TrAILCo Rebuttal Statement No. 19
Witness: Tim Gaul

BEFORE THE

PENNSYLVANIA PUBLIC UTILITY COMMISSION

IN RE: APPLICATION OF TRANS-ALLEGHENY INTERSTATE LINE COMPANY FOR (I) A CERTIFICATE OF PUBLIC CONVENIENCE TO OFFER, RENDER, FURNISH AND/OR SUPPLY TRANSMISSION SERVICE IN THE COMMONWEALTH OF PENNSYLVANIA; (II) AUTHORIZATION AND CERTIFICATION TO LOCATE, CONSTRUCT, OPERATE AND MAINTAIN CERTAIN HIGH VOLTAGE ELECTRIC TRANSMISSION LINES AND RELATED ELECTRIC SUBSTATION FACILITIES; (III) AUTHORITY TO EXERCISE THE POWER OF EMINENT DOMAIN FOR THE CONSTRUCTION AND INSTALLATION OF AERIAL ELECTRIC TRANSMISSION FACILITIES ALONG THE PROPOSED TRANSMISSION LINE ROUTES IN PENNSYLVANIA; (IV) APPROVAL OF AN EXEMPTION FROM MUNICIPAL ZONING REGULATION WITH RESPECT TO THE CONSTRUCTION OF BUILDINGS; AND (V) APPROVAL OF CERTAIN RELATED AFFILIATED INTEREST ARRANGEMENTS	:	**Docket Nos. A-110172** **A-110172F0002** **A-110172F0003** **A-110172F0004** **G-00071229**

REBUTTAL TESTIMONY OF TIM GAUL

Re: The Use of GIS data in the Line Route Evaluation and Visual Impacts

December 10, 2007

REBUTTAL TESTIMONY OF TIM GAUL

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Tim Gaul and my business address is 2445 M Street, N.W., Washington DC 20037-1435.

DUTIES AND RESPONSIBILITIES

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by The Louis Berger Group, Inc. ("Berger") as a Senior Environmental Scientist. I am also the Geographic Information Systems ("GIS") Manager for Berger's D.C. office, and was recently appointed the Manager of the Berger's Transmission Services Division. Each of these titles involves slightly different roles and responsibilities.

As a Senior Environmental Scientist, I provide project management and analytical support for environmental science and planning projects. In this capacity I have conducted a range of natural resource and infrastructure planning efforts, some of which have included evaluation of visual character and assessment of potential visual impacts. As GIS manager, my responsibilities include serving as a senior technical resource for GIS analysis efforts, managing GIS technical staff, overseeing software purchases and licensing agreements, and serving as coordinator of Berger’s Business Partnership agreement with the Environmental Systems Research Institute ("ESRI").

For the Trans-Allegheny Interstate Line ("TrAIL") project, I served as Berger's Project Manager for the Line Route Evaluation studies and was a member of the Routing Team (as defined in the Line Route Evaluation Report, TrAILCo Exhibit JH-1). As Project Manager, I coordinated team efforts, ensured communication and coordination with Trans-Allegheny Interstate Line Company ("TrAILCo") staff, and managed budgets and schedule. As a Routing Team member, I was involved in GIS data gathering, analysis, and mapping; route planning and field reconnaissance; public workshop facilitation; environmental analysis; and Line Route Evaluation ("LRE" or "Report") preparation.

EDUCATION AND EXPERIENCE

Q. PLEASE DESCRIBE YOUR PROFESSIONAL EXPERIENCE AND EDUCATIONAL BACKGROUND.

A. I have a B.S. from SUNY College of Environmental Science and Forestry at Syracuse University (1997) and a M.S. from Creighton University (2000), both in biological sciences. My resume is attached to this testimony as TrAILCo Rebuttal Exhibit TG-1.

Q. DO YOU HAVE ANY SPECIALTIES?

A. Yes. My background as an environmental scientist is interdisciplinary, with a background in forest ecology, aquatic biology, and GIS sciences. I specialize in landscape level environmental assessment and modeling, natural resource

inventory, hydrologic analyses, and GIS analysis in support of environmental planning and compliance efforts.

PURPOSE OF REBUTTAL TESTIMONY

Q. PLEASE DESCRIBE THE PURPOSE OF YOUR REBUTTAL TESTIMONY.

A. On behalf of TrAILCo, I will provide rebuttal testimony regarding the use of GIS data in the TrAIL project route selection study and present several photo-simulations that Berger has prepared for selected properties in Greene and Washington Counties, Pennsylvania, in order to provide an objective depiction of the likely visual character of the TrAIL.

This testimony specifically addresses or rebuts the testimony of Energy Conservation Council ("ECC") witness Richard J. Hoch concerning the use of GIS data, and several witnesses (hereinafter “the witnesses”) from the public input hearings and site visits who claimed that TrAIL will destroy or materially modify the view from their properties.

Q. WILL THE USE OF VARIOUS TERMS IN YOUR REBUTTAL TESTIMONY BE CONSISTENT WITH THE DEFINITIONS ASSIGNED TO THOSE TERMS IN THE TABLE OF NOMENCLATURE ATTACHED TO TRAILCO WITNESS FLITMAN'S DIRECT TESTIMONY AS TRAILCO EXHIBIT DEF-1?

A. Yes. In addition, I may define other terms in my rebuttal testimony.

Q. HAVE YOU TESTIFIED PREVIOUSLY IN THIS PROCEEDING?

A. No, I have not.

EXHIBITS

Q. PLEASE IDENTIFY AND DESCRIBE THE EXHIBITS TO YOUR REBUTTAL TESTIMONY AND SUMMARIZE THE CONTENTS OF THOSE EXHIBITS.

A. I am sponsoring TrAILCo Rebuttal Exhibits TG-2 through TG-70, which consist of a series of aerial photo-based maps and associated photo-simulations providing an objective depiction of the visual character of TrAIL elements from certain discrete property locations and representative area viewsheds. The maps provided present where the photographs were taken, the approximate angle of the photo, and the location, elevation, and height of the transmission line structures. The location and structure height information for the 500 kV structures were derived from the original plan for the line from the 1970's. The locations and heights of the 138 kV poles are based on recent preliminary design plans for the 138 kV portions of TrAIL. In addition, TrAILCo Rebuttal Exhibit TG-71 is a summary table containing the name of the property owner, the exhibit number applicable to that property owner, the photograph number and pertinent notes applicable to each photograph.

GIS DATA

Q. PLEASE DESCRIBE BRIEFLY GIS AND HOW IT WAS USED IN THE LINE ROUTE EVALUTION FOR TRAIL.

A. A Geographic Information System is comprised of the computer hardware, software, user, and geographic data that allows for the capture, analysis, manipulation, and display of geographically referenced information. For the purposes of the line route evaluation study, GIS technology was used as a means to *gather* information about the study area, *present* this compiled information in the form of maps of the study area, and *assess* characteristics of the study area.

For the purposes of this study, GIS data were gathered to help characterize and inventory study area features that might act as constraints for the routing effort. As described in the LRE, these constraints were divided into two major factors – large area constraints and small area constraints. GIS information was often the best information source and tool for identification of large area constraints, such as State Game Land boundaries, Historic Districts, areas near airports and airstrips, and large waterbodies or wetlands. GIS information also served as an aid for the identification of small area constraints; however, identification and mapping of these constraints often included field reconnaissance and/or aerial photo interpretation.

In addition to the identification of constraints, GIS information was also gathered to prepare maps of the study area. These maps were used for route planning,

navigating during field reconnaissance efforts, and for presentation purposes (i.e., public workshops, TrAIL website, LRE reports, etc.).

Lastly, the GIS information gathered from web databases, developed from aerial photo review, and mapped during field reconnaissance efforts was used for characterizing the study area landscape and developing the environmental inventories for each of the alternatives considered.

Q. WAS GIS USED AS THE SOLE TOOL FOR CONDUCTING THE ANALYSIS DOCUMENTED IN THE LINE ROUTE EVALUATION REPORT?

A. No. Although GIS data were used extensively during the routing process, a variety of other data sources and evaluation means were also used to conduct the route selection study. These sources were reported in the LRE on pages 17–20, TrAILCo Exhibit JH-1, and included aerial photographs, GIS data, existing hardcopy maps, field inspections and reconnaissance efforts, public workshops, and data developed by Federal, state, and local agencies.

Aerial and satellite imagery, as stated in the LRE (pg. 17), was one of the most important tools in routing the proposed transmission line. Aerial/satellite photography and its interpretation and consideration facilitated the identification of residences and residential developments, site specific land uses, existing transmission and other infrastructure, and a range of other potential feature constraints.

The imagery-based maps also served as the primary source of information for field reconnaissance efforts for the Routing Team. Reconnaissance efforts involved Routing Team members reviewing the potential routes from points of public access and correlating observed features to information shown on aerial photography, as well as USGS 7.5 minute topographic maps, road maps, locally available development sketch maps, and other information sources.

Public meetings were also an important source of information used for the route planning and selection process. At each of the public meetings, TrAILCo staff and Routing Team members worked with meeting participants to review the hundreds of 1":500' aerial photo map sheets and identify sensitive features in the local landscape. These maps, with comments provided by the public, were then subsequently brought out for additional reconnaissance efforts and, in some cases, resulted in changes to the potential route network.

Q. DID TRAILCO DISCUSS IN THE REPORT THE LIMITATIONS OF USING GIS DATA?

A. Yes. A statement identifying the general limitations of GIS data sources was presented on page 18 of the LRE:

> However, GIS data sources vary widely with respect to their accuracy and precision, and presentation, analysis, and calculations derived from these data sources requires careful consideration when used for planning purposes. For this reason, GIS based calculations and maps presented throughout this study should be considered to be reasonable approximations of the resource or geographic feature they represent, and not absolute measures or

> counts. They are presented in this study to allow for general comparisons between alternatives with the assumption that any inherent error or inaccuracies would be generally equal across all alternatives.

Additional considerations for specific GIS data sources are provided in Table 2-2.

Q. DO THE LIMITATIONS OF THE REFERENCED DATA SOURCES PRECLUDE THEIR USE IN A STUDY OF THIS TYPE?

A. No. The National Wetlands Inventory ("NWI"), National Hydrography Dataset ("NHD"), and the National Land Cover Data ("NLCD") are common tools used in environmental planning studies, especially for studies of this scale. As stated in the LRE:

> The use of GIS data allows for the consideration and efficient use of a wide variety of information that would otherwise be unavailable or impractical to consider for a planning effort of this scope and schedule. GIS information is a highly effective tool when utilized for broad level planning studies, identifying and characterizing landscape level constraints and features, and developing environmental inventory information useful for comparisons between planning alternatives.

TrAILCo Exhibit JH-1, at 18.

In other words, data sources are not presented as an absolute assessment of the features they represent, but rather as a reasonable representation that is suitable for use when comparing between planning alternatives at this scale. Brief considerations for each of the referenced data sources are presented below.

National Wetlands Inventory - ECC witness Hoch claims that "NWI identification of wetlands in forested areas within the project area is most likely limited to identifying forested wetlands 3-5 acres or greater. The identification of smaller wetlands is not likely with the NWI dataset." ECC Statement No. 3, pp. 7-9. We fully understood the limitations on the scale and accuracy of the NWI and the fact that forested wetlands smaller than 3-5 acres were not likely to be obtained from this source. Our primary goal for addressing potential impacts on wetlands in the route selection study is to identify *large* wetlands for which mitigating engineering solutions are problematic. Large wetland areas are generally well represented in the NWI, and the general extent and locations of these wetlands can be reviewed and verified using aerial photos and field reconnaissance. We agree that small forested wetlands (<3-5 acres) are not well represented in the NWI, but these wetlands are typically avoided by structure placement and potential impacts are minimized by modified right of way management procedures. Thus, the absolute accounting of their presence and extent is more important at the detailed engineering design and permitting stage, not for route selection. In fact, all wetlands will and are currently being identified through standard wetland delineation and permitting process and, where necessary and appropriate, measures for identification and mitigation of potential impacts on these wetlands will be addressed through this process.

In summary, ECC witness Hoch's simplified analysis of the NWI and his criticism of this aspect of the siting and evaluation process fail to properly recognize (i) the

role that wetland information plays in the route selection process and (ii) the current stage of TrAIL project planning.

National Hydrography Dataset (NHD) - ECC witness Hoch claims that, due to its development at the 1:100,000 scale, "the NHD is not an appropriate dataset to make precise calculations for a project of this scale" ECC Statement No. 3, pp. 5-6. It should be noted that the NHD information used for the TrAIL route selection study was from the high resolution NHD. The high resolution NHD is an improvement from the original NHD, which was, as ECC Witness Hoch states, developed at a 1:100,000 scale. However, as noted in the High Resolution NHD metadata: "The high-resolution NHD, generally developed at 1:24,000/1:12,000 scale, adds detail to the original 1:100,000-scale NHD."

Although this is a necessary correction to Mr. Hoch's inaccurate statement regarding the scale and associated accuracy of the NHD used, it does not respond to the second point of Mr. Hoch's statement that this nationwide, standard dataset "will not produce the precise information that is necessary and reported for this type of report", ECC Statement No. 3, pp. 5. As similarly described with respect to the NWI, our primary use of the NHD was to map stream and waterbody locations for consideration during routing and field reconnaissance efforts. Potential routes were planned using maps with an aerial imagery base and an NHD overlay. This allowed for easy identification of streams and waterbodies during the route planning exercise, as well as the ability to identify any

discrepencies in the locations of stream and waterbodies identified through comparison to the aerial photo base.

The NHD was also used to tabulate the number of stream crossings for each of the alternatives. This tabulation serves as a guide for comparison between the routes and, as noted in the LRE, it is assumed that the number of stream crossings tabulated represents a reasonable assessment for use in comparing between alternatives using the same dataset. Thus, the NHD is not intended to be an absolute calculation of stream crossings, but rather to serve as a guide for making general comparisons. Based on these applied uses, I believe the NHD is an appropriate data source for use in this line route evaluation study.

National Land Cover Database (2001) – The NLCD is a nationwide land cover dataset compiled by the Multi-Resolution Land Characteristics ("MRLC") Consortium (including the U.S. Geological Survey, Environmental Protection Agency, U.S. Forest Service, National Oceanographic and Atmospheric Association, National Aeronautics and Space Administration, Bureau of Land Management, National Park Service, Natural Resource Conservation Service, and the U.S. Fish and Wildlife Service). It is a nationwide standard data source that is routinely used to characterize general land cover characteristics across landscapes. Among the benefits of using this data layer for line route evaluation studies are its standard methodology and associated quality control and quality assurance procedures, as well as its broad scale multistate spatial extent.

Q. ECC WITNESS HOCH IN ECC STATEMENT NO. 3 MENTIONS SEVERAL DATA SOURCES THAT, IN HIS VIEW, SHOULD HAVE BEEN CONSIDERED FOR USE IN THE LRE. DO YOU AGREE WITH HIS CONCLUSIONS?

A. As I describe in greater detail below, for the most part I do not agree with witness Hoch's conclusions. And, in the one instance where a particular data source may have been useful, I believe that, having reviewed the data, it would not have impacted the selection of the route. I address several of the referenced data sources below:

PaGWIS registered wells and springs – PaGWIS (Pennsylvania Groundwater Information System) is managed by the Pennsylvania Topographic and Geologic Survey and stores information on groundwater well locations and characteristics. It should first be noted that potential impacts on ground water resources are unlikely as a result of transmission line construction and operation. Furthermore, any potential conflicts with water wells would be mitigated by proper structure placement and, in some cases, modified right of way management procedures, the location of which requires highly detailed information on the location and character of the landscape between the structure locations, the right of way, and the well (topography, vegetation, soil characteristics, etc.), as well as discussions with local land owners.

That said, this type of data must have high positional accuracy to serve a useful function for identifying these site specific concerns, and, based on the stated

limitations concerning the positional accuracy of this data source, I feel it would have limited applicability for this purpose:

> "Latitude and longitude was determined in the office by interpreting both handwritten directions and a hand-drawn map supplied by the driller. Most of the location and data entry work has been done by temporary employees of the agency, so it is of varying reliability. Typically one county was worked on at a time. No data entry has been done since August of 1994, when York County was updated."

http://www.dcnr.state.pa.us/topogeo/groundwater/PaGWIS/help.aspx

> "Records originally entered into PaGWIS have latitude and longitude coordinates. These coordinates were determined by Survey staff by plotting the best estimate of the location of the well, based on the written description of the well location and the sketch map included on the paper well record. The goal was for the coordinates of each well to be within 1 mile of its actual location."

http://www.dcnr.state.pa.us/topogeo/groundwater/PaGWIS/PaGWISMenu.asp?c=t

TrAILCo will attempt to work with local landowners to ensure that local water well concerns are addressed.

Trails (Data source: Southwestern Pennsylvania Commission) – The Southwestern Pennsylvania Commission ("SPC") is responsible for planning and prioritizing the use of all state and federal transportation funds allocated to the region. SPC's GIS-based information is available to aid site selection activities for key projects within counties, and along key investment corridors. The SPC maintains a land cover GIS data layer, that delineates land cover for the 10 county region they represent.

Our review of this data layer for Greene and Washington Counties suggests that our inventory and evaluation of recreational resources (including trails) in the area using non-GIS based information sources (Greene County Comprehensive Plan and information from the Warrior Trail Association) characterized the existing features represented in this data source (Section 4.7, Section 5.4.7, Section 6.4.7, and Section 7.4.7 of the LRE) in a manner to similar what is contained in this SPC trails data layer.

Land Cover (SPC) – The SPC maintains a Land Cover data set that we encountered initially through the Pennsylvania Spatial Data Access ("PASDA") website, which provides access to a 1993-1995 version of this data source. Because of the dated nature of this data source, and the desire for a consistent land cover classification source across all the TrAIL-related LRE studies, we elected to use the NLCD from 2001.

However, a recent review of an updated (2000-2001) version of this data source obtained directly from the SPC suggests that it would have been a suitable and appropriate source of information in characterizing land uses in the Greene and Washington Counties. However, based on my review of the SPC land cover data set and the NLCD (2001), it is my opinion that any information derived from the SPC land cover data set would not have altered the route selection conclusions presented in the LRE.

VISUAL ASSESSMENT

Q. WHAT IS A PHOTO-SIMULATION AND HOW IS IT PREPARED?

A. Photo-simulations, as I use the term in this rebuttal testimony, are graphic depictions of proposed TrAIL structures and wires electronically integrated into photographs taken from viewpoints near the proposed route. Simulations are typically used to compare before (i.e., existing) and after project construction visual conditions.

Photo-simulations for this effort were prepared using digital photographs taken from various viewpoints and a combination of GIS, 3D visualization, and image software packages (ArcGIS® 9.2; 3D Studio Max®, and Adobe Photoshop®, respectively). GIS software was used to map out the photographic scene, and to identify the locations, elevations, and distances between the observer (photograph point), preliminary tower locations, and other relevant scene elements (other buildings, structures, etc.). This information was then used to create a digital 3D scene of the transmission line and its associated structures.

For each view chosen for simulation, a 3D scene was created to simulate the proposed line and tower locations by mimicking the viewing perspective of the photograph. With the towers oriented properly in space, a “camera” was set up in the same 3D space at the photographer’s height and location relative to the existing 500 kV line. The camera’s focal length and point of view were set to those of the camera that took the photograph to obtain the correct perspective.

Light sources were set up to simulate the lighting conditions and look of the towers in the photograph. Once the perspective and sizing were comparable to the photograph, the 3D structures were exported from the 3D visualization software as a 2D image and integrated into the digital photograph using imaging software. In some cases, it was necessary to remove vegetation from the photograph to simulate the new cleared right-of-way.

The process of photo-simulation was accompanied by a collaborative review to ensure that the simulated route alignment appeared accurately in the photograph. Several Berger staff reviewed each photograph to comment on the perspective and look of the simulation so that any necessary alterations could be made to reasonably represent the way in which the towers would likely appear upon construction.

Although attempts were made to be as visually accurate as possible, practical limitations are inherent in this process. Most notably, in real world conditions, each tower structure is sized and engineered to exact specifications to fit individual site conditions. Because detailed engineering data are not available at this time, one of several representative 3D tower structure models was selected to fit each location in a scene based on its similarity to the preliminary structure height estimates. Additionally, it should also be noted that the removal of trees in the right of way in some cases requires the interpretation of the land forms and character that exist behind the trees. This is inherently difficult, and can make the

image look less realistic than in other photo-simulations where the landscape behind the structures is visible.

It is the intent that these images provide a reasonable accounting of the transmission line structures and lines in the visible landscape based on the data available at this time, the photographs used, and the technology applied. They are presented to allow for a reasonable assessment of scale and aspect of TrAIL, and to the best of our ability, the character of the transmission structures and lines in the environment.

Q. HOW DID YOU SELECT THE PHOTOS TO BE USED IN YOUR PHOTO-SIMULATIONS?

A. Photo-simulations were prepared using photos from the various properties in Greene and Washington Counties that were the subject of site visits prescribed by the Prehearing Order dated July 26, 2007. Since the purpose of the site visits was to see how the proposed TrAIL would impact any "unique" attributes on these properties, TrAILCo thought that preparing photo-simulations would provide a more objective way of assessing visual impacts. At the outset, it is important to note that the vast majority of people living in Greene and Washington Counties will be unable to see the TrAIL facilities. Our viewshed analysis was limited to the site visit properties, and those properties are not necessarily representative of what the majority of people living and working in Greene and Washington Counties will ever see with respect to TrAIL.

The starting point of the viewshed analyses were digital photographs taken at the various properties that had scheduled site visits. Additional photographs were required for some areas. A list of those properties is contained in TrAILCo Rebuttal Exhibit No. TG-71.

Q. WHAT METHODOLOGY WAS USED TO STUDY THE VISUAL ENVIRONMENT AND ASSESS THE IMPACT OF TRAIL ON LOCAL PROPERTIES IN GREENE AND WASHINGTON COUNTIES, PENNSYLVANIA?

A. As described in the LRE, the preferred route for TrAIL unavoidably crosses through visual resources in the project area. The transmission line structures, conductors, and the cleared right-of-way will be visible in varying degrees to area residents, travelers, and visitors.

While each person's assessment of visual impacts is necessarily based upon the individual's unique aesthetic sensibilities, the review of the visual accessibility of TrAIL presented in the LRE, together with the viewshed analysis and photo-simulations presented in this testimony, provide an objective means to evaluate the aesthetic impacts of TrAIL.

Q. WHAT ARE TYPICAL CONSIDERATIONS FOR ASSESSING VISUAL IMPACTS?

A. There is no generally accepted, standard methodology in the planning and design community for objectively determining the visual impact of development on a given landscape. The reactions of community members visually affected by the modifications in their visual landscape can vary tremendously. These reactions are influenced by many factors, including their physical proximity to, economic interests in, personal philosophy about the project, and an individual's personal aesthetic sensibilities. Clearly, each of these factors has an emotional aspect.

Assessing the impact of something involving factors that have an even partly emotional basis is very complex, and the assessment can never really be verified. However, some logical components can be used to describe how a particular project will physically relate to the landscape for which it is proposed.

Frame of Reference: Everyone experiences a situation somewhat differently depending on where they are when it happens, which can be defined as their "frame of reference." While it is understood that there exist many frames of reference in a given situation, for the purposes of assessing the visual impact of a particular project on a landscape, their are two particular frames of reference that can each be used as a datum from which other components can be measured. The Primary, or Fixed Frame of Reference, can be defined as a place where an individual spends the majority of her domestic life, and from which she has very

little ability to avoid experiencing a particular view. This would typically be represented by a person's place of residence, or their home and yard. The Secondary, or Transitory Frame of Reference, can be defined as a place an individual moves to, or through, from his primary frame of reference. The individual has a choice whether to stay and experience a particular view, or leave the location. It could be represented by a favorite walking path or hiking trail frequented by an individual for recreation.

Perception: The intensity of the emotional response to visual stimuli is directly related to our perception of what we see. The perception of a new object from a given frame of reference, in a familiar landscape, is dependent on several quantifiable factors. The most important and useful of these factors, for the purposes of this discussion, include size, distance, transparency, and contextual relationship.

Size*:* The actual physical dimensions of an object determine its actual size. This can be defined numerically, as actual dimensions (e.g., inches, feet, yards, miles, etc.) or verbally, in relative terms (e.g., small, medium, large, etc.). Actual size is independent of the frame of reference, but clearly has a direct effect on the perception of an object.

Distance: The actual physical dimension between the observer and the object being viewed determine the actual distance from the primary or secondary frame

of reference. Distance can be defined numerically, as actual dimensions (e.g., inches, feet, yards, miles, etc.) or verbally, in relative terms (e.g., beside, near, far, distant, etc.).

Transparency*:* The degree to which it is possible to view other things that are behind an object can be defined as that object's transparency. This can only be defined verbally, in relative terms (e.g., opaque, translucent, transparent, etc.).

Contextual Relationship: The relationship between an object and the defining features of the surrounding landscape, such as treelines, landforms, waterways, roads, and existing development patterns, defines the contextual relationship. This can be defined verbally, in either geometric terms (e.g., parallel to, perpendicular to, at an acute angle to, etc.) or in descriptive relative terms (e.g., aligned with, following, against the grain, etc.). It can also be expressed verbally as an aggregate relative term that combines all of the various facets of context (e.g., low contrast, medium contrast, high contrast, etc.).

Q. BASED ON THESE FACTORS, CAN YOU DESCRIBE THE IMPACTS OF THE TRAIL PROJECT ON THE VISUAL LANDSCAPE IN GREEN AND WASHINGTON COUNTIES?

A. As described above, assessing visual impacts involves the evaluation of an emotional response by the individual, which can be highly complex and the assessment can never really be verified. My earlier discussion of some typical

visual assessment considerations is intended to provide a brief review of the common terminology and assessment factors. However, it is up to the individual to consider the information presented in the LRE and the photo-simulations presented here to evaluate impacts.

Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes. However, I reserve the right to file such additional testimony as may be necessary or appropriate.