COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

INVESTIGATION OF KENTUCKY UTILITIES	**)**	
COMPANY'S AND LOUISVILLE GAS &	**)**	
ELECTRIC COMPANY'S RESPECTIVE NEED	**)**	**CASE NO. 2015-00194**
FOR AND COST OF MULTIPHASE	**)**	
LANDFILLS AT THE TRIMBLE COUNTY AND	**)**	
GHENT GENERATING STATIONS	**)**	

PRE-FILED DIRECT

TESTIMONY OF

J. STEVEN GARDNER PE

ON BEHALF OF

STERLING VENTURES, LLC

AUGUST 6, 2015

DIRECT TESTIMONY

OF

J. STEVEN GARDNER, PE

I. IDENTIFICATION OF WITNESS AND PURPOSE OF TESTIMONY

Q. PLEASE STATE YOUR FULL NAME, ADDRESS, AND OCCUPATION.

A. My name is J. Steven Gardner, and my business address is 340 South Broadway, Lexington Kentucky 40508. I am the President and CEO of ECSI, LLC, an engineering and consulting company. A summary of my educational background, research, and related business experience is provided in Exhibit 1.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. I have been asked by Sterling Ventures, LLC ("Sterling") to provide an opinion as to the reasonableness and technical issues pertaining to Sterling's proposal to utilize Coal Combustion Residuals ("CCR") generated at the Louisville Gas & Electric ("LG&E") and Kentucky Utilities ("KU") Trimble County (jointly referred to as "Companies") plant as a beneficial use material for ventilation at the Sterling underground mine facility located in Gallatin County, Kentucky.

Q. HOW IS YOUR TESTIMONY ORGANIZED?

A. First I provide an overview of the beneficial use that the CCR will provide at the Sterling operation. Second, I will discuss the environmental issues related to placement of the CCR in the Sterling operation. Third, I provide information regarding the ability of Sterling to receive and place CCR within the underground mine voids for the project duration objective of 37 years. Finally, I provide information related to the transportation and material handling of CCR from the generating stations to the Sterling mine.

Q. ARE YOU FAMILIAR WITH THE STERLING UNDERGROUND LIMESTONE MINING OPERATION?

A. I have personally visited the Sterling operation several times, observed the underground mine area where CCR will be placed, and reviewed Sterling's mining plans and projections. I have also reviewed the production and safety records of the mine.

Q. PLEASE SUMMARIZE THE STERLING PROPOSAL TO DISPOSE OF AND BENEFICIALLY USE CCR WITHIN THE UNDERGROUND MINE VOIDS.

A. Sterling owns and operates an underground limestone mine near the Ohio River in Gallatin County, Kentucky. Sterling is proposing to place CCR within the voids left by mined out sections, thereby eliminating the need for the Companies to construct a large and expensive landfill for disposal of CCR. By utilizing the CCR to fill the mine voids in lieu of other materials to facilitate ventilation within the mine, Sterling will be beneficially using the CCR that would otherwise be placed in the landfill proposed by the Companies.

II. BENEFICIAL USE OF CCR AT THE STERLING MINE

Q. PLEASE DESCRIBE THE BENEFICIAL USE THE CCR WILL PROVIDE AT THE STERLING MINE.

A. Placement of CCR in an underground mine serves the purpose of enhancing mine ventilation by assisting in directing air flows, thus reducing the volume of the mine area to ventilate and saving energy required of mine fans to direct the air flow.

Utilizing CCR in certain areas of the mine to replace the ventilation stoppings (mine structure constructed to direct air flow) conserves on the materials currently used to construct stoppings (mined material, concrete and/or brattice curtains). Curtains are typically heavy plastic which can in some areas extend the entire cross-sectional area of the mine entry or cross-cut, sometimes approximately 40'X60'.

I also view placement of CCR in the mine as a future resource upon the cessation of stone mining operations. As the use of coal for electricity generation continues to decline, the sources of flyash, bottom ash and gypsum for other beneficial uses will decline. Having the CCR in an area that can easily be recovered for traditional beneficial uses will avoid the mining of those materials at some date in the future.

Q. IS THE DESCRIBED BENEFICIAL USE ACCEPTED BY THE EPA?

A. The EPA views placement of CCR in the Sterling underground mine as a potentially viable alternative to the Companies landfill construction (See Exhibit 2, letter from EPA to U.S. Army Corps of Engineers, Louisville District, dated August 7, 2014). While not expressly accepted as a beneficial use of

CCR, a reading of the EPA guidelines as to what constitutes a beneficial use clearly demonstrates that utilizing the CCR in the manner which Sterling proposes is a beneficial use of the material which would otherwise be placed in a landfill. The EPA sets forth 3 criteria in determining if CCR use is beneficially used:

1. ***The CCR must provide a functional benefit.*** Under the Sterling plan, the CCR will be used to fill mine void spaces to facilitate mine ventilation. Backstowing of the CCR will also provide additional long-term roof support within the mined out areas.

2. ***The CCR must substitute for the use of a virgin material, conserving natural resources that would otherwise need to be attained through practices such as extraction.*** Sterling currently uses material extracted within the mine to fill mine voids, and places curtains between the top of the extracted material and the roof of the mine to seal the area for mine ventilation purposes.

3. ***The use of CCR must meet relevant product specifications, regulatory standards, or design standards when available, and when such standards are not available, CCR must not be used in excess quantities.*** Use of the CCR under the Sterling plan would meet regulatory and design standards for mine ventilation.

Q. IS PLACEMENT OF THE CCR IN THE MINE VOIDS PERMITTED BY THE MINE SAFETY AND HEALTH ADMINISTRATION (MSHA)?

A. Backstowing of waste rock from mining processes is a standard accepted industry practice and approved by MSHA as long as the process is done according to their regulatory standards. The ventilation plan modifications would be included in the approved MSHA Ventilation Plan for the mine.

Backstowing also has other beneficial uses in mines. In many cases backstowing is done to avoid having to design and permit waste facilities on the surface encroaching on streams or minimizing the amount of waste placed in existing fills or tailings impoundments. In other cases it can provide material for backfilling of stopes or voids to allow mines to recover more of the principle resource the mine is targeting.

III. <u>ENVIRONMENTAL IMPACTS OF THE STERLING PLAN</u>

Q. PLEASE DESCRIBE THE ENVIRONMENTAL IMPACTS ASSOCIATED WITH THE STERLING PLAN.

A. Environmental impacts associated with Sterling's underground disposal plan are minimal. Use of the Sterling mine will not have any significant impact to wetlands, surface water or groundwater. While there will still be a need for certain support facilities to be constructed, the amount of surface disturbance required for these facilities will be minimal compared to other CCR disposal alternatives being considered by the Companies.

Q. PLEASE DESCRIBE THE ENVIRONMENTAL PERMITS THAT WILL BE REQUIRED UNDER THE STERLING PLAN.

A. Environmental permitting requirements with state and federal regulatory authorities are minimal under the Sterling plan. Sterling has already received a Special Waste Facility permit from the Kentucky Division of Waste Management (KDWM) to accept synthetic gypsum produced during the flue gas desulfurization

(FGD) process at KU's Ghent station and use that material to fill mine voids at the Sterling operation. In order for Sterling to be able to accept CCR from the Companies' Trimble County plant, only a modification to the existing Special Waste Facility permit would be required.

Sterling would also need to amend its Kentucky Department for Natural Resource mining permit to reflect material handling facilities.

Q. HOW DO THE ENVIRONMENTAL IMPACTS OF STERLING'S PLAN COMPARE TO THOSE IMPACTS OF THE COMPANIES' PERFERRED LANDFILL CONSTRUCTION ALTERNATIVE?

A. The Companies' plan calls for construction of a 189 acre landfill for CCR storage. Combined with necessary support structures and considering the operations plan, approximately 840 acres of land, 87,254 linear feet of high quality streams, 2.6 acres of wetlands, and 0.5 acres of open water ponds will be impacted.

In contrast, the Companies' alternative analysis of the Sterling plan estimates a total surface disturbance for construction of ancillary facilities of 307 acres impacting 15,521 linear feet of streams and 0.17 acres of wetlands.

In addition to the immediate surface disturbance, stream and wetland impacts, there are potential long-term environmental issues associated with landfills of this type and scale that must be considered. Leaching, stormwater run-on/run-off, erosion control, stability and dust control are just a few of those long-term issues that must be addressed when operating an ash landfill. Under the Sterling plan, these issues do not exist.

Q. WHAT IS THE GEOLOGIC SETTING OF THE STERLING MINE?

A. In central Kentucky, Ordovician limestone and dolomite are mined and quarried for construction aggregate. Stone is being produced from the High Bridge Group and the overlying Lexington Limestone. The High Bridge Group consists of three formations: in descending stratigraphic order, the Tyrone Limestone, Oregon Formation, and Camp Nelson Limestone. Only parts of stone from the Lexington Limestone are mined: the Grier-Curdsville and Tanglewood Members.

High Bridge rocks, 470 to 570 feet thick, are composed of dense, micrograined limestone and finely crystalline dolomite. The Lexington Limestone, 180 to 320 feet thick, contains a variety of carbonate lithologies, but is mainly fine- to coarse-grained, partly shaly, fossiliferous limestone. The High Bridge Group is the region's principal source of aggregate, with stone being produced from nine underground mines and one open-pit quarry. Lesser quantities of aggregate are obtained from four quarries and one mine operating in the Lexington Limestone.

Two of the underground operations in the High Bridge are drift mines and seven are slope mines.

The Sterling operation is a slope mine. In the slope mines, an inclined entry is opened from the ground surface down to the mining interval.

High Bridge limestone and dolomite in the lower Tyrone Limestone and Oregon Formation, an interval about 60 feet thick, commonly have been mined in central Kentucky for aggregate. At several mines, after the lower Tyrone and Oregon reserves were exhausted, an inclined slope was driven down into the underlying Camp Nelson Limestone to produce stone from another interval in the High Bridge Group, bypassing deleterious argillaceous limestone and shale in the uppermost Camp Nelson. Thus, on some properties in central Kentucky, stone has been produced from two and three levels. In the case of the Sterling operation, stone is being mined from three levels: the first level, the one closer to the surface, is being mined in the Tyrone Limestone while levels 2 and 3 have been developed into the Camp Nelson Limestone.

Stone from the Camp Nelson Limestone is used for the manufacture of low-magnesium and high-calcium limes. The limes are used for flue-gas desulfurization at coal-fired power plants, and for steel-furnace flux, chemical manufacture, and water treatment. It is also used for agricultural limestone, fertilizer filler, and rock dust for explosion abatement in coal mines.

Q. DOES THE GEOLOGY IN THE AREA OF THE STERLING MINE SUPPORT SAFE PLACEMENT OF THE CCR IN THE MINE VOIDS?

A. Yes. The presence of significantly thick bentonites in the geologic stratigraphy of the mine area represents a strategic advantage because they act as impervious barriers which prevent the migration of water which may have been in contact with the CCR with the ground water level, which is located several feet above those bentonites. This particular geologic condition makes the Sterling mine a desirable location for CCR storage.

Bentonite is a soft, low-specific-gravity, expandable clay. It is altered volcanic ash and is found in central Kentucky in beds up to 3 feet thick near the top of the Tyrone Limestone. Because of its peculiar property of expanding when wet, bentonite is effective as a water sealer.

The different types of bentonite are each named after the respective dominant element, such as potassium (K), sodium (Na), calcium (Ca), and aluminum (Al). The Tyrone Limestone in Central Kentucky contains at least five potassium bentonites. These are the Mud Cave bentonite of drillers at the top of the formation, the Pencil Cave of drillers 16 to 30 feet below the top, and three unnamed bentonites about 15, 55, and 65 feet below the Pencil Cave. Both the Mud Cave and Pencil Cave bentonites are locally as much as 2 feet thick, but the others are generally only a few inches thick. The lower three bentonites are discontinuous and the Mud Cave was removed from much of the area by erosion, but the Pencil Cave is present throughout nearly all of the outcrop area. This bentonite has been observed during the development of level 1 of the mine when mining through the Tyrone limestone and its presence is well documented.

The Sterling quarry is being mined on three levels. According to a Sterling work map from 06-18-14 Level 1 is mining the Tyrone Limestone at a floor elevation of 130-180 feet msl. Work maps from 06-18-15 indicate the Camp Nelson Limestone is being mine at a floor elevation of -30 to -75 feet msl on Level 2 and an elevation of -110 to -160 msl on Level 3.

Q. DOES PLACEMENT OF THE CCR IN THE MINE VOIDS POSE A RISK OF GROUNDWATER CONTAMINATION?

A. No. Due to the bentonite layers and the water sealing properties of bentonite described above, there is virtually no risk of groundwater contamination from placement of CCR within the mine voids.

IV. CCR STORAGE CAPACITY AT THE STERLING MINE

Q. WHAT IS THE EXISTING VOLUME CAPACITY FOR CCR AT THE STERLING MINE?

A. Based on Sterling's production records and assuming an in-situ density for the limestone of 2.093 tons per cubic yard and variable usability factors, the mine currently has a net available storage volume that exceeds 8 million cubic yards. At the current production level, the mine will have 9.5 million cubic yards of usable storage space in 2018 when the CCRs will start being shipped to the mine. ECSI reviewed the reported volumes and found that Sterling's calculations are reasonable.

Q. WILL PRODUCTION LEVELS OF LIMESTONE AT THE MINE CORRESPOND WITH THE VOLUME OF CCR TO BE RECEIVED?

A. The Trimble County plant, at maximum generating capacity, produces 910,000 cubic yards of CCR on an annual basis, according to previous permit application data. Currently, recycling of the CCR material removes approximately 30 percent of the material from the waste stream, thus leaving 637,000 cubic yards to be disposed. The CCR storage logistics analysis evaluated three scenarios; the 910,000 cubic yard maximum production, the 637,000 cubic yard case, and a hypothetical 800,000 cubic yards per annum. It should be noted that the average annual production over the 16-year life of the mine has been 1,281,000 tons, however that value includes the initial years of mine startup and the downturn in demand during the 2009 recession. The average production rate of the mine during the 8-year span between 2001 and 2008 was 1,516,334 tons.

Comparing the storage capacity available for the Sterling mine assuming future limestone mining at the historical average rate of 1,281,000 tons (612,040 CY) per year against the current CCR disposal requirement of 637,000 cubic yards per year (which includes 30% beneficial reuse), the mine will have adequate space over the 37-year project timeline to dispose of all the CCR waste material with a buffer of at least 5,000,000 cubic yards additional available space (see Exhibit 3). This assumes that 90% of the available mine space will be used for CCR storage. The second scenario shows that for an 800,000 cubic yard CCR disposal rate, the storage capacity available at the Sterling mine (keeping the current limestone production rate) will provide adequate space over the life of the project (see Exhibit 4). Again this scenario assumes that 90% of the available mine space will be used for CCR storage.

The final storage analysis was performed using the full 910,000 cubic yard rate. This scenario assumes power production at the maximum capacity of the plant and no beneficial reuse of the CCR and a modest limestone sales and production increase of 1% per year. This analysis indicates that the limestone mine will be able to accommodate the maximum 910,000 cubic yard CCR disposal rate over the 37-year timeframe (see Exhibit 5).

V. TRANSPORTATION AND MATERIAL HANDLING

Q. PLEASE DESCRIBE HOW CCR WILL BE TRANSPORTED FROM THE GENERATING STATION TO THE STERLING MINE.

A. The proposed method of moving CCR from the Trimble County Power Plant to the Sterling mine will involve the use of both barge and truck transport methods.

Barges will be loaded with CCR at the Trimble County Power Plant and transported up the Ohio River to a permitted unloading site located in Warsaw, Kentucky. Subsequently, trucks will be implemented to transport the CCR material between the unloading facility and the Sterling mine site.

Barge loading and unloading operations were not evaluated in further detail since that analysis was previously performed by Fenner-Dunlop Engineered Conveyor Solutions and included in the GAI Consultants "Supplement to Alternatives Analysis" document submitted in October 2014, as Support Document III.D-1-16. Barge loading and unloading capacities proposed in the Fenner-Dunlop study are sufficient to handle the volume of CCR material generated by the Trimble County plant, therefore this logistics evaluation concentrates only on the number and cycle times for the barges and trucks to deliver the anticipated volume of CCR material to the mine site.

Barge Logistics

Under the Sterling plan, barges would be loaded with CCR at the Trimble County Power Plant and transported to an unloading facility located immediately upstream of Warsaw, Kentucky, a distance of approximately 44 river miles. The proposed transportation route would include passing through the Markland Locks just downstream of Warsaw.

As explained above in the Storage Requirements discussion, three CCR disposal rates were considered in the analysis: 637,000; 800,000; and 910,000 cubic yards per year. For the analysis, the capacity of each barge was assumed to be 1200 tons (1025.64 CY). The number of barges required and the shipping frequency for a fleet of 6 barges are represented in the following table:

Annual CCR Rate	**Weekly CCR Rate**	**Barge Loads per Week**	**Shipping Frequency (6 Barges per Shipment)**
637,000	12,250	12	3.5 days
800,000	15,385	15	2.8 days
910,000	17,500	17	2.5 days

The shipping frequency can be manipulated by adjusting the number of barges used either up or down depending on the preference of the barge shipping vendor.

Trucking Logistics

Similar to the barge logistics analysis, the disposal rates for CCR evaluated in the trucking analysis are the same: 637,000; 800,000; and 910,000 cubic yards per year.

The proposed barge unloading facility will be constructed at a vacant property located on the east side of Warsaw which has an existing barge loading/unloading permit. This proposed site will include the barge unloading equipment; a temporary unloading/storage pad; turnaround/staging space for the trucks and loader equipment; and a small operations structure. CCR material would be off-loaded from the barges at the applicable rate for the unloading equipment selected (600 tons/hour per the Fenner-Dunlop study). Subsequently, a rubber-tired loader equivalent to a Caterpillar 980 would be used to load the haul trucks.

The proposed site provides direct access to US 42, which provides a direct route to the Sterling mine site, a distance of 10 miles east of the unloading facilities.

Assumptions used in the trucking analysis include:

- Truck capacities are 18 cubic yards per load;

- Loading/Unloading times for trucks are 4 minutes for each operation;
- Truck travel times along US 42 are 20 minutes each direction (average 30 MPH);
- Work week will be 6 days; 52 weeks per year; and
- Work days will be approximately 9 to 16 hour days depending on disposal volume of CCR.

Truck loading times are a limiting factor in the maximum volume of material that can be logistically handled in the proposed plan. Based on promotional videos for Caterpillar loaders, the trucks could be loaded in 2-3 passes of a loader resulting in a time of 2 to 3 minutes per truck. We used conservative values of 3.8 to 4 minutes per truck in our analyses. Unloading at the mine site will involve either direct truck dumping into a mineshaft, or truck dumping at a designated surface staging area and subsequent movement of material to the mineshaft by a loader. We also assumed a 4 minute unloading time for the unloading process. Thus, combined with a 20 minute per direction road travel time, the total round trip time for each truck will be approximately 48 minutes.

The following table presents the results of the required trucking logistics to handle each of the CCR storage rates:

Annual CCR Rate (CY)	No. Trucks	Trips/Day/Truck	Hrs/Day/Truck	Max Annual Haul Capacity (CY)
637,000	12	10	8.6	673,920
800,000	13	11	10.2	803,088
910,000	14	12	11.3	943,488

Q. HOW WILL STORAGE OF CCR IN THE MINE TAKE PLACE?

A. The CCR hauled from the barge unload facility will be hauled to Sterling's facility and transported to the interior of the mine. I have prepared two simple schematic drawings (Exhibit 6) to illustrate the general material handling process from the point that the CCR is transferred to the Sterling underground mine and then backstowed.

Three methods have been envisioned to transport the CCR from the surface to the interior of the mine:

METHOD 1: dumping it through a shaft from the surface to the mine void,

METHOD 2: hauling the material underground using articulated trucks on the current ramps or

METHOD 3: hauling the material underground using over the road truck on a new 10% slope.

If METHOD 1 is used, the shaft will be built from level 1 of the mine to the surface. The haul trucks will directly dump the CCR into the shaft where the CCR will be collected at an underground transfer point and hauled to the mine void areas where CCR will be pushed using tractors in order to fill the allocated voids. The decision on which method is the optimum material handling solution, or whether a combination of both will be the preferred option will be based on further material handling analyses.

If METHOD 2 is used, the material from the barge unload facility is dumped into a hopper located inside a material transfer station. The material is conveyed from the hopper and loaded into an articulated truck and hauled underground using the existing ramps.

If METHOD 3 is used, the over the road trucks hauling from the barge unload facility will drive into the mine over a newly constructed 10% ramp and transfer the CCR to the mine void underground.

Q. WHERE WILL THE SHAFT BE LOCATED AND WHAT IS ITS RELEVANCE?

A. The choice of a location for the shaft aims to achieve a balance between geotechnical constraints and operational considerations.

Another consideration, which is extremely important from a geotechnical point of view, is the quality of the rock mass in which the shaft is located. The best possible rock mass quality must be selected for shaft construction. The geology of the Sterling operation supports construction of such a shaft facility, as there are constructed shafts currently used at the site for other purposes. Moreover, the choice of orientation must be considered with regards to geological structures and stress state orientation. In high-stress conditions, this includes a shaft orientation sub-parallel to the maximum principal stress or to locate it in a stress shadow area, and under low stress conditions, to locate it in an area that provides well confined conditions.

Q. WHAT WILL BE THE SHAPE AND SIZE OF THE SHAFT?

A. In this case, since the CCRs will not contain sizeable particles, the type of material will not dictate the minimum diameter of the shaft. Instead, it will be driven by the volume of material to be handled and its flow properties, in order to avoid hangups and blockages.

The proposed construction method will define the shape of the shaft. Circular shaft sections are usually associated with raise boring methods, while rectangular sections are excavated using Alimak methods or drop raise methods. In the case of a Sterling operation, a shaft with a circular cross section built with raise boring methods is anticipated.

Q. HOW WILL THE CCR BE HANDLED IN THE INTERIOR OF THE MINE?

A. Using METHOD 1, the CCR dumped through the shaft will reach a hopper located at the breakthrough of the shaft into the underground mine. This hopper will allow regulating the flow of material into the mine. This material will be stockpiled using wheel loaders which will load it onto haul trucks or a system of portable conveyor belts that will transport the CCR to the areas of final disposition. Track-type tractors will push the CCR in order to fill the storage space.

Using METHOD 2, the material is hauled from the surface in trucks, and would be transported directly to the areas of final disposition within the mine or to a centralized stockpile area from where it would be loaded into a system of portable conveyor belts that would take it to its final destination. As in the case of METHOD 1 where material is dumped through the shaft, the CCR will be pushed using track-type tractors.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

J. STEVEN GARDNER, PE, PS, RMSME

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DETAILED RESUME AND RECORD OF EXPERIENCE

PROFESSIONAL LICENSURE & CERTIFICATIONS

Professional Engineer: Kentucky, Tennessee, West Virginia, Virginia, Colorado and Pennsylvania
Professional Surveyor: West Virginia
Registered Member Society for Mining, Metallurgy & Exploration (RMSME)

EDUCATION

M.S. Mining Engineering – University of Kentucky 1991
Environmental Systems Certificate - University of Kentucky 1991
B.S. Agricultural Engineering – University of Kentucky 1975

PROFESSIONAL EXPERIENCE

ECSI, LLC
Engineering Consulting Services, Inc. (ECSI)
1983-Present: Chairman/President/CEO

- Responsible for business and project management, planning and development for the firm. ECSI provides civil, mining, and environmental engineering services, surveying, health and safety evaluation and training, litigation support, and laboratory and analytical services.

- Mr. Gardner specializes in Natural Resources, energy, mining, environmental, hydrology, health and safety, sensitive land use issues and industrial heritage projects.

- Managed $12 million exploration campaign for industrial minerals in mid-west for fortune 100 company that required establishing office and warehouse facilities and hiring approximately 20 technical personnel.

- As part of a five consultant team, managed ECSI Subject Matter Expert $1million portion on EIS contract for the US Office of Surface Mining, Reclamation and Enforcement.

- Supervised mine planning and preparation of mine permit applications in Kentucky, West Virginia, Virginia, and Tennessee; performed coal property evaluations, environmental, health and safety assessments and audits, general engineering services for limestone quarry operations; mine operations assessments, reserve assessments, hydro geologic assessments, Cumulative Impact Assessments, provided construction management and contracting supervision on mine reclamation operations.

- Served on Advisory Committee to Kentucky Cabinet for Energy and Environment who provided funding to the University of Kentucky Center for Visualization and Virtual Environments (Vis Center) to produce a video documentary exploring the enduring significance of coal in Kentucky. The concept for this project originated after a

“Comment on Kentucky” episode on KET in April 2009 titled “Mountaintop Mining” with a conversation between host Bill Goodman and panel participant Steve Gardner. Gardner was serving as Chairman of the University of Kentucky’s College of Engineering’s Mining Engineering Foundation. He is a graduate of the UK Agricultural Engineering Department and has a Masters in Mining Engineering and Environmental Systems. Gardner proposed the idea to Dr. Len Peters, Secretary of the Energy and Environment Cabinet which led to the project’s funding.

Representative Projects:

- Managed project for Strata Products to provide oversight and Professional Engineering Certification for the first Mine Refuge Chamber approved by West Virginia in March, 2007.

- Managed project for Strata Products to design mine seals; 120 psi, 50 psi. ECSI’s Design received the first MSHA approval for seals under the new standards on 9-17-08.

- Managed contract with Kentucky Department of Energy Development and Independence for “Renewable Energy Resources Inventory” reviewing feasibility of wind, solar and biomass projects on reclaimed mine sites in KY, 2008.

- Managed contract for Kentucky’s FutureGen submittal with Kentucky Office of Energy Policy, 2006.

- Expert testimony/reports/investigations provided in cases involving regulatory takings, lands unsuitable petitions, lost coal and mineral claims, mineral appraisals, operations, environmental assessments, hydrology, defense of environmental non-compliance violations before state and federal agencies, lease/contract/property disputes, and accidents.

- Accident investigations including vehicle, rail, limestone, and coal mining.

- Supervised/reviewed numerous limestone quarry/non-coal permits, mine plans and projects; and updated surveys and mapping.

- Co-edited the “***Coal Mining Reference Book***” ***5th Edition*** published by the Kentucky Mining Institute and used by the Kentucky Department of Mines and Minerals as a study guide for the mine foreman’s guide, 2002. Assisted in updating for KMI under a grant from the Kentucky Energy and Environment Cabinet in 2011 for 6th Edition.

- Health and safety audit programs and training for numerous limestone and coal mine operations.

- Design plans and specs for underground tourist mine at Blue Heron, Big South Fork National River and Park for the Army Corp of Engineers.

- Kentucky Coal Mining Museum, Portal 31 – Lynch. Project manager for public funded exhibition mine. Approximate cost of $2.5 million. The project was selected for one of 16 Engineering Excellence National Honor awards from ACEC in 2010.

- Principal investigator and author of environmental audits, assessments, and reclamation evaluations of numerous mining operations and properties involving hundreds of thousands of acres of acquisition purposes.

- Subsidence investigations of longwall and room and pillar mining.

- Post-mine land use plans for mountaintop mining operations for commercial/industrial, residential, and recreational uses.

- Long-term underground mine plans and projections for federal lease and permit requirements.

- Study of alternative waste disposal methods for thoroughbred racetrack in Kentucky by recycling organic materials as compost for use in landscaping and mine reclamation.

- Internet design and hosting services focusing on the mining industry. Selected Internet projects include: www.coaleducation.org, www.miningusa.com, www.kycoalmuseum.org, and www.portal31.org.

Specialty Coal Processing, Inc.
2003 – 2006: Chairman/CEO

Company organized to provide management and operational services to foreign owner. Operations included the former Gatliff Coal Plant and Blue Gem Mining Company providing coal products for the international Silicon Metals Industry and other specialty markets. Coordinated Blue Gem seam' underground contract mine operations. Contract ended when foreign owner sold operation.

University of Kentucky: Department of Mining Engineering
Lexington, Kentucky

1987 – 1988: Graduate Research Assistant

- Worked on grant from Institute of Mining and Mineral Research (IMMR) to Mining Engineering Department entitled "Mountaintop Mine Planning as Part of Long-Range Post-Mining Land Use," part of a multi-disciplinary study at UK to optimize development potential of 17,000 acres control by Cyprus Mineral's Starfire operation in Eastern Kentucky, 5000 mined by mountaintop mining operations. Conducted a review of "State-of the Art" mine planning computer models.

Kenwill, Inc.
Maryville, Tennessee

1980 – 1982: Vice-President – Engineering Division

- Organized new engineering division, supervising buyout of existing consulting group and established three branch offices. Responsibilities included: division management, business development, and project management. Supervised approximately 20 engineering/scientific/surveying personnel. Coordinated contract engineering services for approximately 20 underground mines.

- Representative Projects:

    - Assisted Koppers Co. in development and presentation of 10-year, 40,000-tons per month mining plan.

    - Supervised re-survey of underground limestone mine, projections and mine plans.

    - Responsible for coal transportation study phases of proposed Kopper's synfuels plant near Oak Ridge, Tennessee, and coordinated background air-quality monitoring.

    - Project manager for design of treatment facilities for runoff from utility coal stockpiles, Milan Army Ammunition Plant, U.S. Corp of Engineers, Mobile District.

    - Accident investigation and reporting. Assisted mining company in investigation of roof fall fatality; provided professional testimony and reports.

Consulting Engineer and Partner in Mining Operation
LaFollette, Tennessee

1979 – 1980: Partner/Consulting Engineer – Big K Operating Co./U.S. Coal Co. – now part of National Coal

- Partner in small underground mining operation. Responsible for engineering, surveying, regulatory liason, labor relations, coal sales, organization and future development plans for 2500 acres. Supervised installation and maintenance of tipple facilities, ponds, and drainage controls.

- Developed engineering consulting practice with several small mining companies and other engineering firms providing reserve evaluations, mine feasibility, mine planning and permitting services.

Hittman Associates, Inc.
Lexington, Kentucky

1977 – 1979: Engineer

Representative Projects:

- Project engineer for U.S. Bureau of Mines and Department of Energy project, "Design Evaluation and Demonstration of Cross Ridge Mountaintop Mining." Responsible for environmental assessments of potential mining sites in Kentucky and Tennessee.

- Project manager – coal reserve evaluation and mining feasibility studies.

- Project engineer for joint EPA/KY Department of Natural Resources project to evaluate feasibility of vegetative filters for control of sediment from surface mines.

  - Technical contributor to audiovisual instructional course entitled “Surface Mining and the Natural Environment” prepared jointly for the Interstate Mining Compact Commission, EPA, and OSM; utilized to train mine inspectors.

Tennessee Gas Pipeline Company Tenneco, Inc.
Greensburg, Kentucky

1977: Assistant Operator

- Summer training program in process control at hydrocarbon recovery plant; gas chromatograph lab analysis, general plant engineering and natural gas and natural gas liquids pipeline operations.

Beth Elkhorn Corporation
Jenkins, Kentucky

1975 – 1977: Project Engineer – Elkhorn Division of Bethlehem Mines Corp.

- Spent six (6) months in corporate orientation Loop program rotating in all departments of division. Responsible for Division’s environmental quality control, permits, monitoring, lab analyses and reporting, impoundments and coal refuse area inspection. Assisted in ventilation surveys and time studies of existing underground mines and mine projects for longwall and shortwall sections. Served as company liaison with local, state, and federal agencies involving regional planning and environmental issues.

- Representative Projects:

  - Project manager for grouting operation designed to seal water infiltration in main entries of large underground operation.

  - Coal exploration and reserve evaluation in Letcher, Knott, and Pike Counties, Kentucky, managing two contract core drillers. Assisted Dr. John Ferm in Beta Testing new computerized core logging protocols for Central Appalachian region.

  - Responsible for developing plans for potential uses of surface mined land for recreation, housing, business, and industrial sites. Coordinated company efforts with local, state, and federal officials to secure funding for federally-financed housing development on surface mined lands.

  - Construction observation of a starter embankment for coal slurry/refuse impoundment.

  - Weekly inspection/reporting 4 large slurry impoundments.

  - Managed water lab and sampling for discharge reporting.

PROFESSIONAL AND COMMUNITY ACTIVITIES:

a. National Council of Examiners for Engineering & Surveying
   - 2008 – Member of Uniform Procedures Legislative Governance Committee

b. Kentucky State Board of Licensure for Professional Engineers and Land Surveyors
   - Reappointed to four-year term by Governor 2008-2012
   - 2008 – Chairman
   - 2007 – Vice Chair
     - Chair – CPD Committee
     - Member – Engineering and Surveying Committee
   - 2006 – Secretary
     - Executive Committee
     - Member – Engineering Surveying, CPD, and Ruse Committee
   - 2005
     - Chairman – Engineering Committee
     - Member – Surveying Committee and CPD Ad Hoc Committee
     - Board observer ABET Accreditation Team – Western Kentucky University
   - Appointed to four-year term by Governor 2004
   - Member – Surveying and Engineering Committees

c. University of Kentucky
   Member of Mining Engineering Foundation
   - 2008 – 2010 Chairman
   - 2007 – 2008 Vice Chair
   - 2005 Board of Directors
   - 1997 Department of Mining Engineering ABET Employer Team
   - 2013-2015 Member - Biosystems and Ag Engineering Advisory Board

d. Kentucky Society of Professional Engineers and NSPE:
   - 2001 – 2009 Professional Engineers in Mining (PEM) Secretary Treasurer
   - 1995 – 2000 KSPE – Professional Development Committee
   - 1993 – 1994 Chairman, Legislative and Government Affairs Committee
   - 1992 – 1993 Co-Chairman – Legislative and Government Affairs Committee
   - 1991 – 1992 Co-Chairman – Legislative and Government Affairs Committee
     - Bluegrass Chapter Director
     - Member – Energy and Environmental Committee
   - 1990 – 1991 KSPE "Achievement in Mining" Award
   - 1989 – 1990 Chairman Professional Engineers in Mining (PEM) Practice Section
   - 1989 – 1994 Member Legislative and Government Affairs Committee
     - Appointed to Special Committee by Board of Registration to study
     - KRS 322 as related to Certification of Mine Maps by Surveyors and Engineers
   - 1988 – 1989 Secretary – Treasurer of PEM Section
   - 1987 – Present PEM Annual Seminar Committee

e. Society for Mining, Metallurgy, & Exploration of AIME (SME)
   Registered Member
   - 2015 President

- 2014 Member – Board of Directors Nominating Strategic Committee
- 2014 Chairman – Erskine Ramsay Award Committee
- 2012 - 2014 Member –Finance Strategic Committee
- 2012 – 2014 Chairman – Government and Public Affairs Committee
- 2008 - 2010 Chairman–Government, Education, & Mining Committee (GEM)
- 2007 – 2010 Member – Mining Unit Committee
- 2005 – Present SME – Vice Chairman – GEM
- 2005 – 2007 Member – Sustainable Development Committee – Coal and Energy Division
- 2004 – 2007 Member – Woomer Award Committee
- 2004 – 2005 SME – Coal and Energy Distinguish Service
- 2003 – 2005 Internet Committee – Member
- 2002 – 2003 VP Southeast Region and member of SME Executive Committee
- 2002 – 2003 Member – Nominating Strategic Committee
- 2002 – 2005 Member – Coal & Energy Division Executive Committee
- 2002 National GEM Award Recipient
- 2002 – 2003 Board of Directors, Southeast Region Vice President
- 2002 – 2003 Internet Committee – Member
- 2002 – 2003 Chair – Distinguished Member Award Nominating Committee
- 2001 – 2002 Chair – Coal and Energy Membership Committee
- 2001 – 2002 Membership Committee Representative – Coal and Energy
- 2001 – 2002 VP Southeast Region, Mining Engineering Regional Rep
- 2000 – 2003 GEM – Regional Vice President
- 2000 – 2002 Southeast Region Vice President, Board of Directors Regional Representatives, Distinguished Member Award Nominating Committee Mining Engineering Committee
- 2000 – 2001 Chair-Elect – Coal and Energy Membership Committee
- 2000 – 2001 Membership Committee Division Representative – SE Region
- 1999 – 2000 Member – Coal and Energy Membership Committee
- 1999 – 2002 Mining Engineering Regional Representatives, SE Region Past Chair
- 1999 – 2000 Vice President Elect – Southeast Region
- 1998 – 1999 Chairman – Southeast Region
- 1998 Chairman – Central Appalachian Section
- 1998 – 1999 Board of Directors Regional Representatives – SE Region, Standby Alternate
- 1996 – 1997 Vice Chairman – Central Appalachian Section
- 1996 – 1997 Membership Committee
- 1995 Vice Chairman – Central Appalachian Section
- 1994 Teller – Central Appalachian Section
- Numerous presentations/papers presented at SME Annual Meeting or Section and published in Mining Engineering

f. SME/GEM – Minerals Education Coalition

- 2008 Co – Chair Cincinnati Regional National Science Teachers Association
- 2003 Chairman Louisville Regional National Science Teachers Association (raised $15,000 for funding)
- 2001 Chaired and organized National Minerals Education Conference in Lexington, Kentucky (raised $27,000 for conference funding)

g. Woodford County Historical Society

- 2006 – 2007 President
- 2004 – 2007 Board of Directors
- 2003 – Present Landmarks' Recognition Program Review Committee

h. Coal Prep Society of America - Member

- 2007 Coal Prep 07 – Organized and moderated – "Coal Waste Disposal Symposium"

i. 1994 – 2013 Chairman COALPAC

j. 1994 – Present Kentucky Coal Association (KCA) Board of Directors
1994 – Present KCA Health and Safety Committee
1994 – Present KCA Environmental Committee

k. Coal Operators and Associates Environmental Committee

l. Organized and coordinate mini-course "The Mining Professional as an Expert Witness" for the 1985 National Symposium of Surface Mining Hydrology Sedimentology and Reclamation.

m. Tennessee Department of Labor Division of Mines, Volunteer Mine Rescue Team, 1981-82. Served as member of state-sponsored mine rescue organization on call to the Tennessee mining industry. Trained in mine rescue techniques and apparatus.

n. Roane State Community College – part-time instructor for Tennessee Coal Mine Technology program. Taught soil test and analysis 1981.

o. Facts About Coal in Tennessee (FACT) – Underground Mining Advisory Committee 1981.

p. 1979 KSPE Public Relations Committee – assisted in planning the Teleconference on Engineering Continuing Education.

q. 1978 Assisted with Hydrology & Sedimentology short course taught by Dr. Bill Barfield and Dr. C. T. Huan.

r. Whitesburg-Letcher County Airport Board 1977.

s. Big Sandy Chapter, KSPE, 1976 Industrial Professional Development Award Selection Committee.

t. Member – National Mine Rescue Association, "Smoke Eaters"
Kentucky Mining Institute (KMI)
National Mining History Association
American Society Mining Reclamation (ASMR)
West Virginia Coal Mining Institute (WVCMI)
American Society of Agricultural & Biological Engineers (ASABE)

PUBLICATIONS/PRESENTATIONS

Jarvie Eggart, Michelle, Editor, J. Zaluski, M. Rajkovich, E. Cullen, J. Hoffman, M. Korpi and J.S. Gardner, "RESPONSIBLE MINING Case Studies in Managing Social & Environmental Risks in the Developed World", coauthored chapter on Crisis Management. SME, 2015.

Zegeer, David A., Shannon Lamkin, J. S. Gardner Editor, "Inside MSHA, The Formative Years of the Mine Safety and Health Administration" Kentucky Foundation, 2014.

Gardner, J. Steven, "A Mine is a Terrible Thing to Waste: Kentucky's Portal 31 Exhibition Mine", The Mining History Association, 2012 Journal, pp 58-68.

Gardner, J., et al., Coal Mining Reference Book Sixth Edition, Kentucky Mining Institute, 2012.

Chairman SME 2008 Annual Meeting – GEM Session – "The Community of Mining: From Disasters to Sustainability Communications is the Key.

Gardner, J., K. Houston, and K. Rose, Slurry Cells prove Successful Alternatives to Impoundments.

Gardner, J., K. Houston, R. Paton-Ash, B. Lusk and S. Lusk, Mine Emergency Shelters/Chambers approved by West Virginia.

Gardner, J.S. and Paul Sainato, Mountaintop Mining and Sustainable Development in Appalachia, Mining Engineering Vol. 59, Issue 3, pp 48-55, 2007.

Gardner, J.S. and Paul Sainato, Sustainable Development in Appalachia – A New Way of Looking at Mountaintop Mining. ASMR June 2005.

Gardner, J.S.; Mountaintop Mining, Energy and Sustainable Development, Energia Vol 16 No. 1. 2005

Goode, James, Editor, *The Cutting Edge, Mining in the 21st Century* (Reference Book targeting 4th and 5th Grades). Wrote several chapters and edited book. Published by Jesse Stuart Press, 2002.

Gardner, J.S., K.E. Houston and A. Campoli. Alternatives Analysis for Coal Slurry Impoundments. SME 2003, Mining Engineering Vol. 56, Issue 8, pp 47-52, 2004.

Gardner, J.S., P.D. Robinson, R. Woolacott. Kentucky's Portal 31 Exhibition Mine. SME 2003.

Gardner, J.S., reviewer, Coal Waste Impoundments – Risks, Responses, and Alternatives. National Research Council, National Academy of Sciences 2002

Rusk, George A. Esq. and J. Steven Gardner; Mountain Top Mining: New Challenges and New Opportunities, EMLF – 2004

Zaluski, J.J., S. Gardner and L. Adams. Black Mountain – An Overview, The Resolution of the Lands Unsuitable Petition from the Legal and Technical Perspectives. SME 2000.

Zaluski, J.J., J.S. Gardner. Surface Mining after the Bragg Decision. SME 2001.

Zaluski, J.J., M.M. Rajkovich, Jr., S. J. Gardner. Crisis Management and Emergency Response - What would You do if Disaster Strikes? SME 2003

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

AUG - 7 2014

Colonel Christopher G. Beck
District Engineer
Louisville District Corps of Engineers
Attn: Kimberly J. Simpson
CELRL-OP-FS, Room 752
P.O. Box 59
Louisville, Kentucky 40201-0059

Subject: Louisville Gas & Electric Company
Coal Combustion Residuals Landfill, Trimble County, Kentucky
LRL-2010-711

Dear Colonel Beck:

The enclosed July 11, 2014, letter from the U. S. Environmental Protection Agency provides comments in response to a Clean Water Act (CWA) Section 404 permit application submitted by the Louisville Gas & Electric Company (LG&E) proposing to construct a 189-acre landfill in jurisdictional waters of the U.S. located in Trimble County, Kentucky. The proposed landfill is designed to accommodate Coal Combustion Residuals (CCR) from the existing LG&E Trimble County Generating Station for the next 37-38 years, and together with its appurtenant structures and operations plan, will affect approximately 840 acres of land and result in direct impacts to 87,254 linear feet of streams, 2.6 acres of wetlands and 0.5 acres of open water ponds.

The EPA's July 11, 2014, letter was sent pursuant to Part IV, paragraph 3(a) of the 1992 CWA Section 404(q) Memorandum of Agreement (MOA) between the EPA and the Department of the Army. As noted below, this letter is being sent pursuant to Part IV, paragraph 3(b) of the 1992 CWA Section 404(q) MOA. The proposed LG&E project would have direct impacts, as stated above, on a watershed drained by an unnamed tributary to Corn Creek that has been documented as having high water quality and a diverse biological community, as evidenced by an "excellent" Macroinvertebrate Bioassessment Index (MBI) rating. An additional indication of the quality of this stream system can be found by comparing the system that is proposed to be impacted to a nearby stream. Sampling conducted by LG&E's consultants in 2007, documented that conditions in the streams proposed to be impacted by construction and operation of the CCR landfill were in fact better (i.e. higher scoring on the MBI) than conditions documented in a stream lying immediately to the north. That northern stream is designated by the Commonwealth of Kentucky as an Exceptional Water of the Commonwealth, an Outstanding State Resource Water and is also included in the Commonwealth's biological reference reach network. The Kentucky Division of Water resampled the streams proposed to be impacted in March 2013 and again found that the stream's biological community ranked as "excellent" according to the MBI.

The EPA's July 11, 2014 comments were based on information contained in the CWA 404 permit application dated January 2014 and provided the EPA's views regarding compliance with the CWA Section 404(b)(1) Guidelines - 40 C.F.R. § 230 (Guidelines). The EPA expressed concerns that the permit applicant had not undertaken a proper alternatives analysis required under the Guidelines in order to justify the proposed alternative as the least environmentally damaging practicable alternative (LEDPA), consistent with 40 C.F.R. § 230.10(a). Specifically, the EPA commented that the applicant dismissed numerous potentially feasible alternatives based on economic considerations that were neither defined, nor documented. Further, the applicant's alternative analysis included little to no comparative analysis of the range of environmental impacts associated with different alternatives or their comparative estimated compensatory mitigation costs.

In addition, since providing the July 11, 2014, comment letter, the EPA has learned of a potentially feasible alternative not considered by the applicant. Sterling Ventures, LLC owns and operates an underground limestone mine in Gallatin County, Kentucky that holds a Special Waste Facility permit from the Kentucky Division of Waste Management (KDWM) to accept synthetic gypsum produced during the flue gas desulfurization (FGD) process at the Kentucky Utilities Ghent Power Station to fill mine voids in the mined out sections of the underground mine. It is the EPA's understanding that subsequent to KDWM's issuance of the Special Waste Facility permit for Sterling Ventures which had originally identified the Ghent Power Station as a source of FGD, Kentucky Utilities elected to dispose of this material on-site of the Ghent Power Station instead of utilizing the Sterling Ventures mine. Based on information contained in the Sterling Ventures permit application approved by KDWM (summarized in enclosure 1), the mine may have the storage capacity necessary to accommodate all of the CCR material generated by the LG&E Trimble County Generating Station. Use of the existing Gallatin County site would likely significantly reduce impacts to wetlands, surface waters, floodplains and groundwater resources in comparison to those impacts associated with construction and operation of the proposed new landfill. In addition, according to KDWM, it would require only a permit modification to the Sterling Ventures Special Waste Facility permit in order to allow for storage of CCR generated at the Trimble County Generating Station. Pursuant to 40 C.F.R. § 230.10(a), it is the applicant's responsibility to consider all practicable alternatives and to select a practicable alternative that does not involve a special aquatic site unless it can be clearly demonstrated that one is not available. The EPA believes that opportunities to utilize the underground limestone mine to store CCR from the Trimble County Generating Station warrant careful consideration as a potentially feasible alternative.

The EPA continues to be concerned that the proposed discharge of dredged or fill material into waters of the U.S. would eliminate 16.5 miles of streams that have been documented to be among the highest quality in this region of Kentucky. In addition, potential opportunities to avoid and minimize impacts to these resources have either not yet been considered, or have been dismissed for reasons that are not clearly defined or documented. The EPA recommends that the applicant undertake a thorough and transparent analysis of alternatives and associated environmental impacts to ensure that the LEDPA can be selected. Without this analysis, we do not believe there is sufficient information to make a determination that the proposed alternative represents the LEDPA, as required by the Guidelines. Given the potential elimination of high quality streams as described above, and consistent with Part IV, paragraph 3(b) of the 1992 CWA Section 404(q) MOA between the EPA and the Department of the Army, the EPA believes that the discharge, as proposed, will have a substantial and unacceptable impact on aquatic resources of national importance.

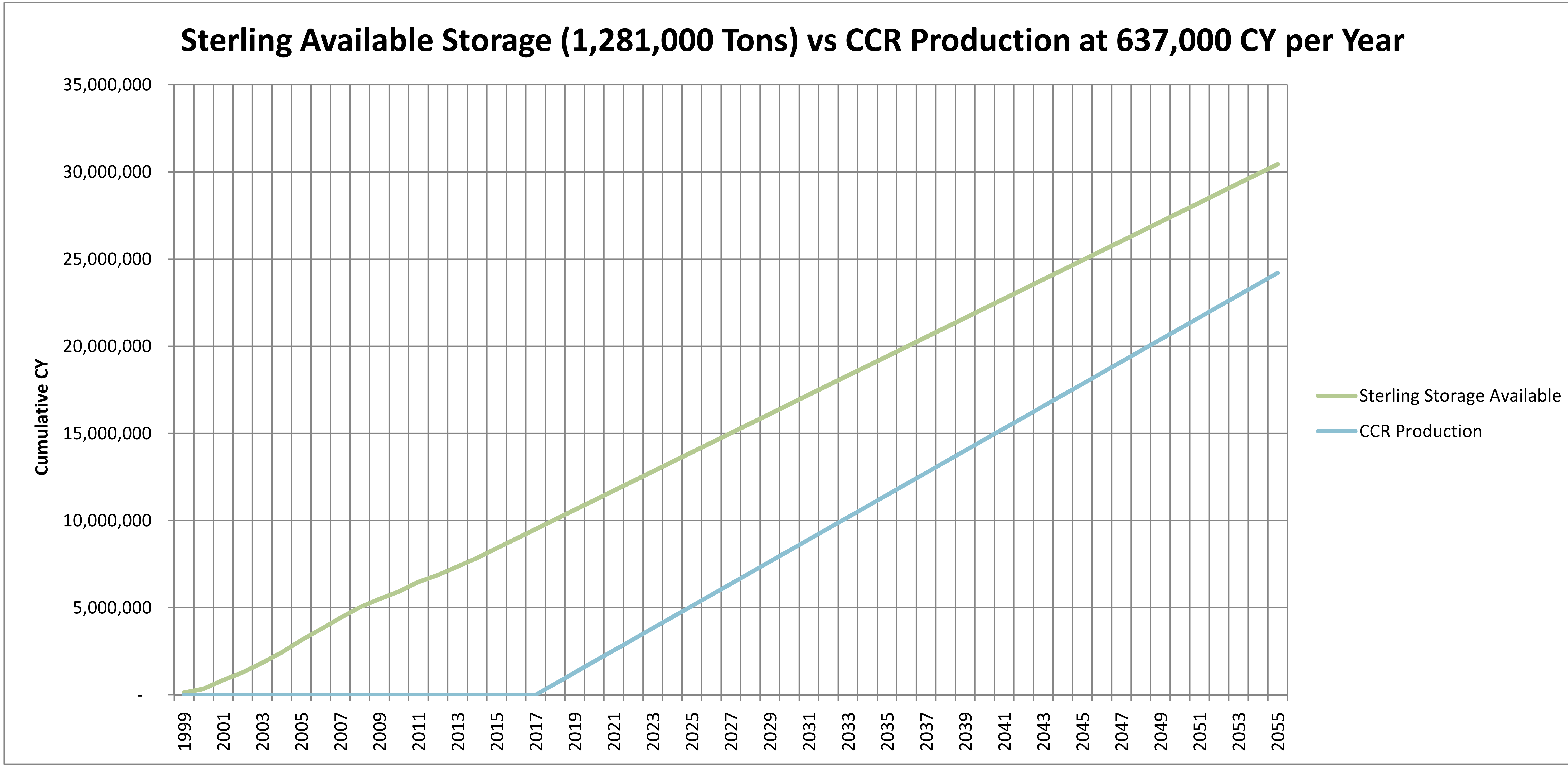
The EPA believes that there are opportunities to address these concerns. We look forward to working with your staff and the applicant to discuss and resolve these issues. If you have any questions, please call Mr. James D. Giattina, Director, Water Protection Division, at (404) 562-9345.

Sincerely,

Heather McTeer Toney
Regional Administrator

Enclosures

cc: Ms. Lee Anne Devine, U.S. Army Corps of Engineers, Louisville District
Mr. Lee Andrews, U.S. Fish and Wildlife Service
Mr. Peter Goodman, Kentucky Division of Water



Sterling Available Storage (1,281,000 Tons) vs CCR Production at 637,000 CY per Year
Cumulative CY
35,000,000
30,000,000
25,000,000
20,000,000
15,000,000
10,000,000
5,000,000
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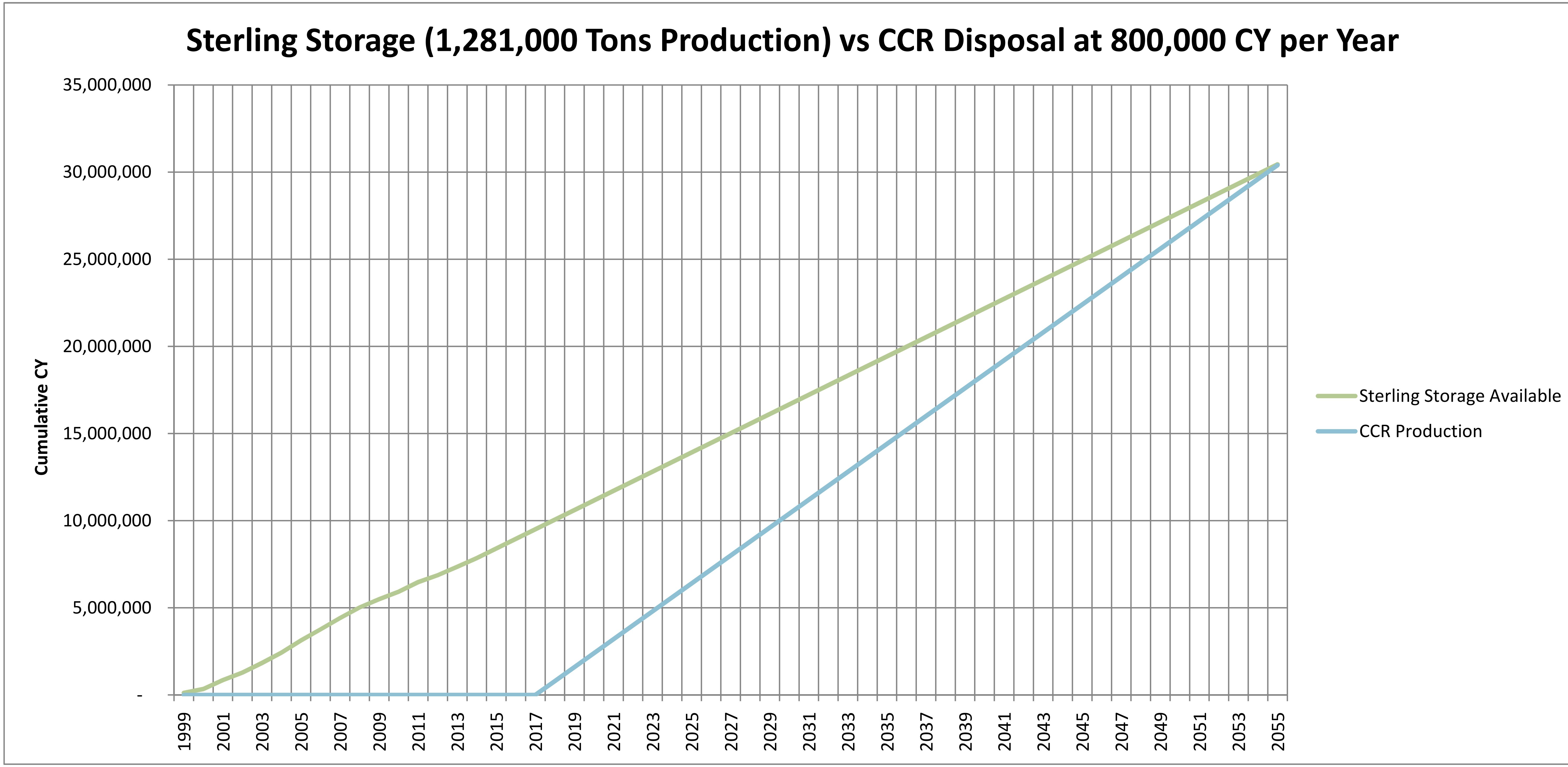
Sterling Storage Available
CCR Production


Sterling Storage (1,281,000 Tons Production) vs CCR Disposal at 800,000 CY per Year
Cumulative CY
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25,000,000
20,000,000
15,000,000
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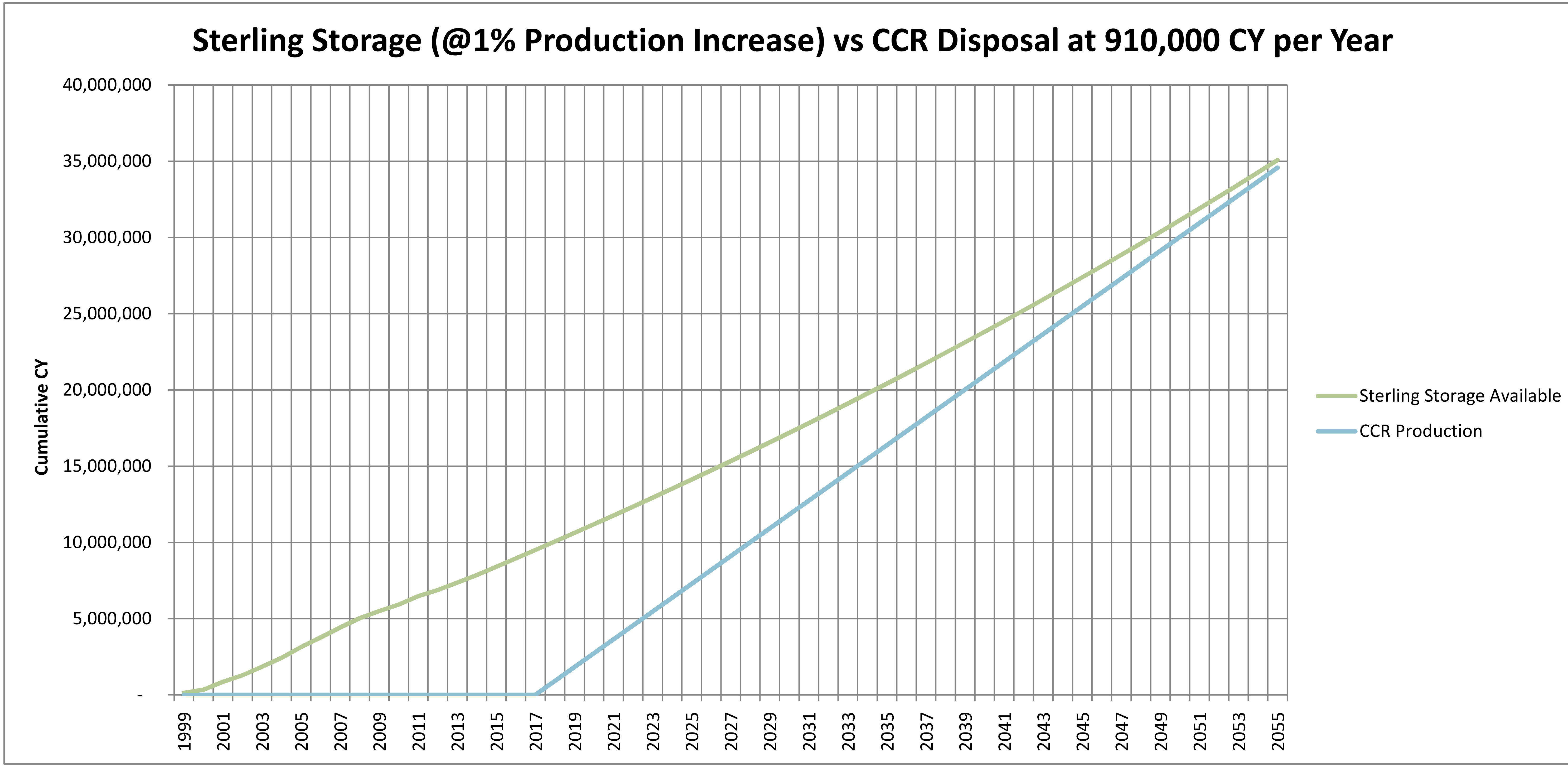
Sterling Storage Available
CCR Production


Sterling Storage (@1% Production Increase) vs CCR Disposal at 910,000 CY per Year
Cumulative CY
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25,000,000
20,000,000
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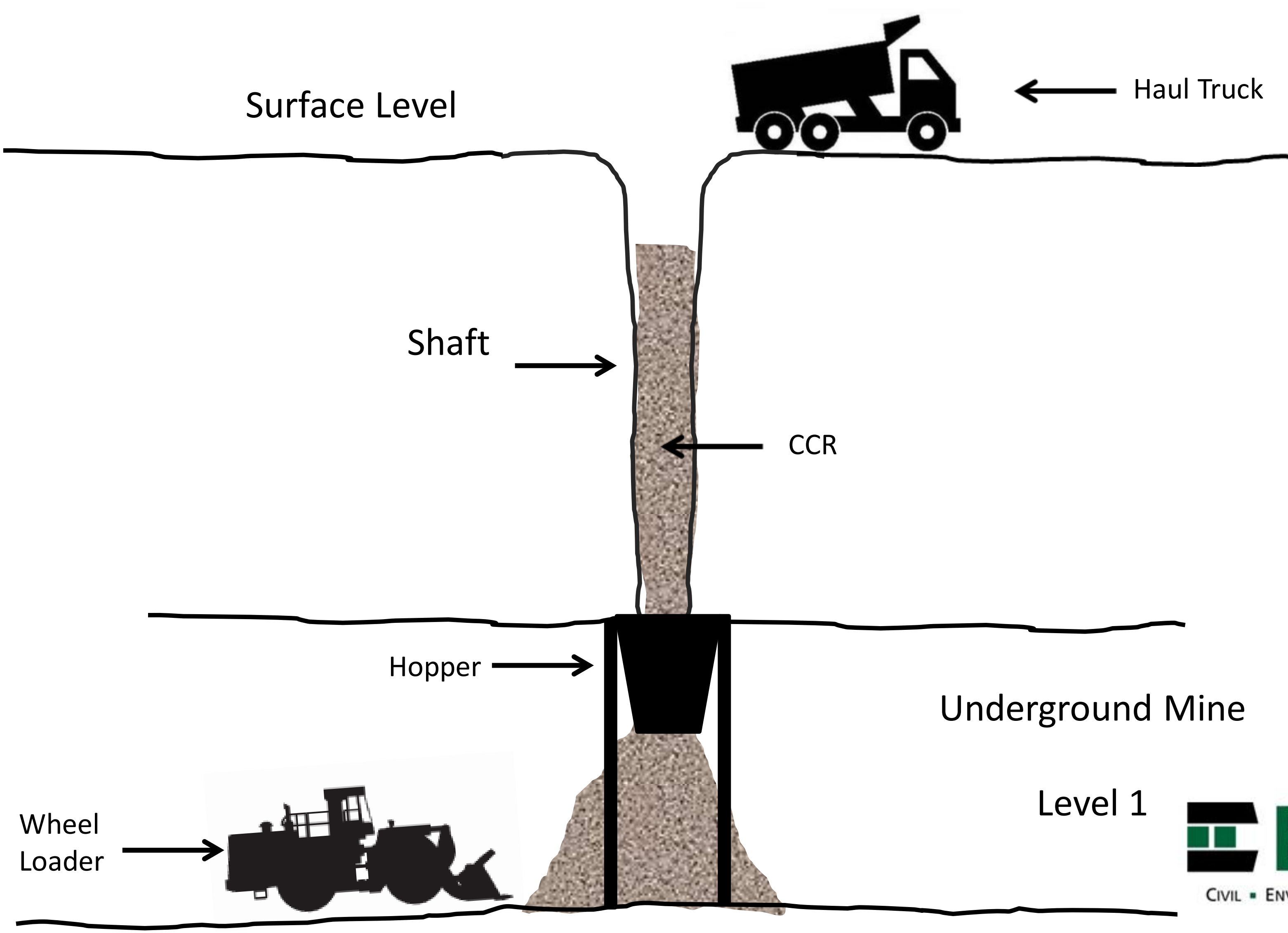
Sterling Storage Available
CCR Production

SIMPLIFIED SCHEMATIC – CCR UNDERGROUND DISPOSAL



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SIMPLIFIED SCHEMATIC – CCR UNDERGROUND DISPOSAL