX	
	230	Asset retirement obligations		XXX
		To record accretion expense for the asset retirement obligation through expected settlement date		
D	182.3	Other regulatory assets	XXX	
	403.1	Depreciation expense for asset retirement costs		XXX
	411.10	Accretion expense		XXX
		To offset depreciation expense and accretion expense recorded in B and C above so that ARO accounting is income neutral		
E	230	Asset retirement obligations	XXX	
	108	Accumulated provision for depreciation of electric utility plant	XXX	
	101	Electric Plant in Service		XXX
	182.3	Other regulatory assets		XXX
		To settle the ARO obligation for CCR closure expenditures		