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FINAL ENVIRONMENTAL IMPACT STATEMENT FOR THE GILBERTON COAL-TO-CLEAN FUELS AND POWER PROJECT

GILBERTON, PENNSYLVANIA

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CONTACTS

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ABSTRACT

This EIS assesses the potential environmental impacts that would result from a proposed DOE action to provide cost-shared funding for construction and operation of facilities near Gilberton, Pennsylvania, which have been proposed by WMPI PTY, LLC, for producing electricity, steam, and liquid fuels from anthracite coal waste (culm). The project has been selected by DOE under the Clean Coal Power Initiative (CCPI) to demonstrate the integration of coal waste gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels at commercial scale. The proposed facilities would use a gasifier to convert coal waste to synthesis gas, which would be conveyed to F-T liquefaction facilities for production of liquid fuels and to a combined-cycle power plant. The power plant would use the synthesis gas to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine. Both turbines would generate electricity.

The EIS evaluates potential impacts of the proposed facilities on land use, aesthetics, air quality, geology, water resources, floodplains, wetlands, ecological resources, socioeconomic resources, waste management, human health, and noise. The EIS also evaluates potential impacts on these resource areas for a scenario resulting from the no-action alternative (DOE would not provide cost-shared funding) in which the proposed facilities would not be built or operated.

PUBLIC PARTICIPATION

DOE encourages public participation in the NEPA process. Comments were invited on the Draft EIS after publication of the Notice of Availability in the Federal Register on December 8, 2005. The public comment period ended on February 8, 2006. DOE considered late comments to the extent practicable. DOE conducted two formal public hearings to receive comments on the Draft EIS: on January 9, 2006, in Shenandoah, Pennsylvania, and on January 10, 2006, in Pottsville, Pennsylvania. An informational session was held prior to each of these hearings for the public to learn more about the proposed project. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE by the close of the comment period.

On January 12, 2007, a Notice of Availability was published in the Federal Register to invite comments on the Supplement to the Draft EIS (DOE/EIS-0357D-S1) that was issued to correct estimates of CO_2 emissions from the proposed plant that were published in the Draft EIS, and to provide additional information regarding CO_2 releases and CO_2-related cumulative impacts. The comment period for the Supplement to the Draft EIS ended on February 27, 2007. In preparing this Final EIS, DOE considered both oral and written comments on the Draft EIS and comments on the Supplement to the Draft EIS.

CHANGES FROM THE DRAFT EIS

All changes, which have been made to improve the usefulness of the document to the decision maker and to be responsive to the public, are shown in boldface italic font (as is this paragraph). Exceptions to the bold face italic style are: Appendix E, which contains the Supplement to the Draft EIS; Appendices D and F, which contain the comments and responses to the draft EIS and the Supplement to the Draft EIS, respectively; and Appendix G, which is a Comparison of the Potential Impacts of Petroleum Coke and Anthracite Culm Use. Appendices D through G are presented in Volume 2 of this EIS.

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ACRONYMS AND ABBREVIATIONS

ADT	average daily traffic
amsl	above mean sea level
BMP	best management practices
Btu	British thermal unit
°C	degrees Celsius
CCPI	Clean Coal Power Initiative
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
cm	centimeter
CO	carbon monoxide
CO_2	carbon dioxide
dB	decibel
dB(A)	decibels as measured on the A-weighted scale
DOE	U.S. Department of Energy
EIS	environmental impact statement
EMF	electromagnetic fields
EPA	U.S. Environmental Protection Agency
°F	degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FR	Federal Register
F-T	Fischer-Tropsch
ft	feet
ft^3	cubic feet
g	acceleration of gravity
gal	gallon
gpm	gallons per minute
H_2	hydrogen gas
H_2O	water
H_2S	hydrogen sulfide
HRSG	heat recovery steam generator
in	inch
IPCC	Intergovernmental Panel on Climate Change
ISCST	Industrial Source Complex Short-Term (an air dispersion model)
kg	kilogram
L	liter
lb	pound
m^3	cubic meter
µg	microgram
µm	micrometer
µS	microsiemens
MCLG	Maximum Contaminant Level Goal
mg	milligram
mgd	million gallons per day
mV	millivolt
MW	megawatt

NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NIEHS	National Institute of Environmental Health Sciences
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRC	National Research Council
NSC	National Safety Council
O_3	ozone
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
Pb	lead
PDC	Pennsylvania Department of Corrections
PDCNR	Pennsylvania Department of Conservation and Natural Resources
PADEP	Pennsylvania Department of Environmental Protection
PDLI	Pennsylvania Department of Labor and Industry
PEMA	Pennsylvania Emergency Management Agency
PennDOT	Pennsylvania Department of Transportation
PFBC	Pennsylvania Fish and Boat Commission
PGC	Pennsylvania Game Commission
pH	hydrogen-ion concentration notation
PM	particulate matter
PM-2.5	particulate matter less than 2.5 µm in aerodynamic diameter
PM-10	particulate matter less than 10 µm in aerodynamic diameter
PNDI	Pennsylvania Natural Diversity Inventory
ppm	parts per million
PSD	Prevention of Significant Deterioration
R&D	research and development
RCRA	Resource Conservation and Recovery Act
s	second
SAIC	Science Applications International Corporation
SCEMA	Schuylkill County Emergency Management Agency
SCREEN3	a screening air dispersion model
SCOT	Shell Claus Off-gas Treating
SEDCO	Schuylkill Economic Development Corporation
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasure
SPLP	Synthetic Precipitation Leaching Procedure
SRBC	Susquehanna River Basin Commission
U.S.	United States
USC	United States Code
USGS	U.S. Geological Survey
VOC	volatile organic compound
yd^3	cubic yard

GLOSSARY

Aerodynamic diameter—a term used to describe particles with common aerodynamic properties, which avoids the complications associated with varying particle sizes, shapes, and densities. For example, PM-10 is defined in 40 CFR 50 as consisting of particles 10 micrometers or less in aerodynamic diameter, meaning particles that behave aerodynamically like spherical particles of unit density (1 gram per cubic centimeter) having diameters of 10 micrometers or less.

Air dispersion model—computer program that incorporates a series of mathematical equations used to predict downwind concentrations in the ambient air resulting from emissions of a pollutant. Inputs to a dispersion model include the emission rate; characteristics of the emission release such as stack height, exhaust temperature, and flow rate; and atmospheric dispersion parameters, such as wind speed and direction, air temperature, atmospheric stability, and height of the mixed layer.

Anthracite—the hardest type of coal, characteristically black in color, lustrous, with a conchoidal fracture (smoothly curved, irregular breakage surface). Anthracite coal consists of 92-98% carbon and less than 8% volatile constituents by weight.

Anticline—a geologic fold that is arch-like in form, with rock layers dipping outward from both sides of the axis, and older rocks in the core. The opposite of syncline.

Aquifer—a body of rock or sediment that is capable of transmitting groundwater and yielding usable quantities of water to wells or springs.

Artesian—groundwater conditions in which water in wells rises above its level in the aquifer, including conditions in which groundwater rises to the ground surface or above.

Ash—the mineral content of a product remaining after complete combustion.

Baghouse—an air pollution control device that filters particulate emissions, consisting of a bank of bags that function like the bag of a vacuum cleaner; the bags intercept particles that are mostly larger than 10 micrometers in aerodynamic diameter.

Beneficiation—the process of washing or otherwise cleaning coal to increase the energy content by reducing the ash content.

Biochemical oxygen demand - a standard quantitative measure of water pollution. It is the amount of oxygen consumed in the biological oxidation (by bacteria or other microorganisms) of organic material in a unit volume of waste water, as measured over a five-day period.

Biocide—a substance (e.g., chlorine) that is toxic or lethal to many organisms and is used to treat water.

Blowdown—the portion of steam or water removed from a boiler at regular intervals to prevent excessive accumulation of dissolved and suspended materials.

Bottom ash—combustion residue composed of large particles that settle to the bottom of a combustor from where they can be physically removed.

Building downwash—the downward movement of an elevated plume toward the area of low pressure created on the downwind (lee) side of a structure in the wake around which the air flows.

Capacity factor—the percentage of energy output during a period of time compared to the energy that would have been produced if the equipment operated at its maximum power throughout the period.

Census tract—a small, relatively permanent statistical subdivision of a county.

Chemical oxygen demand - a standard quantitative measure of water pollution. It is the amount of oxygen required to decompose all of the organic matter and other chemical constituents in a unit volume of wastewater that are susceptible to oxidation by a strong chemical oxidizing agent.

Coal gasification—a process that converts coal into a gaseous product, which involves crushing coal into a powder and heating the powder in the presence of steam and oxygen. After impurities (e.g., sulfur) are removed, the gas can be used as a fuel or further processed and concentrated into a chemical or liquid fuel.

Combustor—equipment in which coal or other fuel is burned at high temperatures.

Cooling water—water that is heated as a result of being used to cool steam and condense it to water.

Culm—coal waste that consists of rock and coal with varying amounts of carbon material remaining after removal of higher-quality saleable coal.

Culm bank—a pile or other deposit of culm on the land surface.

Evapotranspiration—the amount of water removed from a land area by the combination of direct evaporation and plant transpiration.

Fault—a fracture or fracture zone in rock along which the sides have been displaced vertically or horizontally relative to one another.

Fischer-Tropsch (F-T) synthesis—a process that uses a metal-containing catalyst to convert a mixture of carbon monoxide and hydrogen (known as synthesis gas) into a mixture of carbon dioxide, water, and aliphatic compounds (hydrocarbons lacking an arrangement of atoms in their molecular structure), which are used to produce liquid fuels.

Floodplain—the strip of relatively level land adjacent to a river channel that becomes covered with water if the river overflows its banks.

Flue gas—residual gases after combustion that are vented to the atmosphere through a flue or chimney.

Flux—a material (e.g., limestone) that is added to a substance to lower the melting temperature of the substance and promote fluidity.

Fly ash—combustion residue composed of fine particles (e.g., soot) that are entrained with the draft leaving the combustor.

Formation—the primary unit associated with formal geological mapping of an area. Formations possess distinctive geological features and can be combined into "groups" or subdivided into "members."

Gaussian—concentrations of pollutants downwind of a source are assumed to form a normal distribution (i.e., bell-shaped curve) from the centerline of the plume in the vertical and lateral directions.

Groundwater—water below the ground surface in a zone of saturation.

Hazardous waste—a category of waste regulated under the Resource Conservation and Recovery Act (RCRA). To be considered hazardous, a waste must be a solid waste under RCRA and must exhibit at least one of four characteristics described in 40 CFR 261.20 through 40 CFR 261.24 (i.e., ignitability, corrosivity, reactivity, or toxicity) or be specifically listed by the Environmental Protection Agency in 40 CFR 261.31 through 40 CFR 261.33.

Integrated gasification combined-cycle—a process that uses synthesis gas derived from coal to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine.

Laydown area—material and equipment storage area during the construction phase of a project.

Leachate—solution or product obtained by leaching, in which a substance is dissolved by the action of a percolating liquid.

Liquefaction—the process of transforming a gas into a liquid.

Magnitude (of an earthquake) —a quantity that is characteristic of the total energy released by an earthquake. Magnitude is determined by taking the common logarithm of the largest ground motion recorded on a seismograph during the arrival of a seismic wave type and applying a standard correction factor for distance to the epicenter. A one-unit increase in magnitude (e.g., from magnitude 6 to magnitude 7) represents a 30-fold increase in the amount of energy released.

Maximum Contaminant Level Goal (MCLG) —the maximum concentration of a substance in drinking water at which there is no known or anticipated adverse effect on human health, and which allows an adequate margin of safety, as determined by the U.S. Environmental Protection Agency.

Petroleum coke—a high-sulfur, high-energy product having the appearance of coal, which is produced by oil refineries by heating and removing volatile organic compounds (VOCs) from the residue remaining after the refining process.

pH—a measure of the relative acidity or alkalinity of a solution, expressed on a scale from 0 to 14, with the neutral point at 7. Acid solutions have pH values lower than 7, and basic (i.e., alkaline) solutions have pH values higher than 7.

Plume (atmospheric)—a visible or measurable, elongated pattern of emissions spreading downwind from a source through the atmosphere.

Rectisol – A process to remove acid gases, such as hydrogen sulfide, from gasification syngas.

Reference concentrations –- estimates of continuous inhalation exposure to human population (including sensitive subgroups) that are likely to be without an appreciable risk of deleterious effects during a lifetime.

Safe yield—the maximum quantity of water that can be withdrawn continuously from a surface water or groundwater source during a 50-year (or greater) drought without ultimate depletion of the source (considering intrusion of undesirable-quality water, interference with other existing water sources, downstream flow requirements, and other factors).

Secondary drinking water standards—non-enforceable federal guidelines regarding cosmetic effects (e.g., tooth or skin discoloration) or aesthetic effects (e.g., taste, odor, or color) of drinking water.

Selective catalytic reduction—a system to reduce NO_x emissions by injecting a reagent such as ammonia into exhaust gas to convert NO_x emissions to nitrogen gas and water via a chemical reduction reaction.

Slag—*solid glassy inorganic byproduct of a gasification, smelting, or steel manufacturing process, generally consisting primarily of silicates, aluminosilicates, and oxides; formed from the solidification of molten material skimmed from the top of a molten metal bath or collected at the bottom of a combustor or boiler.*

Sludge—a semi-solid residue containing a mixture of solid waste material and water from air or water treatment processes.

Slurry—a watery mixture or suspension of fine solids, not thick enough to consolidate as a sludge.

Specific yield—the volume of water released from storage in a unit area of an unconfined aquifer per unit decline in the water table. Values are dimensionless (corresponding, for example, to cubic feet of water per square foot of aquifer per foot of water table decline) and typically are between 0.01 and 0.3. In physical terms, the specific yield can be understood as the fraction of the aquifer volume that consists of drainable void space.

Spring—a location on the land surface or the bed of a surface water body where groundwater emerges from rock or soil without artificial assistance.

Syncline—a geologic fold in which the rock layers dip inward from both sides toward the axis, with younger rocks in the core. The opposite of anticline.

Synthesis gas—a mixture of gases produced as feedstock, especially as a fuel produced by controlled combustion of coal in the presence of water vapor.

Tailings pond—an outside water-filled enclosure that receives discharges of wastewater containing solid residues from processing of minerals. The solid residues settle due to gravity and separate from the water.

Wetlands—areas that are inundated by surface water or groundwater with a frequency sufficient to support, under normal circumstances, a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflow areas, mudflats, and natural ponds.

SUMMARY

This environmental impact statement (EIS) has been prepared by the U.S. Department of Energy (DOE), in compliance with the National Environmental Policy Act of 1969 (NEPA) as amended (42 USC 4321 et seq.), Council on Environmental Quality regulations for implementing NEPA (40 CFR Parts 1500-1508), and DOE NEPA regulations (10 CFR Part 1021). The EIS evaluates the potential environmental impacts associated with the construction and operation of facilities near Gilberton, Pennsylvania, which have been proposed by WMPI PTY, LLC, for producing electricity, steam, and liquid fuels from anthracite coal waste (culm). The project has been selected by DOE under the Clean Coal Power Initiative (CCPI) to demonstrate the integration of coal waste gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels at commercial scale. The CCPI Program accelerates commercial deployment of advanced coal-based technologies for generating clean, reliable, and affordable electricity in the United States by moving promising technologies from research and development (R&D) to the commercial marketplace through demonstration.

The EIS will be used by DOE in making a decision on whether or not to provide approximately $100 million (about ***10***% of the total cost of approximately $***1 billion***) in cost-shared funding to design, construct, and demonstrate the technologies proposed by WMPI PTY, LLC, at the proposed facilities. The proposed action (DOE's preferred alternative) is for DOE to provide the cost-shared funding. DOE determined that providing cost-shared funding for the proposed project would constitute a major federal action that may significantly affect the quality of the human environment. Therefore, DOE has prepared this EIS to assess the potential impacts on the human and natural environment of the proposed action and reasonable alternatives.

The proposed facilities would use a gasifier to convert coal waste to synthesis gas, which would be conveyed to F-T liquefaction facilities for production of liquid fuels and to a combined-cycle power plant. The power plant would use the synthesis gas to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine. Both turbines would generate electricity. For coal gasification, the project would use Shell technology, which has operated commercially using coal feedstock in the Netherlands since the 1990s. For liquefaction, the SASOL F-T technology would be used, which has operated commercially in South Africa since the 1980s.

The proposed ***Gilberton Coal-to-Clean Fuels and Power project would demonstrate the first clean coal power facility in the United States using coal waste gasification as the basis for power, thermal energy, and liquid fuels production. A successful demonstration would*** generate technical, environmental, and financial data from the design, construction, and operation of the ***facilities to confirm that the integrated technologies can be implemented at the commercial scale***. While the individual technologies have been independently operated, this project would demonstrate the integration of the technologies, which may ultimately help to reduce U.S. dependence on imported oil.

The site for the proposed project is located adjacent to the existing Gilberton Power Plant in the western portion of Mahanoy Township in Schuylkill County in eastern Pennsylvania. The area is primarily rural with a mixture of industrial, commercial, and residential land use in the vicinity. The site is about 1 mile north of Interstate 81. The city of Pottsville is located about 8 miles to the south of the site. The main plant for the proposed project would occupy about 75 acres of nearly level WMPI-owned land on top of Broad Mountain. The land is currently an undisturbed forested area.

Construction of the proposed facilities would ***occur over a 2.5-year period***. An average of 516 construction workers would be at the site during the construction period; approximately 1,000 workers would be required during the peak construction period. Demonstration (including performance testing and monitoring) would be conducted over a 3-year period ***following completion of construction***. If the demonstration is successful, commercial operation would follow immediately. About 250 workers would be required during the demonstration, and 150 workers would be needed for long-term operations. The facilities would be designed for a lifetime of ***50*** years.

The primary feedstock for the proposed facilities would be low-cost anthracite culm, which is a locally abundant, previously discarded resource. ***Culm reserves controlled by the applicant could supply the proposed facilities for about 15 years, and are more than sufficient for the three-year demonstration period. WMPI controls 65 million tons of surveyed culm reserves (estimated to be equivalent to about 16 million tons of beneficiated culm), plus an estimated 85 million tons (equivalent to about 21 million tons of beneficiated culm) that have not been surveyed. A conservative estimate of the amount of locally available culm is 100 million tons (equivalent to about 25 million tons of beneficiated culm).***

The culm would be trucked to the site from the surrounding local area. The proposed facilities would also be capable of using a blend of feedstock containing up to 25% petroleum coke. Micronized limestone, which would be used as a flux added to the feedstock to lower the ash melting temperature of the culm and promote fluidity, would be trucked from mines within 100 miles of the project site.

The facilities would produce about 5,000 barrels of liquid fuels per day and 41 MW of electricity for export to the regional power grid. To reduce costs, the project would take advantage of existing local infrastructure, including rail, water, and transmission lines. The net efficiency would be about 45%, compared to an efficiency of about 33% for a traditional coal-fired power plant and about 40% for a state-of-the-art integrated gasification combined-cycle power plant.

Proposed emissions from the facilities would be small, especially for sulfur dioxide (SO_2), because most of the sulfur would be removed from the synthesis gas prior to conveying the gas to the F-T liquefaction facilities and the combined-cycle power plant. The use of anthracite culm would reduce waste disposal from operating mines and ***support*** reclamation of land currently stockpiled with culm.

Alternatives to the Proposed Action

The EIS ***examines*** the proposed action (funding the demonstration ***project***) and the no-action alternative (not funding the demonstration project). Other alternatives to the proposed action have been ***considered*** and found not to be reasonable alternatives. ***Under the CCPI Program, DOE's role is limited to approving or disapproving the project as proposed by the industrial participant, including the proposed technology and site.***

EIS Process

Scoping

DOE initiated this NEPA review process by publishing in the Federal Register (April 10, 2003; 68 FR 17608–11) a Notice of Intent to prepare the EIS and hold a public scoping meeting. The Notice of Intent invited comments and suggestions on the proposed scope of the EIS, including environmental issues and alternatives, and invited participation in the NEPA process. Advertisements publicizing the public scoping meeting were printed in the Pottsville, Pennsylvania, newspaper, a flyer announcing the public scoping meeting was posted at the public library in Frackville, Pennsylvania, and notices were mailed to stakeholders including federal, state, and local agencies. DOE held a scoping meeting in Pottsville on May 5, 2003, and accepted scoping comments until May 19, 2003.

DOE considered these comments in developing the Draft EIS, in which issues were analyzed and discussed in accordance with their level of importance. The most detailed analyses focused on issues associated with air quality, surface water, groundwater, and solid waste impacts.

Draft Environmental Impact Statement

On December 8, 2005, DOE issued a Notice of Availability in the Federal Register (70 FR 73003-05) to announce the availability of the Draft EIS for public review and comment. The Notice of Availability announced two public hearings on the Draft EIS and invited agencies, organizations, and individuals to present oral comments and submit written comments on the adequacy, accuracy, and completeness of the EIS. On December 24 and 31, 2005, advertisements publicizing the public hearing were printed in Pottsville and Hazleton, Pennsylvania, newspapers; information to announce the public hearings was provided to local publications, radio stations, and television stations in the Schuylkill County region; and flyers announcing the hearings were distributed in the community. The Draft EIS was sent to stakeholders including federal, state, and local agencies, environmental groups, and public citizens for their review and comment. Copies of the Draft EIS were made available at the Pottsville Public Library, Frackville Public Library, Mahanoy City Public Library, and the library at the Mahanoy State Correctional Institution.

Publication of the Notice of Availability initiated the public comment period on the Draft EIS. DOE conducted two formal public hearings to receive comments on the Draft EIS: on January 9, 2006, in Shenandoah, Pennsylvania, and on January 10, 2006, in Pottsville, Pennsylvania. An informational session was held prior to each of these hearings for the public to learn more about

the proposed project. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE by the close of the comment period on February 8, 2006. Testimony was presented by 28 persons during the public hearings, and DOE received correspondence from 95 members of the public, interested groups, and federal, state, and local officials, as well as over 400 inmates at the Mahanoy State Correctional Institution. The comments helped to improve the quality and usefulness of the EIS.

Generally, DOE responded to these comments by revising the appropriate sections of the EIS to provide the requested information or further explore areas of potential impact. In addition, WMPI has agreed to certain measures to reduce and mitigate potential impacts. All comments on the Draft EIS and corresponding responses by DOE are contained in Appendix D of this Final EIS. Where responses to comments have initiated changes that appear in the Final EIS, they have been so noted in the comment response.

Supplement to the Draft EIS

DOE received comments on the Draft EIS from the Natural Resources Defense Council (NRDC) and from several other organizations and members of the public regarding how the Draft EIS addressed CO_2 emissions from the proposed project. In order to address these comments, DOE staff met with NRDC representatives on June 27, 2006, to ensure that the Department understood the comments, which expressed concerns about the potential impacts of CO_2 emissions on global warming and questioned the accuracy of the annual rate of CO_2 emission reported in the Draft EIS. NRDC requested that DOE enhance the analysis of potential CO_2-related cumulative impacts, further explore the feasibility of CO_2 sequestration, and provide a public comment opportunity on the revised sections of the EIS.

In considering these comments, DOE found that the annual rate of CO_2 emissions reported in the Draft EIS included only the total quantity of CO_2 that would be emitted directly from the proposed facilities. The reported quantity did not include a larger quantity of CO_2 in a concentrated stream exiting the Rectisol unit that would also be emitted. It was previously anticipated that this stream would be sold; however, the industrial participant has informed DOE that the commercial sale of the CO_2 would not occur in the foreseeable future, and therefore, all of the CO_2 would be emitted to the atmosphere. To further the purposes of NEPA, in January 2007 DOE issued a Supplement to the Draft EIS (DOE/EIS-0357D-S1) to correct estimates of CO_2 emissions from the proposed plant that were published in the Draft EIS, to provide additional information regarding CO_2 releases and CO_2-related cumulative impacts, and to further explore the possibility of CO_2 sequestration. On January 12, 2007, a Notice of Availability was published in the Federal Register (72 FR 1710) to invite comments on the Supplement to the Draft EIS. The comment period for the Supplement to the Draft EIS ended on February 27, 2007. The Supplement is included as Appendix E of this Final EIS. Material from the Supplement is incorporated into the Final EIS and all comments on the Supplement to the Draft EIS and corresponding responses by DOE are contained in Appendix F to this Final EIS.

Potential Impacts

Potential impacts that could result from construction and operation of the proposed facilities, as well as potential impacts resulting from the scenario under the no-action alternative, were evaluated in the areas of land use, aesthetics, air quality, geology, water resources, floodplains, wetlands, ecological resources, socioeconomic resources, waste management, human health, and noise. ***Resources and impact areas that could be subject to cumulative impacts when the proposed project is considered along with other existing and reasonably foreseeable future projects are (1) air quality, including hazardous air pollutants and greenhouse gases, (2) water resources and related issues, such as water consumption and water quality, and (3) socioeconomic resources and related issues, such as the flow and safety of vehicular traffic and the effects on water and wastewater services.*** The following sections provide key findings for areas of potential concern related to construction and operation of the proposed facilities.

Land Use and Aesthetics. The proposed main plant would be confined to the area between the existing Gilberton Power Plant and the Mahanoy State Correctional Institution, and thus would not affect offsite land use. ***Approximately 75 acres of deciduous forest would be permanently lost to construct the main plant. About 9.5 acres of land would be required during construction for equipment/material laydown, storage, assembly of site-fabricated components, staging of material, and facilities to be used by the construction workforce (i.e., offices and sanitary facilities). The land for these temporary facilities would be situated within the 75-acre main plant site. A new beneficiation plant (or expansion of the existing facility) in the adjacent valley to the north of the main plant area would probably require about 1 acre of land. In addition, slightly over 1 acre would be cleared from the main plant site to the beneficiation plant and railroad siding to establish a 5,000-ft long, 12-ft wide corridor for new water and product pipelines.*** The ancillary facilities would not affect offsite land use due to their small size (i.e., a few acres) and location adjacent to ancillary facilities for the Gilberton Power Plant. During the first 25 years ***of the 50-***year operating life of the proposed facilities, approximately 1,000 acres of land would be reclaimed after culm removal to provide feedstock for the facilities.

Five 200-ft stacks and one 300-ft stack would be constructed as part of the proposed facilities. The five 200-ft stacks would be considerably shorter than the existing 326-ft stack at the adjacent Gilberton Power Plant, and the 300-ft stack would be slightly shorter. The new gasifier and turbine buildings would be similar in size to the existing power plant buildings. Because the visual landscape of the area is already conspicuously marked with industrial structures, the proposed facilities would not alter the industrial appearance of the site and, accordingly, would not degrade the aesthetic character of the area.

Air Quality. Emissions of air pollutants would be discharged primarily from the five new 200-ft stacks located in the main plant area of the proposed facilities. A computer-based air dispersion model was used to estimate maximum increases in ground-level concentrations of SO_2, nitrogen dioxide (NO_2), particulate matter less than or equal to 10 μm in aerodynamic diameter (PM-10), and carbon monoxide (CO) that would occur at any location as a result of emissions from the stacks. In this analysis, the significance of the maximum predicted concentrations was evaluated using “significant impact levels” (a form of ambient air quality standards, as described below). According to U.S. Environmental Protection Agency (EPA) guidelines, a preliminary modeling analysis using significant impact levels should include only the emissions associated with the proposed facilities to determine if the facilities would have a significant impact on ambient air quality. If the maximum predicted concentrations are less than the significant impact levels, additional modeling, including other sources and background concentrations, is not required.

Initial results indicated that maximum concentrations were predicted to be less than their corresponding significant impact levels, with the exception of the annual NO_2 concentration, which had a value of 1.1 $\mu g/m^3$ versus a significant impact level of 1 $\mu g/m^3$. However, oxides of nitrogen (NO_x) emissions from the proposed facilities would be composed of both NO_2 emissions and nitric oxide (NO) emissions. Because not all NO emissions would convert to NO_2 in the atmosphere, the analysis was refined by relaxing the initial conservative assumption that all NO_x emissions would be in the form of NO_2. The revised maximum annual NO_2 concentration was predicted to be 0.8 $\mu g/m^3$, which is less than the significant impact level of 1 $\mu g/m^3$ for NO_2. ***Therefore, additional modeling including other sources and background concentrations is not required for regulatory purposes for any of the pollutants.***

Maximum concentrations for all pollutants were predicted to occur at the same location, on top of Locust Mountain, slightly over 3 miles north of the main plant area. Concentrations would be negligible at the nearest Prevention of Significant Deterioration (PSD) Class I area (Brigantine Wilderness Area), about 130 miles to the southeast in New Jersey. Dispersion of pollutants at that distance would reduce atmospheric concentrations to a small fraction of the maximum modeled concentrations, which were predicted to be less than PSD Class I increments (standards) at the location of their maximum impact (i.e., on top of Locust Mountain).

To address concerns about potential cumulative impacts from the proposed facilities in conjunction with existing generation and cogeneration facilities (expressed in public comments during scoping and on the Draft EIS), DOE conducted an analysis of potential cumulative impacts to air quality including existing sources and background concentrations (which incorporate other existing sources in the atmosphere). The analysis found that emissions of sulfur dioxide, nitrogen dioxide, particulate matter, and carbon monoxide from six existing sources in addition to the proposed facilities, in combination with background concentrations, would result in air concentrations no greater than 42% of the respective National Ambient Air Quality Standards. Proposed and planned future developments, discussed in Section 6.3, were not included in this analysis because of the nature of the activities (regional distribution centers and wind farms). Their potential air pollutant emissions, including vehicle emissions from increased traffic, are expected to be small in comparison to the proposed facilities, existing power plants, and regulatory thresholds. The proposed biofuels production plant described in Section 6.1.1 has not yet been constructed, and estimates of its air emissions are not available. Consequently, DOE is unable to

quantify the potential contribution of the proposed biofuels plant to air pollutants in the cumulative effects assessment.

Ozone (O_3) is not emitted directly from a combustion source but is formed from photochemical reactions involving emitted volatile organic compounds (VOCs) and NO_x. Because the reactions involved can take hours to complete, O_3 can form far from the sources of its precursors (the VOCs and NO_x that initiate its formation). Therefore, the contribution of an individual source to O_3 concentrations at any particular location cannot be readily quantified. Stack emissions of NO_x from the proposed facilities would be about 70 tons per year, which would be less than 1% of Schuylkill County's NO_x emissions inventory of 8,335 tons per year in 1999, the latest year with an available inventory. Stack VOC emissions would be about 28 tons per year, which would be less than 0.4% of the county's VOC emissions inventory of 7,840 tons per year in 1999. Because the nearest O_3 monitoring station is located in Reading, about 35 miles south-southeast of Gilberton (Section 3.2.2), existing ambient O_3 concentrations in the area are uncertain. The small percentage increases in NO_x and VOC emissions would not be likely to degrade O_3 concentrations sufficiently to cause violations in the O_3 NAAQS, but the magnitude of the degradation cannot be quantified.

Trace emissions of other pollutants would include mercury, beryllium, sulfuric acid mist, hydrochloric acid, hydrofluoric acid, benzene, arsenic, and various heavy metals. As required by the F-T synthesis process, the synthesis gas would be cleaned extensively using wet scrubbing followed by acid gas removal using a Rectisol unit, prior to sending the gas to the F-T synthesis facilities and the combined-cycle power plant. Therefore, a high percentage of hazardous air pollutants and trace elements in the synthesis gas would be removed. Part of the purpose of the proposed project is to generate environmental data, including hazardous air pollutant measurements, from the operation of the integrated technologies at a sufficiently large scale to allow industries and utilities to assess the project's potential for commercial application.

Emissions of hazardous air pollutants (e.g., mercury) from the proposed facilities would likely be very similar to emissions from state-of-the-art integrated gasification combined-cycle facilities due to the similarity in the technologies, including synthesis gas cleanup equipment. Extensive characterization of trace elements during demonstration of a Shell pilot-scale integrated gasification combined-cycle plant from 1987 to 1991 indicated that scrubbing in the synthesis gas cleanup train, upstream of the acid gas removal equipment, was very effective in removing volatile trace elements. Volatile trace elements were not detected in the clean product synthesis gas or the acid gas, with the exception of lead in the clean synthesis gas and selenium in the acid gas, which were present at less than 1% of the total inlet feed rate to the gasifier.

Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, establishes maximum allowable limits for total facility emissions of less than 10 tons for any single hazardous air pollutant (e.g., mercury) and less than 25 tons for any combination of hazardous air pollutants during any consecutive 12-month rolling period. Although the permitted limits function as a cap to ensure that the proposed facilities would be a minor new source of hazardous air pollutants under the National

Emissions Standards for Hazardous Air Pollutants regulations, the permitted limits for this plant do not reflect the actual expected emissions of hazardous air pollutants. In WMPI's application for Air Quality Program Permit No. 54-399-034, an estimate of 3.7 tons per year was provided for the sum of all hazardous air pollutants (15% of the 25-ton allowable limit). This estimate was based on a worst-case scenario required by the Pennsylvania Department of Environmental Protection (PA DEP). After more detailed analyses, WMPI has estimated that the actual "sum" of hazardous air pollutant emissions would be about 1.5 tons per year. Consequently, the quantity of any single hazardous air pollutant would likely be less than 1 ton per year, which is considerably less than the permitted limit of 10 tons per year. At this time, estimates of the proposed facilities' emissions of individual hazardous air pollutants include 38.6 lb per year of mercury and 2.4 lb per year of arsenic. Total predicted emissions of mercury from the proposed project and other existing and foreseeable emission sources would add less than 1% to the background concentration. Cumulative emissions of mercury, beryllium and arsenic would remain well below respective EPA reference concentrations. No direct threat to human health is expected from air emissions from the proposed project and existing facilities.

Polychlorinated dibenzo(p)dioxin and polychlorinated dibenzofuran compounds (i.e., dioxins and furans) are not expected to be present in the synthesis gas from gasification systems for two reasons. First, the high temperatures in the gasification process would effectively destroy any dioxin/furan compounds or precursors in the feed. (Gasification temperatures within the refractory-lined reactor would typically range from 2,200 to 3,600 ºF, with associated pressures ranging from near atmospheric to 1,200 psi.). Secondly, the lack of oxygen in the reduced gas environment would preclude the formation of free chlorine from hydrochloric acid, thus limiting the potential for chlorination of any dioxin/furan precursors in the synthesis gas. In addition, the temperature profiles where oxygen is present would not be in the favorable range (660 – 1,290 ºF), for production of free chlorine from hydrochloric acid.

Combustion of synthesis gas in a gas turbine would not be expected to lead to formation of dioxin/furan compounds because very little of the particulate matter required for post-combustion formation of these chemicals would be present in the clean synthesis gas or in the downstream combustion gases.

Local residents expressed concern about the potential for odorous emissions of hydrogen sulfide (H_2S). For the proposed facilities, nearly complete H_2S removal from the shifted synthesis gas, occurring in the acid gas removal plant using a Rectisol unit, would be required by the downstream F-T synthesis process. Remaining concentrations would be as low as 1 to 5 ppm. The captured H_2S would be converted to marketable elemental sulfur in a Claus sulfur recovery unit, a process which should remove approximately 99.99% of the sulfur from the recovered acid gas stream. ***Further, the small vent gas streams exiting the Rectisol, Claus, and SCOT units would be sent to a thermal oxidizer to oxidize any trace contaminants prior to being released through a stack to the atmosphere. Because of the high rate of sulfur removal in these units, and the oxidation of the***

small vent gas streams from the units before release to the atmosphere, H_2S odors should not be perceptible.

Local residents also expressed concern about the possibility of emissions from the proposed facilities creating safety issues, such as emissions from the new bank of 12 mechanical-draft cooling towers generating fog that would affect Interstate 81. During occasional meteorological conditions when the atmosphere is nearly saturated, winds are light, and mixing is very low (i.e., during some early morning hours), condensation of water vapor from the cooling towers is possible, which would appear in the form of a cooling tower plume and/or fog. The fog would probably not affect Interstate 81, due to the distance from the proposed site. No fog resulting from existing Gilberton Power Plant operations has been observed on Interstate 81. However, upon initial operation of the proposed facilities, conditions at the interstate would be monitored.

Carbon dioxide emissions to the atmosphere resulting from the operation of the proposed facilities would add about 2,282,000 tons per year to global CO_2 emissions, thus adding to global emissions of CO_2 resulting from fossil fuel combustion, which are estimated to have been 29,000,000,000 tons during the period 2000 to 2005 (IPCC 2007). Emissions from the facilities include CO_2 emitted directly to the atmosphere by facility operations (832,000 tons per year), plus the concentrated CO_2 stream separated in the gas cleanup system (1,450,000 tons per year), which would be emitted at the site. While it was previously anticipated that the concentrated CO_2 stream would be sold as a byproduct, the industrial participant has informed DOE that the commercial sale of the CO_2 would not occur in the foreseeable future. Although not proposed by the applicant, during the 50-year duration of commercial operation, it may become feasible to reduce the project's contribution to global climate change by sequestering some of the CO_2 captured in the process underground. Over the entire fuel lifecycle (from production of the raw material in a coal mine or oil well through utilization of the fuel in a vehicle), production and delivery of liquid transportation fuels from coal has been estimated to result in about 80% more greenhouse-gas emissions than from production and delivery of conventional petroleum-derived fuels (Marano and Ciferno 2001, Williams and Larson 2003, Williams et al. 2006). Recent estimates by EPA of lifecycle emissions are even higher. Based on a conceptual analysis of potential CO_2 capture and sequestration at facilities that produce liquid fuels from coal using technologies similar to those included in the proposed project, it has been estimated that CO_2 sequestration could reduce total fuel-cycle greenhouse gas emissions to 8% more than from the conventional petroleum-derived fuel cycle (as compared to the 80% increase).

Geology. Because the proposed main plant would be built over rock units that do not contain coal, the plant would not be affected by subsidence from mining activities. Product transfer lines and related facilities in the valley of Mahanoy Creek ***would, however, be located over former underground mines and could be subject to subsidence.*** The potential risks of product line leakage due to gradual subsidence would be reduced by inspecting product lines regularly and repairing any problems. ***Also, the facilities' use of water from the Gilberton mine pool would lower the average water level in the mine pool, and thus could reduce stability of the abandoned mine workings below***

Gilberton. However, this would not be expected to increase the likelihood of collapse because water levels would remain within their current range, which has not been observed to increase the possibility of mine roof collapses or other subsidence.

Water Resources. During construction, water quality could be affected by stormwater runoff from construction sites. Standard engineering practices such as silt fencing, straw bales, revegetation of graded areas, and stormwater detention basins would be implemented to control runoff, erosion, and sedimentation. If runoff from the site drained to old strip mining pits on the north or south slopes of Broad Mountain, any ***contained*** sediments would settle out in the pits ***or be filtered by soil and rock as the water*** seep***ed*** to the underlying mine pool. If runoff were directed toward tributaries of Mill Creek, it would be routed through detention basins in which sediments would settle out before the water would be released to a stream. Impacts attributable to construction-related runoff would be minimal.

Construction and operation of the proposed facilities would not change groundwater use on Broad Mountain, but the facilities would increase the area of impervious surfaces. Water that previously would infiltrate the soil to enter the groundwater under Broad Mountain would instead become stormwater runoff and would be discharged to streams or strip mining pits, thus reducing groundwater recharge to the aquifers on Broad Mountain. Estimated recharge within a 1,000-ft radius of the Morea well should remain sufficient to meet the needs of the Morea water system. The wells serving the Gilberton Power Plant are closer to the proposed main plant site than the Morea well is to the main plant site, and thus would be more likely to experience any impacts from reduced recharge. Because other wells in the area are farther from the proposed facilities than the Morea well is from the proposed facilities, they should not be affected by reduced recharge.

All water for use in the facilities would be obtained from the Gilberton mine pool, which consists of water-filled underground mine workings located beneath the borough of Gilberton. During normal operation, the proposed facilities would require an estimated flow of 3,779 gpm from the mine pool, including an estimated 2,744 gpm for cooling water and 1,035 gpm for processing in the main plant. In addition, about 1,667 gpm would be withdrawn for use in culm beneficiation, which includes operation of the existing beneficiation plant. About 2,314 gpm would be consumed in processing or lost to evaporation. About 1,940 gpm (including an estimated average flow of 93 gpm of stormwater collected from the main plant area) would be discharged from the proposed facilities to the tailings pond in the Mahanoy Creek valley as a blend of treated wastewater and uncontaminated water, and about 1,180 gpm would be discharged to the tailings pond as wastewater from culm beneficiation. The effluents discharged to the tailings pond (an average total of about 3,120 gpm) are expected to seep downward into the Boston Run mine pool, which is believed to be inter-connected with the Gilberton mine pool (Parulis 1985). The Susquehanna River Basin Commission authorization for withdrawal of water from the mine pool requires that WMPI seek alternative water sources if a potential is identified for the water level in the Gilberton mine pool to drop to a level below its current range of fluctuation. Possible alternative water sources include other mine pools or a public water supply system; no conflicts

with other water users would be expected. Any alternative source would require Susquehanna River Basin Commission approval and construction of a new water supply line. The proposed facilities' net consumption of water would contribute to the general trend of increased water consumption in the Susquehanna River Basin, adding about 0.7% to consumption as of 2000.

Operation of the proposed facilities would reduce the water volume in the Gilberton mine pool and the volume of water needed to be pumped from the mine pool and discharged to Mahanoy Creek in order to prevent flooding. ***The net effect on water flux in the mine pool system would be a reduction of about 2,225 gpm or 994 million gal per year (assuming operation of the facilities at an 85% capacity factor). This is equal to about 40% of the water volume currently pumped to Mahanoy Creek from the Gilberton mine pool to control the mine pool elevation. This would allow the Commonwealth of Pennsylvania to reduce its pumping of the mine pool by approximately 40%.*** These changes would result in reduced stream flow in ***Mahanoy Creek***. However, the creek would not go dry from receiving less mine pool water because the creek's minimum flows would be maintained by continuous discharges from mine openings in upstream portions of the watershed. Because the stream is not a source of water supply due to its ***seriously impaired water quality due to acidic mine drainage***, reduced flow would not affect water availability.

Project operation would lead to both positive and negative impacts on water quality in both Mahanoy Creek and the mine pool system.

Facility effluents discharged to the mine pool system would return less acidity and dissolved metals to the mine pool system than were contained in the water withdrawn from the mine pool system for use in the facilities, thus improving the quality of the mine pool water with respect to these contaminants. Additionally, reduced pumping from the mine pool (to prevent flooding) would reduce the amount of poor quality water entering the creek from the mine pool. By reducing the amounts of contaminants entering Mahanoy Creek, these changes would assist in meeting state water quality targets for the creek, which has seriously impaired water quality due to acidic mine drainage and does not meet the water-quality objectives established for its designated use as warm-water fish habitat.

Facility effluents could, however, also introduce new contaminants into the mine pool system and subsequently to the stream, thus further degrading the creek as potential habitat for aquatic organisms. Although the facilities' wastewater treatment system would be designed to treat organic residues, in its application for a water permit WMPI's proposal for maximum contaminant concentrations for effluent discharges indicates that effluents from the facilities could contain large residual amounts of organic compounds and other process residues. Toxic and carcinogenic substances, including phenols, cyanides, and polycyclic aromatic hydrocarbons (PAHs) such as pyrene, might be present in low concentrations. Wastewater constituents that are not successfully treated in the wastewater treatment facility are assumed to pass into the creek in the water pumped from the mine pool, although their concentrations could be reduced to an unknown extent by dilution within the mine pool. When mine pool water is pumped into Mahanoy Creek, the biochemical and chemical oxygen demand in the discharged water would deplete dissolved oxygen

in the creek, thus further degrading the creek as potential habitat for aquatic organisms. In the stream, mixing with air and other natural in-stream processes would transform oxygen-depleting contaminants in the creek water, so the adverse effects of oxygen depletion would extend for a limited distance downstream from the discharge point. The region of influence for potential water quality impacts is not expected to extend beyond the Mahanoy Creek watershed. If the quality of discharged water is determined to be unacceptable, additional treatment steps could be incorporated into the proposed wastewater treatment system to reduce adverse impacts to stream water quality. Because the stream is not a source of water supply, water quality changes would not affect human health.

In terms of potential cumulative impacts, other nearby planned and proposed developments (including warehouses, a distribution center, a wind farm, and a corn-to-ethanol plant) are not likely to be important sources of cumulative impacts to water quantity or quality, either because they would have little impact on water resources, their impacts are included in the Susquehanna River Basin Commission's projected trends, or their impacts would occur outside the watershed areas affected by the proposed action.

Floodplains, Flood Hazards, and Wetlands. The main plant would be located at an elevation well above the Federal Emergency Management Agency's delineated 100-year floodplain. A new culm beneficiation plant or expansion of the existing facility in the adjacent valley to the north of the main plant area would also lie above the elevation of the 100-year floodplain. Ancillary facilities that would cross the 100-year floodplain of Mahanoy Creek would be placed atop an existing trestle at an elevation above the level of the 100-year flood. No new construction within the floodplain would be required. ***The Federal Emergency Management Agency flood hazard delineations do not include areas potentially at risk from flooding due to failure of dams or berms. However, staff of the Pennsylvania Department of Environmental Protection have identified a concern that discharge of facility effluents to the tailings pond could increase the potential for berm failure, which would cause flooding in the vicinity of the pond and downstream in Gilberton. The probability and potential consequences of a tailings pond failure at the Gilberton site have not been quantified, but the Gilberton tailings pond appears to be less susceptible to catastrophic failure than other Appalachian region coal mine impoundments whose failures resulted in serious damage. Also, if the pond were to fail, the relatively low land surface slope in the valley would limit the velocity and distance of travel of the pond contents, thus resulting in less severe consequences than could occur in steeper watersheds. The potential for failure of the earthen berm could be reduced, but not eliminated, by discharging facility effluents directly to Mahanoy Creek (bypassing the tailings pond), thus reducing the volume of water managed in the pond. A discharge location would be designated as part of the Pennsylvania Department of Environmental Protection water quality permitting process.***

Construction and operation of the proposed facilities would have no adverse effects on wetlands because none are present on the project site. Runoff and spills from the site would not be expected to reach wetlands due to use of standard construction engineering practices and spill control procedures.

Ecological Resources. Loss of approximately 75 acres of deciduous forest to construct the main plant and 1.5 acres for ancillary structures would affect wildlife species. Other factors associated with construction of the proposed facilities would include increased human activity in the main plant area, increased traffic on local roads, and noise. The presence of construction crews and increased traffic would cause some wildlife species to avoid areas next to the construction site during the 30-month construction period. Burrowing and less mobile species such as amphibians, some reptiles, and some small mammals could be adversely affected during site preparation activities. Construction would temporarily modify the quality of the surrounding habitat in the project area by the creation of noise. No long-term impacts on the hearing ability of wildlife species would be expected from construction-generated noise. Some unavoidable impacts on wildlife would occur as a result of increased vehicular traffic. Construction traffic along the new access road would increase the potential for roadkills for animals such as turkeys, squirrels, and chipmunks.

The loss of deciduous forest during construction would displace some small mammals and songbirds from the construction areas, but would not be expected to eliminate any wildlife species from Broad Mountain because similar habitat is relatively common along and on both sides of the ridge. Clearing for support facilities would create additional forest edge and introduce habitat diversity as these areas partially revegetate. This would tend to benefit edge-related wildlife species, while displacing forest-related species from the new habitat. Over the operating life of the proposed facilities, the terrestrial habitat created on ***more than*** 1,000 acres of reclaimed land after culm removal would offset the 76.5 acres of deciduous forest that would be cleared for the facilities.

Impacts to aquatic habitats and fish from construction and operation of the proposed facilities would be minor to negligible. No surface waters are on or in the immediate vicinity of the proposed project site. Because the proposed facilities would not be located within an area that provides habitat for any protected species except for occasional transient individuals, it is unlikely that any such species would be affected by project construction or operations.

Social and Economic Resources. Construction and operation of the proposed facilities would not result in major impacts to population, housing, local government revenues, or public services in Schuylkill County. Overall, construction of the proposed facilities would have short-term positive effects on employment and income in the east central Pennsylvania region. Project operations would also have positive effects on employment and income and, provided that the demonstration is successful, these effects would last longer than the effects of construction. The project's positive effects on employment and income would contribute to the regional economy.

Schuylkill County and eight of the nine census tracts (small, relatively permanent statistical subdivisions of a county) within 3 miles of the proposed facilities have lower minority percentages than Pennsylvania and the United States. For the remaining census tract, however, significant minority populations reside at the Mahanoy and Frackville State Correctional Institutions. The Mahanoy State Correctional Institution is located 2,600 ft east of the proposed main plant site, and its minority inmate population represents an "environmental justice" population to which the adverse impacts of constructing and operating the proposed facilities could be distributed disproportionately.

However, disproportionately high and adverse air quality, water quality, and health impacts would not be expected because the potential impacts to the prison communities would not be appreciable, with the exception of temporary fugitive dust during construction.

Schuylkill County's population percentage below the poverty level is lower than that of Pennsylvania and the United States. However, two nearby census tracts have poverty rates that exceed those of both Pennsylvania and the United States. The relatively large low-income populations in these tracts represent "environmental justice" populations to which the adverse impacts of constructing and operating the proposed facilities could be distributed disproportionately. However, there would be no disproportionately high and adverse air quality, water quality, and health impacts to these populations.

With regard to transportation, all of the 1,000 workers during the 6-month peak construction period would access the project site from State Route 1008 (Morea Road), and most of these workers would access State Route 1008 from its intersection with State Route 61 in the town of Frackville. This assessment assumed that 1,000 additional vehicle trips (500 to the site and 500 from the site) would be generated each day during the peak construction period, which would represent increases of 10% and 22% over existing traffic on State Route 61 and State Route 1008, respectively. Increases of this size on these roads would likely cause traffic congestion and have an appreciable impact on traffic flow and safety during morning and afternoon commutes. In addition to these construction workers' vehicles, the number of construction delivery trucks accessing the project site from State Route 61 and State Route 1008 would increase. WMPI personnel have committed to contacting the Pennsylvania Department of Transportation to discuss potential mitigation options, including signaling, road widening, and scheduling work hours and/or deliveries to avoid periods of heavy traffic.

During the demonstration and long-term project operations, all of the 250 and 150 workers, respectively, would access the facilities from State Route 1008 (primarily via State Route 61 in Frackville). This assessment assumed that 500 additional vehicle trips (250 to the site and 250 from the site) would be generated each day by workers commuting during the demonstration, while 300 additional vehicle trips (150 to the site and 150 from the site) would be generated each day by workers commuting during long-term operations. Approximately 104 truck trips per day (52 to the site and 52 from the site) would deliver culm to the site, 40 truck trips per day (20 to the site and 20 from the site) would bring limestone, and 22 truck trips per day (11 to the site and 11 from the site) would transport waste material to an offsite landfill. In addition, if liquid fuels produced by the proposed facilities should be shipped by truck rather than rail, about 80 additional vehicle trips would occur daily (40 to the site and 40 from the site). The impacts of operations-related traffic would be less severe than those of construction-related traffic but would be more long lasting. WMPI personnel have committed to contacting the Pennsylvania Department of Transportation to discuss the same potential mitigation options as those available for construction-related traffic.

Once per week, a new supply of empty tank cars would be delivered, and a train of tank cars filled with liquid fuels produced by the proposed facilities would be transported from the site. Rail shipments of this magnitude would not have adverse impacts on the local rail system.

DOE has consulted with the Pennsylvania State Historic Preservation Office (SHPO) regarding the potential for impacts associated with the proposed facilities on any historic resources that may be listed in or eligible for the National Register of Historic Places. Impacts from construction and operation of the facilities would not be likely because the SHPO has identified no such historic or archaeological properties in the project area.

Construction and operation of the proposed project could combine with other ongoing and planned activities, particularly industrial development in the Schuylkill Highridge Business Park and Mahanoy Business Park and possible construction activity to install new turbines at the Locust Ridge Wind Farm, to contribute to cumulative impacts on the area's socioeconomic resources. The proposed project would add the presence of up to 1,000 workers during the 6-month peak construction period.

Waste Management. Because project construction waste quantities would be small in comparison with commercial landfill capacities and waste quantities currently handled at these facilities, landfills in the region should have ample capacity to receive project construction wastes for disposal.

Solid wastes and byproducts generated by the operation of the proposed facilities would include gasifier slag, fine solids, elemental sulfur, and sludges from water and wastewater treatment. Commercial uses would be sought for the gasifier slag, including lightweight construction aggregate, asphalt roofing shingle granules, blasting grit, and pipe-bedding material. However, markets for this material have not yet been established. Any slag that is not used commercially would be used as fill material for surface mine reclamation at and near sites where culm would be obtained. Because the Pennsylvania residual waste management regulations are intended to prevent or reduce the potential for adverse impacts from leaching of wastes, compliance with these regulations would minimize the potential for adverse impacts to water quality from land application of the slag.

Most of the fine solids generated by the proposed facilities would be used as fill material in a permitted ash disposal area on WMPI land as part of mine reclamation, subject to the same residual waste regulations that would govern the slag. The potential for impacts to water quality from using this material in mine reclamation would be larger than from similar use of slag, but compliance with the residual waste regulations would minimize the potential for adverse impacts to water quality. Provided that the residual waste regulations are met, sludges from treatment of raw water and wastewater would also be placed on WMPI land that is permitted for disposal of coal byproducts. The placement of the proposed facilities’ solid wastes and byproducts on lands that were previously mined or covered with culm banks would contribute to reclamation of surface-mined lands. Reclamation activities and needs in the vicinity could easily absorb the volume of material that would be generated by the proposed facilities.

If fine solids or sludges from the facilities failed to meet criteria for land application, they would require disposal in an offsite commercial landfill. The additional waste would increase average daily waste volumes at either of the two nearest landfills by more than 10%. However, commercial landfill capacity in the region appears to be sufficient to handle the additional waste volume. Management of the fine solids and sludges would require special clearance from the Pennsylvania Department of Environmental Protection. Special handling might also be required before shipment or within the landfill to control the release of water, which could affect the quantity and characteristics of landfill leachate.

Elemental sulfur would be produced and sold commercially. Because consumption in the United States exceeds domestic production, a market should be available for the elemental sulfur that the proposed facilities would generate.

None of the proposed facilities' solid wastes and byproducts would be expected to be hazardous as defined under the Resource Conservation and Recovery Act (RCRA). The Toxicity Characteristic Leaching Procedure test would be performed to verify this expectation, and any wastes found to be subject to RCRA hazardous waste regulations would be handled in accordance with applicable procedures.

Several wastewater collection and treatment units would be used to manage liquid waste streams. Stormwater collected from process areas and stormwater from parking lots and other portions of the site not used for processing or materials storage would be collected in two separate lined retention basins. Wastewater from the gasification and liquefaction processes would be combined with runoff from process areas in an equalization basin, then routed to a series of oil-water separation units where droplets of oil and grease would be recovered and oily sludge would be collected for disposal or recycling to the gasification process. Effluent from this stage of treatment would be mixed with non-oily wastewater streams and routed to a biological treatment unit that would combine aeration with clarification in order to treat wastewater with high levels of chemical and biological oxygen demand. This unit would be designed to consume the organic compounds and nutrients in the wastewater, yielding treated effluent for discharge and a biological sludge for disposal. Treated effluent would be mixed with non-process-area stormwater in an equalization basin for final settling and testing prior to discharge to a tailings pond in Mahanoy Creek valley.

Potential odor impacts from liquid waste streams would be controlled by treating all process wastewater within enclosed facilities prior to discharge to the final equalization basin. Treatment system upsets (e.g., if fluctuations in wastewater characteristics were to cause a die-off of microorganisms in the biological treatment unit) could result in release of incompletely treated water, causing odor problems and water quality degradation off the site. The potential for upsets could be minimized by designing the system with ample reserve capacity, selecting treatment units that are demonstrated to tolerate a wide range of wastewater characteristics, and controlling inflows to the treatment system to maintain consistent wastewater characteristics. Potential for explosion in oil-water separation units could be minimized by using a nitrogen gas blanket over these units.

Human Health and Safety. A potential health impact to the public would be associated with operational air emissions from the proposed facilities, including criteria pollutants and hazardous air pollutants. However, all maximum ambient concentrations of criteria pollutants from the proposed facilities were estimated to be less than their corresponding significant impact levels, and Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, establishes maximum allowable limits to ensure that the proposed facilities would be a minor new source of hazardous air pollutants (e.g., mercury).

The proposed facilities would be subject to Occupational Safety and Health Administration standards. During construction, permits would be required and safety inspections would be employed to minimize the frequency of accidents and maximize worker safety. Construction equipment would be required to meet all applicable safety design and inspection requirements, and personal protective equipment would be used, as needed to meet regulatory standards. Operations would be managed from a control room. All instruments and controls would be designed to ensure safe start-up, operation, and shut down. The control system would also monitor operating parameters. The overall design, layout, and operation of the facilities would minimize human hazards. With regard to electromagnetic fields, no perceptible changes would occur because no new transmission line would be built.

While catastrophic accidents would be possible, including accidents involving fire and/or explosion, the probability of such an incident would be remote. ***Both the Shell gasification technology and the Fischer-Tropsch liquefaction technology are commercially available with extensive development histories (20-40 years). No reports of injuries or fatalities to the public from catastrophic or industrial accidents for either of the technologies have been identified.***

Regarding potential accidents associated with transport of the produced liquid fuels from the proposed facilities, a train of filled tank cars would be moved off the site only once per week. Because fuels produced by the facilities would be transported to local distribution centers and/or refineries within a 150-mile radius, a rail accident involving the tank cars would be very unlikely.

Although concerns have been raised about the vulnerability of nuclear power plants to terrorist attack (Behrens and Holt 2005), the potential for such attacks on coal-based power plants has not been identified as a threat of comparable magnitude. Nuclear materials would not be present at the proposed project, but there is the potential for release of hazardous materials in the event of an intentional destructive act (i.e., terrorism or sabotage). The potential consequences of a hazardous materials release from the proposed gasification, liquefaction, or electric generating facilities would be similar to those from accidental causes.

Noise. During construction of the proposed facilities, the principal sources of noise would be from construction equipment and material handling. The amount and type of construction equipment would vary depending on the specific construction activity occurring at the time (e.g., site excavation, structural steel/mechanical/electrical equipment erection and installation, piping, fabrication, etc.). Construction activity would primarily occur within 6 acres of the 75-acre main plant site.

During operation of the proposed facilities, the principal sound sources would include equipment like the combustion turbine/generator, steam turbine/generator, heat recovery systems, turbine air inlets, exhaust stacks, cooling towers, pumps (e.g., feed, circulating, etc.), and compressors. These sound sources would be enclosed and acoustically insulated. Noise sources within the buildings would be fitted with sound-attenuating enclosures or other noise dampening measures.

The proposed project site's highest sound level was measured to be 55 dB(A) under existing conditions. The highest sound level during simultaneous operation of the Gilberton Power Plant and the proposed facilities was estimated by assuming that the sound level generated by the two facilities would be equal. A doubling of sound energy corresponding with operation of both facilities yielded an increase of 3 dB, indicating that the proposed site's highest sound level measurement would be 58 dB(A). A change in sound level of plus or minus 3 dB is the threshold of perception to the human ear.

The center of the proposed main plant would be about 2,600 ft west of the Mahanoy State Correctional Institution. The increase in noise levels (i.e., 3 dB) would probably be imperceptible because of (1) the distance between the prison and the proposed project site, (2) planned noise attenuation measures, (3) natural and man-made terrain features and structures, and (4) the limited period during which the inmates are allowed outside the prison. No perceptible change in noise associated with the proposed facilities would be expected at the nearest residence, located 3,600 ft southeast of the proposed main plant, or other offsite locations.

The applicant has proposed measures to prevent or mitigate many of the potential impacts about which the public expressed concerns (Table 4.2.1). For example, air quality would be protected by dust suppression measures during construction and air pollution control devices to capture contaminants and remove odors during operation. Water quality would be protected by the use of Spill Prevention, Control, and Countermeasures Plan and Best Management Practices Plan. The treatment of process effluents would result in discharges to the tailings pond, Mahanoy Creek, and mine pool that have lower levels of acidity and dissolved metals than presently occur in the mine water, but higher concentrations of other pollutants (e.g., biochemical and chemical oxygen demand). Excavated culm bank areas would be re-graded and vegetation would be re-established. Additional pollution prevention and mitigation measures may be required by permits issued by the Pennsylvania Department of Environmental Protection. Environmental monitoring would be carried out to ensure that the proposed project operates within permit limits. The applicant does not plan to sequester the carbon dioxide produced during operation of the project. The release of carbon dioxide from the proposed facilities would add an estimated 2,282,000 tons per year to global carbon dioxide emissions.

Impacts of Commercial Operation following the Demonstration Period

DOE's assessment of the impacts of the proposed action includes analysis of impacts during the 3-year demonstration that DOE proposes to support, as well as analysis of the potential environmental consequences of continued commercial operation of the facility after the demonstration period.

Commercial operation of the facility following the 3-year demonstration period might require the use of alternative fuels, if all readily available culm has been consumed. Depending on the alternative fuel selected, changes in air emissions, solid wastes and byproducts, and impacts related to acquiring the fuel (including mining, beneficiation, and transportation) would be anticipated.

Over the assumed 50-year operating life of the proposed facilities, continued progress in reclamation of abandoned mine lands in the watershed could reduce the availability of water from the mine pool system and require the establishment of an alternative water supply. Adequate capacity should be available for disposal of facility solid wastes, either for beneficial use, or for mine reclamation or in commercial landfills. If changes in market conditions necessitate the disposal of byproduct elemental sulfur, the material would be acceptable for disposal in a commercial landfill, but treatment or other special handling could be required to prevent adverse impacts. Carbon dioxide emissions could continue at levels projected for the demonstration period. However, during the commercial life of the project it might become feasible to reduce the project's contribution to global climate change by sequestering some of the recovered CO_2 ***underground.***

No-Action Alternative

Under the no-action alternative, DOE would not provide cost-shared funding to demonstrate the commercial-scale integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels. At the site of the proposed project, it is reasonably foreseeable that no new activity would occur. Thus, under the no-action alternative, no construction or operation of the proposed facilities would occur; no site preparation would be required, such as clearing of trees and other vegetation; no employment would be provided for construction workers in the area or for operators of the proposed facilities; and no resources would be required and no discharges or wastes would occur. This scenario would not contribute toward the removal of anthracite culm, which is stacked locally in numerous piles that were set aside during previous mining of anthracite coal.

Because no new activity would occur, current environmental conditions at the site, which are described in Section 3 (Existing Environment), would not change. Specifically, air quality in the area would remain the same, and no changes would occur to existing geologic and soil conditions in the area. No changes would occur to the quantity and quality of surface water and groundwater and the availability of water supplies in the area. Ecological resources would remain the same. No changes would affect the current management of solid and hazardous waste in the proposed project area.

Refer to Table 2.2.1 for a comparison of key potential impacts between the proposed facilities and the scenario under the no-action alternative.

1. PURPOSE OF AND NEED FOR AGENCY ACTION

1.1 INTRODUCTION

This environmental impact statement (EIS) has been prepared by the U.S. Department of Energy (DOE), in compliance with the National Environmental Policy Act of 1969 (NEPA) as amended (42 USC 4321 et seq.), to evaluate the potential environmental impacts associated with the construction and operation of facilities proposed by WMPI PTY, LLC (WMPI), for producing electricity, steam, and liquid fuels from coal waste. WMPI's team members include Nexant, Inc., Shell Global Solutions B.V., Uhde GmbH, Sasol Technology Ltd., and Chevron Lummus Global LLC. The EIS will be used by DOE in making a decision on whether or not to provide cost-shared funding to design, construct, and demonstrate the proposed facilities to be located adjacent to the existing Gilberton Power Plant near the borough of Gilberton in the western portion of Mahanoy Township in Schuylkill County, Pennsylvania. The project has been selected by DOE under the Clean Coal Power Initiative (CCPI) to demonstrate the integration of coal waste gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels at the commercial scale.

1.2 CLEAN COAL POWER INITIATIVE

"Clean coal technologies" refer to advanced coal utilization technologies that are environmentally cleaner, and in many cases, more efficient and less costly than conventional coal-utilization processes. These technologies contribute to a major objective of the national energy strategy for reducing U.S. dependence on potentially unreliable energy suppliers. Because the abundant domestic reserves of coal provide one of the nation's most important resources for sustaining a secure energy future, DOE has pursued a research and development (R&D) program to increase the use of coal while improving environmental quality. However, technologies displaying potential at the proof-of-concept scale in an R&D program must be operated at a larger scale to demonstrate readiness for commercialization. The CCPI Program moves promising technologies from R&D to the commercial marketplace through demonstration. Successful demonstrations also help position the United States to supply advanced coal-fired combustion and pollution control technologies to a rapidly expanding world market.

In Fiscal Year 2002, the U.S. Congress established the CCPI Program by providing $150 million in funding to accelerate commercial deployment of advanced coal-based technologies for generating clean, reliable, and affordable electricity in the United States. To implement the program, Congress also provided $150 million in funding in Fiscal Year 2003 and directed DOE to include certain previously appropriated funds so that DOE could offer over $300 million in cost-shared funding for a first round of commercial-scale demonstration projects. Congress indicated that projects in the program should be industry projects assisted by the government and not government-directed demonstrations. The projects are expected to showcase technologies in which coal-fired power plants can continue to generate low-cost electricity with improved efficiency and in compliance with more stringent environmental standards expected in the future.

In the CCPI Program, the project participant (i.e., the non-federal-government participant or participants) must finance at least 50% of the total cost of the project. The government assists the project participant by sharing in the project's cost, as detailed in a cooperative agreement negotiated between the participant and DOE. The government also shares in the rewards of successful projects. After a technology has been successfully demonstrated, the participant must repay the government's financial contribution to ensure that taxpayers benefit. Specifically, the government's investment is to be repaid within a 20-year period following completion of the demonstration based, for example, on revenue from the demonstration project itself and/or royalties from sales and licensing of the technology in the United States and abroad. At least 75% of the direct labor cost for the project, including subcontractor labor, must be incurred in the United States unless the participant can demonstrate that the U.S. economic interest would be better served through a greater percentage of the work being performed outside the United States. An example of the exception would be if the expertise to develop a proposed technology exists only outside the United States, but commercialization of the technology would result in substantial benefits to the United States, such as improved reliability of electricity, increased employment, and increased exports of U.S.-manufactured products.

The project participant has primary responsibility for designing, constructing, and demonstrating the project. ***During project execution, the government provides technical advice and assesses progress by periodically reviewing project performance. The government also reviews and approves or disapproves continuation applications which are submitted by the participant to request funds for subsequent project budget periods. In this manner, the government monitors schedules, costs, and project objectives for compliance with the terms in the cooperative agreement***.

The CCPI Program is open to any technology advancement related to coal-based power generation that results in efficiency, environmental, and economic improvement compared to currently available state-of-the-art alternatives. The program is also open to technologies capable of producing any combination of heat, fuels, chemicals, or other useful byproducts in conjunction with power generation. Coal for the demonstration projects is required to provide at least 75% of the fuel energy input to the process. This provision ensures that multiple-fuel concepts such as co-firing are not excluded, but that a focus is maintained on coal-based power generation. Additionally, projects must show the potential for rapid market penetration upon successful demonstration of the technology or concept.

DOE issued the first-round CCPI solicitation in March 2002 and received 36 proposals in August 2002. Eight projects (including the proposed project) were selected in January 2003. Evaluation criteria used in the selection process included technical merit of the proposed technology, potential for a successful demonstration of the technology, and potential for the technology to be commercialized. DOE considered the participant's funding and financial proposal; DOE budget constraints; environmental, health, and safety implications; and program policy factors, such as selecting projects that represent a diversity of technologies, utilize a broad range of U.S. coals, and represent a broad geographical cross-section of the United States.

1.3 PROPOSED ACTION

The proposed action is for DOE to provide cost-shared funding for the design, construction, and demonstration of proposed facilities near Gilberton, Pennsylvania, for producing electricity, steam, and liquid fuels from anthracite coal waste by integrating technologies for coal gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels. The commercial-scale demonstration would allow industries and utilities to make decisions regarding commercialization of the integrated technologies.

DOE's share of the funding for the 3-year demonstration project is expected to be approximately $100 million (about ***10***% of the total cost of approximately $***1 billion***), which would be subject to a repayment agreement between WMPI and DOE.

WMPI PTY, LLC and the other project team members (Section 1.1) conceived and proposed the project in response to the DOE solicitation. Because DOE’s role would be limited to providing cost-shared funding for the proposed project, DOE’s decision is whether or not to fund the project. DOE’s limited involvement constrains the range of alternatives considered in the EIS (Section 2), and DOE will make its decision based on those alternatives.

The proposed project would demonstrate the first clean coal power facility in the United States using coal waste gasification as the basis for power, thermal energy, and fuels production. A successful demonstration would generate technical, environmental, and financial data from the design, construction, and operation of the facilities to confirm that the integrated technologies can be implemented at the commercial scale. The project would demonstrate that coal waste can be used to produce steam, electricity, and liquid hydrocarbon fuels that may ultimately help to reduce U.S. dependence on imported oil. While the individual technologies have been independently operated, this project would demonstrate the integration of the technologies. A successful demonstration would indicate that the performance and cost targets for the integrated technologies are achievable at the commercial scale.

1.4 PURPOSE AND NEED

The need for action is twofold. First, DOE’s need is to address the Congressional mandate to demonstrate advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States (Section 1.2). Second, WMPI’s need is to provide steam, electricity, and liquid hydrocarbon fuels that would promote economic development in the region, while consuming coal waste that has degraded the quality of regional watersheds. Although DOE recognizes that the need for the project may be justified on either basis, its reason for selecting the proposed project is to support the demonstration of innovative, coal-based technology, not for regional economic development or reduction in legacy waste.

The cost-shared contribution by DOE for the demonstration would help reduce the risk to the WMPI team in developing the integrated technologies to the level of maturity needed for decisions on commercialization.

1.4.1 DOE's Need

Since the early 1970s, DOE and its predecessor agencies have pursued a broadly based coal R&D program to ensure available and affordable energy supplies while improving environmental quality. This R&D program includes long-term activities supporting the development of innovative, unproven concepts for a wide variety of coal technologies through the proof-of-concept stage. However, the availability of a viable technology at the proof-of-concept stage is not sufficient to ensure its continued development and subsequent commercialization. Before any technology can be seriously considered for commercialization, it must be demonstrated at a sufficiently large scale. Utilities and industries are generally reluctant to demonstrate technologies at an unproven scale in the absence of strong economic incentives or firm legal requirements. Implementation of the CCPI Program, with cost-shared funding from the federal government, has been endorsed by Congress and industry as a mechanism to accelerate the commercialization of innovative technologies to meet near-term environmental goals in the power industry and to reduce risk to an acceptable level through cost-shared funding. The proposed project was selected for demonstration in the CCPI Program as one of the projects that would best further these goals.

Nearly 50% of current electrical generating capacity in the United States is over 30 years old. Thus, much replacement or refurbishment of aging facilities is anticipated over the next several decades to continue to meet current electricity demand, and new capacity will be needed to keep pace with rising demand for electricity. Currently, about 55% of U.S. electricity requirements are met by power plants fired with pulverized coal. As the most abundant domestic energy source, coal continues to represent an attractive option for future power plants, particularly through advanced technologies that have the potential to dramatically improve environmental performance and efficiency. The abundance of U.S. coal reserves makes coal one of the nation's most important strategic resources for minimizing dependence on imported oil and sustaining a secure energy future. Based on existing mining technology, recoverable reserves of coal in the United States could supply coal consumption at current levels for nearly 300 years. However, advanced coal utilization technologies must be successfully demonstrated if coal is to provide an environmentally acceptable and economically competitive source of energy in the 21st century.

DOE's need is to demonstrate that advanced coal-based technologies, such as the integrated technologies offered by the proposed project as part of the CCPI Program, can generate clean, reliable, and affordable electricity. The ability to show prospective domestic and overseas customers an operating facility rather than a conceptual or engineering prototype would provide a persuasive inducement to replicate the technology. Data obtained on operational characteristics would allow prospective customers to assess the potential of the integrated technologies for commercial application. Successful demonstration would enhance prospects of exporting the integrated technologies to other nations and could provide the United States with an important advantage in the global competition for new markets. DOE would work closely with the project participants to develop plans for technology transfer and commercialization.

1.4.2 WMPI's Need

The proposed facilities would meet WMPI's need to provide steam, electricity, and liquid hydrocarbon fuels that would promote economic development in the region, while consuming coal waste that has degraded the quality of regional watersheds. The level of unemployment in Schuylkill County was 7% in 2001, well above the Pennsylvania statewide average of 4.7%. In addition, the median household income in the county was only 81.5% of the statewide level in 2001. The project's construction and operational jobs would improve the regional economy, as would the indirect jobs created by other industries that could benefit from the steam and electricity supplied by the proposed facilities.

About 1 billion tons of coal waste exist in Pennsylvania. The proposed facilities would consume anthracite coal waste that for decades has polluted regional watersheds. The project would reduce piles of coal waste from the landscape, increasing the scenic beauty of the land and eliminating a major source of metals, acidic discharge, and sedimentation to the area's rivers and watersheds. Some of the solid residues produced by the proposed facilities would be returned to coal waste sites, aiding in the restoration of lands adversely impacted by past mining.

The WMPI team members, as well as DOE, are interested in demonstrating the commercial viability of the integrated technologies. The potential exists for application of the technologies across the United States to accommodate a wide range of feedstocks, environmental conditions, and market needs. Successful demonstration, which is necessary prior to widespread market penetration, would provide an appreciable advantage in the global competition for new markets. The cost-shared funding from the federal government would reduce the project's risk to an acceptable level for the WMPI team members.

1.5 NATIONAL ENVIRONMENTAL POLICY ACT STRATEGY

This EIS has been prepared in compliance with NEPA for use by DOE decision makers in determining whether or not to provide cost-shared funding for the design, construction, and demonstration of the proposed project under the CCPI Program. DOE's policy is to comply fully with the letter and spirit of NEPA, which ensures that early consideration is given to environmental impacts in federal planning and decision making. The EIS provides a means for the public to participate in the decision making process. Actions taken by DOE with regard to any proposal, including project selection or award, are not considered final decisions prior to completion of the NEPA process.

An overall strategy for compliance with NEPA has been developed for the CCPI Program, consistent with the Council on Environmental Quality (CEQ) NEPA regulations (40 CFR Parts 1500-1508) and DOE regulations for compliance with NEPA (10 CFR Part 1021). The DOE strategy has two principal elements. The first element involved proposers completing a DOE environmental questionnaire, along with submission of a technical proposal to the CCPI solicitation. The responses to the questionnaire contained discussions of the site-specific environmental, health, safety, and socioeconomic issues associated with each project.

The second element consists of preparing site-specific NEPA documents for each selected project. For this project, DOE has determined that providing cost-shared funding for the proposed project would constitute a major federal action that may significantly affect the quality of the human environment. Therefore, DOE has prepared this EIS to assess the potential impacts on the human and natural environment of the proposed action and reasonable alternatives. ***DOE has utilized information prepared by WMPI PTY, LLC for the proposed project, as well as from sources provided by government agencies and others.*** The EIS has been prepared in accordance with Section 102(2)(C) of NEPA, as implemented under regulations promulgated by the CEQ (40 CFR Parts 1500-1508) and as provided in DOE regulations for compliance with NEPA (10 CFR Part 1021). The EIS is organized according to CEQ recommendations (40 CFR Part 1502.10).

A Notice of Intent to prepare the EIS and hold a public scoping meeting was published by DOE in the *Federal Register* on April 10, 2003 (68 *FR* 17608–11). The Notice of Intent invited comments and suggestions on the proposed scope of the EIS, including environmental issues and alternatives, and invited participation in the NEPA process. An advertisement publicizing the public scoping meeting was printed in the *Pottsville Republican & Evening Herald* newspaper in Pottsville, Pennsylvania, on April 17, 18, and 19, and May 1, 2, and 3, 2003. A flyer announcing the public scoping meeting was posted at the Frackville Free Public Library in Frackville, Pennsylvania. On April 22, 2003, the Notice of Intent and the newspaper notice were sent to 12 stakeholders including federal, state, and local agencies for their information and comments on the proposed project.

Publication of the Notice of Intent initiated the EIS process with a public scoping period for soliciting public input to ensure that (1) significant issues are identified early and appropriately addressed, (2) issues of little significance do not consume time and effort, (3) the EIS is thorough and balanced, and (4) delays occasioned by an inadequate EIS are avoided (40 CFR Part 1501.7). DOE held the scoping meeting in Pottsville, Pennsylvania, on May 5, 2003. The public was encouraged to provide oral comments at the scoping meeting and to submit additional comments in writing to DOE by the close of the EIS scoping period on May 19, 2003.

DOE received 15 oral responses at the public scoping meeting and 90 responses by comment card, mail, e-mail, fax, and telephone from members of the public, interested groups, and federal, state, and local officials. The responses assisted in establishing additional issues to be analyzed in the EIS and in determining the level of analysis required for each of the issues. Issues raised during public scoping are identified in Section 1.6.

On December 8, 2005, DOE issued a Notice of Availability in the Federal Register (70 FR 73003-05) to announce the availability of the draft EIS for public review and comment. The Notice of Availability announced two public hearings on the draft EIS and invited agencies, organizations, and individuals to present oral comments and submit written comments on the

adequacy, accuracy, and completeness of the EIS. On December 24 and 31, 2005, advertisements publicizing the public hearing were printed in the Republican & Herald in Pottsville, Pennsylvania, and on December 23 and 30 , 2005, and January 6 and 8, 2006, in the Standard Speaker newspaper in Hazelton, Pennsylvania. Information to announce the public hearings was provided to local publications, radio stations, and television stations in Schuylkill County region. Flyers announcing the hearings were distributed in the community. The draft EIS was sent to stakeholders including federal, state, and local agencies, environmental groups, and public citizens for their review and comment. Copies of the draft EIS were made available at the Pottsville Public Library, Frackville Public Library, Mahanoy City Public Library, and the library at the Mahanoy State Correctional Institution.

Publication of the Notice of Availability initiated the public comment period. DOE conducted two formal public hearings to receive comments on the draft EIS: the first was on January 9, 2006, at Shenandoah Valley Junior/Senior High School in Shenandoah, Pennsylvania, and the second was on January 10, 2006, at D.H.H. Lengel Middle School in Pottsville, Pennsylvania. An informational session was held prior to each of these hearings for the public to learn more about the proposed project. The public was encouraged to provide oral comments at the hearings and to submit written comments to DOE by the close of the comment period on February 8, 2006. Testimony was presented by a total of 28 persons during the public hearings, and DOE received correspondence from 95 members of the public, interested groups, and federal, state, and local officials, as well as over 400 inmates at the Mahanoy State Correctional Institution. The comments helped to improve the quality and usefulness of the EIS. Among the topics or issues raised in the comments were concerns about:

- *Air emissions (SO_x, NO_x, CO_2, CO, particulates, hazardous air pollutants, volatile organic compounds) during operation*
- *Fugitive dust*
- *Fog*
- *Odor, noise, and visual aesthetics*
- *CO_2 emissions and carbon sequestration*
- *Health impacts to the public, plant workers, and employees and inmates of the Mahanoy State Correctional Institution*
- *Contamination of surface water, groundwater, and drinking water*
- *Disposal of byproducts and waste*
- *Impacts to transportation, including accidents*
- *Emergency response to onsite accidents*
- *Property values, job creation, and environmental justice*
- *Project economics and use of tax revenues*
- *Alternatives to the proposed action*
- *Cumulative impacts*

Generally, in responding to these comments, DOE revised the appropriate sections of the EIS to provide the requested information or further explore areas of potential impact. In addition, WMPI has agreed to certain measures to reduce and mitigate potential impacts. For example, pollution prevention and mitigation measures would be incorporated by WMPI as part of the design of the proposed project. A description of these measures is provided in Section 4.2 and Table

4.2.1. All comments on the draft EIS and corresponding responses by DOE are contained in Appendix D of this final EIS. Where responses to comments have initiated changes that appear in the final EIS, they have been so noted in the comment response.

On January 12, 2007, a Notice of Availability was published in the Federal Register (72 FR 1710) to invite comments on the Supplement to the Draft EIS (DOE/EIS-0357D-S1). The Supplement was issued to correct estimates of CO_2 emissions from the proposed plant that were published in the draft EIS, and to provide additional information regarding CO_2 releases and CO_2-related cumulative impacts. The comment period for the Supplement to the DEIS ended on February 27, 2007. The Supplement is included as Appendix E of this final EIS. All comments on the Supplement to the draft EIS and corresponding responses by DOE are contained in Appendix F. Appendices D, E, and F are presented in Volume 2 of this EIS.

1.6 SCOPE OF THE ENVIRONMENTAL IMPACT STATEMENT

The following issues were initially identified as requiring analysis and assessment in the EIS and were included in the Notice of Intent:

1. Atmospheric Resources: potential air quality impacts resulting from emissions during construction and operation of the proposed facilities, including odor impacts;
2. Water Usage: potential effects on surface and groundwater resources, including impacts from withdrawals of groundwater and mine pool water from the Susquehanna River and Delaware River watersheds;
3. Water Quality: potential impacts resulting from wastewater treatment and discharge, from water usage, and from reclaiming abandoned anthracite coal waste (culm);
4. Infrastructure and Land Use, including Potential Environmental and Socioeconomic Effects Resulting from: plant construction; delivery of feed materials; recovery of coal waste and mine pool water; steam and heat distribution; electric power generation and transmission; product hydrocarbon liquids transportation, distribution, and use; measures to prevent soil erosion and degradation; and site restoration;
5. Solid Waste: pollution prevention and waste management, including ash, slag, and wastewater treatment facility sludge;
6. Noise: potential impacts resulting from construction and operation of the proposed plant and from transportation of feed materials and plant products;
7. Construction: potential impacts associated with traffic patterns, construction-related emissions, and involvement of floodplains and wetlands;
8. Safety and health impacts, including construction-related safety, process safety, and management of chemicals and catalysts;
9. Ecological: potential onsite and offsite impacts to vegetation, terrestrial wildlife, aquatic wildlife, threatened and endangered species, and ecologically sensitive habitats;

10. Community impacts, including potential impacts from local traffic patterns, socioeconomic impacts on public services and infrastructure, and environmental justice;

11. Visual impacts associated with plant structures and plant operations;

12. Reclamation Impacts: potential impacts resulting from recovery of coal waste from disposal and reclamation sites;

13. Cumulative effects that result from the incremental impacts of the proposed project when added to the other past, present, and reasonably foreseeable future projects, including the existing 80-MW Gilberton Power Plant and other power plants in the area;

14. Connected actions, including processing of gasifier slag into aggregate for use in construction applications, use of heat and energy from the plant, and both processing and use of liquid hydrocarbon products;

15. Compliance with regulatory requirements and environmental permitting; and

16. Environmental monitoring.

During the scoping process (Section 1.5), local residents expressed concerns about potential effects that could result from the proposed project. The issues of most concern were: (1) potential impact to air quality from emissions, including hazardous air pollutants, from the proposed facilities; (2) potential effect on surface and groundwater resources by the withdrawal and discharge of water associated with process use; and (3) potential impact of solid waste generated by the proposed facilities. Most of these concerns related to effects on human health, such as potential deterioration in respiratory function and potential increases in occurrences of cancer. Other concerns that were expressed during the scoping process were the potential for odorous emissions; the possibility of emissions reducing atmospheric visibility and creating safety issues such as fog affecting Interstate 81; airborne emissions resulting from vehicles traveling over red anti-skid material (bottom ash from the Gilberton Power Plant) applied to roads; increased traffic and emissions from trucks; potential noise impacts; potential effects on ecological resources including endangered species; potential depreciation of property values; potential effects on historic properties; effect of the proposed project on local taxes; potential impacts to inmates at two nearby state prisons; environmental justice; regulatory requirements; the possibility of accidents and spills; cumulative impacts from the proposed facilities in conjunction with existing cogeneration facilities; global warming impacts; the use of alternative feedstocks by the proposed facilities; alternative sites; alternative technologies; and comparisons of technologies and impacts with those of the operating coal-to-oil facilities in South Africa.

DOE used public input obtained during the scoping process to add to the list of issues requiring analysis and assessment and to provide additional focus to analysis of initially identified issues. Table 1.6.1 lists the composite set of issues identified for consideration in the EIS (i.e., issues identified in the Notice of Intent, and additional issues identified during public scoping that expanded the scope of the assessment). Issues are analyzed and discussed in this EIS in accordance with their level of importance. The most detailed analyses focus on issues associated with air quality, surface water, groundwater, and solid waste impacts.

Table 1.6.1. Issues identified for consideration in the environmental impact statement

Issues identified in the Notice of Intent		
Atmospheric resources	Construction	Reclamation impacts
Water usage	Safety and health impacts	Cumulative effects
Water quality	Ecological impacts	Connected actions
Infrastructure and land use	Community impacts	Compliance
Solid waste	Visual impacts	Environmental monitoring
Noise		
Additional issues identified during public scoping that expanded the scope of the assessment		
Property values	Inmates at prisons	Alternative feedstocks
Historic properties	Accidents and spills	Technology and impact comparisons

1.7 APPROACHES AND ASSUMPTIONS

The following approaches are used and assumptions are made in this EIS:

- Except as specifically noted in the text, potential environmental effects of the proposed facilities are based on the operating characteristics discussed in Section 2.
- One major exception to the above is that air quality impacts predicted by air dispersion modeling are based on the conservative assumption that the proposed facilities operate at a 100% capacity factor rather than the expected 85% capacity factor.
- Potential environmental impacts are assessed for the surrounding environment (beyond the boundary of the facilities), as described in Section 3.
- Potential environmental impacts resulting from construction and operation of the proposed facilities during the demonstration period are assessed in Section 4. Section 5 addresses potential impacts of commercial operation following completion of the demonstration.

2. THE PROPOSED ACTION AND ALTERNATIVES

This section discusses the proposed action, the no-action alternative, and alternatives dismissed from further consideration.

2.1 PROPOSED ACTION

The proposed action is for DOE to provide cost-shared funding for the design, construction, and demonstration of proposed facilities near ***the borough of*** Gilberton, Pennsylvania, to produce electricity, steam, and liquid fuels from coal waste by integrating coal gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels (Section 1.3). The proposed action described in the following sections is DOE's preferred alternative.

2.1.1 Project Location and Background

The site for the proposed project is located adjacent to the existing Gilberton Power Plant near the borough of Gilberton ***in the western portion of Mahanoy Township*** in Schuylkill County, Pennsylvania (Figure 2.1.1 and Figure 2.1.2). The area is primarily rural with a mixture of industrial, commercial, and residential land use in the vicinity. The site is about 1 mile north of Interstate 81 and 2 miles east of State Highway 61. The city of Pottsville is located about 8 miles to the south of the site. The city of Reading lies 35 miles to the south-southeast, the city of Harrisburg is situated 50 miles to the southwest, and the city of Scranton is located slightly over 50 miles to the northeast. The main plant for the proposed project would occupy about 75 acres of nearly level land owned by WMPI PTY, LLC on top of Broad Mountain. The land is currently an undisturbed forested area, ***except for about 15 acres of the site that WMPI cleared at its own risk in 2006.***

WMPI's Gilberton Power Plant began operation in 1988 and employs about 150 people. The plant generates from two circulating fluidized-bed boilers a total of approximately 80 MW (net) of electricity for the regional power grid and provides 800,000 lb of steam per hour to heat a nearby state prison and to dry coal. As a comparison, if all of the energy were used to generate electricity rather than also providing steam, the power plant would generate about 82 MW (net). The plant annually burns about 640,000 tons of anthracite coal waste (culm) for fuel. Culm consists of rock and coal with varying amounts of carbon material remaining after removal of higher-quality saleable coal. The principal structures of the existing plant, which occupy about 6 acres of the 20-acre cleared site, are the boiler building, turbine building, administration building, raw water treatment building, water storage tanks, circulating water pump house, mechanical-draft cooling towers, baghouses for particulate control, and solid waste silo. The plant provides electricity to the adjacent Hauto-Frackville #3 69kV transmission line. Coal mining and disposal of coal combustion byproducts occur on a portion of the 36,000 acres of WMPI land in the local area. Bottom ash and fly ash from the Gilberton Power Plant are either sold (e.g., for use as road aggregate) or used on WMPI land to restore the contours of land changed by strip mining. The closest railroad siding is about 1 mile away near the borough of Gilberton ***(Figure 2.1.2)***.

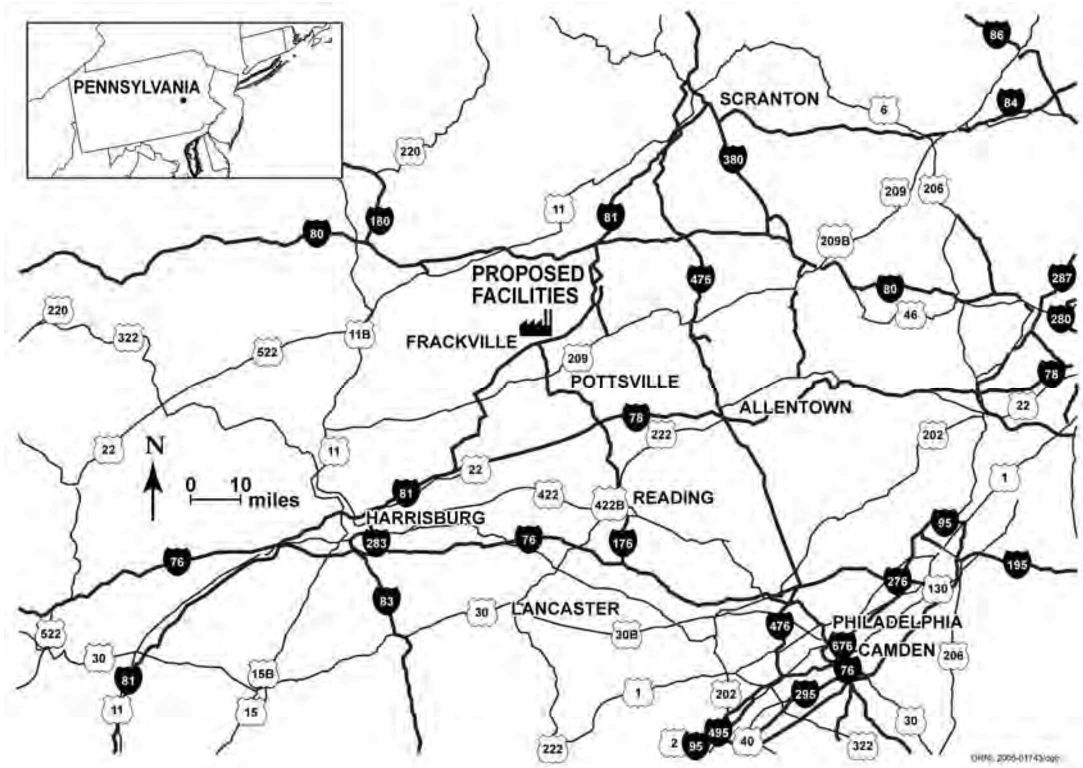

Figure 2.1.1. General location of proposed facilities.

2.1.2 Technology and Project Description

The proposed facilities would use coal waste to produce electricity, steam, and high-quality liquid fuels, including low-sulfur and low-nitrogen diesel fuel and naphtha, by integrating the coal gasification and F-T synthesis technologies. The primary feedstock would be low-cost anthracite culm, which is a locally abundant, previously discarded resource that could accommodate fuel requirements ***during the demonstration period and for some time thereafter. However, according the original proposal, the facilities would also be capable of using a blend of feedstock containing up to 25% petroleum coke. Petroleum coke is a high-sulfur, high-energy product having the appearance of coal. Oil refineries produce petroleum coke by heating and removing volatile organic compounds (VOCs) from the residue remaining after the refining process. Due to the expected effectiveness of the facility's gas cleanup system, if petroleum coke were to be used as part of a blended feedstock to the gasifier, air emissions would not be significantly affected by feedstock composition. As a result, if petroleum coke were used, air emissions would be expected to remain within the permitted levels for criteria pollutants and hazardous air pollutants identified in Section 4.1.2.2. Because of the low ash content of petroleum coke, its use would reduce the facilities' production of gasification slag, but production of byproduct sulfur would increase due to the higher sulfur content of petroleum coke (Appendix G).***

Figure 2.1.2. Location of proposed main plant and ancillary facilities.

The facilities would produce about 5,000 barrels of liquid fuels per day and 41 MW of electricity for export to the regional power grid by tapping into the nearby, existing Hauto-Frackville #3 69kV transmission line. The net efficiency would be about 45%, compared to an efficiency of about 33% for a traditional coal-fired power plant and about 40% for a state-of-the-art integrated gasification combined-cycle power plant, which uses synthesis gas derived from coal to drive a gas combustion turbine and exhaust gas from the gas turbine to generate steam from water to drive a steam turbine.

Regulated air emissions from the facilities would be small (Section 2.1.6.1), especially for sulfur dioxide (SO_2), because most of the sulfur would be removed from the synthesis gas prior to conveying the gas to the F-T liquefaction facilities and to a combined-cycle power plant, which is part of the proposed project. The use of anthracite culm would ***support*** reclamation of land currently ***occupied by*** culm ***banks***.

The proposed project would provide the first demonstration of integrating the coal gasification and F-T technologies, both of which have been commercially demonstrated individually. For coal gasification, the project would use Shell technology, which has operated commercially using coal feedstock in the Netherlands since the 1990s. For liquefaction, the SASOL F-T technology would be used, which has operated commercially in South Africa since the 1980s. One of the objectives of the proposed project would be to demonstrate the economic viability of the integrated technologies. To reduce costs, the project would take advantage of existing local infrastructure, including rail, water, and transmission lines. To accelerate deployment to potential customers, the integrated technologies would include systems that would be adapted easily to construction and operation by utilities and petroleum industries. Figure 2.1.3 displays a generalized diagram of the technologies integrated into the proposed facilities.

The integration of these complex technologies offers potential economic and environmental advantages by allowing byproducts of some processes to be used as feedstock in other onsite processes. While the technology description includes the byproducts that are recycled into other processes, the environmental impacts of operations would result primarily from the energy and materials that enter and exit the overall system. To aid understanding of the proposed facilities and their environmental impacts, Figure 2.1.4 provides a simplified schematic that identifies inputs and outputs associated with major system components. Materials that would be recycled between the major system components are omitted.

2.1.2.1 Gasification Technology

The Shell gasification technology consists of the following six major processes (with subprocesses in parentheses): air separation, feedstock preparation (beneficiation, milling and drying), gasification and cooling (pressurization and feeding, gasification, high-temperature synthesis gas cooling, fine solids removal, scrubbing, sour water stripping), sour water-gas-shift and cooling, acid

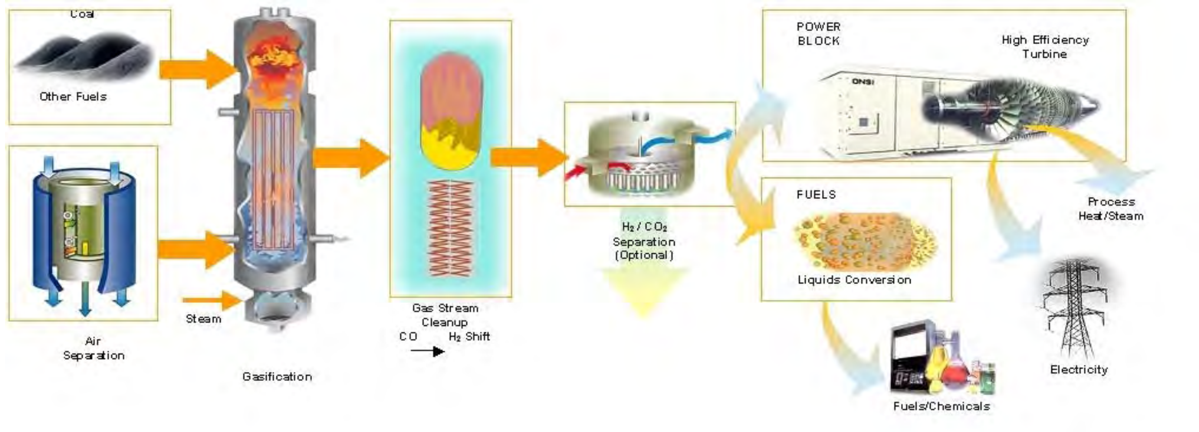

Figure 2.1.3. A generalized diagram of the technologies integrated into the proposed facilities.

gas removal, and sulfur recovery and tail gas treating. The air separation unit would supply high-pressure oxygen (95% purity) to the gasifier and nitrogen (at least 99% purity) for culm feed pressurization and conveying and, if needed, for acid gas removal and other plant services.

To provide a consistent culm feed to the Shell gasification facilities, a new beneficiation plant or expansion of the existing facility in the adjacent valley to the north of the main plant area would be required to remove lower-quality material (e.g., rock) in the culm. The culm (sized as large as 3 ft upon arrival at the beneficiation plant) would be screened mechanically by bars that would tend to exclude the large, break-resistant rock, while allowing the higher-quality material to split and pass between the bars. As with the existing beneficiation plant, a flotation process would subsequently be used to separate the higher- and lower-quality material passing through the mechanical screening. The higher-quality material would be less dense and would tend to float, while the lower-quality material would be denser and would tend to sink. The mechanically excluded rock and lower-quality material separated during flotation would be trucked from the beneficiation plant for reclamation of local coal stripping pits.

After flotation, the higher-quality anthracite culm from the beneficiation plant (sized no greater than 1 in.) would be transported by conveyor belts to the Shell gasification facilities. The culm would be ground and dried to a size suitable for efficient gasification (i.e., no greater than 50 μm). Micronized limestone would be injected into the culm stream in the milling and drying unit from a silo located in the main plant area. A bag filter would limit airborne particles from milling and drying.

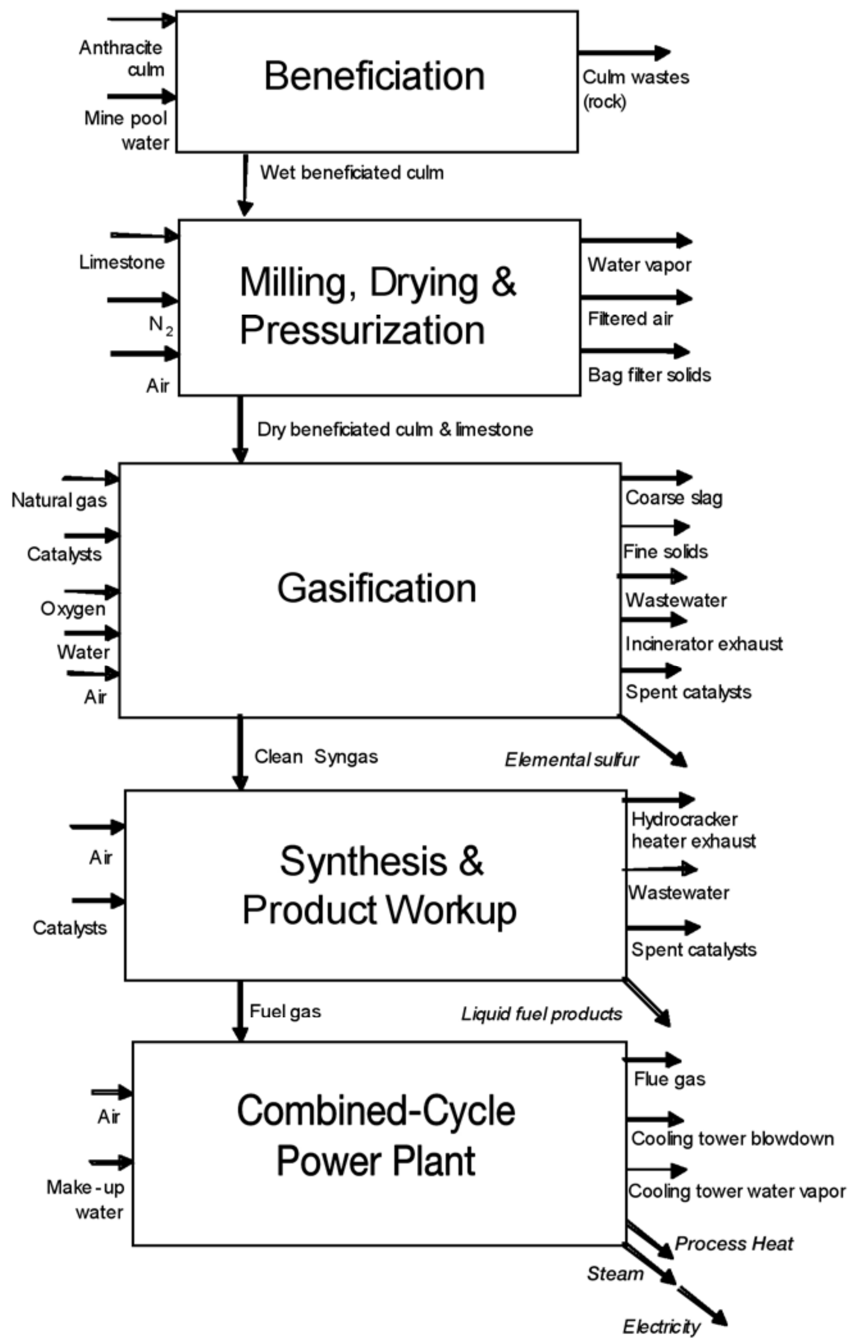

Figure 2.1.4. Simplified schematic that identifies inputs and outputs associated with major system components of the proposed project.

Milled and dried culm and limestone would be transported to the culm pressurization and feeding system by transport screws and rotary feeders. Pressurized culm and limestone would be withdrawn from feed vessels and pneumatically conveyed with nitrogen to the gasifier's burners. The pressurized feedstock and oxygen would enter the gasifier through pairs of opposed burners.

The gasifier would consist of a vessel operating at high temperature (i.e., above 2,700°F) and high pressure (i.e., about 700 lb per square inch) with a water-cooled internal wall chamber. An opening at the bottom of the gasifier would remove slag, and an opening at the top would allow hot synthesis gas and fine solids to exit. Most of the mineral content in the feed would leave the gasifier in the form of molten slag. The high gasifier temperature and limestone would ensure that molten slag flows freely down the reactor wall into a water-filled compartment at the bottom of the gasifier, where the molten slag would be quenched, solidified, and removed. Negligible non-methane hydrocarbons would be present in the synthesis gas because of the high temperature and high carbon conversion (greater than 99%) associated with the Shell gasification technology.

The hot raw synthesis gas leaving the gasification zone would be quenched with cooled, recycled synthesis gas from the synthesis gas cooler to convert any entrained molten slag into a hardened solid material prior to entering the synthesis gas cooler. Heat released during the cooling of the synthesis gas would be recovered by generating steam from water. The fine solids contained in the synthesis gas leaving the cooler would be removed using commercially available filters and sent to a silo for temporary storage prior to final disposal. Synthesis gas leaving the fine solids removal section would be cleaned and cooled further by a wet venturi scrubbing unit, which would remove any residual fine solids to a level of less than 1 ppm and would also remove minor contaminants such as soluble alkali salts and hydrogen halides. Make-up water would be added continuously to the wet scrubbing unit to compensate for evaporative losses and to generate a blowdown stream to control the concentration of contaminants. The contaminated water would be sent to a sour water stripping plant to remove hydrogen sulfide (H_2S), ammonia, and other soluble gases prior to a portion of the water being used as make-up for slag quenching. In the stripping plant, low-pressure steam would provide the necessary heat and stripping medium. Residual solids would be removed and recycled to the culm milling and drying unit. The remaining wastewater from the stripping plant would be combined with other effluents from the facilities and delivered to a new onsite wastewater treatment facility dedicated to the proposed facilities.

The raw synthesis gas leaving the stripping plant would be sent to the sour water-gas-shift facility where the hydrogen-to-carbon monoxide (H_2-to-CO) equilibrium ratio would be shifted. Specifically, a chemical reaction would occur in which a fraction of the CO would be oxidized to form carbon dioxide (CO_2), while steam (H_2O) would be reduced to produce H_2 to increase the H_2-to-CO ratio for optimum F-T synthesis. Prior to F-T synthesis, H_2S would be removed from the shifted synthesis gas in the acid gas removal plant using a Rectisol unit and would be converted to marketable elemental sulfur in a Claus sulfur recovery unit. ***More sulfur compounds would be removed from the synthesis gas by passing the tail gas from the Claus unit through a SCOT (Shell Claus Off-gas Treating) process) unit, which additionally improves the efficiency of the Claus unit.***The Rectisol unit would also recover CO_2 (although not all of the CO_2 produced by the integrated technologies) in a concentrated stream. The off-gas stream exiting the Rectisol unit, as well as the concentrated CO_2 stream would be sent to a thermal oxidizer. Any trace organic contaminants would be oxidized to less noxious elements and compounds prior to release ***of the off-gas and*** CO_2 through a stack to the atmosphere, ***together with the concentrated*** CO_2 ***stream from the Rectisol unit (see Section 2.1.6)***.

The gasification facilities would process daily about 4,700 tons (dry) of ***beneficiated*** anthracite culm and 430 tons of limestone to generate about 220 million standard ft^3 of synthesis gas consisting primarily of H_2 and CO gases. The facilities would also produce daily about 800 tons of coarse slag and 200 tons of fine solids on a dry basis. The Shell gasification technology has the flexibility to gasify anthracite culm with an ash content of up to 40%.

2.1.2.2 Fischer-Tropsch Technology

The F-T technology consists of the following three major processes: F-T synthesis, product work-up, and effluent water primary treatment. The F-T synthesis plant would consist of a catalyst reduction unit and an F-T synthesis unit. To maintain a constant level of F-T catalyst, the catalyst reduction unit would activate fresh catalyst for use in the F-T slurry reactor to compensate for deactivated catalyst. Pure H_2 and synthesis gas would be required for the catalyst reduction and conditioning operation. The F-T synthesis unit would consist of the F-T slurry reactor and primary product recovery facilities. The synthesis unit would convert the shifted, clean synthesis gas containing H_2 and CO into hydrocarbon products, including wax and hydrocarbon condensate, reaction water, and tail gas (unreacted synthesis gas and light hydrocarbons from F-T synthesis). A portion of the tail gas would be recycled to increase the overall F-T synthesis conversion, while the remainder would be sent to a high-pressure fuel gas system for routing to the combined-cycle power plant.

In the product work-up section, the F-T wax and hydrocarbon condensate streams would be converted into the final products (i.e., diesel fuel and naphtha). The operation would also produce additional light hydrocarbon materials, which would be consumed as fuel within the plant.

The reaction water would be sent to the effluent water primary treatment unit (i.e., a fractionation column). The reaction water would contain a small quantity of oxygenates, including alcohols, ketones, aldehydes, and carboxylic acids, which are byproducts of the synthesis reaction. The effluent water primary treatment unit would remove the non-acid oxygenates prior to treatment of the effluent water at the wastewater treatment facility. Oxygenates would be recycled to the gasification facilities where their energy content would be recovered.

The F-T synthesis facilities would process the 220 million standard ft^3 of synthesis gas to produce approximately 5,000 barrels of F-T liquids per day, of which 3,700 barrels would be diesel fuel and 1,300 barrels would be naphtha. While the proposed plant would be designed to maximize diesel production with naphtha as a byproduct, the plant would have the flexibility to produce different mixes of products.

2.1.2.3 Combined-Cycle Power Plant

The combined-cycle power plant would use the excess fuel gas from the facilities to generate electricity using a gas ***combustion*** turbine and ***two*** steam turbines ***(Figure 2.1.4)***. Steam would be injected into the gas turbine combustor to control oxides of nitrogen (NO_x) emissions by reducing the combustion temperature. Exhaust flue gas from the gas ***combustion*** turbine would be conveyed to a heat recovery steam generator (HRSG) to generate steam for producing additional electricity in ***two*** steam turbines. The total amount of electricity generated would be approximately 133 MW, of which 92 MW would be consumed internally by the proposed facilities and 41 MW would be exported to the regional power grid. Ammonia would be injected into the cooled flue gas to reduce NO_x and CO in a selective catalytic reduction reactor. A stack would then discharge the flue gas to the atmosphere.

2.1.3 Construction Plans

Construction of the proposed facilities would ***take about 2-1/2 years***. Site preparation would include clearing of trees and other vegetation, site leveling and contouring, and construction of onsite roads, parking lots, fences, and stormwater drainage areas. Roads and parking lots would be constructed of asphalt or concrete on a crushed limestone base. Site preparation would also involve construction of load-bearing concrete piers and foundations for heavy and settlement-sensitive structures. Excavation would be performed for footings, grade beams, pits, basements, retaining walls, and catch basins. Topsoil removed during site preparation would be stored in stockpiles and later spread on finished contoured areas. Following site preparation, other phases of construction would include mechanical installation, piping interconnection, electrical installation, and instruments and controls configuration.

Construction materials would consist primarily of structural steel beams and steel piping, tanks, and valves. Locally obtained materials would include crushed stone, sand, and lumber for the proposed facilities and temporary structures such as enclosures, forms, and scaffolding. Components of the facilities would also include concrete, ductwork, insulation, and electrical cable.

Most of the materials would be delivered to the site by truck. A truck loading and unloading area would be built at the main plant site. If economically feasible, shipping by rail would also be an option for heavier components. The closest rail siding is approximately 1 mile away. From the rail siding, the components would be trucked to the site. Special permits and advanced planning would be required.

Large, pre-fabricated equipment (e.g., gasifier, F-T reactor) would likely be transported by ship or barge to the USX facility at Fairless Hills, Pennsylvania, on the Delaware River about 90 miles southeast of the proposed site. At the facility, the load would be transferred to truck for transport to the site. The USX facility is experienced with handling heavy loads and would be a viable option as part of optimizing highway routes and obtaining permits.

An average of 516 construction workers would be at the site during the construction period; approximately 1,000 workers would be required during the peak construction period. An average of about 50 vehicles would be used for construction activities on the site.

Land requirements during construction and operation are discussed in Section 2.1.5.1.

2.1.4 Operational Plans

After mechanical checkout of the proposed facilities, demonstration (including performance testing and monitoring) would be conducted over a 3-year period ***following the completion of construction***. The project would demonstrate high-capacity operation and reliability of the facilities. About 250 workers would be required during the demonstration, of which approximately 150 would be plant operators with the remaining employees a mix of craft workers, managers, supervisors, engineers, clerical workers***, and others temporarily assigned to the site to test equipment and gather data***. An average of about 50 vehicles would be used for operational activities on the site.

The truck loading and unloading area would be capable of handling all liquid fuels and byproducts generated by the proposed facilities, as well as required materials such as catalysts and chemicals. However, the liquid fuels are planned to be shipped from the facilities solely by rail.

If the demonstration is successful, commercial operation would follow immediately (Section 5). About 150 workers would be required for long-term operations. The facilities would be designed for a lifetime of ***50*** years, including the 3-year demonstration period.

2.1.5 Resource Requirements

Table 2.1.1 summarizes the operating characteristics, including resource requirements, for the proposed facilities.

2.1.5.1 Land Area Requirements

Figure 2.1.5 displays a preliminary layout of the proposed main plant. About 9.5 acres of land would be required during construction for equipment/material laydown, storage, assembly of site-fabricated components, staging of material, and facilities to be used by the construction workforce (i.e., offices and sanitary facilities). The land for these temporary facilities would be situated adjacent to the truck loading area within the southeast quadrant of the 75-acre main plant site.

The new beneficiation plant or expansion of the existing facility in the adjacent valley to the north of the main plant area would probably require about 1 acre of land. In addition, slightly over 1 acre would be cleared from the main plant site to the beneficiation plant and railroad siding to establish a 5,000-ft long, 12-ft wide corridor. The corridor would accommodate (1) a new water supply pipeline transporting mine pool water from the existing pump house, (2) two new product pipelines transporting naphtha and diesel fuel to holding tanks in the railroad car loading area, and (3) possibly a new culm feed conveyor, which would traverse adjacent to the existing conveyor. All of these proposed items would be installed above ground. Similarly, about 0.5 acres would be cleared for a 2,000-ft by 12-ft path along which a new, aboveground wastewater line would run by gravity flow from the main plant site to an existing tailings pond to the north. About 0.4 acres would be cleared for a 1,500-ft by 12-ft corridor in which a new, buried natural gas line would run to the main plant site

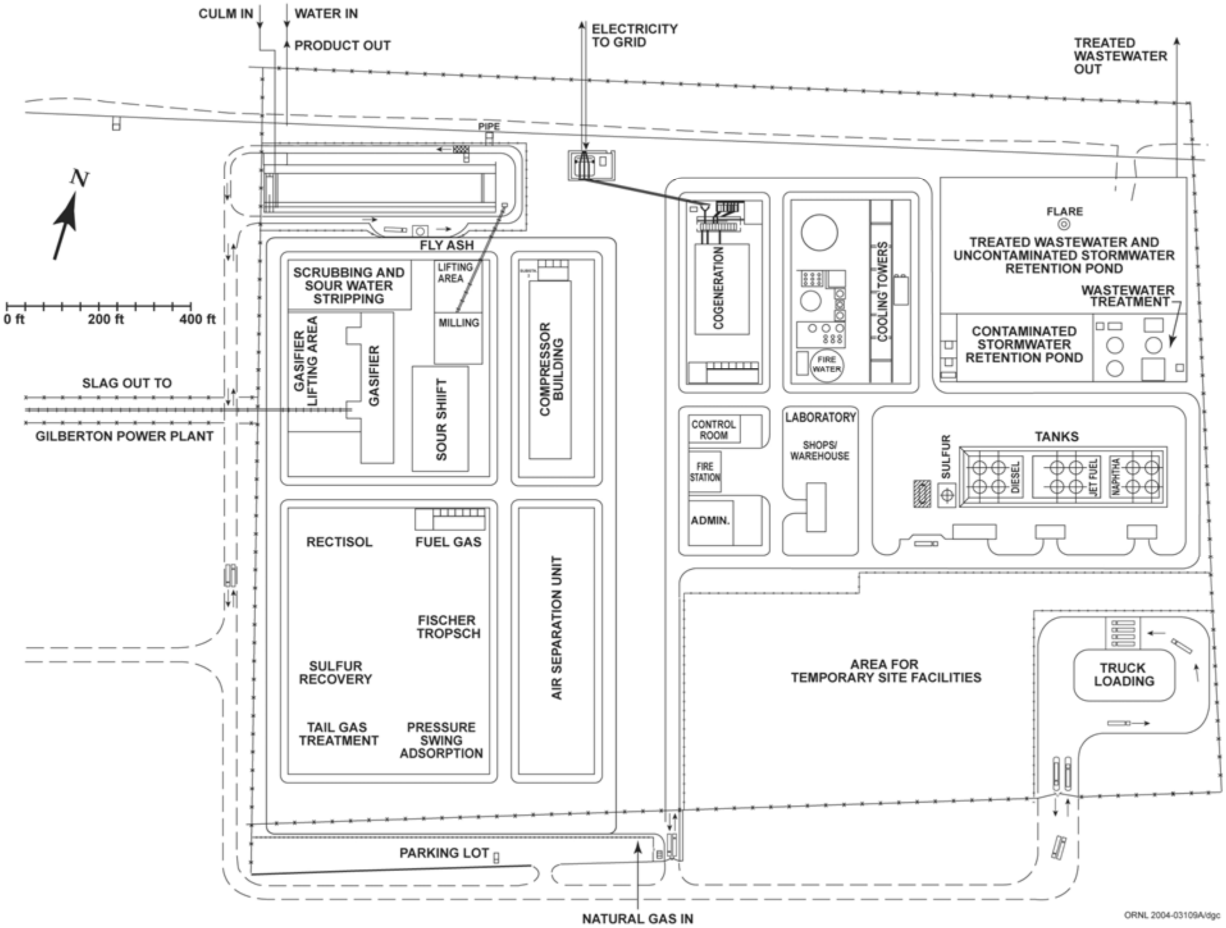

Figure 2.1.5. Preliminary layout of proposed main plant.

from the existing connection to the south. A minimal amount of land would be required for a new, 300-ft above-ground line to tap into the existing Hauto-Frackville #3 69kV transmission line immediately to the north of the main plant site. During operation, the land used previously for construction staging and lay down at the main plant site would be used for parking and other purposes.

2.1.5.2 Water Requirements

Water would be used during construction of the proposed facilities for various purposes including personal consumption and sanitation, concrete formulation, preparation of other mixtures needed to construct the facilities, equipment wash down, general cleaning, dust suppression, and fire protection. Water would be obtained from the Gilberton mine pool (a man-made aquifer resulting from a network of voids produced during underground mining activities) (Section 3.4.3). The water would be purified to a potable quality using demineralization and reverse osmosis at the main plant site as part of the

Table 2.1.1. Anticipated operating characteristics of the proposed facilities

Basic data	
Size of main plant site	75 acres
Capacity factor [a]	85%
Production capacities	
Liquid fuels	
Diesel fuel	3,700 barrels/day
Naphtha	1,300 barrels/day
Electricity	
Consumed internally	92 MW
Exported	41 MW
Byproducts	
Surplus steam	0 lb/hour [b]
Elemental sulfur	4,000 tons/year
Resource consumption	
Anthracite culm ***(beneficiated)***	***1,468,000*** tons/year [b]
Petroleum coke	0 tons/year [b]
Limestone	134,000 tons/year
Methanol	11,400 gal/year
Sulfuric acid	5,000 gal/year
Ammonia	3,200 gal/year
Natural gas	17,000,000 BTU/hour[c]
Water	
Cooling tower make-up water	2,744 gpm
Water supply to main plant[d]	1,035 gpm
Water supply to beneficiation plant(s)	1,667 gpm

[a] Capacity factor is the percentage of energy output during a period of time compared to the energy that would have been produced if the equipment operated at its maximum power throughout the period.

[b] Based on the most likely operational scenario, including using anthracite culm alone.

[c] Assuming 85% capacity and a constant rate of gas consumption during full operation, this equates to 127 billion BTU/year or 123 million ft^3 (mcf) of natural gas at 1,031 BTU/ ft^3. Because the rate of gas consumption would not be constant, actual annual consumption would be less.

[d] Includes 4 gpm for potable water supply.

Table 2.1.1. Anticipated operating characteristics of the proposed facilities (continued)

Effluents	
Air emissions[e]	
Sulfur dioxide (SO_2)	29 tons/year
Oxides of nitrogen (NO_x)	70 tons/year
Particulate matter (PM)	23 tons/year
Carbon monoxide (CO)	54 tons/year
Volatile organic compounds (VOCs)	28 tons/year
Hazardous air pollutants	<10 tons/year (individual) <25 tons/year (combined)
Ammonia	<100 tons/year
Sulfuric acid mist	<15 tons/year
Carbon dioxide (CO_2) ***from thermal units***	832,000 tons/year
Carbon dioxide (CO_2) from Rectisol unit	***1,450,000 tons/year***
Wastewaters	
Effluents from intake water treatment[f]	***479*** gpm
Process streams[g]	***332*** gpm
Cooling tower blowdown	877 gpm
Boiler blowdown and process condensate[h]	***159 gpm***
Contaminated stormwater runoff (annual average flow)[i]	***44 gpm***
Sanitary wastewater	4 gpm
Solid wastes	
Coarse slag (dry basis)	250,000 tons/year
Fine solids (dry basis)	62,500 tons/year
Iron sludge (dry basis)	3,400 tons/year
Wastewater treatment sludge	4,000 tons/year
Spent iron-based ***F-T*** catalysts	***810*** tons/year
Reprocessable spent catalysts, adsorbents, and resins from production or water treatment	***4,400 ft^3/year***
Reprocessable spent adsorbents from instrument air drying	***2.5 tons/year***
Anthracite/sand filter material	***275 ft^3/year***
F-T precoat material	***1550 ft^3/year***
Spent filter cartridges from air, water, or hydrogen processing	***110 units/year***

[e] Potential-to-emit annual emissions included in the air permit application submitted to the Pennsylvania Department of Environmental Protection were slightly greater because those emissions included other sources such as fugitive dust from facility vehicles traveling on roads. Specifically, those annual emissions were listed as 34 tons of SO_2, 72 tons of NO_x, 49 tons of PM, 64 tons of CO, and 33 tons of VOCs.

[f] ***Includes water treatment purges from treating mine pool water for use in the cooling tower (110 gpm), as well as reverse osmosis purges (360 gpm) and demineralizer regeneration wastes (9 gpm) from treating mine pool water for in-plant use.***

[g] ***Includes stripped sour water (28 gpm), F-T wastewater (124 gpm), Rectisol purge water (36 gpm), gasifier purge (106 gpm), and plant water return (38 gpm). These wastewater streams would be treated in the onsite wastewater treatment facilities.***

[h] ***Includes polisher regeneration wastewater (6 gpm), recovery condensate purge (110 gpm), and boiler blowdown (43 gpm).***

[i] ***Estimated from average annual precipitation and the size of the area contributing contaminated runoff. Onsite wastewater treatment facilities would be designed to treat contaminated runoff at a rate of 151 gpm.***

plant process water system. Potable water use during construction would average about 1 gpm. Portable toilets would minimize requirements for additional sanitary water.

During operation, all water for process and potable needs would be drawn from the Gilberton mine pool. ***A combined total of about 1,667 gpm of mine pool water would be used in the flotation process to prepare culm for the new facilitie****s and* ***the existing Gilberton Power Plant. About 29% of this water (an average of 487 gpm) would be retained in culm delivered to the proposed facilities or to the existing Gilberton Power Plant, but the majority (about 1,180 gpm) would be*** transported by pipeline to an existing tailings pond (Figure 2.1.2) for percolation back to the ***underlying*** mine pool ***system***. About ***1,035*** gpm would be withdrawn for process and potable water needs at the main plant site and would be purified to a potable quality using demineralization and reverse osmosis at the main plant site. Table 2.1.2 itemizes the process water requirements for the proposed facilities. ***Figure 2.1.6 provides a graphical summary of facility water use and effluents.*** Process water consumed at the main plant site would total about ***557*** gpm, primarily from (1) moisture loss in the wet slag and fines byproducts, (2) reaction losses to produce hydrogen in the gasification facilities, and (3) reaction losses to produce additional hydrogen in the sour water-gas-shift facility. Most of the remaining used process water would be treated in the wastewater treatment plant, conveyed to a synthetic-lined retention pond, and transported by a gravity-flow pipeline to the tailings pond. Potable water needs during operation would be about 4 gpm.

A closed-loop cooling water system would be installed to meet the cooling requirements of the gasification facilities, F-T synthesis facilities, and the combined-cycle power plant. The cooling system would feature a bank of 12 mechanical-draft cooling towers with 6 operating circulation pumps plus a spare to deliver a total circulation rate of 120,000 gpm. About 2,744 gpm of make-up water would be drawn from the mine pool to compensate for evaporation and blowdown from the cooling towers. Because the mine pool water is acidic with a high level of iron, aeration and pH adjustment would be required to remove the iron and improve the water quality to an acceptable level for use in the cooling towers. About ***two-thirds*** of the ***cooling water*** would ***be lost to*** evaporation, while nearly all of the remaining amount would be blowdown discharged from the cooling towers to the wastewater treatment plant for the purpose of controlling the level of total dissolved solids in the cooling water. About 1 gpm of water droplets would escape beyond the cooling towers' drift water eliminators to the atmosphere. Chemicals for biocide and corrosion inhibition would be injected into the circulating and make-up water.

As detailed in Table 2.1.2, on average a total of 5,446 gpm (7.8 million gal/day) would be withdrawn from the mine pool to support operations of the proposed facilities. (This total includes the continuation of an ongoing withdrawal of water for beneficiation of culm for the existing Gilberton Power Plant.) A total of 2,314 gpm (3.3 million gal/day) would be consumed in processing or by evaporation, and 3,027 gpm (4.4 million gal/day) would be discharged to the tailings pond.

Table 2.1.2. Water balance for the proposed facilities (flow rates in gpm) ***[Extensively revised since Draft EIS]***

	Coal beneficiation[a]		Production facilities		Cooling towers		Totals
Input	Pumped from mine pool	1,667	Pumped from mine pool	1,035	Pumped from mine pool	2,744	**5,446**
			Contained in beneficiated coal	386[b]			
			Total water input	1,421			
Output			**Water consumption, transfers, and losses**				
	Contained in beneficiated coal supplied to new facilities	386[b]	Boiler feedwater deaerator vent	0.4	Evaporation and drift loss	1,757	
			Gas turbine steam injection	161			
	Contained in beneficiated coal supplied to Gilberton Power Plant	101	Net process consumption and losses	372			
			Plant consumption[c]	24			
	Total transfers outside new facilities	101					**101**
			Total consumption and losses	557	*Total consumption and losses*	1,757	**2,314**
			Discharge to tailings pond				
	Coal beneficiation plant wastewater	1,180	Mine pool water treatment (reverse osmosis) purges	360	Mine pool water treatment purge	110	
			Demineralizer regeneration wastes	9	Cooling tower blowdown	877	
			Stripped sour water	28			
			F-T wastewater	124			
			Rectisol purge water	36			
			Gasifier purge	106			
			Polisher regeneration wastewater	6			
			Recovery condensate purge	110			
			Boiler blowdown	43			
			Plant water return[c]	38			
	Total discharge to tailings pond	1,180	*Total discharge to tailings pond*	860	*Total discharge to tailings pond*	987	**3,027**[d]
			Discharge to septic system				
			Sanitary wastewater	4			**4**
	Total water output	1,281[b]	Total water output	1,421	Total water output	2,744	**5,446**

[a] Values for beneficiation include water requirements and discharges of the existing beneficiation plant as well as additional beneficiation capacity that would be built to supply the proposed facilities.

[b] Water contained in beneficiated coal delivered to the production facilities (386 gpm) is accounted for under outputs from the production facilities and, therefore, is not included in the total for water outputs from coal beneficiation.

[c] Revised by WMPI since submission of water quality management permit application (WMPI 2005c).

[d] Discharge to tailings pond would also include 93 gpm (annual average basis) of stormwater runoff from the area of the proposed facilities.

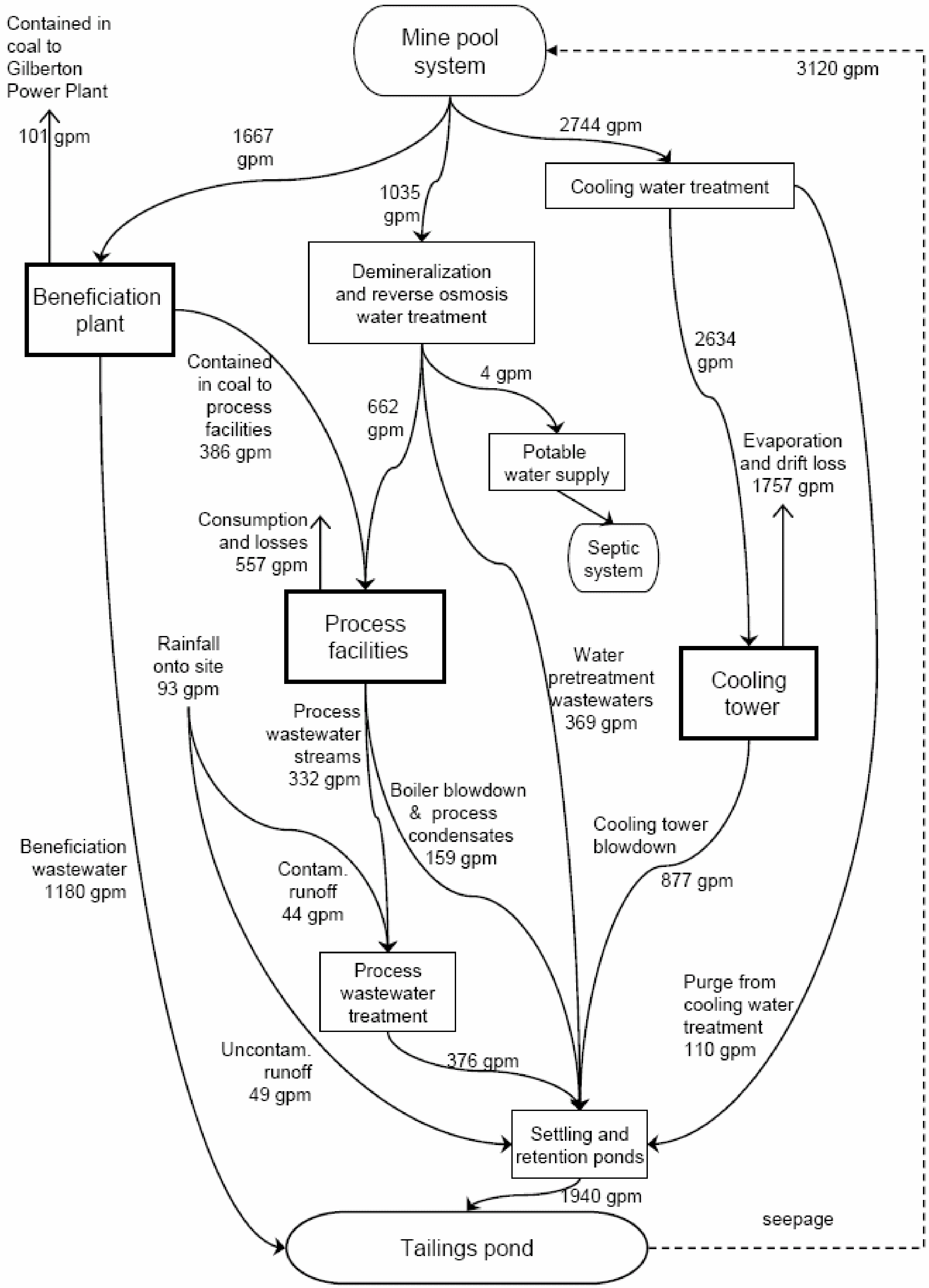

Figure 2.1.6. Summary water balance for the proposed facilities, including water sources, uses, and effluents (annual average flows in gpm).

2.1.5.3 Fuel and Other Material Requirements

The primary feedstock for the proposed facilities would be anthracite culm, which is abundantly available locally. Much of the culm is ***deposited on the landscape*** in piles that were ***created*** during previous mining of anthracite coal because the quality of the culm was insufficient to sell it at the time. ***Authoritative estimates are not available for the total quantity of potentially recoverable anthracite culm remaining on the land surface in eastern Pennsylvania, but the quantity is considered to be very large. A conservative estimate of the amount of locally available culm available to WMPI is 100 million tons (equivalent to about 25 million tons of beneficiated culm).*** All of the culm would be suitable feedstock for the proposed facilities. The heating value of the culm averages about 5,500 Btu/lb prior to beneficiation and 8,340 Btu/lb after beneficiation, as compared to an average of about 11,000 Btu/lb for freshly mined anthracite coal. The gasification facilities would process daily about 4,700 tons (dry) of anthracite culm with 430 tons of limestone used as a flux, which would be added to the feedstock in the culm milling and drying unit to lower the ash melting temperature of the culm and promote fluidity. The proposed facilities would also be capable of using a blend of feedstock containing up to 25% petroleum coke (Section 2.1.2 ***and Appendix G***). Table 2.1.3 presents ***a comparison*** of the composition of beneficiated anthracite culm and petroleum coke.

Table 2.1.3. *Comparison* of the composition of anthracite culm and petroleum coke

Characteristic	Beneficiated anthracite culm	Petroleum coke	
		Sample 1	Sample 2
Heating value, Btu/lb (dry basis)	8,340	14,191	15,251
Analysis, percent by weight [a]			
Moisture	1.9	11.7	0.4
Carbon[b]	54.4	88.6	85.9
Hydrogen	1.7	1.8	3.9
Nitrogen	0.7	1.7	1.3
Sulfur	0.3	6.2	5.4
Ash	40.0	0.7	1.8
Oxygen	2.9	1.0	1.7
Chlorine	--	--	--

[a] Because the analysis was conducted on a dry basis for all constituents except moisture, the sum of percentages for all constituents excluding moisture equals 100% in each column.

[b] The carbon content of the non-ash component is similar for all three samples. Considering only the non-ash component, carbon content is 90.7% for beneficiated anthracite culm and 89.2% and 87.5% for the two samples of petroleum coke.

Source: WMPI PTY, LLC

The culm would be trucked from the surrounding local area to the beneficiation plant. The limestone would be trucked in micronized form (i.e., the milling would be conducted at the limestone quarry) from mines within 100 miles of the project site, probably from a quarry at Herndon, Pennsylvania, located about 35 miles west of the site. If used by the proposed facilities during commercial operation following the demonstration period, petroleum coke would be delivered by truck or rail from undetermined locations outside of the local area. The culm, limestone, and petroleum coke would be unloaded at the beneficiation plant, truck unloading area, or railroad car unloading area, as appropriate.

About 11,400 gal of methanol would be used annually as a solvent for the Rectisol process. About 5,000 gal per year of sulfuric acid would be used for processing and wastewater treatment. About 3,200 gal per year of ammonia would be used for selective catalytic reduction in the combined-cycle power plant to reduce NO_x and CO in the flue gas. These chemicals would be trucked to the truck unloading area.

A new, buried line would deliver natural gas to the main plant site from the existing connection about 1,500 ft to the south. The natural gas would be used as fuel to incinerate (1) tail gas from the Rectisol unit in a thermal oxidizer and (2) vented fumes from the truck loading and unloading area in a thermal incinerator.

2.1.6 Outputs, Discharges, and Wastes

Table 2.1.1 includes a summary of discharges and wastes for the proposed facilities.

2.1.6.1 Air Emissions

Based on a plant operating rate of 7,500 hours per year (an 85% capacity factor), air emissions from the proposed facilities would total less than 100 tons per year for each of the criteria pollutants. SO_2 emissions would be about 29 tons per year, NO_x emissions would be about 70 tons per year, particulate emissions would be about 23 tons per year, and CO emissions would be about 54 tons per year. VOC emissions would be about 28 tons per year (see footnote b of Table 2.1.1 for potential-to-emit annual emissions included in the air permit application submitted to the Pennsylvania Department of Environmental Protection). Trace emissions of other pollutants would include mercury, beryllium, sulfuric acid mist, hydrochloric acid, hydrofluoric acid, benzene, arsenic, and various heavy metals, which are not yet quantified but for which an air quality permit has been issued by the Pennsylvania Department of Environmental Protection with annual limits to ensure that the proposed facilities would be a minor new source of the pollutants (Section 4.1.2.2). ***The proposed facilities would also produce about 2,282,000 tons per year of*** CO_2 ***(Radizwon 2006), which would be released to the atmosphere. Carbon dioxide is a greenhouse gas that is generally regarded by a large body of scientific experts as contributing to global warming and climate change (IPCC 2001, IPCC 2007). Although not proposed by the applicant, during the 50-year duration of commercial operation it may become feasible to reduce the proposed project's contribution to global climate change by sequestering some of the*** CO_2 ***underground.***

Air emissions would be vented continuously from five 200-ft stacks and flared infrequently from a 300-ft emergency ***main flare*** stack. The ***five main stacks consist of a CT/HRSG stack, a hydrocracker reactor stack, a hydrocracker fractionator, a heater stack, a SRU/TGTU thermal oxidizer stack, and the product loading vent thermal oxidizer stack.*** The ***300-ft*** emergency stack would flare quenched, raw synthesis gas from the gasifier during start-ups and during unexpected shut-downs, such as during loss of power or loss of cooling water. ***There are also five baghouse stacks, one stack for the emergency main flare, one stack for an emergency engine, and one stack for a carbon adsorption unit.***

2.1.6.2 Liquid Discharges

Most of the water processed through the proposed facilities would be classified as wastewater that would require treatment at the new onsite wastewater treatment facility prior to discharge to a tailings pond and seepage back to the ***underlying*** mine pool ***system***. No wastewater would be discharged to surface waters. The wastewater treatment plant, which would be located in the northeastern corner of the main plant area (Figure 2.1.5) and dedicated to the proposed facilities, would receive all waste streams from the process areas and rainfall runoff considered contaminated. The plant would remove oil, sludge, and other organic compounds from the water using an oil/water separator, air flotation unit, and biological reactor, and would neutralize the water to a pH of 7. Oil recovered by the oil/water separator would be directed to a used oil storage tank and ultimately removed by a contractor for recycling and/or disposal. About ***332*** gpm of liquid effluent from process sources, including F-T wastewater, gasifier purge water, Rectisol (acid gas removal) purge water, ***stripped sour water, and in-plant water return (e.g., wash water), would be treated in the onsite wastewater treatment facilities, together with rainfall runoff from process areas (design flow of 151 gpm, average annual flow of 44 gpm). Additionally, about 479*** gpm of effluent from initial treatment of mine pool water, 877 gpm of cooling tower blowdown, and **159** gpm of other blowdown water ***and process condensates would be stored in settling basins and blended with wastewater treatment facility effluents and stormwater runoff*** before discharge to the tailings pond ***(Figure 2.1.6)***. ***Table 2.1.4 lists WMPI's proposal for maximum contaminant concentrations for effluent discharges to the tailings pond. WMPI based these requested effluent limits on existing NPDES discharge permits for petroleum refining operations and electric power generating stations in Pennsylvania.***

Table 2.1.4. Proposed concentration limits for NPDES discharge permit for the proposed facilities

Contaminant	***Proposed Limit (mg/L, except as indicated)***	
	Monthly (average, except as indicated)	***Maximum (daily value, except as indicated)***
pH (range; pH units)	***6-9 (range)***	--
Oil and grease	***15***	***30 (instantaneous value)***
Chlorine, free	--	***0.2***
Chromium, total	--	***0.36***
Zinc	--	***1.56***
Ammonia nitrogen (NH_3-N)	***22***	***47***
Biochemical oxygen demand, 5-day	***40***	***70***
Chemical oxygen demand	***275***	***530***
Phenolic compounds	***0.2***	***0.5***
Sulfide	***0.2***	***0.5***

Source: Chandran 2005.

Rainfall runoff from the uncovered process plant areas (areas without roofs) would be considered contaminated ***for at least the first hour of any storm event*** and would drain via a segregated collection system of buried pipes and open ditches to a synthetic-lined stormwater retention pond prior to treatment. The retention pond would be sized at a 2,000,000-gal capacity, ***which would*** accommodate ***3.9 inches of rainfall runoff from the 19 acres of uncovered process areas, thus providing sufficient capacity for the 3.76 in. of precipitation estimated to result from a 100-year 2-hour storm or the 3.84 in. of precipitation estimated to result from a 1000-year 1-hour storm (Bonnin et al. 2004).*** The wastewater treatment facility would ***have capacity*** to process contaminated rainfall runoff ***from the pond at a rate of 151 gpm***, in addition to the continuous waste streams associated with operation of the facilities. After treatment, the wastewater would be conveyed to a larger synthetic-lined retention pond sized at a ***11,000,000-***gal capacity.

Rainfall runoff from uncontaminated process plant areas (areas with roofs) and non-process plant areas (e.g., parking lots and outdoor storage areas) would be classified as uncontaminated and would drain by another set of buried pipes and open ditches directly to the larger retention pond. Some process plant areas would contain retention dikes with two independent valves to allow plant maintenance personnel to determine whether the stormwater should be directed to the wastewater treatment plant or could bypass the treatment plant. In the larger retention pond, uncontaminated rainfall runoff would combine with uncontaminated process water and treated wastewater. The blended streams would subsequently be transported by a gravity-flow pipeline to the existing tailings pond for percolation back to the mine pool, with the rate of discharge to the tailings pond being controlled by the retention pond. Suspended solids included in the effluent would be trapped within the tailings pond and would not percolate to the mine pool.

Either a new septic system or an addition to the existing septic system for the Gilberton Power Plant would be constructed for management of sanitary wastewater and sewage. The septic system would be designed for continuous operation at a capacity of 4 gpm.

2.1.6.3 Solid Wastes *and Byproduct Materials*

Construction

During construction of the proposed facilities, land preparation activities would include clearing, grubbing, stripping, excavation, and placement of fill to establish approximate grading elevations. All trees, stumps, roots, vegetation, rubbish, and other unsuitable material would be removed to a depth of 3 ft below the existing grade or below the final grade, whichever would be greater. Reusable topsoil and soil containing organic material would be stored in stockpiles and later overlaid on finished grading areas.

Potential construction waste could include metal scraps, electrical wiring and cable, surplus consumable materials (e.g., paints, greases, lubricants, and cleaning compounds), packaging materials, and office waste. However, much of these materials would be retained in the operating stores warehouse for future use, and the recyclable paper would periodically be collected and transferred to environmental-waste recycling facilities. Metal scraps unsuitable for the operating stores warehouse would be sold to scrap dealers, while the other remaining materials would be collected in a dumpster and periodically trucked off the site by a waste management contractor for disposal in a licensed landfill. The volume of metal scrap would be no more than one dumpster per month during the period of peak scrap generation, with less generated during the first six months and last three months of construction.

Packaging materials and nonmetal components broken during installation would be collected in dumpsters for offsite disposal. The largest volume of solid waste requiring disposal would be packaging material, including wooden pallets and crates, support cradles used for shipping of large vessels and heavy components, and cardboard and plastic packaging. The rate of generation for packaging waste would be up to two truckloads per month (about 18 yd^3 or 18 tons per month) during construction. The volume of broken components would be much smaller.

No hazardous waste generation is anticipated during construction. If any hazardous waste, as defined under the Resource Conservation and Recovery Act (RCRA), is generated incidental to project construction, quantities would be small. Such waste would be handled in accordance with standard procedures currently employed at the Gilberton Power Plant.

Operation

During operation, the proposed facilities would consume anthracite culm as feedstock from operating mines and/or from land ***containing*** culm ***banks,*** covering about 1,000 acres in Schuylkill County (where the facilities would be located) and the adjacent Northumberland County to the northwest. Based on an 85% capacity factor ***and a design-basis assumption that beneficiated culm would contain 20% ash***, coal gasification byproducts would include about 250,000 tons per year of coarse slag and 62,500 tons per year of fine solids (dry basis). These ***quantities would approximately double, if the facilities processed culm with 40% ash content. These*** wastes would generally be managed wet, which would approximately double the weight of the waste material. The anticipated characteristics of the coarse slag and fine solids are displayed in Table ***2.1.5. Because of the low ash content of petroleum coke, its use would reduce the facilities' production of gasification slag (Appendix G).***

Table *2.1.5*. Expected characteristics of coarse slag and fine solids generated by the use of culm in the proposed facilities

	Coarse slag	Fine solids
Ash, wt%	48.2	44.5
Carbon, wt%	1.8	5.5
Water, wt%	50.0	50.0
Particle diameter (nominal), inch	0.25	0.002
Bulk density, dry, lb/ft^3	38.6	NA[a]
Bulk density, wet, lb/ft^3	76.9	NA

[a]Not available
Source: WMPI PTY, LLC

During gasification, molten slag would flow freely down the reactor wall into a water-filled compartment at the bottom of the gasifier vessel, where the molten slag would be quenched, solidified, and removed. The ***solidified*** slag would be crushed and discharged as a wet mixture. ***Specific decisions on the subsequent management of the slag and other project residues would be consistent with Pennsylvania Department of Environmental Protection residual waste regulations (Section 7.2).*** Coarse slag would be sold as a marketable byproduct to the extent possible. If the slag were sold, the moisture would be drained prior to shipment of the slag by truck or rail (the slag could be transported by conveyors to the vicinity of the railroad siding about 1 mile away, near the borough of Gilberton). If no markets were found, the slag would probably be used for restoration of sites where culm was removed or in other local mine reclamation. The fine solids would ***either be fed back into the gasifier as a supplemental fuel, or*** trucked to the adjacent valley to the northeast for placement in ***an*** area on WMPI land ***that*** is permitted for disposal of coal ***ash*** as part of mine reclamation ***(Section 3.8)***. Disposal would move to other previously mined areas as needed to accommodate the fine solids ***and other residues***.

About 3,400 tons per year of iron sludge extracted during the purification of water from the mine pool and about 4,000 tons per year of dewatered wastewater treatment plant sludge would be trucked to the adjacent valley to the northeast for placement in the permitted ash disposal area on WMPI land. As with the fine solids, disposal would move to other previously mined areas as needed.

Elemental sulfur produced in a Claus sulfur recovery unit as a result of H_2S removal from the shifted synthesis gas would be trucked off the site to be sold as a byproduct. ***Production of byproduct sulfur is estimated at about 4,000 tons per year, assuming 0.3% sulfur content in the beneficiated culm (Table 2.1.3).***

Process wastes would also include various spent catalysts, adsorbents, resins, and filtration materials used in the process facilities or in raw water treatment. About 810 tons per year of spent iron-based catalysts from the F-T synthesis technology would need to be replaced periodically. These would either be returned by truck to the manufacturer for regeneration, or used as a flux in the gasifier. Approximately 2.5 tons per year of spent adsorbents and 4,400 ft^3 per year of other spent catalysts, absorbents, resins, and filtration materials would be returned to their

manufacturers for regeneration or other processing. Anthracite/sand filter material from water treatment (about 275 ft^3 per year), F-T pre-coat material (about 1550 ft^3 per year), and spent filter cartridge units from air, water, and hydrogen processing (totaling about 110 units per year) would be sent to a municipal solid waste landfill.

In addition to process wastes, solid wastes generated during facility operation would include used office materials and packaging materials. The disposition of these items would be similar to that discussed previously for these materials during the construction period.

2.1.6.4 Toxic and Hazardous Materials

Operation of the proposed facilities would involve potentially toxic or hazardous materials and wastes generated during operation, including waste paints, solvents, oils, and empty material containers. ***All solid wastes, including these materials, would be evaluated (and tested as necessary) to determine whether they are hazardous as defined under the Resource Conservation and Recovery Act.*** Hazardous wastes generated during operation would be removed from the site by a waste management contractor at regular intervals and trucked to authorized facilities for disposal. ***Management of any hazardous wastes generated as a result of processing*** of spent catalysts***, absorbents, resins, and filtration materials at a manufacturer's offsite facility*** would be ***the responsibility of the owners and operators of the facilities where the materials were processed.***

The facilities would implement a program to reduce, reuse, and recycle materials to the extent practicable. All light bulbs would be treated as hazardous waste and transported to properly licensed facilities for disposal. The facilities would have a Spill Prevention, Control, and Countermeasures (SPCC) Plan (40 CFR Part 112) addressing the accidental release of materials to the environment.

2.1.7 Summary Characteristics of the Proposed Action

Table 2.1.6 summarizes some key characteristics of the proposed facilities in comparison with the existing Gilberton Power Plant.

2.2 ALTERNATIVES

Section 102 of NEPA requires that agencies discuss the reasonable alternatives to the proposed action in an EIS. The term "reasonable alternatives" is not self defining, but rather must be determined in the context of the statutory purpose expressed by the underlying legislation.

Congress established the CCPI Program with a specific goal — to accelerate commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States. ***The CCPI legislation (Pub. L. No. 107-63) has a narrow focus in directing DOE to demonstrate technology advancements related to coal-based power generation designed to reduce the barriers to continued and expanded use of coal. Technologies capable of producing any combination of heat, fuels, chemicals, or other use byproducts in conjunction with power generation were considered; however, coal is required to provide at least 75% of the fuel for power generation. DOE's purpose in considering the proposed action (to provide cost-shared***

Table 2.1.6 Summary comparison of some key operating characteristics for the existing Gilberton Power Plant and the proposed facilities

	Existing Gilberton Power Plant	Proposed facilities
Land area (main plant)	20 acres	75 acres
Employees (operations)	150	250 during demonstration; 150 thereafter
Tallest stack	326 ft	300 ft
Anthracite culm utilization	640,000 tons per year	1,468,000 tons per year
Electricity production (net power for export)	80 MW	41 MW
Surplus steam production for export	800,000 lb/hr	None
Liquid fuels production	None	5,000 barrels/day
Air emissions (tons/year)[a]		
Criteria air pollutants		
Sulfur oxides (sulfur dioxide)	1600	29
Nitrogen oxides	260	70
Particulate matter (PM-10)	32	23
Particulate matter (PM-2.5)	5	
Carbon monoxide	362	54
Volatile organic compounds (VOCs)	32	28
Hazardous air pollutants		<25 combined total
Formaldehyde	0.0072	
Hydrochloric acid	76.63	
Lead	0.0066	
Mercury	0.04	
Ammonia	0.2957	<100
Water supply requirements		
Coal beneficiation (from mine pool)	up to 1,500 gpm	1,667 gpm (including existing Gilberton Power Plant)
Cooling water make-up (from mine pool)	up to 1,400 gpm	2,744 gpm
Process water and potable water	about 44 gpm (from well)	1,035 gpm (from mine pool)
Consumptive water use	up to 1,050 gpm	2,314 gpm
Wastewater discharge	1,300 gpm (to tailings pond); tailings pond also receives an undetermined volume from beneficiation plant	1,947 gpm (to tailings pond); also 1,080 gpm from beneficiation plant (including existing uses)
Principal solid waste and its management	Coal ash, used beneficially for construction aggregate, anti-skid material for roads, and fill material for mine reclamation	Gasification slag (250,000 tons/year), used beneficially for commercial applications or as fill material in mine reclamation

[a]For the existing Gilberton Power Plant, values are 2005 emissions as reported to Pennsylvania Department of Environmental Protection (http://www.dep.state.pa.us/efacts/); values for criteria pollutants are rounded to the nearest ton. For the proposed facilities, values are those included in the permit application submitted to Pennsylvania Department of Environmental Protection, except for hazardous air pollutants and ammonia, which are the maximums allowed under the facility permit (Air Quality Program Permit No. 54-399-034).

funding) is to meet the goal of the program by demonstrating the viability of the proposed project (the integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels). Other technologies that cannot serve to carry out the goal of the CCPI Program (e.g., natural gas, wind power, conservation) are not relevant to DOE's decision of whether or not to provide cost-shared funding support for the Gilberton Coal-to-Clean Fuels and Power Project, and therefore, are not reasonable alternatives.

The CCPI Program only allows for joint funding of proposed projects that have been selected through a solicitation and negotiation process. In 2002, DOE issued the first round CCPI solicitation. Private sector participants submitted proposals in response to the solicitation. A group of proposals, representing diverse technologies and using a variety of coals, was selected to further the goals of the CCPI Program. DOE's choices were limited by virtue of having to choose from the proposals that were submitted under the solicitation process. The proposed project was selected under the first round of the CCPI Program because of the opportunity to demonstrate the specific technologies proposed: the integration of coal waste gasification and Fischer-Tropsch (F-T) synthesis of liquid hydrocarbon fuels at commercial scale. Other projects that proposed to demonstrate other technologies are not alternatives to the proposed project for NEPA purposes.

Congress not only prescribed a narrow goal for the CCPI Program, but also directed DOE to use a process to accomplish that goal that would involve a more limited role for the Federal government. Instead of requiring government ownership of the demonstration project, Congress provided for cost-sharing in a project sponsored by the private parties, with the provision for repayment of the public funds invested. Therefore, rather than being responsible for the siting, construction and operation of the projects, DOE has been placed in the more limited role of evaluating CCPI project applications to determine if they meet the CCPI Program's goal. It is well established that an agency should take into account the needs and goals of the applicant in determining the scope of the EIS for the applicant's project. When an applicant's needs and goals are factored into the deliberations, a narrower scope of alternatives may emerge than would be the case if the agency is the proprietor responsible for all project-related decisions.

2.2.1 No-Action Alternative

Under the no-action alternative, DOE would not provide cost-shared funding to demonstrate the commercial-scale integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels. Without DOE participation, it is possible the proposed project would be canceled, and if it were, the proposed technology may not be demonstrated elsewhere. Consequently, eventual commercialization of the integrated technologies would probably not occur because utilities and industries tend to use known and demonstrated technologies rather than unproven technologies.

At the site of the proposed project, it is reasonably foreseeable that no new activity would occur. WMPI would not construct and operate the proposed facilities. Accordingly, no employment would be provided for construction workers in the area or facility operators. No electricity, steam, or liquid fuels would be produced by the proposed facilities. No resources would be required and no ***new*** discharges, ***emissions,*** or wastes would occur. No anthracite culm would be removed from piles in the local area for use by the proposed facilities. No change in current environmental conditions at the site would result. The adjacent Gilberton Power Plant would continue to operate without change. This scenario would not contribute to the CCPI Program goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States.

Table 2.2.1 presents a comparison of key potential impacts between the proposed facilities and the scenario under the no-action alternative.

Table 2.2.1. Comparison of key potential impacts between the proposed facilities and the no-action alternative

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Land use and aesthetics	The locations of the proposed main plant and ancillary facilities would not affect offsite land use. Over ***the first half of the 50***-year operating life of the proposed facilities, approximately 1,000 acres of land would be reclaimed after culm removal to provide feedstock for the facilities. Because the visual landscape is already conspicuously marked with industrial structures, the proposed facilities would not alter the industrial appearance of the site and would not degrade the aesthetic character of the area.	Offsite land use would not be affected. No additional structures would be built. Impacts would remain unchanged from existing conditions.
Air quality	Modeling results based on emissions from the proposed facilities predicted that maximum concentrations would be less than their corresponding significant impact levels. Concentrations would be negligible at the nearest Prevention of Significant Deterioration (PSD) Class I area (Brigantine Wilderness Area). The small percentage increases in VOC and NO_x emissions would not be likely to degrade local or regional air quality sufficiently to cause violations in the O_3 standards, but the magnitude of the degradation cannot be quantified. Limits stated in the authorized permit would ensure that the proposed facilities would be a minor new source of hazardous air pollutants. Because nearly complete H_2S removal from the shifted synthesis gas would be required by the downstream F-T synthesis process, odorous emissions of H_2S should not be perceptible. ***The proposed facilities would also produce about 2,282,000 tons per year of*** CO_2***, which would be released to the atmosphere.***	No additional air emissions would occur. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Comparison of key potential impacts between the proposed facilities and the no-action alternative

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Geology	Because the proposed main plant would be built over rock units that do not contain coal, the plant would not be affected by subsidence from mining activities. Product transfer lines and related facilities in the valley of Mahanoy Creek ***would, however, be located over former underground mines and could be subject to subsidence.*** The potential risks of product line leakage due to gradual subsidence would be reduced by inspecting product lines regularly and repairing any problems. ***Also, the facilities' use of water from the Gilberton mine pool would lower the average water level in the mine pool, and thus could reduce stability of the abandoned mine workings below Gilberton. However, this would not be expected to increase the likelihood of collapse because water levels would remain within their current range, which has not been observed to increase the possibility of mine roof collapses or other subsidence.***	Impacts would remain unchanged from existing conditions.
Ecological resources	Loss of approximately 76.5 acres of deciduous forest to construct the main plant and ancillary structures would affect wildlife species. Over the long term, the terrestrial habitat created on reclaimed lands from which culm would be obtained would offset the loss of deciduous forest. Impacts to aquatic habitats and fish from construction of the proposed facilities would be minor to negligible because no surface waters are on or in the immediate vicinity of the proposed project site. ***Depletion of dissolved oxygen in Mahanoy Creek due to contaminants in wastewater from operations would, however, hinder the restoration of aquatic life in the creek.*** Because the proposed facilities would not be located within an area that provides habitat for any protected species except for occasional transient individuals, it is unlikely that any such species would be affected by project construction or operations.	No clearing of trees or other vegetation would be required. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Continued

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Water resources	Impacts attributable to construction-related runoff would be minimal. Because the facilities would increase the area of impervious surface on Broad Mountain, water that previously would infiltrate the soil to enter the groundwater under Broad Mountain would instead be included in the wastewater discharge to Mahanoy Creek valley, thus reducing groundwater recharge to the aquifers on Broad Mountain. Estimated recharge ***closer to*** the Morea well should***, however, continue to be more than*** sufficient to meet the needs of the Morea water system, and other wells farther away from the proposed facilities should not be affected. Operation of the proposed facilities would reduce the water volume in the Gilberton mine pool and the volume of water needed to be pumped from the mine pool and discharged to Mahanoy Creek in order to prevent flooding. These changes would result in reduced stream flow in the creek. However, the creek would not go dry from receiving less mine pool water because the creek's minimum flows would be maintained by continuous discharges from mine openings in upstream portions of the watershed. Discharge of treated effluent to the mine pool ***system*** by seepage from the tailings pond would be expected to improve the ***quality of*** mine pool ***water with respect to*** concentrations of acidity and dissolved metals ***associated with acid mine drainage, but would introduce additional process-related contaminants. Reductions in the volume of water pumped from the mine pool to Mahanoy Creek and in concentrations of mine-related contaminants would contribute toward meeting total maximum daily load targets for these contaminants, but added contaminants resulting from facility operations would continue to degrade the creek as potential habitat for aquatic organisms.***	No changes in water requirements or discharge of effluents would occur. Impacts would remain unchanged from existing conditions.
Floodplains, flood hazards, and wetlands	The main plant and a new culm beneficiation plant or expansion of the existing facility would be located above the elevation of the 100-year floodplain. Ancillary facilities that would cross the 100-year floodplain of Mahanoy Creek would be placed atop an existing trestle at an elevation above the 100-year floodplain. No new construction within the floodplain would be required. ***It is possible that discharge of facility effluents to the tailings pond could increase the potential for berm failure, causing flooding in the vicinity and downstream in Gilberton. However, the Gilberton tailings pond appears to be less susceptible to catastrophic failure than other Appalachian region coal mine impoundments whose failures resulted in serious damage, and if the pond were to fail, the relatively low land surface slope in the valley would limit the velocity and distance of travel of the pond contents, thus resulting in less severe consequences than could occur in steeper watersheds.*** Construction and operation of the proposed facilities would have no adverse effects on wetlands because none are present on the project site.	No floodplains or wetlands would be affected. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Continued

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Socioeconomic resources	Construction and operation of the proposed facilities would not result in major impacts to population, housing, local government revenues, or public services in Schuylkill County. With regard to environmental justice, one nearby census tract has significant minority populations residing at the Mahanoy and Frackville State Correctional Institutions. Disproportionately high and adverse impacts to these populations ***are*** not expected because air quality impacts would not be appreciable with the exception of temporary fugitive dust during construction. Similarly, for two nearby census tracts that have relatively high poverty rates, disproportionately high and adverse impacts to these populations ***are*** not expected. Increases in traffic during project construction would likely cause congestion and have an ***adverse effect*** on traffic flow and safety during morning and afternoon commutes. WMPI personnel have committed to contacting the Pennsylvania Department of Transportation to discuss potential mitigation options, including signaling, road widening, and scheduling work hours and/or deliveries to avoid periods of heavy traffic. Although the impacts of additional operations-related traffic would be less severe than those during construction, they would ***last longer.*** WMPI personnel have committed to contacting the Pennsylvania Department of Transportation to discuss the same potential mitigation options. Impacts on historic or archaeological properties would not be likely because the State Historic Preservation Office has identified no such properties in the project area.	No employment would be provided for construction workers in the area or for operators of the proposed facilities. Impacts would remain unchanged from existing conditions.
Waste management	Solid wastes and byproducts generated during operations would be sold, used for mine reclamation, or transported to an offsite commercial landfill for disposal***, in compliance with Pennsylvania residual waste management regulations.*** None of these materials would be expected to be hazardous as defined under the Resource Conservation and Recovery Act (RCRA). The Toxicity Characteristic Leaching Procedure test would be performed to verify this expectation, and any wastes found to be subject to RCRA hazardous waste regulations would be handled in accordance with applicable procedures. ***Spent catalysts, absorbents, resins, and filtration materials would be returned to their manufacturers for regeneration or other processing. Management of any hazardous wastes generated in this processing would be the responsibility of the manufacturer and would utilize the capacity of existing licensed treatment, storage, or disposal facilities.*** Wastewater from the gasification and liquefaction processes would be combined with stormwater from process areas in an equalization basin, then routed to a series of oil-water separation units where droplets of oil and grease would be recovered and oily sludge would be collected for disposal or recycling to the gasification process. Effluent from this stage of treatment would be mixed with non-oily wastewater streams and routed to a biological treatment unit that would combine aeration with clarification in order to treat wastewater with high levels of chemical and biological oxygen demand. This unit would be designed to consume the organic compounds and nutrients in the wastewater, yielding treated effluent for discharge and a biological sludge for disposal. Potential odor impacts from liquid waste streams would be controlled by treating all process wastewater within enclosed facilities prior to discharge to the final equalization basin.	No changes would result to the current management of solid and hazardous waste in the proposed project area. Impacts would remain unchanged from existing conditions.

Table 2.2.1. Concluded

Resource	Impacts of the proposed facilities	Impacts of the no-action alternative
Human health and safety	Regarding operational air emissions, all maximum ambient concentrations of criteria pollutants from the proposed facilities were estimated to be less than their corresponding significant impact levels, and the air permit establishes maximum allowable limits to ensure that the proposed facilities would be a minor new source of hazardous air pollutants (e.g., mercury). The proposed facilities would be subject to Occupational Safety and Health Administration standards. During construction, permits would be required and safety inspections would be employed to maximize worker safety. Construction equipment would be required to meet all applicable safety design and inspection requirements, and personal protective equipment would be used, as needed to meet regulatory standards. Operations would be managed from a control room. All instruments and controls would be designed to ensure safe start-up, operation, and shut down. No perceptible changes in electromagnetic fields would occur because no new transmission line would be built. The probability of a catastrophic accident associated with the facilities, including transportation of liquid fuels off the site, would be very unlikely. ***A Risk Management Plan and Emergency Response Program would be used to identify potential hazards and to develop process controls, procedures, and evacuation plans for inmates, employees, and nearby residents. The potential consequences of a terrorist attack resulting in the release of hazardous materials from the proposed gasification, liquefaction, or electric generating facilities would be similar to those from accidental causes.***	Impacts would remain unchanged from existing conditions.
Noise	During operations, the increase in noise levels (i.e., 3 dB) would probably be imperceptible at the Mahanoy State Correctional Institution because of (1) the distance between the prison and the proposed project site, (2) planned noise attenuation measures, (3) natural and man-made terrain features and structures, and (4) the limited period during which inmates are allowed outside the prison. No perceptible change in noise associated with the proposed facilities would be expected at the nearest residence or other offsite locations. ***Increased construction- and operation-related traffic will increase the frequency, but not the levels of noise along transportation corridors.***	No additional noise would be generated. Impacts would remain unchanged from existing conditions.

2.2.2 Alternatives Dismissed from Further Consideration

The following sections discuss alternatives, including alternative sites and technologies that were initially identified and considered by DOE or the project participant. The project as proposed meets the needs outlined in the CCPI solicitation that was issued by DOE in March 2002 (Section 1.2). Factors considered in DOE’s project selection process included the desirability of projects that collectively represent a diversity of technologies, utilize a broad range of U.S. coals, and represent a broad geographical cross-section of the United States. Otherwise, DOE did not constrain the proposals with regard to site or technology.

The proposals included responses to a DOE environmental questionnaire (Section 1.5). The responses contained discussions of the site-specific environmental, health, safety, and socioeconomic issues associated with each project. Based on the evaluation criteria discussed in Section 1.2, including consideration of environmental implications, DOE selected 8 projects, including the proposed project, for possible cost-shared financial assistance.

2.2.2.1 Alternative Sites

No other sites to host the proposed project were seriously considered by WMPI PTY, LLC and its project partners. The site needed to closely meet the project's technical needs and easily integrate with existing infrastructure (e.g., roads, railroad siding, electrical transmission lines). An existing plant site or site adjacent to an existing plant site would avoid the additional cost associated with construction of facilities and infrastructure at an undeveloped, remote site, and the environmental impacts likely would be much greater at a site without existing infrastructure. The geographical area considered for the proposed site was limited by the economic and environmental advantages resulting from using nearby piles of anthracite culm, the primary feedstock for the proposed facilities. Because WMPI's Gilberton Power Plant is adjacent, the site proposed for the facilities by the participant was an obvious choice. Based on the above considerations, other sites are not reasonably foreseeable alternatives and are not evaluated in this EIS.

2.2.2.2 Alternative Technologies

Other technologies have been dismissed as not reasonable. ***DOE selected*** the proposed project to demonstrate the integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels. The use of other technologies and approaches that are not applicable to coal (e.g., natural gas, wind power, solar energy, and conservation) would not contribute to the CCPI Program goal of accelerating commercial deployment of advanced coal-based technologies that can generate clean, reliable, and affordable electricity in the United States.

2.2.2.3 Other Alternatives

Other alternatives, such as delaying or reducing the size of the proposed project, have been dismissed as not reasonable. Delaying the project would not result in any change of environmental impacts once the project ***was*** implemented**,** but would adversely ***affect the CCPI Program goal and adversely*** delay reclamation of land currently ***occupied by*** culm ***banks***. The design size for the proposed project was selected because it is sufficiently large to show potential customers that the integrated technologies, once demonstrated at this scale, could be applied commercially without further scale-up. A demonstration indicating that the performance and cost targets are achievable at this scale would convince potential customers that the integration of these technologies is not only feasible but economically attractive (Section 1.4).

3. EXISTING ENVIRONMENT

3.1 SITE DESCRIPTION, LAND USE, AND AESTHETICS

3.1.1 Site of the Proposed Facilities

The proposed facilities would be located in a rural setting adjacent to the existing Gilberton Power Plant ***near the borough of Gilberton in the western portion of Mahanoy Township*** in Schuylkill County, Pennsylvania (Figure 2.1.1 and Figure 2.1.2). The main plant for the proposed project would occupy about 75 acres of nearly level land owned by WMPI PTY, LLC on top of Broad Mountain. The land is currently unoccupied and covered by second-growth forest***, except for an area of about 15 acres that WMPI cleared at its own risk during 2006***. The new beneficiation plant, or expansion of the existing facility, would occupy about 1 acre of land in the adjacent valley to the north of the main plant area.

3.1.2 Land Use

Land use in Mahanoy and West Mahanoy townships in the vicinity of the proposed facilities is primarily woodland (55%) and mined lands (36%). Other land uses include residential (2.8%), public (1.6%), agricultural/open space (1.6%), and smaller areas of retail, manufacturing, and service (Schuylkill County 1995).

The proposed project site is bounded by woodlands to the north and south, the Mahanoy State Correctional Institution to the east, and the existing Gilberton Power Plant to the west. The nearest private residence is 3,600 ft southeast of the site (Suresh Chandran, Philip Services Corporation, e-mail to Cheri Foust, ORNL, September 20, 2004), while the commercial and recreational areas closest to the site are within 3,000 ft and 5,000 ft, respectively (McMullen 2003).

3.1.3 Aesthetics

Because the site is located adjacent to the existing Gilberton Power Plant, the visual landscape is conspicuously marked with structures of an industrial character, including the boiler building, turbine building, water storage tanks, mechanical-draft cooling towers, baghouses, solid waste silo, administration building, and other associated infrastructure. The tallest structure is the power plant's 326-ft flue gas stack. The power plant is visible from part of the surrounding local area, depending on the topography and extent of vegetation from specific viewpoints. Emissions from the stack and plumes of water droplets from the cooling towers are occasionally visible. In addition, several other power plants are located within approximately 20 miles of the proposed facilities, including Schuylkill Energy Resources, Wheelabrator Frackville Energy Company, Mt. Carmel Cogeneration, Northeastern Power Company, and Panther Creek (Figure 3.1.1). Strip mines and anthracite culm piles are also visible in the area.

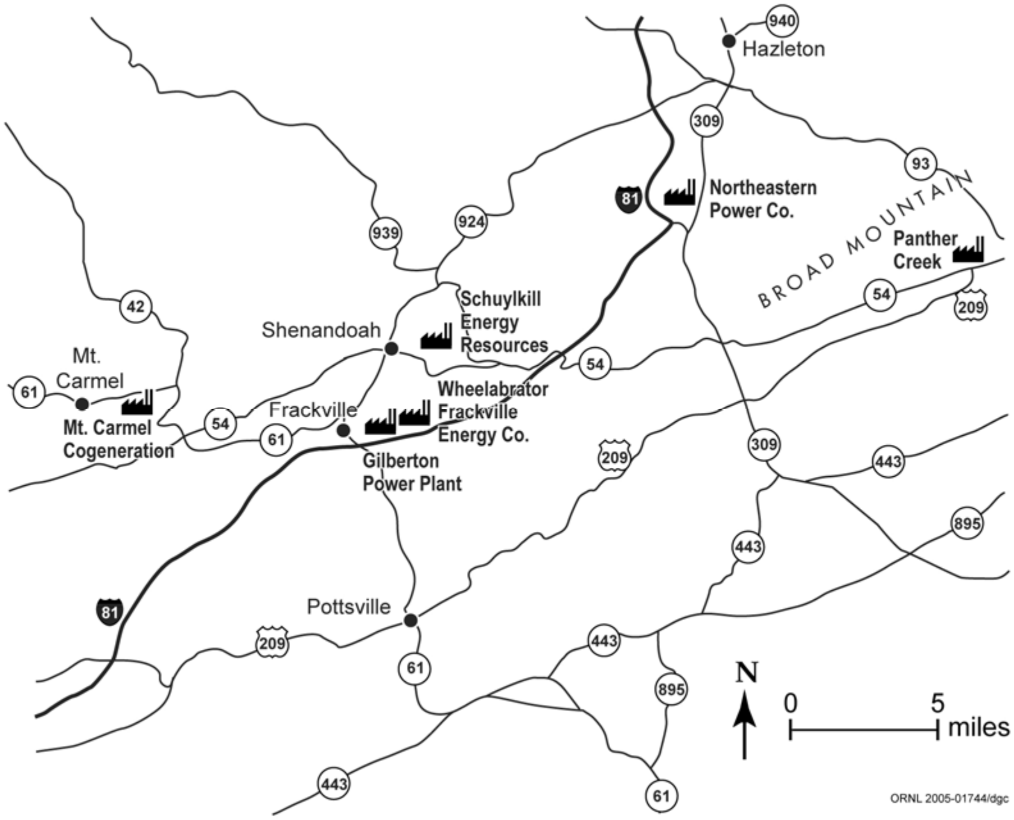

Figure 3.1.1. Power plants in the region of the proposed facilities.

3.2 CLIMATE AND AIR QUALITY

3.2.1 Climate

The proposed site is located in the "ridge and valley province" of Pennsylvania, in which parallel forested ridges and cleared valleys are aligned in a west-southwest to east-northeast orientation. The regional climate, which is classified as humid continental, is influenced by the passage of multiple types of air masses. Cold, dry air frequently arrives from the northern interior of the continent, while winds from the south and southwest transport warm, humid air from the Gulf of Mexico and adjacent subtropical waters. These two air masses provide the dominant characteristics of the area's climate. A third type of air mass occasionally flows inland from the Atlantic Ocean to produce cool, cloudy, and damp weather conditions.

Winters are generally long and cold, with an average of about 140 days per year with temperatures below 32°F and an average of 5 days per year with temperatures below 0°F. In January, the daily maximum temperature is about 32°F, on average, while the daily minimum is about 16°F. Average annual snowfall is about 45 in. Summers are pleasant, with an average of only 2 days per year with temperatures above 90°F. In July, the daily maximum temperature is about 80°F, on average, while the daily minimum is about 60°F. Average annual precipitation is about 45 in. (including melted snowfall). The distribution of precipitation is fairly uniform during the year, ranging from around 3 in. during the winter months to around 4.5 in. during the summer months. On an annual basis, nearly half of the days are cloudy, and during the winter over half of the days are cloudy. Since 1881, twelve tornadoes have been reported in Schuylkill County.

For the purpose of air dispersion modeling, no ***quality-assured*** wind data have been archived from a location, including from any of the ***existing*** power plants in the area, ***that are*** near enough to be representative of the proposed site ***(Timothy Leon Guerrero, Pennsylvania Department of Environmental Protection, personal communication to Robert Miller, ORNL, March 20, 2006).*** An examination of ***quality-assured*** wind data from surrounding locations (i.e., Harrisburg ***and*** Scranton***, Pennsylvania***) about 50 miles away suggests that prevailing winds are likely to be from the west-southwest, paralleling the ridge and valley orientation. ***The west-southwest direction of the prevailing winds is also supported by data from the wind monitoring station in Shenandoah, Pennsylvania, about 2 miles north of Gilberton, which are not quality-assured and advised not to be used for air dispersion modeling (Timothy Leon Guerrero, Pennsylvania Department of Environmental Protection, personal communication to Robert Miller, ORNL, March 20, 2006)***.

3.2.2 Air Quality

Criteria pollutants are defined as those for which National Ambient Air Quality Standards (NAAQS) exist (Table 3.2.1). These pollutants are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), lead (Pb), and particulate matter less than or equal to 10 μm in aerodynamic diameter, designated PM-10. The U.S. Environmental Protection Agency (EPA) has also promulgated NAAQS for particulate matter less than or equal to 2.5 μm in aerodynamic diameter (PM-2.5) (***71 FR 61144***), and a new 8-hour NAAQS for O_3 to replace the 1-hour O_3 standard (62 *FR* 38856).

The NAAQS are expressed as concentrations of pollutants in the ambient air; that is, in the outdoor air to which the general public has access [40 CFR Part 50.1(e)]. Primary NAAQS define levels of air quality that EPA deems necessary, with an adequate margin of safety, to protect human health. Secondary NAAQS are similarly designated to protect human welfare by safeguarding environmental resources (such as soils, water, plants, and animals) and manufactured materials. States may modify NAAQS to make them more stringent, or set standards for additional pollutants. Pennsylvania has adopted the NAAQS as the state standards without modifications and has also set ambient air quality standards for beryllium, fluorides, and hydrogen sulfide. The Pennsylvania beryllium standard is 0.01 $\mu g/m^3$ for a 30-day averaging period, the fluorides standard is 5 $\mu g/m^3$ for a 24-hour averaging period, and the hydrogen sulfide standards are 0.005 ppm for a 24-hour average and 0.1 ppm for a 1-hour average.

Schuylkill County is in attainment with NAAQS and state ambient air quality standards for all pollutants, including the PM-2.5 and 8-hour O_3 standards (Arleen Shulman, Pennsylvania Department of Environmental Protection, personal communication to Robert Miller, ORNL, August 31, 2004). Schuylkill County was formerly designated as nonattainment for the 1-hour O_3 standard, based on "incomplete data" (the least severe of the classifications), but EPA revoked the 1-hour O_3 standard on June 15, 2005, relying solely on the 8-hour O_3 standard as of that date.

Table 3.2.1. National Ambient Air Quality Standards (NAAQS) for criteria pollutants

	Primary (Health related)		Secondary (Welfare related)	
Pollutant	Averaging period	Concentration	Averaging period	Concentration
CO	8-hour [a]	9 ppm (10 mg/m^3)		No secondary standard
	1-hour [a]	35 ppm (40 mg/m^3)		No secondary standard
Lead	Maximum quarterly average	1.5 μg/m^3		Same as primary standard
NO_2	Annual arithmetic mean	0.053 ppm (100 μg/m^3)		Same as primary standard
O_3	Maximum daily 1-hour average [b]	0.12 ppm (235 μg/m^3)		Same as primary standard
	4th highest 8-hour daily maximum [c]	0.08 ppm (157 μg/m^3)		Same as primary standard
PM-10	Annual arithmetic mean [d]	***Revoked***		***Revoked***
	24-hour [d]	150 μg/m^3		Same as primary standard
PM-2.5	Annual arithmetic mean [e]	15.0 μg/m^3		Same as primary standard
	98th percentile 24-hour [e]	***35*** μg/m^3		Same as primary standard
SO_2	Annual arithmetic mean	80 μg/m^3 (0.03 ppm)	3-hour [a]	1,300 μg/m^3 (0.50 ppm)
	24-hour [a]	365 μg/m^3 (0.14 ppm)		

[a] Not to be exceeded more than once per year.

[b] This former standard (revoked on June 15, 2005) was attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm was equal to or less than 1, as determined according to Appendix H of the Ozone NAAQS.

[c] The 8-hour standard is met when the 3-year average of the annual 4th highest daily maximum 8-hour O_3 concentration is less than or equal to 0.08 ppm.

[d] The annual PM-10 standard is attained when the expected annual arithmetic mean concentration is less than or equal to 50 μ/m^3 (3-year average); the 24-hour standard is attained when the expected number of days above 150 μg/m^3 is less than or equal to 1 per year. ***Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, EPA revoked the annual PM_{10} standard effective December 17, 2006.***

[e] The annual PM-2.5 standard is met when the annual average of the quarterly mean PM-2.5 concentrations is less than or equal to 15.0 μg/m^3, when averaged over 3 years. If spatial averaging is used, the annual averages from all monitors within the area may be averaged in the calculation of the 3-year mean. The 24-hour standard is met when the 98th percentile value, averaged over 3 years, is less than or equal to ***35*** μg/m^3.

Attainment status for NAAQS is determined primarily by evaluating data from ambient air quality monitoring stations. The nearest SO_2 and CO monitoring stations are located in Shenandoah, about 2 miles north of Gilberton. The closest NO_2, PM-2.5, and O_3 monitoring stations are located in Reading, Pennsylvania, about 35 miles south-southeast of Gilberton. A lead (Pb) monitoring station is located in Laureldale, Pennsylvania, immediately north of Reading. The Pennsylvania Department of Environmental Protection has recently installed a PM-10 monitor at the Mahanoy State Correctional Institution adjacent to the proposed facilities to measure ambient PM-10 concentrations. In addition, high-volume particulate samplers to measure ambient concentrations of metals (i.e., arsenic, cadmium, chrome, nickel, and lead) and total suspended particles have recently been installed by the Pennsylvania Department of Environmental Protection at the Mahanoy State Correctional Institution, the Mahanoy City Sewage Treatment

Plant, and the Frackville State Correctional Institution. All samplers began running on the same day (May 9, 2006) on a 6-day cycle (i.e., operating for one 24-hour period every sixth day).

In addition to ambient air quality standards, which represent an upper bound on allowable pollutant concentrations, national air quality standards exist for Prevention of Significant Deterioration (PSD) (40 CFR Part 51.166). The PSD standards differ from the NAAQS in that the NAAQS specify maximum allowable concentrations of pollutants, while PSD requirements provide maximum allowable increases in concentrations of pollutants for areas already in compliance with the NAAQS. PSD standards are therefore expressed as allowable increments in the atmospheric concentrations of specific pollutants. Allowable PSD increments currently exist for three pollutants (NO_2, SO_2, and PM-10). One set of allowable increments exists for Class II areas, which cover most of the United States, and a much more stringent set of allowable increments exists for Class I areas, which include many national parks and monuments, wilderness areas, and other areas as specified in 40 CFR Part 51.166(e). Allowable PSD increments for Class I and Class II areas are presented in Table 3.2.2. The PSD Class I area nearest to Gilberton is Brigantine Wilderness Area in New Jersey, about 130 miles to the southeast.

Table 3.2.2. Allowable increments for Prevention of Significant Deterioration (PSD) of air quality

Pollutant	Averaging period	Allowable increment ($\mu g/m^3$)	
		Class I[a]	Class II[a]
Sulfur dioxide (SO_2)	3-hour	25	512
	24-hour	5	91
	Annual	2	20
Nitrogen dioxide (NO_2)	Annual	2.5	25
Particulate matter less than 10 μm aerodynamic diameter (PM-10)	24-hour	8	30
	Annual	4	17

[a] Class I areas are specifically designated areas in which the degradation of air quality is to be severely restricted. Class II areas (which include most of the United States) have a less stringent set of allowable increments.

Contaminants other than the criteria pollutants are present in the atmosphere in varying amounts that depend on the magnitude and characteristics of the sources, the distance from each source, and the residence time of each pollutant in the atmosphere. In the ambient air, many of these pollutants are present only in extremely small concentrations, requiring expensive state-of-the-art equipment for detection and measurement. Measurements of existing ambient air concentrations for many hazardous pollutants are, at best, sporadic. Regulation of these pollutants is attempted at emission sources based on the National Emissions Standards for Hazardous Air Pollutants (40 CFR Part 61; 40 CFR Part 63).

3.3 GEOLOGY AND SOILS

3.3.1 Physiography

The proposed project site is located in the Anthracite Upland section of the Ridge and Valley physiographic province of the Appalachian Mountains (Sevon 2000). The regional landscape is characterized by a series of northeast-trending linear ridges and valleys, reflecting the structure of the underlying folded and faulted bedrock. Stream drainage has a trellised pattern defined by major streams that follow linear courses in the valleys, fed by tributaries that flow down the slopes of ridges. The elevation difference between ridges and adjacent valleys ranges from 500 to 1,000 ft. The landscapes of many of the valleys and ridges have been extensively altered by surface and underground mining of the underlying anthracite coal. Landforms created by past mining include water-filled mine pits, coal refuse piles, and spoil banks.

The proposed main plant would be located on the crest of Broad Mountain at an elevation of about 1,700 ft above mean sea level (amsl). Broad Mountain is an east-northeast trending ridge with steep flanks and a broad, flat to gently rolling crest. Topographic relief across the main plant site is about 40 ft. Other project-related facilities and activities, including coal preparation, rail transfer, extraction of groundwater, and discharge of wastewater, would occur on the northern slope of Broad Mountain and in the valley of Mahanoy Creek north of Broad Mountain, which has an elevation of about 1,150 to 1,200 ft amsl. Topographic features of this valley have been extensively altered by past strip mining.

3.3.2 Stratigraphy and Structure

The site area is underlain by sedimentary rocks of Mississippian and Pennsylvanian age (about 290 to 360 million years old) deposited primarily in rivers, swamps, and bogs. The oldest geologic unit mapped in the area is the Mauch Chunk Formation, which was deposited in Late Mississippian and Early Pennsylvanian time. This formation consists of shale, siltstone, sandstone, and some conglomerate. Above the Mauch Chunk is the Pennsylvanian age Pottsville Formation, which consists of conglomerate and sandstone interbedded with siltstone, shale, and anthracite coal. The Pottsville Formation has a total thickness of up to 1,600 ft. Above the Pottsville Formation, the Pennsylvanian age Llewellyn Formation consists primarily of sandstone and siltstone, interbedded with shale, conglomerate, and anthracite coal. In Schuylkill County, the Llewellyn Formation is as much as 4,400 ft thick and includes as many as 40 mineable coal layers.

Regional bedrock structure is very complex. Multiple cycles of regional deformation resulted in an east-northeast-trending system of folds and thrust faults, within which are complex sets of subsidiary folds and faults. In the vicinity of the proposed project site, coal-bearing formations typically are exposed in synclinal structures that form valleys.

At the proposed main plant site on top of Broad Mountain, bedrock units are the Mauch Chunk Formation and the overlying Tumbling Run Member, which is the basal unit of the Pottsville

Formation. The Tumbling Run Member, which consists primarily of sandstone and conglomeratic sandstone, is stratigraphically below the coal layers in the Pottsville Formation. These geologic units are relatively erosion-resistant and form several prominent ridges in the area.

Broad Mountain is the topographic expression of an anticline formed by the Mauch Chunk Formation and other geologic units stratigraphically below the coal-bearing formations. The axis of the anticline lies a short distance south of the site of the proposed main plant. At the site, bedrock dips approximately 26° to the north-northwest.

The Mahanoy Creek valley north of Broad Mountain occupies a broad syncline. Several subsidiary folds and faults are within the syncline. Rock units stratigraphically above the Mauch Chunk Formation, including the Pottsville Group and the Llewellyn Formation, are exposed in the Mahanoy Creek valley and on the north slope of Broad Mountain.

Coal-bearing units of the Pottsville Group and Llewellyn Formation also are exposed south of Morea in an east-west-trending syncline outcropping along the south flank of Broad Mountain. This exposure is truncated on the south by a fault.

3.3.3 Mineral Resources

The region surrounding the proposed project site is rich in anthracite coal. The anthracite coal-bearing rocks of eastern Pennsylvania cover about 484 square miles within a 3,300 square mile region in Carbon, Columbia, Dauphin, Lackawanna, Lebanon, Luzerne, Northumberland, Schuylkill, Susquehanna, and Wayne counties, and are estimated to have originally held 22.8 billion tons of coal (Edmunds 2002), representing most of the United States' anthracite coal resources.

The region has a long history of coal production. Some mining and use of anthracite occurred before 1800. Large-scale mining began early in the 1800s, primarily in underground mines using the room-and-pillar mining method. In this method, large "rooms" of coal are excavated and intervening "pillars" of coal are left to hold up the roof. Mine spoil known as "culm," including coal that did not meet size or purity standards for commercial sale, was deposited on the surrounding landscape. As early as the late 1800s miners began extracting coal from this old waste material by excavating culm deposits on the land surface (called "culm banks") and dredging rivers and streams for coal that had been deposited in them. Strip mining also began to supplement underground mining and increased in prevalence during the 20th century. The peak year for anthracite production in the region was 1917, when about 100 million tons were mined, almost all from underground mines (USGS 1968; PDEP 2000). Underground mining activity declined through the middle years of the 20th century, and most deep mines were eventually forced to close due to the difficulty of mining in steeply dipping and faulted rocks and the high cost of pumping increasing volumes of water out of the mines. For example, the mine served by the Gilberton Shaft in Gilberton was abandoned in 1967 when dewatering operations were terminated (Yaccino 1976). Annual production of anthracite from river dredging and culm banks has fluctuated over time in response to market conditions, peaking at more than 10 million tons per year during World War II and declining to as little as 500,000 tons per year during the 1980s. Strip mining peaked in 1948, when more than 13 million tons were produced by this method (USGS 1968; PDEP 2000). In recent years, annual production from mines has generally been less than 3 million tons, while culm utilization rates (which include some non-coal material that is mixed with the coal) have been variable (Figure 3.3.1). In 2002, 40% of the region's anthracite output came from Schuylkill County (PDEP 2003).

In total, more than 5.5 billion tons of coal have been produced from the anthracite region (Milici and Campbell 1997). Much of the coal remaining in the ground cannot be mined (for example, because it forms the pillars in old room-and-pillar mines). The Energy Information Administration (1999) has estimated the demonstrated reserve base of anthracite as 7.2 billion tons, but most of the potentially mineable coal is inaccessible or cannot be recovered. Based on Energy Information Administration estimates of accessibility and recovery factors, only 788 million tons of recoverable anthracite remained in the ground, including 485 million tons recoverable by surface mining methods and 303 million tons recoverable by underground mining. Authoritative estimates are not available for the total quantity of potentially recoverable anthracite culm remaining on the land surface in eastern Pennsylvania, but the quantity is considered to be very large. WMPI controls 65 million tons of surveyed culm reserves ***(estimated to be equivalent to about 16 million tons of beneficiated culm),*** plus an estimated 85 million tons ***(equivalent to about 21 million tons of beneficiated culm)*** that have not been surveyed. Accordingly, a conservative estimate of the amount of locally available culm is 100 million tons ***(equivalent to about 25 million tons of beneficiated culm)***.

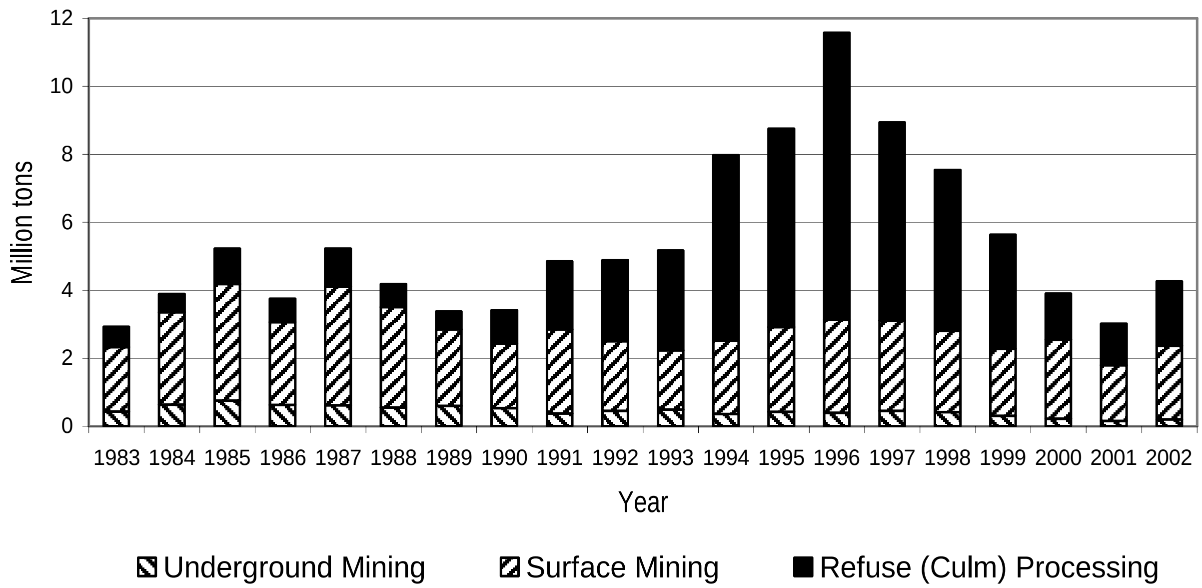

Figure 3.3.1. Reported anthracite coal production in Pennsylvania, 1983-2002. Culm processing reflects the total amount of culm material produced, including noncoal waste materials. ***Culm processing figures are probably less than actual values, because not all processors report data***. *Source:* Pennsylvania Department of Environmental Protection, Office of Mineral Resources Management, Annual Reports on Mining Activities.

3.3.4 Soils

The proposed main plant site on top of Broad Mountain has residual soils formed from weathering of the underlying sandstone bedrock. Soil thickness in the site vicinity ranges from 2 to 14 ft, with rock fragments frequently encountered in the deeper layers. The soil is generally a silty fine to coarse sand with some clay and gravel. Site soils are classified in the "Hazleton-Clymer soil association, gently sloping to sloping." These units are described as consisting of deep, well-drained, permeable, stony soils formed in sandstone, siltstone, and shale residuum on uplands. The "Buchanan extremely stony loam" soil series is also present in one area of the site. This is a deep, moderately well to somewhat poorly drained soil formed on upland colluvium derived from sandstone, siltstone, and shale. None of these soils are classified as prime farmland or Pennsylvania farmland of statewide importance.

Soil classifications in the valley north of Broad Mountain reflect the area's history of disturbance. The predominant soil map unit in the valley is "Udorthents, strip mine," a classification that indicates mined land and mine spoil in which no evidence of natural soil development exists. Other areas in the valley are mapped as "mine dumps," "coal waste dumps," and "urban land."

3.3.5 Geologic Hazards

3.3.5.1 Mines

Subsidence of underground coal mines is a significant potential hazard in all portions of the project area that are underlain by active or abandoned mine workings. Damage can result from either sudden collapses or gradual subsidence. One particularly severe event in the region was the collapse of an underground coal mine in Wilkes-Barre (about 35 miles northeast of the proposed project site) in 1954 (von Hake 1973). This collapse damaged hundreds of homes, broke gas and water mains, and caused streets and sidewalks to buckle and collapse. Many older buildings in the valley of Mahanoy Creek have structural damage resulting from gradual subsidence of abandoned underground coal mines. Dewatering of mine pools (man-made aquifers resulting from a network of voids produced during underground mining activities) ***is one process that*** can ***contribute*** to surface subsidence ***by draining voids and other pore spaces (in effect,*** the presence of water ***in voids*** helps to ***maintain the stability of the rock)***. ***Also, cycling between wet and dry conditions in mined openings may contribute to subsidence by promoting weathering of underground rock and degradation of timber used for mine roof support.*** However, ***after several decades of pumping to control mine-pool water levels,*** the Pennsylvania ***Department of Environmental Protection*** has not observed any mine roof collapses or other subsidence related to pumping from the mine pools at Gilberton or other locations in the region (Buckwalter 2004; Veil et al. 2003).

Abandoned mines and mining waste also are potential fire hazards. Fires in culm banks and underground mines can be ignited by surface fires, mining activities (such as welding or use of explosives), or spontaneous combustion of coal fines or combustible trash materials mixed in with the culm (Stracher et al., undated). Once started, these fires can be very difficult to extinguish and may become long-term hazards to public health and safety. Underground fires in coal seams emit carbon monoxide and other toxic gases that can migrate through cracks and voids and enter buildings. Also, ground surface subsidence often occurs above burned-out coal seams. The borough of Centralia, about 8 miles west of Gilberton, has been permanently evacuated due to an underground coal fire that has been burning since 1962. Fires in culm banks threaten the safety of people occupying the area and degrade air quality by the uncontrolled release of smoke. Long-lasting smoldering fires in culm banks were common in the region in past decades, but have nearly been eliminated by improved fire-suppression capabilities.

The site of the proposed main plant is located over rock units that do not contain coal. Therefore, the site is not subject to hazards associated with past coal mining.

Extensive underground mining has occurred in the Mahanoy Creek valley, where some buildings have visible damage due to subsidence. Culm banks also are present in the valley.

3.3.5.2 Seismic Activity

The proposed project site is in a region of relatively low earthquake risk. It is included in Seismic Risk Zone 1 of the Uniform Building Code (ICBO 1994). Under the newer International Building Code (International Code Council 2002) most types of structures would be assigned to Seismic Design Category B. No earthquakes centered in Schuylkill County have been recorded. Southeastern Pennsylvania has a history of seismic activity, however, and is rated as having somewhat higher seismic risk than the area of the project site. The largest seismic event measured in southeastern Pennsylvania was a magnitude 4.6 earthquake in January 1994 at Wyomissing Hills in Berks County, about 40 miles south of the proposed project site. Seismic activity in southeastern Pennsylvania is associated with two different source areas: (1) a north-south trending zone in Lancaster and Lebanon Counties and (2) the margins of a Triassic-age rift basin that crosses southeastern Pennsylvania (including Wyomissing Hills) and New Jersey (Scharnberger 1989 and 2003).

The U.S. Geological Survey (1996) estimates that a peak ground acceleration of 0.12 g[1] due to seismic activity has a 2% probability of occurring at the proposed project site during a 50-year period. Ground accelerations above about 0.1 g can cause damage to residential buildings that were not designed to resist earthquakes (USGS 1996), but significant earthquake damage is generally not expected unless ground accelerations exceed 0.15 g (Scharnberger 2003).

3.4 WATER RESOURCES

Pennsylvania has a humid climate, with precipitation distributed relatively evenly through the year. In the area of the proposed facilities, the average annual precipitation of about 45 in. (Section 3.2.1) substantially exceeds the average annual evapotranspiration, which is estimated to be about 26 in. (Fleeger 1999), leaving nearly 20 in. as average annual runoff. Rates of evapotranspiration are typically lower and runoff correspondingly higher on mined land with little or

[1] 12% of the acceleration of gravity

no revegetation. Statewide, approximately 12 to 15 in. annually, or about one-third of the precipitation, is estimated to infiltrate to the groundwater system, with the remainder of the runoff going directly to surface waters (Callaghan et al. 1998).

3.4.1 Surface Water

Broad Mountain forms a watershed boundary, dividing the Susquehanna River watershed to the north from the Schuylkill River watershed to the south. The Susquehanna River flows south and southeast, entering Chesapeake Bay at Havre de Grace, Maryland. The Schuylkill River flows southeast to Philadelphia and the Delaware River, which flows to Delaware Bay.

The north slope of Broad Mountain drains to Mahanoy Creek, which flows 50 miles westward from headwaters east of Mahanoy City to the Susquehanna River, entering the river about 10 miles south of the city of Sunbury. The southern side of Broad Mountain is in the watershed of Mill Creek, which enters the Schuylkill River near Pottsville. No streams are located on the sites for the main plant or ancillary facilities, but old strip mining pits and artificial ponds in the Mahanoy Creek valley and on the southern side of Broad Mountain collect precipitation, stormwater runoff, and other wastewater. Because most activities associated with the proposed facilities would occur in the Mahanoy Creek watershed and facility effluent discharges would be directed into the Mahanoy Creek watershed, Mahanoy Creek is the focus of the remainder of this discussion. ***The region of influence for potential water quality impacts is not expected to extend beyond the Mahanoy Creek watershed.***

Mahanoy Creek drains a watershed (Figure 3.4.1) with an area of approximately 157 square miles (PDEP 2002a). At Gilberton, the creek has a surface watershed area of less than 18 square miles (NWISWeb accessed September, 2004; site 0155521140).

Past mining in the region has altered both surface and groundwater hydrology on a large scale. Mine workings and other underground openings act as large drains or sinks for groundwater. During active underground mining this water was removed by pumping and by tunnels that provided gravity drainage to nearby streams. After mining ceased, the underground openings flooded. The interconnected mine shafts, tunnels, gangways, and other workings now collect and divert both groundwater and surface streams, forming highly transmissive man-made aquifers that in many instances transfer water between surface watersheds. Disturbance of the land surface by surface mining, deposition of coal waste, and collapse of underground openings also has altered hydrology by modifying stream courses and forming artificial ponds where surface water collects and infiltrates into the man-made aquifer system. Numerous seeps, boreholes, and mine tunnel discharges enter Mahanoy Creek and its tributaries. The creek segment near the proposed project area receives mine-water inflow from pumping of the Gilberton mine pool (Section 3.4.3) and from several uncontrolled mine-water discharges upstream from Mahanoy City (PDEP 2002a).

Limited flow data are available for Mahanoy Creek in the proposed project area (USGS NWISWeb). In August 2001, creek discharge at Gilberton was measured as 2.8 ft^3/s. About 3 miles downstream at Girardville, below the entry point for discharges from the Girard Mine, measured stream discharge on the same day was 7.8 ft^3/s. About 2 miles farther downstream at Ashland, discharge that day was 50 ft^3/s. ***These measurements were made following a period of dry weather,***

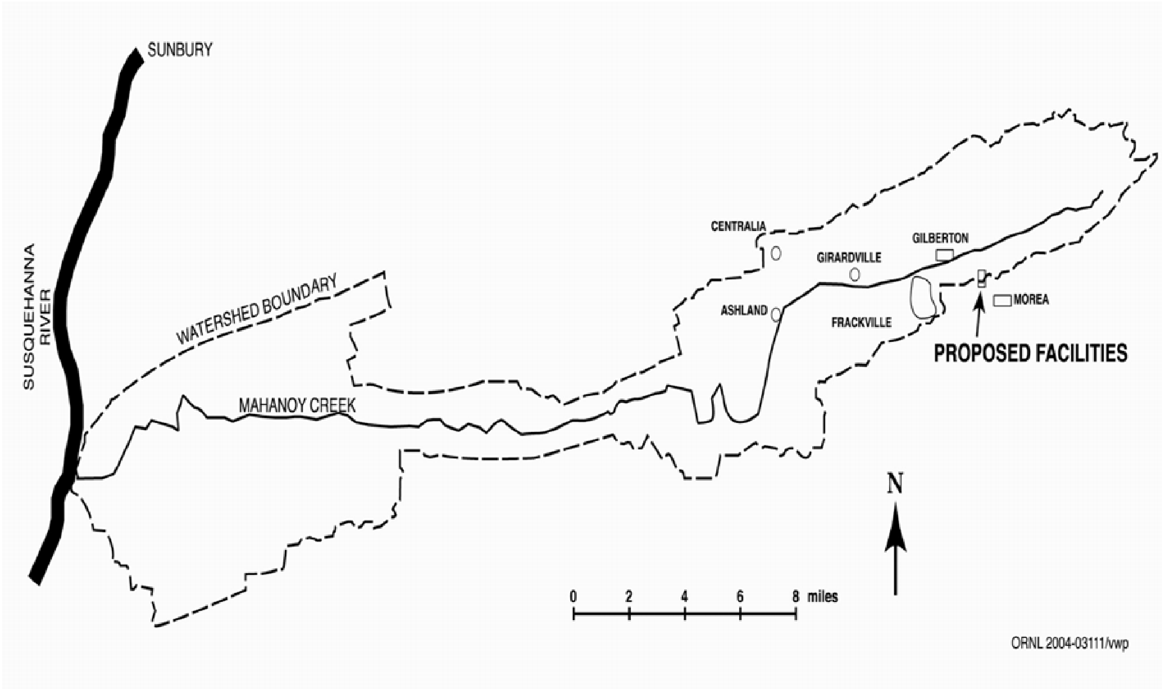

Figure 3.4.1. Mahanoy Creek watershed.

and are considered to represent low base-flow conditions (Cravotta 2005). Stream flow at these locations is substantially higher when the Pennsylvania Department of Environmental Protection pump is operating (at a pumping rate up to 25 ft^3/s) to withdraw water from the Gilberton mine pool and discharge that water into the creek (Section 3.4.3). Other flow measurements at Girardville range from 4.8 to 32 ft^3/s, and other measurements at Ashland range from 40 to 88 ft^3/s ***(USGS NWISWeb)***. For the purpose of water quality calculations, the Pennsylvania Department of Environmental Protection (2002a) assumed an average discharge at Girardville of 9.5 ft^3/s (6.15 million gal per day). ***In February 2007 the Pennsylvania Department of Environmental Protection (2007) issued an updated water-quality analysis in which the average flow at Girardville was reported as 11.9 ft^3/s (7.68 million gal per day).*** Measured discharges at ***both*** Gilberton and Girardville are much smaller than the average annual discharges of 27 ft^3/s and 31 ft^3/s, respectively, calculated from the watershed sizes and estimated annual runoff of 20 in. At Ashland, however, observed stream flow compares reasonably well with calculated stream flow of 63 ft^3/s. The discrepancy between observed and calculated stream flow at Gilberton and Girardville may indicate that some runoff generated within the upper Mahanoy Creek watershed bypasses the stream as groundwater ***or is lost from the stream to underlying mines, probably emerging farther downstream as mine discharges or groundwater seepage into the stream.***

Water quality in Mahanoy Creek is considered to be severely impaired from the source to the mouth (Edwards 1998). The principal cause of water quality degradation is acidic mine drainage. Aquatic life is severely diminished due to low pH conditions and high concentrations of dissolved metals. Sewage also is reported to contribute to water quality degradation in the upper watershed (where the proposed facilities would be located), but sewage effects are largely masked by the effects of mine drainage. Water quality has improved over time, possibly due to reclamation of abandoned mines, but does not meet the water-quality objectives established for the creek, which are based on a designated use as warm-water fish habitat (PDEP 2002a).

Table 3.4.1 presents two sets of results from water quality sampling of Mahanoy Creek near the proposed project site. State water quality criteria applicable to the creek also are shown. The water is acidic (indicated by the measured values for pH and acidity) and has elevated levels of sulfate and metals (aluminum, iron, and manganese) that are typical of waters affected by acid mine drainage. Water quality factors adverse to fish habitat are the acidity, which promotes release of metals such as aluminum and lead in forms that are toxic to aquatic life and the elevated manganese and iron levels which can cause deposition of metal oxide precipitates that physically degrade streambed habitat.

The Pennsylvania Department of Environmental Protection has published preliminary ***(Pennsylvania Department of Environmental Protection 2002a) and final (Pennsylvania Department of Environmental Protection 2007)*** calculations of the total maximum daily load reductions required in Mahanoy Creek above Girardville (which includes the stream segment in Gilberton) in order to achieve water quality criteria in the creek at least 99% of the time. In 2002, the agency estimated that reductions of 69 lb per day of manganese (73% less than the current load), 32 lb per day of aluminum (78% less than the current load), and 657 lb per day of acidity (63% less than the current load) would be needed. The ***final total maximum daily load targets issued in 2007 indicate a need to reduce manganese loading by 135 lb per day (84% of the current load) to reduce its water concentration from 2.5 to 0.4 mg/L, aluminum loading by 39 lb per day (82% of the current load) to reduce its water concentration from 0.75 to 0.14 mg/L, iron loading by 309 lb/day (94% of the current load) to reduce its water concentration from 5.2 to 0.36 mg/L, and acidity loading by 656 lb/day (63% of the current load) to reduce its water concentration from 16.2 to 6.0 mg/L.***

3.4.2 Groundwater

Groundwater is present at relatively shallow depth throughout the site area, in intergranular pore space, fractures, and man-made bedrock voids. Recharge to groundwater is primarily from infiltration of precipitation. The Mauch Chunk and Pottsville Formations are productive sources of groundwater throughout the region, storing and transmitting water primarily in interconnected fractures. Saturation is continuous at depths below the water table, but discrete water-bearing zones are identified in these aquifers where wells intersect well-connected fracture zones. Productive water-bearing zones are most commonly found at depths between 50 and 300 ft. Wells finished in these aquifers and developed for maximum production have a median yield of 75 gpm, with some wells in the Mauch Chunk aquifer yielding several hundred gpm. Most of the smaller wells in both aquifers yield sufficient water to supply a household. A specific yield (the fraction of the aquifer volume that consists of drainable void space) of 0.034 has been calculated for the Mauch Chunk aquifer in the region (Becher 1991). This value is characteristic of an unconfined (water-table) aquifer in which groundwater is stored primarily in fractures. The zone of influence around pumped wells is much

Table 3.4.1. Water quality data for Mahanoy Creek near Gilberton

	Concentration (mg/L, except as noted)		
Analyte	U.S. Geological Survey[a]	Pennsylvania Department of Environmental Protection[b]	Applicable water quality criteria[b,c] (maximum except as noted)
pH (field; pH units)	5.0	--[d]	6.0 - 9.0 (range)
Oxidation-reduction potential (mV)	440	--	--
Dissolved oxygen	6.7	--	min. 5.0 (daily average)
Silica	9.5	--	--
Specific conductance (μS/cm)	660	--	--
Acidity, as calcium carbonate	11	16.25	--
Alkalinity	--	16.50	--
Cations			
Aluminum	0.3	0.75	0.75
Calcium	61	--	--
Iron, total	0.63	--	1.5
Iron, dissolved	0.41	5.18[e]	0.3
Lead, dissolved	0.0004	--	--
Magnesium	26	--	--
Manganese	1.8	2.5	1.0
Nickel, dissolved	0.049	--	--
Potassium	4.3	--	--
Sodium	25	--	--
Strontium	0.38	--	--
Zinc	0.17	--	--
Anions			
Chloride	26.9	--	--
Fluoride	0.1	--	--
Nitrate, as nitrogen	1.95	--	--
Sulfate	320	--	--

[a]Measured August 20, 2001. *Source*: NWISWeb.
[b]*Source*: PDEP (Pennsylvania Department of Environmental Protection) 2002a.
[c]Pennsylvania Code Title 25, Environmental Protection, Section 93.7, Specific water quality criteria.
[d]Not available.
[e]Not identified as total or dissolved.

larger parallel to bedrock strike than perpendicular to bedrock strike, and may extend to a distance of 1,500 ft or more from a high-capacity production well (Becher 1991).

Under natural conditions, groundwater flow is from upland areas, such as Broad Mountain, laterally and downward toward natural discharge sites in springs and seeps in valleys, such as the valley of Mahanoy Creek. Groundwater flow patterns generally mirror the topography. However, the influence of bedrock structure on subsurface flow may cause groundwater divides to be located updip from surface water divides. Downward flow gradients would typically be observed in the uplands, which are net recharge areas. Upward flow would occur in valleys, which are net discharge areas, and might have artesian conditions under which deep wells flow at the ground surface.

Previous underground mining activities, which created extensive networks of voids that are now filled with water, have substantially altered natural groundwater systems. Abandoned mine workings function as highly permeable man-made aquifers, known as mine pools. Because mining removed much of the rock that once impeded upward groundwater flow, the higher groundwater heads that existed at depth under valleys are now expressed at the ground surface. The valley mine pools function similarly to large artesian wells, often producing upwelling groundwater at the ground surface and causing flooding in the valleys. The Mahanoy Creek valley in the area of the proposed facilities is underlain by an extensive system of mine pools (Section 3.4.3).

Particularly during active mining, underground mines also act as groundwater drains or sinks, and could possibly cause lower water levels in upgradient portions of a groundwater flow system. However, valley mines in the proposed project area have not been reported to affect groundwater levels in uplands.

The quality of groundwater is generally good in the Mauch Chunk Formation and portions of the Pottsville Formation that are not affected by mining. Water from both aquifers is low in dissolved solids content. Median concentrations of total dissolved solids are 80 mg/L in the Mauch Chunk Formation and 53 mg/L in the Pottsville Formation. Water from the Pottsville Formation is soft (median hardness of 15 mg/L, as calcium carbonate), while the Mauch Chunk Formation produces water that is soft to very hard (median hardness of 90 mg/L) (Becher 1991). Some wells in the region naturally produce water with undesirably high levels of iron and manganese, and contamination is reported in some wells due to nearby septic systems, underground storage tanks, and other localized sources (Becher 1991, Edwards 1998).

3.4.3 Mine Pool

An extensive system of mine pools (man-made aquifers resulting from a network of voids produced during underground mining activities) exists under the Mahanoy Creek valley in the vicinity of the proposed project site. Inflow comes from groundwater that would naturally discharge in the valley, seepage of surface water from Mahanoy Creek (the water elevation in the mine pools is generally lower than that of the creek), and seepage from tailings ponds in the valley.

The Gilberton mine pool consists of water-filled underground mine workings located beneath the borough of Gilberton and connected with the Gilberton Shaft. The mine extended as deep as 1,200 ft, to an elevation of -66 ft amsl (Parulis 1985). The underground mining operation closed and dewatering stopped in 1967, after which the workings filled with water (Yaccino 1976). The water-filled volume of the mine pool has been estimated at 1.868 billion gal (Parulis 1985). The Gilberton pool has been reported to be interconnected with the Lawrence and West Bear Ridge mine pools to the west and with the Boston Run, St. Nicholas, and Tunnel Ridge mine pools to the east (Parulis 1985). Together, these pools have been estimated to hold over 7.1 billion gal of water (Parulis 1985). Hydraulic testing demonstrated a direct interconnection only with the Lawrence mine pool (Leaver 1976), which has an estimated volume of 2.127 billion gal. However, water from the three mine pools east of the Gilberton pool probably flows as groundwater into the Gilberton pool.

Based on records of pumping during active mining, the Gilberton mine pool and other interconnected mine pools were estimated to have average inflow of about 6,200 gpm (13.8 ft^3/s or 3.25 billion gal per year). Parulis (1985) estimated the inflow to be about 8,200 gpm, based on pumping rates for a 29-month period in the early 1980s. ***Using records of pumping from 1972 onward, staff of the Susquehanna River Basin Commission estimated that the mine pool could supply 7.4 million gal per day (about 5,100 gpm or 2.7 billion gal per year) on a sustainable basis in all but the most severe droughts (SRBC 2005).***

Underground pumps supply water from the mine pool to use ***in the existing culm beneficiation plant and*** as cooling water at the Gilberton Power Plant. ***Pumping rates are not measured. The SRBC has authorized pumping up to an average rate of about 1,400 gpm for the power plant; an additional quantity estimated as up to 1,500 gpm is pumped for the beneficiation plant (SRBC 2005). Evaporation and other losses consume most of the cooling water (SRBC has approved consumptive water use of up to 1.51 million gal per day, or about 1,050 gpm)*** and some of the culm preparation water. About 1,300 gpm are discharged as treated wastewater to a tailings pond in the Mahanoy Creek valley ***(Figure 2.1.2).***

The Pennsylvania Department of Environmental Protection operates another subsurface pump to control the mine pool elevation in order to prevent flooding in Gilberton. This pump, with an estimated capacity of 11,300 gpm, is run as needed to keep the water elevation between 1,096 and 1,113 ft amsl (Jack Buckwalter, Pennsylvania Department of Environmental Protection, personal communication to Ellen Smith, ORNL, May 17, 2004). This protects the lowest basements in Gilberton, which extend down to about 1,117 ft amsl. The pumping operation began in 1972, five years after underground mining operations ended (Yaccino 1976). The pumping rate varies. During dry periods, the pump may operate just a few days a month or not at all, but during wet periods it may run continuously. Annual pumpage over the 12-year period 1992 to 2003 averaged more than 2.5 billion gal, which equates to almost 4,800 gpm (11 ft^3/s) (Jack Buckwalter, Pennsylvania Department of Environmental Protection, personal communication to Ellen Smith, ORNL, May 17, 2004). The pumped water is discharged directly to Mahanoy Creek and is a source of mine-drainage contamination in the creek. The site where pumped water enters the creek is stained with iron precipitate.

Mine pools in the anthracite region typically are chemically stratified into "top water" with near-neutral pH and "bottom water" with low pH and much higher concentrations of dissolved metals, sulfate, and other constituents associated with acidic mine drainage. Top water is believed to reflect shallow groundwater circulation and relatively short residence times, while bottom water is drawn from greater depths and has longer residence times (Brady et al. 1998). ***Chemical analyses*** of the mine pool water withdrawn for use at the Gilberton Power Plant (Table 3.4.2) exhibit the characteristics of acid mine drainage. A grab sample of water withdrawn by the Pennsylvania Department of Environmental Protection had pH 5.9 and an iron concentration of 30 mg/L, all in the divalent ferrous form (Jack Buckwalter, Pennsylvania Department of Environmental Protection, personal communication to Ellen Smith, ORNL, May 17, 2004), which is more soluble than the trivalent ferric form. The near-neutral pH of ***most of*** these samples is consistent with top water, but the high concentrations of iron, manganese, and sulfate are more typical of bottom water. The chemistry of water pumped from the mine pool is likely to vary.

Treated wastewater from the existing Gilberton Power Plant is discharged to a tailings pond in the Mahanoy Creek valley ***(Figure 2.1.2). Effluent from the existing beneficiation plant is also discharged to the pond. The tailings pond occupies an oblong area of approximately 30 acres. The pond was established in the 1940s in an old strip mine pit whose base is estimated to be approximately 60 ft below the surrounding grade. The pond was built against the northern flank of Broad Mountain and is contained on the other three sides by earthen berms constructed of coal mining overburden that extend up to 38 feet above the surrounding grade. Of the total 107,000,000-ft^3 volume of the pond, as of early 2007 about 80-85% was filled with solid waste (primarily silt and waste rock, often called "tailings") from coal beneficiation. The fluid capacity of the pond is estimated to be in the range 16 million to 21 million ft^3 (120 million to 160 million gal). Some surface runoff from uphill areas may flow into the pond, but the size of the contributing watershed is limited due to the extensive topographic alteration caused by past strip mining in the vicinity.***

Water seeps from the pond into the underlying Boston Run mine pool; overflow from the pond flows into old strip pits east of the pond, from which water also seeps to the mine pool. The rate of seepage has not been measured, but observations suggest that all water discharged to the pond percolates into the mine pool; the water level in the pond does not fluctuate. Discharge to the pond ***from the Gilberton Power Plant*** is regulated by Pennsylvania NPDES industrial wastewater discharge permit ***PA0061697, which was issued in 1997 and authorizes discharge to Mahanoy Creek***. No violations of permit requirements have been recorded.

Table 3.4.2. Chemical analyses of Gilberton mine pool water

ANALYTE	*Concentration (mg/L, except pH)*									
	WMPI Data	*Pennsylvania Department of Environmental Protection data*[a]								
		4/28/ 1986	*2/3/ 1987*	*8/14/ 1988*	*2/27/ 1991*	*8/9/ 1994*	*6/5/ 1995*	*9/19/ 1995*	*3/14/ 2002*	*12/13/ 2002*
pH (at 25˚C)	***6.3-6.4***	***5.8***	***6.2***	***5.7***	***4.5***	***5.7***	***6.2***	***5.9***	***6.1***	***6.3***
Silica	***13***									
Total dissolved solids	***966***[b]	***1359***	***1145***	***1222***	***1042***	***984***	***1070***	***997***	***951***	***824***
Total suspended solids		***14***	***11***	***10***	***55***	***48***	***195***	***10***	***5***	***95***
Alkalinity		***2***	***68***	***51***	***1***	***10***	***72***	***56***	***68***	***27***
Acidity		***600***	***164***	***77***	***22***	***26***	***47***	***18***	***15***	***10***
CATIONS AND METALS										
Magnesium	***19.4***		***88***	***68***		***70***	***78***	***61***	***63***	***64***
Manganese	***9.3***	***8.7***	***12***	***11.7***	***1***	***9.1***	***9.8***	***8.8***	***8.4***	***7.9***
Sodium	***14.5***									
Calcium	***47.6***					***144***	***155***	***150***	***96***	***116***
Potassium	***2***									
Strontium	***0***									
Iron	***43***	***38***	***12***	***61***	***51***	***47***	***89***	***46***	***45***	***50***
Aluminum			***0.1***	***1.16***		***2.15***	***16.1***	***0.81***	***0.42***	***4.53***
Arsenic			***0.008***	***0.003***		***0.017***	***0.063***	***ND***[c]	***<0.005***	***0.012***
Cadmium			***0.01***	***ND***		***ND***	***ND***	***ND***	***0.006***	***<0.005***
Chromium			***0.01***	***ND***		***ND***	***ND***	***ND***	***<0.005***	***<0.005***
Lead			***0.01***	***ND***		***ND***	***ND***	***ND***	***<0.05***	***<0.025***
Selenium			***0.001***	***ND***		***0.008***	***ND***	***ND***	***<0.005***	***<0.005***
Barium			***0.02***	***0.2***		***ND***	***ND***	***ND***		
Silver			***0.14***	***0.03***		***ND***	***ND***	***ND***		
ANIONS										
Chloride	***12***									
Fluoride	***0***									
Nitrate	***0***									
Sulfate	***723***	***622***	***760***	***790***	***686***	***707***	***746***	***568***	***614***	***438***
Bicarbonate	***95***									

[a]Hornberger et al. 2004. (Some values rounded.)

[b]Determined from sum of individual parameter concentrations.

[c]Not detected (below minimum level of detection).

3.4.4 Water Supply

Schuylkill County's water supplies are obtained from a combination of surface water and groundwater sources (PDEP 2002b). About 56% of the population is supplied from surface reservoirs operated by public water supply systems. The remaining 44% use groundwater. Most groundwater users are supplied by public water systems, but about 9% of the population is served by private wells. Surface reservoirs and wells used for public drinking water supply are located in upland areas and receive inflow from watersheds that are unaffected by past mining.

The proposed project site is not in the watershed of any surface water supply reservoirs. A small reservoir on Broad Mountain about 1 mile southwest of the site is in the headwaters of Stony Creek (a tributary to the Schuylkill River), which does not receive flows from any area where project activities would occur.

Several active groundwater supply wells are within a 1-mile radius of the proposed facilities. For a source of sanitary water, the Gilberton Power Plant maintains two 440-ft-deep wells, both completed in the Mauch Chunk Formation, near the southern perimeter of the proposed project site. One of the two wells is pumped intermittently at 70 gpm, while the other well serves as a backup source. The pump operates about 15 hours per day on average to withdraw approximately 63,000 gal per day.

The Morea Citizens Water Company, which serves a population of 350 in the village of Morea, obtains water from a 380-ft-deep well located about 1,***500*** ft southeast of the proposed project site. This well is completed in the Pottsville Formation (Becher 1991). Average daily water use of 20,500 gal (about 14 gpm) compares with an estimated safe yield of 144,000 gal per day (100 gpm) (PDEP 2002b). Two nearby wells include a well that the Morea water company maintains as a backup source and a well used by a state police facility. At least four domestic wells are located west and south of the proposed project site at distances between about 1,200 ft and one mile of the site. These wells, which supply residents and small businesses, are completed in the Pottsville Formation or the upper portion of the Mauch Chunk Formation and extend 70 to 90 ft below ground surface. Other water users in the area, including the Mahanoy State Correctional Institution east of the proposed project site, are supplied by municipal water systems that obtain supplies from surface water reservoirs.

Schuylkill County's public water supply systems are estimated to have a total safe yield of more than 48 million gal per day. This substantially exceeds current average daily usage of about 23 million gal, current peak demand of almost 31 million gal, and projected future demand, which is expected to be less than current usage due to population decline (PDEP 2002b). However, concerns about the adequacy of water supplies have been raised in past drought periods (Becher 1991) and some water suppliers have problems with water treatment and distribution systems (PDEP 2002b).

The Morea water utility's source of water is judged to have adequate capacity, but the utility has experienced difficulties in maintaining adequate water pressure through its distribution system. Other water supply utilities that operate near the proposed project site have been identified as having sufficient unused capacity to serve additional customers in Morea and the Broad Mountain area (PDEP 2002b). An analysis prepared for the Pennsylvania Department of Environmental Protection

(2002b) recommended that the Schuylkill County Municipal Authority, which serves nearly 32,000 county residents from surface water sources, supplying more than 4.4 million gal per day on average, could acquire the Morea Citizens Water Company in order to improve water service in Morea. Also, a consultant to the Pennsylvania Department of Environmental Protection recommended that the Mahanoy Township Authority could extend its service area on the top of Broad Mountain (PDEP 2002b). This utility supplies water to about 6,500 people in Mahanoy Township, Gilberton Borough, and Mahanoy City, using both surface water sources and wells. Another public water supplier in the site vicinity is the Pennsylvania American Water Company, Frackville Division, which serves 5,700 people in Frackville Borough and parts of Butler and Mahanoy Townships from five wells that supply about 507,000 gal daily.

In addition to the Gilberton Power Plant, existing industrial water users in the area include several other cogeneration plants that use water for cooling and for steam. Agricultural water use is minimal in the vicinity of the proposed project site.

3.5 FLOODPLAINS AND WETLANDS

3.5.1 Floodplains

The proposed site for the main plant area is a nearly level plot of 75 acres atop Broad Mountain at an elevation of 1,700 ft amsl, which is above the Federal Emergency Management Agency's delineated 100- and 500-year floodplains (FEMA 1983, 1986). The new culm beneficiation plant, or expansion of the existing facility, would be located to the north and across Mahanoy Creek from the main plant area. ***This*** location would ***also*** be above the Federal Emergency Management Agency's delineated 100- and 500-year floodplains (FEMA 1983, 1986).

Certain project support facilities (i.e., product transportation, culm preparation, water intake) would be connected to the main plant area by (1) product rundown lines to a railroad siding, (2) an expansion of the coal conveyor from the culm beneficiation plant, and (3) a mine pool water source line. These structures would cross above the level of the Federal Emergency Management Agency's delineated 100- and 500-year floodplains, which are centered along Mahanoy Creek (FEMA 1983, 1986), by using an existing trestle.

The Federal Emergency Management Agency flood hazard delineations do not include areas potentially at risk from flooding if the failure of a dam or berm were to lead to releasing the contents of a surface-water reservoir or tailings impoundment. The tailings pond which would receive effluent from the proposed facilities (Section 3.4.3) has been identified as a potential source of flooding, possibly affecting both project-related coal beneficiation facilities and the borough of Gilberton, and therefore is discussed in Section 4.1.5.1. The berm that surrounds the tailings impoundment does not have a dam safety permit from the Pennsylvania Department of Environmental Protection. For dams such as this one that are not built across streams, permits are not required unless the impoundment receives storm water runoff from more than 100 acres and stores more than 50 acre-feet (about 2.2 million ft^3; PDEP 2006).

3.5.2 Wetlands

Wetlands do not occur on or within about 1,000 ft of the proposed site for the main plant area. No natural wetlands are known to occur in the valley below in the vicinity of the proposed culm preparation and conveyance facilities, although some of the tailings ponds and other collection basins in Mahanoy Creek valley may provide some wetland functions.

3.6 ECOLOGICAL RESOURCES

3.6.1 Terrestrial Ecology

Under Bailey's (1995) classification system for the ecoregions of the United States, the proposed project site and environs lie in the Northern Ridge and Valley Section of the Central Appalachian Broadleaf Forest – Coniferous Forest – Meadow Province. The Northern Ridge and Valley Section comprises about 23,000 square miles, or 47% of the total area of the province, and about 0.9 % of the total area of the United States (McNab and Avers 1994). Most, if not all, of the proposed site lies within the lower Susquehanna River subbasin, the most developed of the six subbasins of the Susquehanna, particularly in terms of hydropower, industry (including coal mining), and agriculture (SRBC 1998).

Since the die-off of the formerly dominant American chestnut, oak-hickory and oak-hickory-pine forests have become the dominant forests of otherwise undisturbed areas of the Northern Ridge and Valley Section (McNab and Avers 1994). Maple, beech, and birch also are fairly widespread in the section (USGS 2003a). The region is dominated by second- and third-growth forest that has regenerated since the extensive logging of the 1800's. These forests are typically mixed oak communities, with an abundance of northern red oak, chestnut oak, white oak, sycamore, yellow birch, red maple, white ash, and tulip poplar, and a scattering of eastern hemlock and white pine. Forest understories often include black locust, dogwood, spicebush, mountain laurel, rhododendron, blueberry, and serviceberry. Ferns, grasses, and forbs comprise the ground cover in these forests. Deer, black bear, turkey, grouse, squirrel, and chipmunk are common inhabitants of the woodlands.

The proposed main plant site is on a ridge top covered by a 25- to 30-year old, even-aged forest of chestnut oak, white oak, hickory, cherry, pine, red maple, dogwood, sassafras, and birch. The tallest trees are about 45 ft in height, and up to about 1 ft in diameter at breast height. Common understory species include early low blueberry, highbush blueberry, witch hazel, downy serviceberry, and mountain laurel. Scattered hawthorns, wintergreen, greenbrier, blackhaw, and nannyberry are also present. Herbaceous species present on the site include ferns (e.g., bracken, interrupted), colt's foot, spotted knapweed, thistle, dock, common plantain, primrose-leaved violet, common mullein, common cinquefoil, goldenrod, broomsedge, and other grasses. Mosses and lichens occur on most trees and rocks within the proposed project area. Soils are generally very poor, dry, and rocky (Section 3.3.4), with large rocks scattered on the ground.

The site is flanked by the Gilberton Power Plant to the west and the Mahanoy State Correctional Institution to the east. Land in the valleys to the north and south has been strip-mined. With the exception of a few road cuts and utility crossings, the site is almost entirely wooded and does not appear to have ever been strip-mined.

Since the elimination of the mountain lion, gray wolf, woodland bison, and elk in the nineteenth and early twentieth centuries by hunting and habitat destruction or alteration, the only large vertebrates naturally occurring in the region are the black bear and the whitetail deer. Other mammals, all considerably smaller, include weasel, deer mouse, meadow jumping mouse, fox squirrel, gray squirrel, and bats (McNab and Avers 1994).

Wildlife using the site is consistent with that described for the region. Black bear, red fox, coyote, whitetail deer, gray squirrel, red squirrel, grouse, and turkey have been reported by employees that work at the adjacent Gilberton Power Plant. Bird species seen include blue jay, American crow, turkey vulture, downy woodpecker, hairy woodpecker, rufous-sided towhee, black-capped chickadee, chipping sparrow, black and white warbler, palm warbler, yellow-rumped warbler, black-throated blue warbler, and several additional unidentified warblers. The site lies in an important migration route for raptors such as red-tailed and red-shouldered hawks, and great horned owls (PDCNR-State Parks 2004); although these species have not been reported on the site, they may pass through. Bird species activity and diversity are moderate and probably characteristic of higher elevations within the region. ***Other vertebrates (reptiles and amphibians) likely inhabit the proposed project site.***

One of the eight segments of Weiser State Forest lies approximately 1.8 miles to the east of the proposed site, adjacent to Locust Lake State Park (USGS 1969). Weiser State Forest provides a number of recreational opportunities including hunting, fishing, hiking, and picnicking (PDCNR-State Forests 2004). Immediately adjacent to Weiser State Forest, heavily forested Locust Lake State Park offers hiking, camping, hunting, fishing, and boating. Among the more than 100 species of birds observed at Locust Lake State Park are 16 birds of prey (i.e., raptors) including ospreys, merlins, red-shouldered hawks, red-tailed hawks, great-horned owls, and screech owls. Important game species include ruffed grouse, wild turkey, woodcock, doves, ring-necked pheasants, rabbits, squirrels, and white-tailed deer (PDCNR-State Parks 2004). Many of these same species likely also occur on or near the proposed site. The nearest state game land lies about 8 miles northeast of the proposed site, and numerous state game lands can be found in almost any direction within 20 miles (USGS 2003b).

3.6.*2 Aquatic Ecology*

The proposed site lies on a fairly flat ridgetop that forms the divide between the Susquehanna and Schuylkill River watersheds. The north side of the ridge drains to upper Mahanoy Creek, a 56-mile tributary of the Susquehanna River to the west, while the south side drains to one or more small impoundments and Mill Creek, a tributary of the Schuylkill River.

No surface waters are on or in the immediate vicinity of the proposed facility site. However, tailing ponds and other collection basins are located along upper Mahanoy Creek in formerly strip

mined areas including the tailings pond that currently serves the Gilberton Power Plant, as described in Section 3.4.3. This pond would also serve the proposed facilities.

The proposed site drains to Mahanoy Creek watershed. Mahanoy Creek water quality and aquatic ecology have been substantially altered by acid mine drainage. Due to the high acidity and concentrations of dissolved metals, aquatic life is severely reduced, with diminished diversity and abundance in reaches in the vicinity of Gilberton Power Plant (Cravotta 2005; SRBC 1986, 1994). Aquatic macroinvertebrates of generally medium to high pollution tolerance, but no fish, were found in this stretch in a study of abandoned mine drainage in the Mahanoy Creek Basin (Cravotta 2005). Efforts are currently underway to improve water quality, particularly by a project sponsored by the Mahanoy Creek Watershed Association to convert a large tract of land to wetland to treat acid mine drainage passively (Schuylkill County 2005).

3.6.3 Threatened and Endangered Species

Except for occasional transient individuals, the proposed facilities are not located within an area that is the habitat of an endangered, threatened, candidate, special concern, or rare species of bird, mammal, reptile, amphibian, fish, aquatic invertebrate, or plant recognized by the state or federal government (PNDI 2003; PFBC 2003; PGC 2003; Appendix A). Although the endangered Virginia big-eared bat and the endangered Indiana bat occur in the region (McNab and Avers 1994) and the U.S. Fish and Wildlife Service includes adjacent Luzerne County (to the north) within the area of distribution of the Indiana bat (Appendix A), neither species is likely to reside in the immediate vicinity of the proposed site because suitable habitat is not present. No caves or abandoned mine shafts, which are necessary to provide winter habitat for the Indiana bat and both winter and summer habitat for the Virginia big-eared bat, are known to be present on the project site. Riparian habitat used extensively by Indiana bats in summer is also lacking. Neither species has been sighted in the project area.

3.6.4 Biodiversity

Biodiversity is a general term broadly defined as the variety and variability of life, or the diversity of genes, species, and ecosystems (CEQ 1993). Presence of rare species and habitat types increases local biodiversity. The proposed site consists of about 75 acres of second-growth forest habitat typical of the region. The habitat is not noted for rare species.

3.7 SOCIAL AND ECONOMIC RESOURCES

This section contains data on the social and economic resources most likely to be affected by construction and operation of the proposed facilities. Most of the data are for Schuylkill County, but data for Mahanoy and West Mahanoy townships and Frackville and Gilberton boroughs are provided where available. Data are also included for the city of Pottsville ***because it*** is the largest city in

Schuylkill County and would likely be the destination of any workers relocating to the area for project construction or operations.

3.7.1 Population

Table 3.7.1 provides population data for Schuylkill County, Mahanoy and West Mahanoy townships, Frackville and Gilberton boroughs, and the city of Pottsville. Between 1990 and 2000 (the most recent year for which complete U.S. Census Bureau data are available), each of these jurisdictions experienced a population decrease except for West Mahanoy Township, which experienced a population increase of 35.8%. The U.S. Census Bureau's 2003 population estimate of 147,944 for Schuylkill County (other jurisdictions are not available) indicates that the county continued to experience a population decrease (1.6% from 2000 to 2003).

The population increase in West Mahanoy Township was primarily due to the opening of the Mahanoy State Correctional Institution in 1993. As an indication of how the prison's inmate population figures affect West Mahanoy Township's total population figures, the inmate population in December 2000 (1,984) represented over 32% of the township's total population (PDC 2001).

Table 3.7.1. Population data for Schuylkill County and selected communities

	1990 population	2000 population	Percentage change 1990–2000
Schuylkill County	152,585	150,336	-1.5
Mahanoy Township	1,273	1,113	-12.6
West Mahanoy Township	4,539	6,166	35.8
Frackville Borough	4,700	4,361	-7.2
Gilberton Borough	953	867	-9.0
City of Pottsville	16,603	15,536	-6.4

Sources: U.S. Census Bureau 2004a; U.S. Census Bureau 2004b

3.7.2 Employment and Income

Table 3.7.2 provides employment and income data for residents of Schuylkill County in 2000. The unemployment rate in Schuylkill County (6.0%) was slightly higher than that in Pennsylvania (5.8%), but lower than that in the United States (6.6%). Schuylkill County's per capita income ($17,230) was lower than that of both Pennsylvania ($20,880) and the United States ($21,587) (U.S. Census Bureau 2004b).

Table 3.7.2. Employment and income data for Schuylkill County in 2000

Location	Labor force	Number employed	Number unemployed	Unemployment rate (%)	Per capita income ($)
Schuylkill County	67,989	63,902	4,087	6.0	17,230

Source: U.S. Census Bureau 2004b

Table 3.7.3 provides data on employment by industry or economic sector in Schuylkill County in 2001. The employment data in Table 3.7.3 differ from the data in Table 3.7.2 because Table 3.7.3 provides information on the number of employees in Schuylkill County regardless of their residence, while Table 3.7.2 provides information on the number of Schuylkill County residents employed regardless of work location.

The largest sectors in Schuylkill County are manufacturing, retail trade, health care and social assistance, and accommodation and food services. The largest employer in Schuylkill County is Alcoa Engineering Products in Cressona (1,000 employees). Other employers in Schuylkill County with more than 400 employees include the Good Samaritan Regional Medical Center in Pottsville (926), J.E. Morgan Knitting Mills in Tamaqua (625), Guilford Mills in Pine Grove (530), Quaker State Farms in Klingerstown (450), and St. Luke's Miners Memorial Hospital in Coaldale (425) (NEPaA 2004a).

Table 3.7.3. Employment by industry or economic sector in Schuylkill County in 2001

Industry	Number	Percentage
Manufacturing	13,146	30.3
Retail trade	7,765	17.9
Health care and social assistance	7,215	16.6
Accommodation and food services	2,624	6.0
Other services (except public administration)	1,929	4.4
Wholesale trade	1,625	3.7
Construction	1,371	3.2
Finance and insurance	1,332	3.1
Transportation and warehousing	1,131	2.6
Auxiliaries (except corporate, subsidiary, and regional management)	987	2.3
Administrative, support, waste management, remediation services	853	2.0
Professional, scientific, and technical services	839	1.9
Information	560	1.3
Mining	551	1.2
Educational services	416	1.0
Real estate, rental, and leasing	318	0.7
Utilities	272	0.6
Arts, entertainment, and recreation	230	0.5
Management of companies and enterprises	219	0.5
Forestry, fishing, hunting, and agricultural support	29	0.1
Unclassified	28	0.1
Total employment	43,440	100.0

Source: U.S. Census Bureau 2004c

WMPI is the largest employer in Gilberton, with 150 employees at the existing Gilberton Power Plant (NEPaA 2004a). Most of these current power plant employees reside in Schuylkill County. Total employee payroll at the Gilberton Power Plant was over $7.6 million in 2004.

3.7.3 Housing

Table 3.7.4 provides housing data for Schuylkill County, Mahanoy and West Mahanoy townships, Frackville and Gilberton boroughs, and the city of Pottsville. Schuylkill County's vacancy rate (10.7%) is slightly higher than that of Pennsylvania and the United States, both of which are around 9.0%. The housing stock in Schuylkill County is relatively old, especially in Mahanoy Township and Gilberton where 68.4% and 67.7% of the housing units, respectively, were built before 1940. Also, the median values of owner-occupied housing in both townships and in the borough of Gilberton are far lower than the median value of owner-occupied housing in Schuylkill County. Related factors associated with environmental justice are addressed in Section 3.7.7.

Twenty-eight hotels and motels with a total of 2,046 rooms are located within 35 miles of the proposed project site. The hotels closest to the project site are the Econo Lodge (39 rooms; 1.9 miles from the project site) and the Holiday Inn Express and Suites (64 rooms; 2.6 miles from the project site) in Frackville.

Table 3.7.4. Housing data for Schuylkill County and selected communities in 2000

	Schuylkill County	Mahanoy Township	West Mahanoy Township	Frackville Borough	Gilberton Borough	City of Pottsville
Total housing units	67,806	488	1,503	2,094	474	7,343
Occupied units	60,530	436	1,307	1,914	385	6,413
Vacant units	7,276	52	196	180	89	930
Vacancy rate (%)	10.7	10.7	13.0	8.6	18.8	12.7
Median value, owner-occupied ($)	63,900	34,500	45,200	57,000	23,800	57,200
Median monthly rent, renter-occupied ($)	379	397	441	394	336	324
Units built before 1940 (%)	52.9	68.4	59.5	61.2	67.7	60.8

Source: U.S. Census Bureau 2004b

3.7.4 Water and Wastewater Services

Residences and businesses in Schuylkill County obtain their water from two main types of sources, reservoirs (56%) and wells (44%). The water is supplied by a variety of community, private, and self-suppliers. Water usage in Schuylkill County is estimated to average 33 million gal per day (mgd) (PDEP 2002b).

The Mahanoy Township Authority, which services the immediate vicinity of the proposed facilities, provides approximately 1.9 mgd and has about 5 million gal of reserve capacity in reservoirs (PDEP 2002b). The Schuylkill County Municipal Authority, which provides water to the city of Pottsville, is the largest water supplier in Schuylkill County (approximately 4.6 mgd). According to the Pennsylvania Department of Environmental Protection (2002b), the Schuylkill County Municipal Authority services many different parts of the county with no limitation on its extent of growth.

Wastewater disposal in rural areas near the proposed facilities is provided by individual septic systems. In more urbanized nearby areas, wastewater disposal is provided by the Frackville Area Municipal Authority and the Mahanoy City Sewer Authority.

Wastewater disposal in the city of Pottsville is provided by the Greater Pottsville Area Sewer Authority, which divides the city into two sewer districts—West End and Main. The West End Treatment Plant's current permitted capacity is 0.5 mgd. At present, the plant cannot handle peak flow, particularly during rainfall events of normal intensity and duration. Due to this problem, the Pennsylvania Department of Environmental Protection initiated a moratorium on new connections to this portion of the system (City of Pottsville 2001). The city's Main Treatment Plant has a permitted capacity of 4.5 mgd and average flows of around 3.6 mgd. The Main Plant also exceeds its capacity during peak flow rainfall events, although not to the degree of the West End Plant. Due to this problem, and the probable need to upgrade mechanical equipment at the Main Plant, the Pennsylvania Department of Environmental Protection also initiated a moratorium on new connections to this portion of the system (City of Pottsville 2001). In 2002, the Pennsylvania Department of Environmental Protection approved the Sewer Authority's plan for improving its system and discharge. The plan calls for closing the West End Plant, upgrading the Main Plant from 4.5 mgd to 8.2 mgd, separating 37,000 ft of combined stormwater and sanitary sewer lines, and replacing 24 combined sewer overflow structures (PDEP 2002c). Implementation of the plan is allowing the Sewer Authority to connect new residential and commercial customers to its system.

3.7.5 Public Services

3.7.5.1 Police Protection

In Schuylkill County, police protection is provided by a combination of local and state police forces. The Schuylkill County sheriff's office provides police protection for the entire county with 14 full-time officers (Dennis Kane, Schuylkill County Sheriff's Office, personal communication to James W. Saulsbury, ORNL, June 14, 2005). Many of the less populated boroughs and townships with limited or no local police service also rely on the Pennsylvania state police (Schuylkill County 2004). In Schuylkill County, the Pennsylvania state police operate stations in Frackville and Schuylkill Haven.

Near the proposed project site, the West Mahanoy Township police department has four officers, the Frackville Borough police department has seven officers, and the Gilberton Borough police department has two officers. Currently, Mahanoy Township does not have a police department and is covered by the Pennsylvania state police (Dennis Kane, Schuylkill County Sheriff's Office, personal communication to James W. Saulsbury, ORNL, June 14, 2005). The police department in the city of Pottsville has 31 full-time officers (City of Pottsville 2005).

3.7.5.2 Fire Protection and Emergency Medical Services

Fire protection and emergency medical services in Schuylkill County are provided by volunteer fire departments located in or near the small towns and boroughs and within the city of Pottsville. Gilberton Borough has two fire stations, Continental Fire Company in Gilberton and American Hose Company in Mahanoy Plane. Frackville Borough has three fire stations, Balliet Street, Frack & Broad Mountain, and Friendship Fire Company. There are also fire stations located throughout Mahanoy City and West Mahanoy Township. In addition to fire protection, many of these stations provide emergency medical services throughout their coverage area (Schuylkill County 2004).

The Pottsville fire department provides fire protection and emergency medical services to residents of Pottsville and has mutual aid support agreements with the surrounding communities. The department is comprised of eight individual volunteer fire companies equipped with nine fire engines, one 100-ft aerial ladder, one 75-ft aerial ladder, one heavy rescue truck, six squad/utility vehicles, and two four-wheel-drive vehicles. Special equipment includes two multi-gas monitors and five thermal imaging cameras (City of Pottsville 2005).

3.7.5.3 Schools

During the 2002–03 school year, Schuylkill County had 13 public school districts and 24 independent schools. The proposed facilities would be located within the Mahanoy Area School District, which in the 2002–03 school year had a kindergarten–8th grade enrollment of 809 students and a 9th–12th grade enrollment of 402 students. Schuylkill County anticipates that the Mahanoy Area School District's enrollment will decrease by more than 39% for all grade levels by the 2012–13 school year (Schuylkill County 2004).

The Pottsville Area School District had a kindergarten–8th grade enrollment of 1,908 students and a 9th–12th grade enrollment of 1,209 students during the 2002–03 school year. Schuylkill County anticipates that the Pottsville Area School District's enrollment will decrease by 5% for kindergarten–8th grade and by 23% for 9th–12th grade by the 2012–13 school year (Schuylkill County 2004). The Pottsville Area School District, which reports that its facilities are in excellent condition, has no immediate plans for any major renovations or construction efforts (Pottsville Area School District 2005).

3.7.5.4 Health Care

In Schuylkill County, health care is provided by four regional health care facilities: Good Samaritan Regional Medical Center, Pottsville Hospital and Warne Clinic, Ashland Regional Medical Center, and St. Luke’s Miners Memorial Hospital. Good Samaritan Regional Medical Center, which is located in Pottsville, is a 174-bed, full service, acute care hospital with emergency services in its 15-bed emergency department. Also located in Pottsville, the Pottsville Hospital and Warne Clinic is a 200-bed, full service, acute care hospital, which includes an emergency department.

The Ashland Regional Medical Center is an 86-bed, private, not-for-profit medical center located in Ashland. The center features a 40-bed long-term care unit. St. Luke's Miners Memorial Hospital, located in Coaldale, has 61 acute care beds and 53 geriatric care beds.

3.7.6 Local Government Revenues

In 2002, Schuylkill County had over $89 million in total revenues, with over $18.6 million coming from property taxes and $0.5 million coming from the county's hotel and per capita taxes. Schuylkill County had expenses of over $90 million during the same period, but had net assets of over $22 million at the end of 2002 because of carryover funds totaling $23 million from 2001 (Schuylkill County 2003). In 2004, the existing Gilberton Power Plant paid $116,000 in property taxes to Schuylkill County, West Mahanoy Township, and the Shenandoah Valley School District.

3.7.7 Environmental Justice

Table 3.7.5 lists the percentages of the total population that are classified as "minority" and ***"low-income"*** for the United States, Pennsylvania, Schuylkill County, and the nine census tracts (small, relatively permanent statistical subdivisions of a county) that are wholly or partly within 3 miles of

Table 3.7.5. Environmental justice data for the United States, Pennsylvania, Schuylkill County, and the nine census tracts within 3 miles of the proposed facilities

Place	% Minority[a]	***% Low-Income***[b]
United States	30.9	12.4
Pennsylvania	15.9	11.0
Schuylkill County	4.0	9.5
Census tracts within Schuylkill County[c]		
Census Tract 1 (Union Township)	0.8	6.9
Census Tract 4 (Mahanoy Township, Ryan Township)	0.8	10.2
Census Tract 5 (Mahanoy City)	1.7	17.4
Census Tract 6 (Shenandoah Borough)	0.4	20.1
Census Tract 7 (West Mahanoy Township, exclusive of boroughs)	29.3[d]	6.4[e]
Census Tract 8 (Frackville)	1.9	7.4
Census Tract 9 (Butler Township, Englewood)	1.2	8.7
Census Tract 14 (New Castle Township)	12.6	11.3
Census Tract 24 (Blythe Township)	0.8	10.3

[a]Includes all persons who identified themselves as not "White alone," plus those who identified themselves as both "White alone" and "Hispanic or Latino."

[b]Represents individuals below the poverty level as defined by the U.S. Census Bureau.

[c]Of the 39 census tracts in Schuylkill County, the 9 census tracts listed in this table are those located at least partially within 3 miles of the proposed project site.

[d]U.S. Census population data in Census Tract 7 include inmates at the Frackville and Mahanoy State Correctional Institutions.

[e]U.S. Census poverty data in Census Tract 7 do not include inmates at the Frackville and Mahanoy State Correctional Institutions.

Source: U.S. Census Bureau. 2004b

the proposed project site. Schuylkill County and eight of the nine census tracts evaluated have lower minority percentages than the United States and Pennsylvania. As reported by the Census Bureau, Census Tract 7 has a much higher minority percentage than Pennsylvania, Schuylkill County, or any other census tract near the proposed facilities.

The unusually high minority population of Census Tract 7 is due to two Pennsylvania prisons, the Mahanoy and Frackville State Correctional Institutions. While these prisons are listed in Census Tract 7 because their mailing addresses are in Census Tract 7, the prisoner facilities are located in Census Tract 4. Frackville State Correctional Institution is located just south of Interstate 81, a short distance east of the intersection with State Route 61. Mahanoy State Correctional Institution, which is located adjacent to the eastern property boundary of the proposed main plant, has the highest concentration of minority persons in the vicinity of the proposed facilities. This institution, which is a medium-security facility for male inmates, has an operational bed capacity of 1,900 but housed 2,174 inmates in 2004. About 60% of the inmates are minorities.

Schuylkill County's percentage of persons living below the poverty level is lower than that of Pennsylvania and the United States. Census Tracts 5 and 6 have relatively high proportions of ***low-income residents,*** 17.4% and 20.1%, respectively. Census Tract 5 encompasses Mahanoy City, a small unincorporated urban area about 3 miles east-northeast of the proposed facilities. Census Tract 6, about 1 mile north-northeast of the proposed facilities, encompasses Shenandoah Borough.

3.7.8 Transportation

3.7.8.1 Roads

Road access to the proposed project site is from Interstate 81 (Figure 2.1.1) via State Route 61 and State Route 1008 (Morea Road) (Figure 2.1.2). Annual average daily traffic (ADT) on the segment of State Route 61 near the proposed project site is 10,186 vehicles (both directions combined). ADT on the segment of State Route 1008 that provides access to the proposed project site is 4,486 vehicles (both directions combined). The Pennsylvania Department of Transportation does not calculate level of service or volume/capacity ratio figures; however, these ADT figures (especially for State Route 61) represent “heavy traffic on two-lane highways going through such a small town” (Dave Gruber, Pennsylvania Department of Transportation District 5, personal communication to James W. Saulsbury, ORNL, May 26, 2004). The Pennsylvania Department of Transportation has no current or planned road construction activities for Interstate 81, State Route 61, or State Route 1008 in the vicinity of the proposed facilities (PDOT 2004).

3.7.8.2 Railways

The railroad siding closest to the proposed project site is about 1 mile away near the borough of Gilberton. National rail access to the area is provided by Norfolk Southern and CSX railroads, which connect with the Reading Blue Mountain & Northern Railroad Company.

3.7.9 Cultural Resources

The Pennsylvania Historical and Museum Commission's Bureau for Historic Preservation, which serves as the State Historic Preservation Office (SHPO), reports no historic or archaeological properties that are listed or eligible for listing on the *National Register of Historic Places* in the area of the proposed facilities (Appendix B). In Schuylkill County, 19 properties are listed on the *National Register* (NPS 2004). The *National Register* property closest to the proposed facilities is St. Paul's Union Church and Cemetery, located in Ringtown, about 6 miles northwest of the project site.

3.8 WASTE MANAGEMENT

The region is served by several commercial municipal solid waste landfills. Statewide, the disposal capacity of Pennsylvania landfills exceeds the state's own needs. As a result of abundant landfill capacity, low disposal fees, and proximity to states with a shortage of disposal capacity, Pennsylvania receives more out-of-state solid waste for disposal than any other state. In 2003, about 10.5 million tons of solid waste from out-of-state sources were shipped to Pennsylvania for disposal, representing nearly half of the solid waste disposal in the state and 23.5% of all interstate waste shipments in the nation (McCarthy 2004).

The three commercial municipal solid waste landfills nearest the proposed project site are the Commonwealth Environmental Services facility in Foster Township, Schuylkill County; the ***closed*** Pine Grove landfill in Pine Grove Township, Schuylkill County; and the Delaware County Solid Waste Authority's Rolling Hills landfill, in Earl Township, Berks County (PDEP 2004a). In addition to household refuse and other municipal wastes, ***municipal solid waste landfills such as these can*** receive industrial wastes (which are classified as residual waste in Pennsylvania Department of Environmental Protection regulations) and construction and demolition wastes (PDEP 2004b). The Commonwealth Environmental Services landfill, which is currently permitted to receive an average of 2,100 tons of waste daily and a maximum of 2,400 tons daily (PDEP 2004e), received a total of 506,670 tons (about 1,600 tons per day) in 2003 (PDEP 2004b). The current 10-year permit for this landfill expires in 2007, but the operator has requested a new permit that would (1) add 250 acres of permitted area (including 165 acres of disposal area), (2) increase permitted average and maximum daily waste volume to 4,750 tons and 5,000 tons, respectively, and (3) add about 8 years of waste capacity (PDEP 2004e). Commonwealth Environmental Services owns additional land adjacent to the landfill (Bob Wallace, Pennsylvania Department of Environmental Protection, personal communication to Ellen Smith, ORNL, September 22, 2004) that could provide space to accommodate future expansion. The Pine Grove landfill was formerly approved to receive 1,500 tons of waste per day and received nearly 1,200 tons daily as recently as 2002 (PDEP 2004b), but reached its permitted capacity in 2004 and stopped receiving waste. In 2004, the Pennsylvania Department of Environmental Protection denied an application for a small expansion of the facility (PDEP 2004e) but the operator ***has applied for a*** permit for a larger expansion that would allow resumption of operations (***Pennsylvania Department of Environmental Protection comment letter on draft EIS; Letter 49, Appendix D***). The Rolling Hills landfill also is a high-volume facility, receiving over 600,000 tons in 2003, but operating records show that it does not normally receive waste from Schuylkill County sources (PDEP 2004b).

The state also authorizes landfills exclusively for construction and demolition waste. No landfills of this type are located near the proposed facilities; however, the Pennsylvania Department of Environmental Protection has received an application to establish a new construction and demolition landfill in Blythe Township, Schuylkill County (PDEP 2004e). The nearest landfills exclusively for construction and demolition waste are located in Lancaster, Lackawanna, and Montgomery Counties (PDEP 2004a).

Most coal combustion products from the electric power generation facilities in the region are beneficially reused in accordance with requirements of the Pennsylvania residual waste management regulations (25 Pennsylvania Code Chapter 287). Current and past uses of coal-combustion ash from the Gilberton Power Plant include construction aggregate, non-skid material for application to roads during winter weather, and fill material for mine reclamation. Currently, fine ash and water treatment sludge from the power plant are placed ***within a 1,590-acre*** area in Mahanoy Creek valley that is permitted for coal refuse ***(i.e., culm)*** reprocessing, ***coal preparation, and disposal of coal ash and biosolids under coal surface mining*** permit 54850202, issued ***to B-D Mining Co.*** by the Pennsylvania Department of Environmental Protection. ***Operations*** under that permit are inspected monthly by the agency. Inspections during the three-year period from 2002 to 2004 resulted in 11 environmental violations for which the operator paid penalties totaling $5,775. Specific violations included failure to employ adequate air pollution controls; failure to properly design, control, or maintain erosion and sedimentation controls; failure to post signs and markers; discharge of water not meeting water quality limits; and other unspecified violations of permit conditions or regulatory requirements.[2]

The Pennsylvania Municipal Waste Recycling, Planning and Waste Reduction Act (Act 101 of 1988) mandates recycling programs in the state's larger municipalities. Recycling and composting are encouraged statewide. According to the Pennsylvania Department of Environmental Protection,[3] composting facilities that accept land-clearing debris are located in Robesonia (Berks County), Bethlehem, and the Philadelphia area.

3.9 HUMAN HEALTH AND SAFETY

3.9.1 Air Quality and Public Health

The quality of ambient air plays an important role in the health of the public. Exposure to pollutants is associated with numerous effects on human health, including increased respiratory symptoms, hospitalization for heart or lung diseases, and even premature death. The air breathed in

[2] http://www.dep.state.pa.us/efacts/

[3] http://www.dep.state.pa.us/wm_apps/CompostingPrograms/default.asp

many U.S. cities is polluted by vehicle exhaust emissions; particulate emissions from tires and roads; burning coal, oil, and other fossil fuels; and manufacturing chemicals. These activities add gases and particles to the air people breathe. Hazardous air pollutants are those that the EPA has confirmed or suspects cause cancer or other serious human health effects, such as damage to the immune system and the neurological and respiratory systems. These chemicals include volatile organic compounds, pesticides and herbicides, inorganic chemicals, and radionuclides.

The Clean Air Act required the EPA to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to the public health and the environment. Primary standards were established to protect public health, including the health of sensitive populations, such as asthmatics, children, and the elderly. The EPA established standards for six principal pollutants, which are referred to as “criteria pollutants.” Section 3.2.2 describes the existing air quality in the region.

The American Lung Association (2006) provides interpretive information on the health implications of ground-level ozone and fine particle ($PM_{2.5}$) air pollution on a state-by-state, county-by-county basis. Because the report evaluates only those counties with air quality monitors, no analysis is available for Schuylkill County. However, the results for the surrounding counties (Berks, Dauphin, Lehigh and Luzerne) were examined to provide a general indication of the potential health impacts of existing air quality conditions in the region.

The American Lung Association assessments use EPA’s Air Quality Index, which is based on NAAQS standards. Daily air quality monitoring values are classified on a scale ranging from “good” to “very unhealthy” or “hazardous.” Additionally, the American Lung Association assigns a letter grade ranging from A through F to each county, based on how often its air quality crosses into the “unhealthy” categories of the Air Quality Index. Figure 3.9.1 displays the number of high-ozone days in the four counties mentioned above between 1998-2000 and 2002-2004. An orange day is one in which the county’s maximum measured 8-hour average ozone concentration was in the range 0.085-0.104 ppm, which is rated as “unhealthy for sensitive groups.” A red day is one in which the maximum 8-hour average ozone level was in the range of 0.105-0.124 ppm, which is rated as “unhealthy.” A purple day is one in which the maximum 8-hour average ozone level would be in the range of 0.125-0.374 ppm, which is rated as “very unhealthy;” however no “purple” days were recorded in any of the four counties during either reporting period. While all four counties were assigned grades of F for both time periods, all four counties did experience improved conditions between the two time periods. This is indicated by fewer orange and red days in 2002-2004 than in the earlier period, except for Luzerne County which experienced the same number of red days.

Figure 3.9.2 displays the number of days in the 3-year period 2002-2004 that each county’s maximum 24-hour $PM_{2.5}$ concentration was classified as “unhealthy for sensitive groups” (orange, 40.5 to 65.4 ug/m^3); “unhealthy” (red, 65.5 to 150.4 ug/ m^3); and “very unhealthy” (purple, 150.5 to 250.4 ug/ m^3). (There were no data for particle pollution in the period 1998-2000.) Both Berks County and Luzerne County received grades of D based on the daily data provided in the table, while Dauphin County and Lehigh County received grades of F. Additionally, the American Lung Association report notes that both Berks County and Dauphin County exceeded the NAAQS

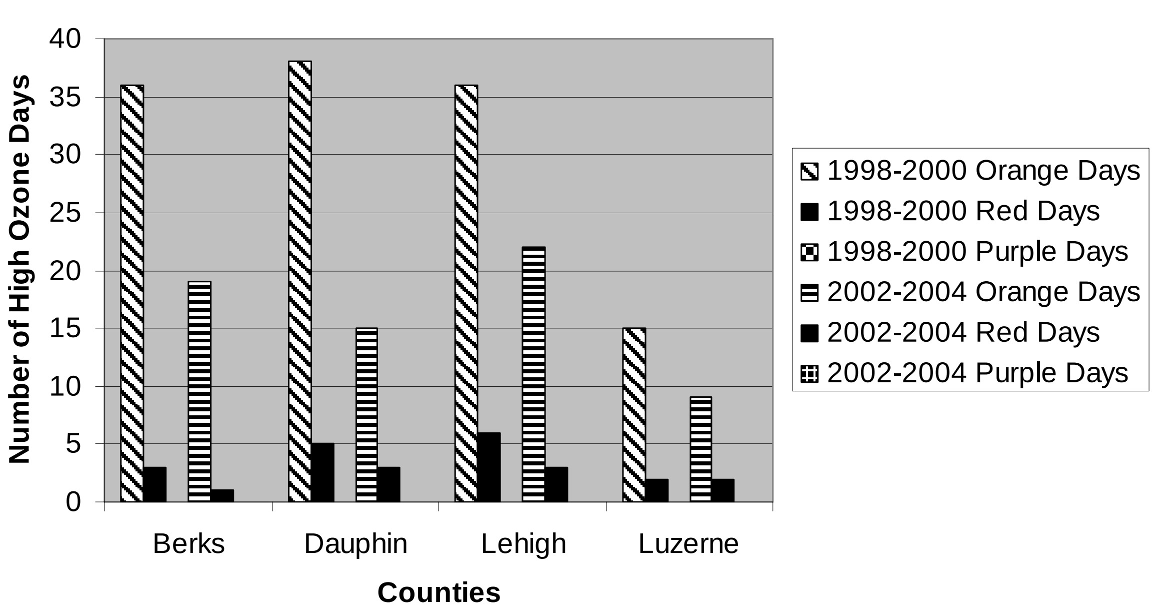

Figure 3.9.1 Comparison of High Ozone Days, 1998-2000 and 2002-2004.

Source: American Lung Association. American Lung Association State of the Air: 2002, American Lung Association National Headquarters, New York City, NY.

Source: American Lung Association. American Lung Association State of the Air: 2006, American Lung Association National Headquarters, New York City, NY.

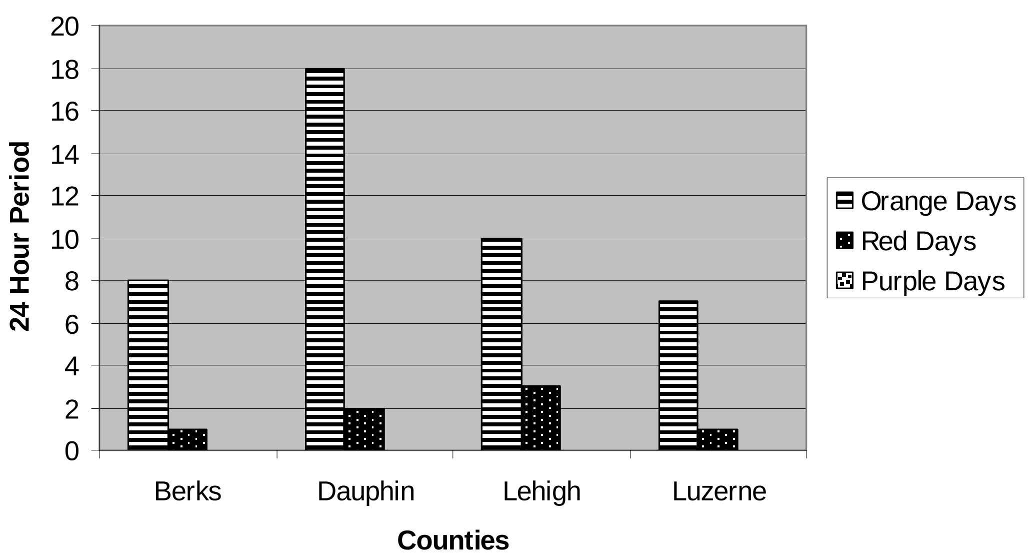

Figure 3.9.2. Comparison of Particle Pollution Days (24-Hour Period), 2002-2004.

Source: American Lung Association. American Lung Association State of the Air: 2002, American Lung Association National Headquarters, New York City, NY.

Source: American Lung Association. American Lung Association State of the Air: 2006, American Lung Association National Headquarters, New York City, NY

standard of 15 ug/ m^3 for annual average $PM_{2.5}$ concentration, while Lehigh County and Luzerne County met the annual average standard.

Certain segments of the population are more vulnerable to adverse health effects from air pollution. Children are particularly vulnerable to environmental influences because of their narrow airways and rapid respiration rate. Compared to adults, children's fast metabolism, ongoing physical development, and daily behavior place them at increased risk from exposure to environmental pollutants. Moreover, exposures that may not harm adults can cause permanent damage in children (Children's Environmental Health Network 1997). ***Chronic respiratory conditions in persons of any age, including asthma, chronic bronchitis, and emphysema, can be caused or aggravated by air pollution exposure. Persons with other chronic diseases, such as cardiovascular disease and diabetes, also have higher vulnerability to adverse effects of air pollution.***

The American Lung Association (2006) compiled estimates of the number of people in various geographic areas who have increased vulnerability to air pollution due to their age or health status. Table 3.9.1 presents estimates of populations at increased risk for the four counties surrounding Schuylkill County. (Estimates were not compiled for counties, such as Schuylkill County, that did not have air monitors during the years for which the report presents data.) Estimates of the numbers of people with chronic health conditions are approximations based on county populations, the age breakdown of the population, and national or state data on the prevalence of the health condition. National prevalence data were the basis for estimates for all conditions with the exception of adult asthma, which was estimated on the basis of state-level data published in 2004.

Table 3.9.1. Estimates of populations at increased risk for adverse health effects from air pollution exposure in counties surrounding Schuylkill County

	Berks County	Dauphin County	Lehigh County	Luzerne County
Total county population	391,640	253,282	326,050	313,431
Population under age 18	93,203	60,463	76,665	62,952
Population age 65 and over	55,741	35,870	49,608	58,511
Pediatric asthma (under age 18)	7,894	5,121	6,494	5,332
Adult asthma (age 18 and over)	26,559	17,150	22,059	21,783
Chronic bronchitis	12,771	8,338	10,792	11,101
Emphysema	5,359	3,546	4,661	5,123
Cardiovascular disease	103,981	68,977	89,459	95,376
Diabetes	22,147	14,710	19,098	20,491

Source: American Lung Association. American Lung Association State of the Air: 2006, American Lung Association National Headquarters, New York City, NY.

Asthma is a condition that disproportionately affects children and minorities. Over 5.3 million American children less than 18 years of age have asthma (American Lung Association 1999). Air ***pollution*** is believed to be a major contributor to pediatric asthma***, which is increasing in prevalence. The Pennsylvania Department of Health (2006) reports that the lifetime incidence of asthma***

among students currently enrolled in the state's schools (grades K-12) increased from 6.6% in 1997 to 9.8% in 2003. In Schuylkill County, 8.2% of students enrolled in 2002 had had asthma at some time in their lives; this was less than the statewide incidence of 9.2% reported for that same year.

In 2001, Pennsylvania ha***d*** a slightly higher rate of asthma-related pediatric ***hospital*** admissions than the nation as a whole (Table 3.9.***2***). County-level pediatric admission rates were not available ***for 2001. In 2003, Pennsylvania had a statewide pediatric asthma hospitalization rate (including patients up to age 19) of 27.1 per 10,000 total population (not adjusted for age); the hospitalization rate in Schuylkill County was below the state average at 17.1 per 10,000 (Pennsylvania Department of Health 2006).***

Approximately 12% of Pennsylvania adults report having had asthma at some time during their lives, and about 8% of adults reported that they currently had asthma in 2003 (Pennsylvania Department of Health 2006).

Pennsylvania's age-adjusted asthma death rate in 2001 was slightly lower than the national average. Pennsylvania had 11.2 asthma deaths per million population, while there were 15.0 asthma deaths per million population in the entire United States (Pennsylvania Department of Health 2006).

Table *3.9.2.* Hospitalization rates for pediatric asthma in Pennsylvania (1997–2001) and the United States (2001)

	1997	1998	1999	2000	2001
Pennsylvania	27.8 [a]	21.7	28.3	24.7	26.7
United States	—	—	—	—	21.4

Source: Pennsylvania Department of Health 2003. Family Health Statistics for Pennsylvania and Counties, 2003 Report, Bureau of Health Statistics and Research, Harrisburg, PA.

[a] Admissions per 10,000 persons under 18 years of age.

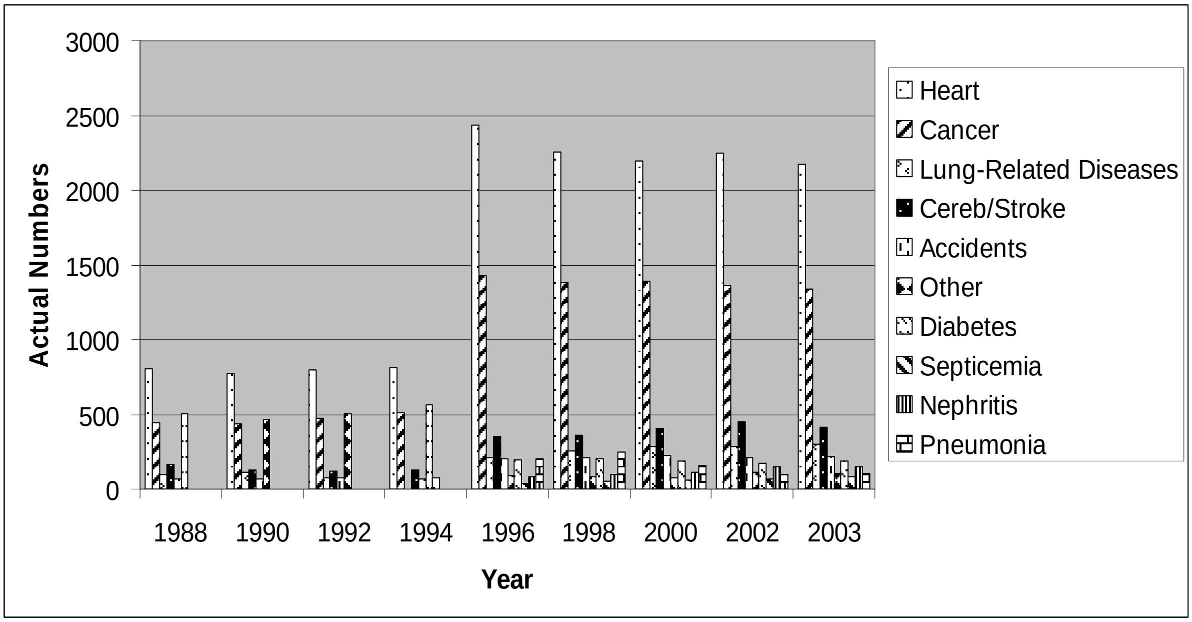

Figure 3.9.3. Select leading causes of death for Schuylkill County from 1988-2003. Source: Pennsylvania Department of Health (2003).

Figure 3.9.3 displays data on heart-related, cancer-related (malignant neoplasms), lung-related and cerebrovascular/stroke-related deaths in Schuylkill County between 1988 (when the first of the area power plants began operation) and 2003. The numbers of heart-, cancer-, and lung-related deaths and cerebrovascular/stroke-related deaths remained fairly constant from 1988 until 1994. In 1994 there were no lung-related deaths reported. However, in 1996, there was a significant rise in all categories that may be due in part to a change in the reporting categories. The top-four leading causes of death from 1988 through 1994 remained the top-four leading causes of death for 1996 through 2003. The top four (in order) are heart-, cancer-, cerebrovascular/stroke-, and lung-related deaths.

For both Schuylkill County and Pennsylvania, the leading causes of death by age group are the same (Pennsylvania Department of Health 2004). However, for malignant neoplasms, cerebrovascular disease, chronic lower respiratory disease, and accidents, the average death rate is higher for Schuylkill County than for the state and nearby counties, and the death rate from heart disease is higher for Schuylkill County than for the state (Figure 3.9.***4***).

3.9.2 Electromagnetic Fields

Over the past two decades, some members of the scientific community and the public have expressed concern regarding human health effects from electromagnetic fields (EMF) during the transmission of electrical current from power plants. The scientific evidence suggesting that EMF exposures pose a health risk is weak. The strongest evidence for health effects comes from observations of human populations with two forms of cancer: childhood leukemia and chronic lymphocytic leukemia in occupationally exposed adults (NIEHS 1999). A National Institute of Environmental Health Sciences report concluded that "extremely low-frequency electric and

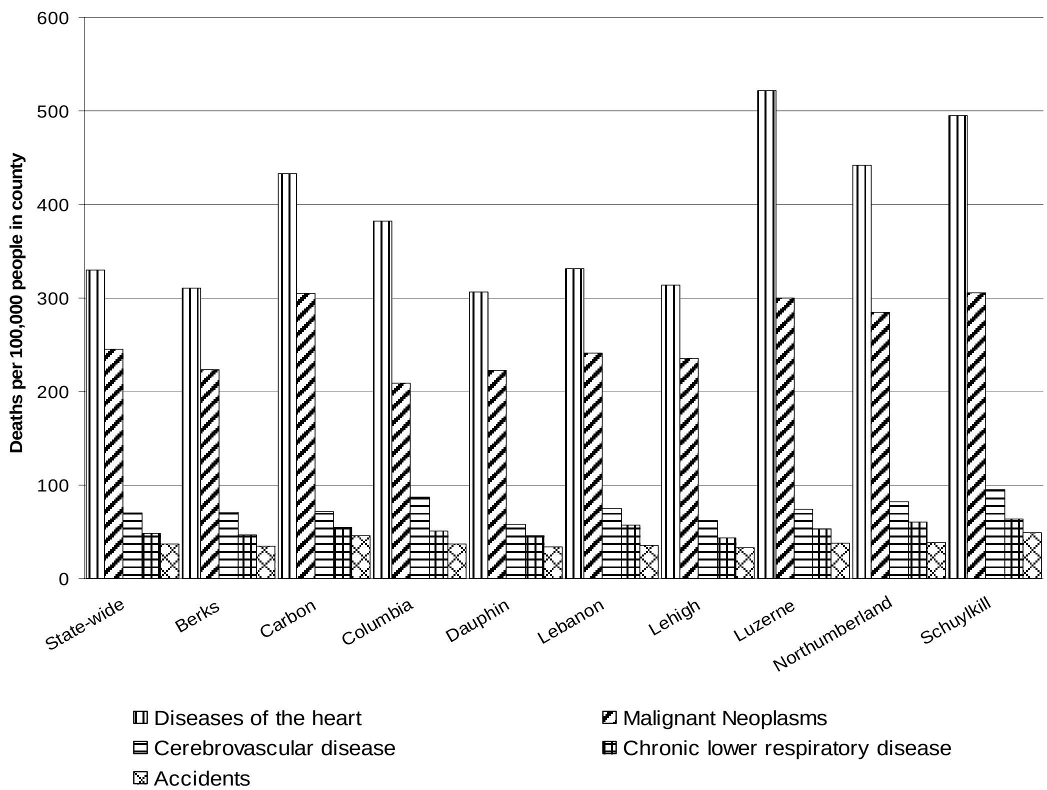

Figure 3.9.4. Rates of death by cause in Pennsylvania, Schuylkill County and surrounding counties. Source: Pennsylvania Department of Health 2004. Pennsylvania Vital Statistics for 2002.

magnetic field exposure cannot be recognized as entirely safe because of weak scientific evidence that exposure may pose a leukemia hazard" (NIEHS 1999). While considerable uncertainty still exists about the EMF health effects issue, the following facts have been established from the available information:

- Any exposure-related health risk to the exposed individual would likely be small.
- The types of exposures that are most biologically significant have not been established.
- Most health concerns are about the magnetic field.
- The measures employed for field reduction can affect line safety, reliability, efficiency and maintainability, depending on the type and extent of such measures.

No federal regulations have been established specifying environmental limits on the strengths of fields from power lines.

3.9.3 Worker Health and Safety

The Bureau of Labor Statistics annually reports on the number of workplace injuries, illnesses, and fatalities in the United States, and includes the number of fatalities in individual states. Such information is useful in identifying industries with high rates and/or large numbers of injuries, illnesses, and fatalities. The results of the annual reports can be used by industry organizations and private companies to start or revise worker safety programs that hopefully will reduce, and ultimately prevent, workplace injuries, illnesses, and fatalities. The Bureau of Labor Statistics (2003a) defines a work-related injury as “any wound or damage to the body resulting from an event in the work environment.” In 2003, the construction industry reported 408,300 nonfatal injuries and illnesses in the United States among 6,672,000 workers, while the utilities industry reported 24,500 injuries and illnesses among 576,000 workers (Table 3.9.3).

Table 3.9.3. Number of nonfatal occupational injuries and illnesses in the United States (2003)

Industry	Total recordable cases	Cases with days away from work	Cases with job transfer or restriction	Other recordable cases
Construction	408,300	155,400	62,500	190,300
Utilities	24,500	6,600	5,600	12,300

Source: U.S. Department of Labor, Bureau of Labor Statistics 2003. Bureau of Labor Statistics News – Workplace Injuries and Illnesses in 2003. http://www.bls.gov/news.release/pdf/osh.pdf.

The Bureau of Labor Statistics (2003b) defines a fatality as “a death that results from a traumatic occupational injury,” where injury is defined in this case as “any intentional or unintentional wound or damage to the body resulting from acute exposure to energy, such as heat, electricity or kinetic energy from a crash, or from the absence of such essentials as heat or oxygen caused by a specific event, incident, or series of events within a single workday or shift.” In 2003, the construction industry reported 1,126 fatalities in the United States, while the utilities industry reported 32 fatalities (Table 3.9.4). In the ***Commonwealth*** of Pennsylvania, 39 construction fatalities and no utilities industry fatalities were reported.

Table 3.9.4. Number of fatal occupational injuries (2003)

Industry	Number of U.S. fatalities	Number of Pennsylvania fatalities
Construction	1,126	39
Utilities	32	0

Sources: U.S. Department of Labor, Bureau of Labor Statistics 2003. Bureau of Labor Statistics News – National Census of Fatal Occupational Injuries in 2003. http://www.bls.gov/news.release/pdf/cfoi.pdf.

U.S. Department of Labor, Bureau of Labor Statistics 2003. Bureau of Labor Statistics News – Pennsylvania Workplace Fatalities, 2003. http://www.bls.gov/news.release/pdf/cfoi.pdf.

3.10 Noise

Noise can be defined as unwanted sound. Annoyance occurs when noise is loud enough to be heard above the usual background sounds to which people have become accustomed. Background levels, in turn, vary with location and time of day. Sound levels are measured in decibels (dB); measured values are normally adjusted to account for the response of the human ear, in which case they are expressed as decibels as measured on he A-weighted scale [dB(A)].

The proposed project site is located in a primarily rural area in Mahanoy and West Mahanoy Townships adjacent to the existing Gilberton Power Plant (Section 2.1.1). A mixture of industrial, commercial, and residential land use exists in the vicinity. The borough of Gilberton is located approximately 1 mile west-northwest of the project site, and the borough of Frackville lies approximately 2 miles west-southwest of the project site. The site is about 1 mile north of Interstate 81 and 2 miles east of State Highway 61. The center of the Mahanoy State Correctional Institution is 2,600 ft east of the center of the proposed main plant. The distance to the nearest residence is 3,600 ft southeast of the proposed project site (Suresh Chandran, Philip Services Corporation, e-mail to Cheri Foust, ORNL, September 20, 2004).

Sound levels at the Gilberton Power Plant are similar to those at other industrial plants surveyed by Goodfriend and Associates (1971). However, recorded data on noise levels at the Gilberton Power Plant were unavailable. The relatively steady noise resulting from the plant is augmented by the presence of other sound sources in the area, including other industrial activities, vehicular traffic, and nearby passing trains. For example, sound levels may exceed 100 dB(A) within 50 ft of a train passing on one of the nearby railroad tracks.

None of the municipalities with jurisdiction over the site for the proposed facilities have ordinances regarding noise.

A noise survey was performed around the perimeter of the proposed project site in March 2003 (Suresh Chandran, Philip Services Corporation, e-mail to Robert L. Miller, ORNL, May 30, 2004). Noise measurements were taken using a Bruel & Kjaer Precision Sound Level Meter, Model 2209. Noise levels were measured in 11 different locations around the perimeter of the proposed site . The highest noise level measured ***was*** 55 dB(A)***, measured at two locations on the western boundary of the proposed site (the boundary closest to the existing Gilberton Power Plant). Other measured values ranged from 44 to 54 dB(A).*** For comparison, 55 dB(A) is the approximate level of a quiet subdivision during daylight hours. This level is also specified by EPA as a guideline upper limit with an adequate margin of safety for protection from activity interference and annoyance during the daytime in outdoor locations “in which quiet is a basis for use” (EPA 1974).

4. ENVIRONMENTAL CONSEQUENCES

4.1 PROPOSED ACTION

The proposed action is for DOE to provide cost-shared funding for the design, construction, and demonstration of the proposed facilities to produce electricity, steam, and liquid fuels from anthracite culm by integrating coal gasification and Fischer-Tropsch synthesis of liquid hydrocarbon fuels. During the 3-year demonstration period, the plant would be operated at an 85% capacity factor. DOE's role would be to collect operating and environmental data on the integration of the technologies. The following sections discuss the potential environmental consequences of constructing the facilities and operating them during the demonstration period.

4.1.1 Land Use and Aesthetics

4.1.1.1 Land Use

The proposed main plant would be confined to the area between the existing Gilberton Power Plant and the Mahanoy State Correctional Institution, and thus would not affect offsite land use. The ancillary facilities would not affect offsite land use due to their small size (i.e., a few acres) and location adjacent to ancillary facilities for the existing power plant. As with the Gilberton Power Plant, the proposed facilities would be consistent with existing land use plans and local zoning. The limited in-migration of workers required for plant construction and operation would not increase offsite land use for residential purposes (Section 4.1.7.3).

The culm that would be used as feedstock for the proposed facilities would be obtained from culm banks ***deposited*** during previous anthracite mining in the region. Following culm removal from lands in the adjacent valley and the region, these lands would be graded to minimize erosion and revegetated. Although a reasonable estimate cannot be made of the amount of land that would be reclaimed during the 3-year demonstration period (because of uncertainty in the selection of culm banks to be used and variations in bank dimensions), ***it is estimated that*** approximately 1,000 acres would be reclaimed over the ***first half of the 50-year*** operating life of the proposed facilities.

4.1.1.2 Aesthetics

As part of the proposed facilities, five 200-ft stacks and one 300-ft stack would be constructed. The five 200-ft stacks would be considerably shorter than the existing 326-ft stack at the adjacent Gilberton Power Plant, and the 300-ft stack would be slightly shorter. In addition, ***there would also be five baghouse stacks, one stack for the emergency main flare, one stack for an emergency engine, and one stack for a carbon adsorption unit. These stacks would be smaller than the 200-ft stacks.*** The new gasifier and turbine buildings would be similar in size to the existing power plant buildings. Consequently, the proposed facilities would appear as an extension of the existing industrial character of the locale rather than as an appreciable change in character. Depending on the viewpoint, other power plants, strip mines, and culm piles could also be visible (Section 3.1). Topography and vegetation would contribute in some locations to the visual screening of the proposed facilities.

As with the Gilberton Power Plant (Section 3.1), stack emissions and cooling tower plumes from the proposed facilities would occasionally be visible. Under most meteorological conditions, the atmosphere would be unsaturated and would provide enough mixing so that the water vapor from the cooling towers would not condense. However, during meteorological conditions when the atmosphere is nearly saturated, winds are light, and mixing is very low (i.e., during some early morning hours), condensation is possible, which would appear in the form of a cooling tower plume and/or fog (Section 4.1.2.2).

The Federal Aviation Administration would regulate the marking and lighting of temporary and permanent structures associated with the proposed facilities (Section 7.1). Generally, construction cranes and other elevated equipment require lighting if their height above the ground exceeds 200 ft. The 300-ft stack and perhaps the 200-ft stacks would require medium- or high-intensity flashing white obstruction lights. The lights would operate at reduced intensity during the night. Because this type of lighting is currently installed and operating on the Gilberton Power Plant’s stack, the additional lighting would be consistent with the area’s industrial appearance.

In summary, because the visual landscape of the area is already conspicuously marked with industrial structures (Section 3.1), the proposed facilities would not alter the industrial appearance of the site and, accordingly, would not degrade the aesthetic character of the area.

4.1.2 Atmospheric Resources and Air Quality

This section evaluates potential impacts to atmospheric resources that could result from construction and operation of the proposed facilities. Section 4.1.2.1 discusses effects of construction, including fugitive dust associated with earthwork and excavation. Section 4.1.2.2 discusses operational effects, including from emissions of criteria and hazardous air pollutants, regional-scale acidic deposition, and global climate change.

4.1.2.1 Construction

During construction of the proposed facilities, temporary and localized increases in atmospheric concentrations of NO_x, CO, SO_2, VOCs, and particulate matter would result from exhaust emissions of workers’ vehicles, heavy construction vehicles, diesel generators, and other machinery and tools. ***An estimated 500 vehicles would transport workers to and from the site during the 6-month peak construction period (Section 4.1.7.8). Onsite,*** an average of about 50 vehicles ranging from passenger vehicles to earthmovers would be used for construction activities, with a peak of about 75 vehicles. Construction vehicles and machinery would be equipped with standard pollution-control devices to minimize emissions. These emissions would be very small compared to regulatory thresholds typically used to determine whether further air quality impact analysis is necessary [such as 40 CFR Part 93.153(b)].

Fugitive dust would result from clearing, excavation, and earthwork. Most of this work would occur at the 75-acre main plant site. Minor clearing and grading activities would occur at the approximately 1-acre site of the new beneficiation plant (or expansion of the existing facility) in the adjacent valley to the north of the main plant area and in new 12-ft wide corridors to accommodate conveyors and pipelines (Section 2.1.5.1). After completion of the initial earthmoving operations, gravel would be spread on the main access roads to mitigate further dust generation. Near the end of the construction period, these roads would be paved to minimize dust generated on the site by vehicular traffic.

The impacts of fugitive dust on offsite ambient air concentrations of particulate matter less than 10 μm in aerodynamic diameter (PM-10) were modeled using the EPA-approved SCREEN3 air dispersion model, which is a single-source Gaussian plume model that predicts maximum ground-level concentrations downwind from point, area, flare, and volume sources (EPA 1995a). SCREEN3, a screening version of the ISCST3 model, provides conservative results (forming an upper bound) using a full range of 54 potential meteorological conditions (i.e., conditions representing different combinations of atmospheric stabilities and wind speeds). This screening meteorological data set typically results in appreciably greater modeled concentrations compared to modeled concentrations using actual meteorological data, which are not available at the proposed site or a nearby representative location (Section 3.2.1). The SCREEN3 model was run using flat terrain, which is conservative for a non-buoyant ground-level source, such as fugitive dust generated during earthwork. Conversion factors ***(also called multiplying factors)*** were used to adjust the maximum 1-hour concentrations predicted by SCREEN3 to 24-hour and annual averages (EPA 1992), as required for comparison with PM-10 standards (Section 3.2.2). ***In addition, interpolation between the 8-hour conversion factor of 0.7 and the 24-hour conversion factor of 0.4 was used to obtain a conversion factor of 0.6 for the 13-hour exposure period described below.***

The temporary impacts of fugitive dust from construction activities on offsite particulate concentrations would be localized because of the relatively rapid settling of larger-size fugitive dust particles. An average emission factor of 1.2 tons of total suspended particulate matter per acre per month was assumed (EPA 1985). Of these emissions, roughly 30% of the mass would consist of PM-10 (Kinsey and Cowherd 1992). To minimize fugitive dust emissions, water spray trucks would dampen exposed soil with water as necessary, which was assumed would reduce fugitive dust by 50% (EPA 1985). Because construction on the 75-acre main plant site would be staggered, the maximum area undergoing heavy earthwork at any one time ***would*** be ***less than 75*** acres.

The total concentrations, obtained by adding maximum modeled concentrations (adjusted by the conversion factors) to their corresponding background concentrations, were compared with the NAAQS (Section 3.2.2). The background concentrations used (i.e., ***60*** μg/m^3 for the 24-hour averaging period and ***24*** μg/m^3 for the annual average) were recorded in 200***5*** at the nearest PM-10 monitoring station, located in Reading (Section 3.2.2). Consequently, the maximum modeled 24-hour concentration should not exceed ***90*** μg/m^3 because when it is added to the ***60*** μg/m^3 background concentration, the sum should not exceed the NAAQS of 150 μg/m^3 [***90*** (modeled) +***60*** (background)

=150 (total)]. Similarly, the maximum modeled annual concentration should not exceed ***26*** μg/m^3 because when it is added to the ***24*** μg/m^3 background concentration, the sum should not exceed the NAAQS of 50 μg/m^3 [***26*** (modeled) +***24*** (background) =50 (total)].

Concentrations were modeled at locations along or outside the WMPI property boundaries, including the neighboring Mahanoy State Correctional Institution. At the prison, the analysis assumed that an individual could continuously be exposed to pollutants in the outside air, except for limiting an individual's outside exposure to fugitive dust from proposed construction activities to a maximum of 13 hours during a 24-hour period (Edward K. Beleski, Mahanoy State Correctional Institution, Local President of Pennsylvania State Corrections Officer Association, personal communication to Robert L. Miller, ORNL, March 22, 2006).

The windows of the 28 buildings on the Mahanoy State Correctional Institution campus are closed. The ventilation systems mix recycled air with outside air when outside air temperatures range between 45 and 75°F. These ventilation systems include anti-microbial filters placed downstream of the air mixing chambers (Ken Mumma, Mahanoy State Correctional Institution, Facility Maintenance Manager, personal communication to Robert L. Miller, ORNL, March 16, 2006). The filters are changed monthly. Consequently, exposure to fugitive dust inside the buildings from construction activities would be negligible. An individual could be exposed to the outside air for as long as 13 hours per day.

Based on the above assumptions, modeling results indicated no exceedances from construction activities, except possibly at the Mahanoy State Correctional Institution, depending on the amount of acreage undergoing heavy earthwork simultaneously. Results indicated that the maximum area undergoing heavy earthwork at any one time would need to be limited to 2.5 acres of the 75-acre main plant site to stay within ambient air quality standards at all locations, including the prison.

The Pennsylvania Department of Environmental Protection has recently installed a PM-10 monitor at the prison to measure ambient concentrations of particles, including fugitive dust (Section 3.2.2). The monitor began operating on May 9, 2006, and the data are available from the Department by request. If the monitor indicates that ambient air quality standards are being exceeded during construction, WMPI has agreed to lessen the intensity of the heavy earthwork to prevent future exceedances.

Actual concentrations would likely be less than predicted because of the conservative assumptions, including linking worst-case meteorological conditions (occurring during the nighttime) with the emission factor described above. Actual emissions during these nighttime meteorological conditions would be considerably less because no machinery would be operating and because of the low wind speed (about 2 miles per hour) associated with worst-case meteorological conditions, which would minimize exposed soil from becoming airborne.

A similar modeling analysis was not conducted for the impacts of fugitive dust on offsite ambient air concentrations of ***particulate matter less than or equal to 2.5 μm in aerodynamic diameter (PM-2.5)***. The annual PM-2.5 background concentration of ***17*** μg/m^3 recorded in 200***5*** at the closest monitoring station, located in Reading (Section 3.2.2), exceeded the NAAQS of 15 μg/m^3, but

Schuylkill County is designated as a PM-2.5 attainment area (Section 3.2.2). Consequently, the Reading monitoring station is not an accurate indicator of existing PM-2.5 concentrations in Schuylkill County, which has no monitoring station. However, as with PM-10 concentrations, PM-2.5 concentrations from fugitive dust emissions would be expected to exceed the NAAQS near the edge of the disturbed area, but decrease to within the NAAQS in a short downwind distance. Because the PM-2.5 concentrations at the Reading monitoring station are greater than expected in Schuylkill County, PM-10 concentrations are also likely to be greater in Reading than in Schuylkill County, which is another indication that the PM-10 modeling analysis using Reading ambient air data is conservative.

During site preparation, open burning of cleared trees and other vegetation would be conducted to reduce or eliminate the amount of vegetation requiring removal off the site (Section 4.1.8). Open burning would not be conducted during drought conditions in which advisories have been issued by the Pennsylvania Department of Environmental Protection. Non-hazardous construction waste would also be burned. Particulate emissions generated during burning would be temporary and intermittent. ***Open burning would be subject to the requirements of Mahanoy Township Ordinance 2006-3, known as the Mahanoy Township Burning Ordinance, which regulates and restricts outdoor fires. T***he fire chief would be notified prior to each ***open-burning event.***

On March 18, 2005, the Pennsylvania Department of Environmental Protection issued Air Quality Program Permit No. 54-399-034 for the proposed facilities. The permit, which expires on March 31, 2010, addresses open burning during preparation of the proposed site. Specifically, the permit states that open burning of cleared trees and other vegetation may not be visible outside the property, malodorous air contaminants may not be detectable outside the property, and emissions may not cause harm to human or animal health, vegetation, or property.

4.1.2.2 Operation

This section discusses potential air quality impacts resulting from operation of the proposed facilities. Based on a plant operating rate of 7,500 hours per year (an 85% capacity factor), air emissions from the proposed facilities would total less than 100 tons per year for each of the criteria pollutants (Section 2.1.6.1). Plant-wide SO_2 emissions from the proposed facilities would be about 29 tons per year, NO_x emissions would be about 70 tons per year, particulate emissions would be about 23 tons per year, and CO emissions would be about 54 tons per year. Volatile organic compound (VOC) emissions would be about 28 tons per year (see footnote b of Table 2.1.1 for potential-to-emit annual emissions included in the air permit application submitted to the Pennsylvania Department of Environmental Protection). As a measure of the magnitude of the expected emissions, a source (i.e., the proposed facilities) with potential emissions under the threshold of 100 tons per year for a specific pollutant would not be considered a major stationary source of that pollutant, as defined by the Clean Air Act’s Prevention of Significant Deterioration (PSD) regulations (40 CFR Part 51.166). Because the proposed facilities would be considered a minor new source of all regulated pollutants by the Pennsylvania Department of Environmental Protection, no modeling is required for regulatory applications.

Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, establishes maximum allowable limits for total facility emissions during any consecutive 12-month rolling period: 99.9 tons for SO_2, 99.9 tons for NO_x, 99.9 tons for PM-10, 99.9 tons for CO, and 49.9 tons for VOCs. The permitted limits, which are intentionally slightly larger than the expected emissions, function as a cap to ensure that the proposed facilities would be a minor new source of all regulated pollutants.

Emissions of air pollutants would be discharged primarily from five 200-ft stacks located in the main plant area. The stacks would be associated with the heat recovery steam generator (HRSG), the F-T product work-up area (2 stacks), the thermal oxidizer, and the tank-truck loading area. The HRSG stack would emit the most NO_x (43 tons per year), particulate matter (21 tons per year), and CO (31 tons per year). The thermal oxidizer stack would emit the most SO_2 (17 tons per year)***, and the concentrated CO_2 stream from the Rectisol unit***. Infrequently, a 300-ft emergency stack would flare quenched, raw synthesis gas from the gasifier during start-ups and during unexpected shut-downs, such as during loss of power or loss of cooling water. ***Due to the expected effectiveness of the gas cleanup system, if petroleum coke were to be used as part of a blended feedstock to the gasifier, air emissions would not be significantly affected by feedstock composition (Appendix G), and air emissions would be expected to remain within the permitted levels.***

Sources of air pollutants other than stacks would include plant vehicular traffic and personal commuter vehicles. Approximately 50 vehicles ranging from passenger vehicles to tanker trucks would be used during operations on the site. These vehicles would be equipped with standard pollution-control devices to minimize emissions, which would be very small compared to regulatory thresholds typically used to determine whether further air quality impact analysis is necessary [such as 40 CFR Part 93.153(b)]. The small amount of traffic would not contribute appreciably to ambient air pollutant concentrations in the area. Additional particulate matter would be generated from handling and transfer of anthracite culm, petroleum coke, limestone, and process wastes and byproducts. To reduce these particulate emissions, the number of handling and transfer points would be minimized, the conveyors and material loading and unloading points would be enclosed, and wetting systems and collection devices (e.g., baghouses) would be installed.

Predicted Concentrations of Criteria Pollutants

The ISCST3 atmospheric dispersion model (EPA 1995b) was used to estimate maximum increases in ground-level concentrations of SO_2, NO_2, PM-10, and CO. The analysis conservatively included emissions from all 5 process stacks operating simultaneously.[1] Because exact stack locations within the main plant area have not yet been determined, the center of each appropriate process area

[1] The SCREEN3 model was not used because it is limited to simulating atmospheric transport and dispersion of air emissions from a single source.

(e.g., tank-truck loading area) was used for the stack coordinates. Maximum potential hourly emissions and a 100% capacity factor were used in the modeling. All particulate emissions were conservatively assumed to be less than or equal to 10 µm in aerodynamic diameter (PM-10) for comparison with the standards. Initially, all NO_x emissions were conservatively assumed to be in the form of NO_2 for comparison with the standard.

Because no ***quality-assured*** wind data have been archived from a location near enough to be representative of the proposed site (Section 3.2.1), maximum concentrations were calculated for the same full range of 54 potential meteorological conditions used by the SCREEN3 model (***Section*** 4.1.2.1). The ISCST3 model was run for each of these meteorological conditions for each of 360 wind directions (at 1° compass intervals). Concentrations were modeled at over 30,000 locations (receptors) along or outside the WMPI property boundaries at a spacing of 650 ft and 1° compass intervals at distances of up to 12 miles from the main plant area, as well as for specified receptors along nearby public roads. Topography was included in the modeling. Because the height of the proposed stacks would be at least 2.5 times the height of the buildings in the main plant area (i.e., Good Engineering Practice stack height), wake effects from building downwash were not considered. Due to the absence of representative ***quality-assured*** wind data, ***multiplying*** factors were used (as in Section 4.1.2.1) to adjust the maximum 1-hour concentrations predicted by ISCST3 to 3-hour, 8-hour, 24-hour, and annual averages (EPA 1992) to facilitate comparison with applicable averaging periods for SO_2, NO_2, PM-10, and CO standards (Section 3.2.2).

In this analysis, "significant impact levels" were used to measure the significance of the maximum predicted concentrations (EPA 1990). The significant impact levels are much more stringent than the NAAQS (Table 3.2.1) and PSD Class II increments (Table 3.2.2), and even more stringent or the same as the PSD Class I increments (Table 3.2.2). According to EPA guidelines (EPA 1990), a preliminary modeling analysis using significant impact levels should include only the emissions associated with the proposed facilities to determine if the facilities would have a significant impact on ambient air quality. If the maximum predicted concentrations are less than the significant impact levels, additional modeling including other sources and background concentrations is not required (EPA 1990).

Modeling results indicated that maximum concentrations are predicted to be less than their corresponding significant impact levels, with the exception of the annual NO_2 concentration, which has a value of 1.1 $\mu g/m^3$ versus a significant impact level of 1 $\mu g/m^3$ (Table 4.1.1). However, NO_x emissions are composed of ***both*** NO emissions ***and*** NO_2 emissions, and not all NO emissions convert to NO_2 in the atmosphere. Consequently, the analysis was refined by relaxing the initial conservative assumption that all NO_x emissions were in the form of NO_2. EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W) recommends an approach using the ambient ratio method with a NO_2-to-NO_x ratio of 0.75 (the annual national default ratio) to more accurately predict ambient NO_2 concentrations in the area of concern. Using this approach, the revised maximum annual NO_2 concentration was predicted to be 0.8 $\mu g/m^3$, which is less than its significant impact level of 1 $\mu g/m^3$. Therefore, additional modeling including other sources and background concentrations was not required ***for regulatory purposes*** for any of the pollutants. ***Nevertheless, potential cumulative impacts including existing sources and background concentrations have been evaluated in Section 6.1.1.*** Because of the conservative assumptions used in the analysis, actual degradation of air quality should be even less than the small amounts predicted.

Maximum concentrations for all pollutants were predicted to occur at the same location on top of Locust Mountain, an undeveloped forested area slightly over 3 miles north of the main plant area and immediately northeast of Shenandoah. Concentrations at other locations, including the nearby Mahanoy State Correctional Institution, would be less. Concentrations would be negligible at the nearest PSD Class I area, about 130 miles to the southeast (Section 3.2.2), because dispersion of pollutants at that distance would reduce atmospheric concentrations to a small fraction of the maximum modeled concentrations, which are predicted to be less than PSD Class I increments at the location of their maximum impact on Locust Mountain.

No significant impact levels or PSD increments currently exist for PM-2.5. However, assuming conservatively that all PM-10 emissions ***would be small enough to be*** PM-2.5 ***emissions***, the maximum ***predicted*** 24-hour concentration of 0.8 μg/m^3 ***(Table 4.1.1)*** would be only ***2%*** of the corresponding ***24-hour PM-2.5*** NAAQS of ***35*** μg/m^3 (Table 3.2.1). Similarly, the maximum ***predicted*** annual concentration of 0.2 μg/m^3 ***(Table 4.1.1)*** would be about 1% of the corresponding ***annual PM-2.5*** NAAQS of 15 μg/m^3 (Table 3.2.1). These small percentages would not be expected to result in violations of the PM-2.5 NAAQS, for which Schuylkill County is in attainment (Section 3.2.2).

Table 4.1.1. Maximum predicted air pollutant concentrations from proposed project operations compared to National Ambient Air Quality Standards (NAAQS), allowable increments for Prevention of Significant Deterioration (PSD) of air quality, and significant impact levels.

Pollutant	*Averaging period*	*Maximum predicted concentrations (μg/m^3)*	*NAAQS concentration[a] (μg/m^3)*	*PSD allowable increment[a] (μg/m^3)*		*Significant impact level (μg/m^3)*
				Class I[b]	*Class II[c]*	
Sulfur dioxide (SO_2)	***3-hour***	***10.6***	***1,300***	***25***	***512***	***25***
	24-hour	***4.7***	***365***	***5***	***91***	***5***
	Annual	***0.9***	***80***	***2***	***20***	***1***
Nitrogen dioxide (NO_2)	***Annual***	***1.1 (initial) 0.8 (revised)***	***100***	***2.5***	***25***	***1***
Carbon monoxide (CO)	***1-hour***	***11.4***	***40,000***	***-***	***-***	***2,000***
	8-hour	***8.0***	***10,000***	***-***	***-***	***500***
Particulate matter less than 10 μm aerodynamic diameter (PM-10)	***24-hour***	***0.8***	***150***	***8***	***30***	***5***

[a] See Tables 3.2.1 and 3.2.2 for additional information.
[b] Class I areas are specifically designated areas in which the degradation of air quality is to be severely restricted.
[c] Class II areas (which include most of the United States) have a less stringent set of allowable increments.

No appreciable ***lead*** (Pb) emissions would occur from operation of the proposed facilities. Concentrations of Pb in recent years have been well below NAAQS, largely because of the decreased use of leaded gasoline in automobiles. Therefore, Pb emissions from the proposed facilities are not evaluated further.

Ozone (O_3) is not emitted directly from a combustion source but is formed from photochemical reactions involving emitted VOCs and NO_x. Because the reactions involved can take hours to complete, O_3 can form far from the sources of its precursors (the VOCs and NO_x that initiate its formation). Therefore, the contribution of an individual source to O_3 concentrations at any particular location cannot be readily quantified. Stack emissions of NO_x from the proposed facilities would be about 70 tons per year, which would be less than 1% of Schuylkill County's NO_x emissions inventory of 8,335 tons per year in 1999, the latest year with an available inventory. Stack VOC emissions would be about 28 tons per year, which would be less than 0.4% of the county's VOC emissions inventory of 7,840 tons per year in 1999. Because the nearest O_3 monitoring station is located in Reading, about 35 miles south-southeast of Gilberton (Section 3.2.2), existing ambient O_3 concentrations in the area are uncertain. The small percentage increases in NO_x and VOC emissions would not be likely to degrade O_3 concentrations sufficiently to cause violations in the O_3 NAAQS, but the magnitude of the degradation cannot be quantified.

Conformity Review

Schuylkill County is in attainment with NAAQS and state ambient air quality standards for all ***criteria*** pollutants (Section 3.2.2). Further, ***Schuylkill County has not been designated by the EPA as being in a maintenance area for any pollutant (an area that previously was a nonattainment area, which is striving to maintain attainment and comply with the state implementation plan). Consequently, the proposed action is exempt from General Conformity requirements (i.e., the action's air emissions would not occur in an area subject to a conformity review).***

Hazardous Air Pollutants

Trace emissions of other pollutants would include mercury, beryllium, sulfuric acid mist, hydrochloric acid, hydrofluoric acid, benzene, arsenic, and various heavy metals. As required by the F-T synthesis process, the synthesis gas would be cleaned extensively using wet scrubbing followed by acid gas removal using a Rectisol unit, prior to sending the gas to the F-T synthesis facilities and the combined-cycle power plant. Therefore, a high percentage of hazardous air pollutants and trace elements in the synthesis gas would be removed. Part of the purpose of the proposed project is to generate environmental data, including hazardous air pollutant measurements, from the operation of the integrated technologies at a sufficiently large scale to allow industries and utilities to assess the project's potential for commercial application (Section 1.4).

Emissions of hazardous air pollutants (e.g., mercury) from the proposed facilities would likely be very similar to emissions from state-of-the-art integrated gasification combined-cycle facilities due to the similarity in the technologies, including synthesis gas cleanup equipment. Extensive characterization of trace elements during demonstration of a Shell pilot-scale integrated gasification combined-cycle plant from 1987 to 1991 indicated that scrubbing in the synthesis gas cleanup train, upstream of the acid gas removal equipment, was very effective in removing volatile trace elements (SAIC 2002). Volatile trace elements were not detected in the clean product synthesis gas or the acid gas, with the exception of lead in the clean synthesis gas and selenium in the acid gas, which were present at less than 1% of the total inlet feed rate to the gasifier.

Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, establishes maximum allowable limits for total facility emissions of less than 10 tons for any single hazardous air pollutant (e.g., mercury) and less than 25 tons for any combination of hazardous air pollutants during any consecutive 12-month rolling period. The permitted limits function as a cap to ensure that the proposed facilities would be a minor new source of hazardous air pollutants under the National Emissions Standards for Hazardous Air Pollutants regulations.

The permitted limit for this plant does not reflect the actual expected emissions of hazardous air pollutants. In WMPI's application for Air Quality Program Permit No. 54-399-034, an estimate of 3.7 tons per year was provided for the sum of all hazardous air pollutants. This estimate was based on a worst-case scenario required by the Pennsylvania Department of Environmental Protection for comparison with the Pennsylvania Department of Environmental Protection's corresponding 25-ton limit for the sum of all hazardous air pollutants during any consecutive 12-month rolling period. After more detailed analyses, WMPI has estimated that the actual "sum" of hazardous air pollutant emissions would be about 1.5 tons per year. Consequently, the quantity of any single hazardous air pollutant would likely be less than 1 ton per year, which is considerably less than the permitted limit of 10 tons per year. At this time, the only estimates of the proposed facilities' emissions of individual hazardous air pollutants are 38.6 lb per year of mercury and 2.4 lb per year of arsenic.

Based on the same averaging period (12 months), the permit also specifies a maximum allowable limit of 100 tons for ammonia and 15 tons for sulfuric acid mist, which are not designated as hazardous air pollutants under the National Emissions Standards for Hazardous Air Pollutants regulations.

Polychlorinated dibenzo(p)dioxin and polychlorinated dibenzofuran compounds (that is, dioxins and furans) are not expected to be present in the syngas from gasification systems for two reasons (Orr and Maxwell 2000). First, the high temperatures in the gasification process would effectively destroy any dioxin/furan compounds or precursors in the feed. (Gasification temperatures within the refractory-lined reactor would typically range from 2200 to 3600 ºF, with associated pressures ranging from near atmospheric to 1200 psi.). Secondly, the lack of oxygen in the reduced gas environment would preclude the formation of free chlorine from hydrochloric acid, thus limiting the potential for chlorination of any dioxin/furan precursors in the syngas. In addition, the temperature profiles where oxygen is present would not be in the favorable range (660 – 1290 ºF), for production of free chlorine from hydrochloric acid.

Combustion of syngas in a gas turbine would not be expected to lead to formation of dioxin/furan compounds because very little of the particulate matter required for post-combustion formation of these chemicals would be present in the clean syngas or in the downstream combustion gases.

Measurements of dioxin and furan compounds in gasification systems reviewed by Orr and Maxwell (2000) confirm these theoretical expectations. Measured concentrations of dioxin/furan compounds in gas streams (i.e., raw syngas, clean syngas, sulfur removal acid gas, and flash gas) from a test gasifier evaluated by the EPA Superfund Innovative Technology Evaluation (SITE) Program were all comparable to the blanks, indicating that these species, if present, were at concentrations less than or equal to the method detection limits. Measurement results from a gasification facility in Germany have also shown extremely low levels of dioxin/furan compounds in the clean product syngas.

Visibility

Visibility, or background visual range, is defined as the maximum distance a large, black object can be observed on the horizon. The scenic quality of natural landscapes and their color, contrast, and texture, are improved by good visibility. Visibility, as a measure of clarity of the atmosphere, has been established as an important air-quality-related value of national parks and wilderness areas that are designated as PSD Class I areas. Because concentrations of pollutants from the proposed facilities would be negligible at the nearest PSD Class I area, about 130 miles to the southeast (Section 3.2.2), no degradation in visibility would be perceptible.

Acidic Deposition

Acid rain, the popular name for acidic deposition, occurs when SO_2 and NO_x are chemically transformed and transported in the atmosphere and deposited on the earth’s surface in the form of wet (rain, snow, fog) or dry (particle, gas) deposition. SO_2 and NO_x are readily oxidized in the atmosphere to form sulfates and nitrates. Subsequently, the sulfates and nitrates may form sulfuric acid and nitric acid when combined with water, unless neutralized by other chemicals present. Acidic deposition contributes to the acidification of lakes and damage to ecological resources. SO_2 and NO_x can be transported by the wind for hundreds of miles from one region to another. Therefore, air over any given area will contain some residual emissions from distant areas and infusions received from nearby areas. This continuing depletion and replenishment of emissions along the path of an air mass makes it extremely difficult to determine relationships between specific sources of emissions and acidic deposition at any particular location.

As a comparison to evaluate acidic deposition, stack SO_2 emissions from the proposed facilities would be about 29 tons per year, which would be about 0.4% of Schuylkill County’s SO_2 emissions inventory of 8,046 tons per year in 1999. Stack emissions of NO_x from the proposed facilities would be about 70 tons per year, which would be less than 1% of the county’s NO_x emissions inventory of

8,335 tons per year in 1999. Because these emissions are less than 1% of existing county emissions, no perceptible changes in acidic deposition would be expected.

Global Climate Change

A worldwide environmental issue is the possibility of changes in the global climate (e.g., global warming) as a consequence of increasing atmospheric concentrations of “greenhouse” gases. ***International scientific consensus has indicated that the earth’s climate is changing and that human activity is a factor (IPCC 2001, 2007).*** The atmosphere allows a large percentage of incoming solar radiation to pass through to the earth’s surface and be converted to heat energy (infrared radiation) that does not pass back through the atmosphere as easily as the solar radiation passes in. The result is that heat energy is “trapped” near the earth’s surface.

Greenhouse gases include water vapor, CO_2, methane, nitrous oxide, O_3, and several chlorofluorocarbons. ***While*** greenhouse gases constitute a small percentage of the earth’s atmosphere, their collective effect is to keep the temperature of the earth’s surface about 60°F warmer, on average, than it would be if no atmosphere existed. Water vapor, a natural component of the atmosphere, is the most abundant greenhouse gas. The second-most abundant greenhouse gas is CO_2. ***It has been estimated that CO_2 concentrations in the atmosphere increased by about 35% (from about 280 ppm to 379 ppm) from pre-industrial times to 2005 (IPCC 2007) and by 19% from 1959 to 2003 (Keeling and Whorf 2005).*** Fossil fuel burning is the primary contributor to increasing concentrations of CO_2 ***(IPCC 2001, 2007).*** The increasing CO_2 concentrations ***likely*** have contributed to a corresponding increase in ***temperature in the lower atmosphere***. ***The*** globally averaged temperature in the lower atmosphere ***has increased by about 1 to 1.7 ºF since the second half of the 19th century (IPCC 2007).*** Because CO_2 is ***relatively*** stable in the atmosphere and essentially uniformly mixed throughout the troposphere and stratosphere, the climatic impact ***of CO_2 emissions*** does not depend on ***where the emissions occur***.

Carbon dioxide emissions to the atmosphere resulting from the operation of the proposed facilities would add about 2,282,000 tons per year to global CO_2 emissions, thus adding to global emissions of CO_2 resulting from fossil fuel combustion, which are estimated to have been 29,000,000,000 tons during the period 2000 to 2005 (IPCC 2007). The total emissions from WMPI would include CO_2 emitted directly to the atmosphere by (1) facility operations (832,000 tons per year), and (2) the concentrated CO_2 stream separated in the gas cleanup system (1,450,000 tons per year; Radizwon 2006), which would be emitted at the site (released through the thermal oxidizer stack). Section 5.1.4 discusses the possible feasibility of CO_2 sequestration during the 50-year life of the proposed facilities. Although not proposed by the applicant, during the 50-year duration of commercial operation, it may become feasible to reduce the project’s contribution to global climate change by sequestering some of the CO_2 captured in the process underground.

Scoping Concerns

During the scoping process, local residents expressed concern about the potential for odorous emissions (Section 1.5). The potential for odor would most likely result from emissions of hydrogen sulfide (H_2S). For the proposed facilities, however, nearly complete H_2S removal from the shifted synthesis gas, occurring in the acid gas removal plant using a Rectisol unit, would be required by the downstream F-T synthesis process. Remaining concentrations would be as low as 1 to 5 ppm. The captured H_2S would be converted to marketable elemental sulfur in a Claus sulfur recovery unit, a process which should remove approximately 99.99% of the sulfur from the recovered acid gas stream. Further, the gas streams exiting the Rectisol, Claus, and SCOT units would be sent to a thermal oxidizer to oxidize any trace contaminants prior to being released through a stack to the atmosphere. Because of the high sulfur removal rates in these units and the oxidation of gases vented from them, H_2S odors should not be perceptible at and beyond the project boundaries.

As with state-of-the-art integrated gasification combined-cycle facilities, odors from the proposed facilities should not be perceptible due to the similarity in the technologies, including synthesis gas cleanup equipment. In contrast, a slightly different technological process removes about 75% of the sulfur from the gas stream at Sasol's existing coal-to-oil facilities in Secunda, South Africa. The Secunda facilities, built beginning in 1976, have averaged about 3 odor complaints per month over the last year, primarily for H_2S odors. The rate of complaints is higher at Sasol's coal-to-oil facilities in Sasolburg, South Africa, which have been operating since 1955, because the process removes no sulfur.

Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, states that the proposed facilities may not emit into the atmosphere any malodorous air contaminants from any source in such a manner that the malodors are detectable outside the property.

During the scoping process, local residents also expressed concern about the possibility of emissions from the proposed facilities creating safety issues, such as fog affecting Interstate 81 (Section 1.5). The primary source of any fog generated by the proposed facilities would be the new bank of 12 mechanical-draft cooling towers. About 1,757 gpm of water would evaporate from the cooling towers (Table 2.1.2), which could condense in the atmosphere to form fog under certain meteorological conditions. Interstate 81 is aligned in a west-southwest to east-northeast orientation in a valley about 1 mile to the south of the proposed site on Broad Mountain. Under most meteorological conditions, the atmosphere would be unsaturated and would provide enough mixing so that the water vapor from the cooling towers would not condense. However, during meteorological conditions when the atmosphere is nearly saturated, winds are light, and mixing is very low (i.e., during some early morning hours), condensation is possible, which would appear in the form of a cooling tower plume and/or fog. The fog would probably not affect Interstate 81 due to the distance from the proposed site. No fog resulting from existing Gilberton Power Plant operations has been observed on Interstate 81. However, upon initial operation of the proposed facilities, conditions at the interstate would be monitored.

Finally, a concern was expressed regarding airborne emissions resulting from vehicles traveling over red anti-skid material applied to roads (Section 1.5). This material is bottom ash from the existing Gilberton Power Plant, which is applied to alleviate treacherous road conditions during the winter. ***More vehicles would use the roads during construction and operation of the proposed facilities (Section 4.1.7.8) and would contribute to the breakup of the bottom ash from the existing plant. However, the increases in airborne emissions of this material are not strictly related to increased traffic volume, but rather to the occurrence of treacherous road conditions that call for the application of anti-skid material. T***he bottom ash from the proposed facilities would be in the form of a glass-like slag, which ***would*** not ***be*** suitable ***for use*** as an anti-skid material and ***therefore*** would not be applied to the roads. ***The proposed project is not expected to affect either the amount and frequency of bottom ash applications to local roads, or the public health or aesthetic effects arising from the applications.***

4.1.3 Geology and Soils

4.1.3.1 Mineral Resources

The proposed facilities would increase the removal and utilization of the anthracite culm deposited on the landscape of the project area. The facilities' estimated use of 4,711 tons (dry) of beneficiated culm per day (about 1.7 million tons per year) equates to 2.7 times the culm consumption of the existing Gilberton Power Plant. The proposed facilities would increase total ***anthracite*** culm utilization by 20 to 140% over levels ***reported*** during the period from 1993 to 2002, when ***reported*** anthracite culm utilization in the state ranged from 1.2 to 8.4 million tons per year (Figure 3.3.1). ***Anthracite culm availability is more than sufficient for the demonstration period. The culm reserves controlled by WMPI (Section 3.3.3) are estimated to be sufficient to supply the proposed facilities for about 15 years, or to supply both the proposed facilities and the Gilberton Power Plant for about 11 years.***

4.1.3.2 Soils

The proposed facilities would not affect any soil types classified as prime farmland or Pennsylvania farmland of statewide importance. The facilities' use of culm from mine waste dumps in the Mahanoy Creek valley and surrounding region, together with the possible use of project byproduct materials in reclaiming abandoned surface mines and spoil areas, would accelerate the ongoing process of restoring soil productivity in the region.

4.1.3.3 Geologic Hazards

Construction and operation of the proposed facilities ***could*** increase the likelihood of ground surface subsidence due to collapse of abandoned underground mine workings***, but the potential for such an impact would be small.*** The facilities' use of water from the Gilberton mine pool would lower the average water level in the mine pool, and thus ***could*** reduce ***stability of*** the abandoned mine workings below Gilberton ***(Section 3.3.5.1)***. However, this would not be expected to increase the likelihood of collapse. Water levels would remain within their current range (Section 3.4.3), and the Pennsylvania ***Department of Environmental Protection*** has not observed any mine roof collapses or other subsidence from several decades of pumping from the mine pools at Gilberton and other locations in the region (Section 3.3.5.1). ***The SRBC authorization allowing WMPI to withdraw mine pool water for the proposed project (SRBC 2005) includes conditions intended to ensure that the mine pool water level would not drop below its current elevation range. If a potential were identified for the water elevation to drop below its current range, WMPI would need to seek an alternative water source or take other measures to limit effects on the mine pool water level, as discussed in Section 4.1.4.1. In this circumstance, a delay in implementing actions intended to limit effects on the mine pool possibly could result in excessive drawdown and an increased potential for subsidence below Gilberton. If a sudden collapse or additional gradual subsidence were to occur below Gilberton as a result of the proposed project, impacts would be similar to the historical impacts of subsidence described in Section 3.3.5.1.***

Because the proposed main plant would be built over rock units that do not contain coal, the plant would not be affected by subsidence from mining activities. Subsidence could, however, affect product transfer lines and related facilities in the valley of Mahanoy Creek. Abrupt subsidence could rupture product transfer lines and release liquid-fuel product into the environment. Environmental consequences of such an event would be similar to those from collision and rupture of a gasoline truck, potentially including fire, explosion, and release of a toxic material into surface waters and soils. ***Health and safety consequences of potential accidents are discussed in Section 4.1.9.1.*** Gradual subsidence also could damage product lines and cause leakage, with similar but smaller impacts. The possibility of abrupt subsidence has decreased over time following the closure of underground mines, and will continue to decrease in the future. The potential risks of product line leakage due to gradual subsidence would be reduced by inspecting product lines regularly and repairing any problems.

Although unlikely (as discussed in Section 3.3.5.2), seismic activity also has the potential to cause accidental rupture of product lines and containment systems associated with the proposed facilities***, with potential impacts similar to those from abrupt subsidence.***

By removing culm waste from the landscape to recover its energy value, the proposed facilities would help to reduce the hazards associated with culm waste, including the potential for culm bank fires. The proposed facilities would not be expected to change either the likelihood of fires or the feasibility and effectiveness of fire control in abandoned underground mines.

4.1.4 Water Resources

4.1.4.1 Surface Water and Mine Pool

Construction

No change in the existing utilization or consumption of surface water or mine pool water would occur during construction of the proposed facilities. No dredge or fill material would be deposited in surface streams.

Water quality could be affected by stormwater runoff from construction sites. However, an Erosion and Sediment Control Plan would be developed and implemented for the project, in accordance with NPDES discharge permit PAR-105804R issued by the Schuylkill Conservation District. Standard engineering practices such as silt fencing, straw bales, revegetation of graded areas, and stormwater detention basins would be implemented to control runoff, erosion, and sedimentation. If runoff from the site drained to old strip mining pits on the north or south slopes of Broad Mountain, any ***contained*** sediments would settle out in the pits ***or be filtered by soil and rock as the water*** seep***ed*** to the underlying mine pool. If runoff were directed toward tributaries of Mill Creek, it would be routed through detention basins in which sediments would settle out before the water would be released to a stream. Impacts attributable to construction-related runoff would be minimal.

Accidental spills of construction materials such as solvents, paint, caulk, oil, and grease that could contain hazardous substances would be cleaned up in a timely manner and in accordance with a Spill Prevention, Control, and Countermeasure (SPCC) Plan and best management practices, thus minimizing the potential for overland flow into streams.

Operation

Water Quantity. Operation of the proposed facilities would reduce the water volume in the Gilberton mine pool and the volume of water needed to be pumped from the mine pool and discharged to Mahanoy Creek in order to prevent flooding. These changes would result in reduced stream flow in the creek. During normal operation, the proposed facilities would require ***an estimated flow of 3,779*** gpm from the mine pool, including ***an estimated flow of 2,744*** gpm for cooling water ***and 1,035 gpm*** for processing in the main plant ***(Table 2.1.2 and Figure 2.1.6). In addition, about 1,667 gpm would be withdrawn for use in culm beneficiation, which includes operation of the existing beneficiation plant (Table 2.1.2 and Figure 2.1.6).*** About ***2,314 gpm*** would be consumed in processing[2] or lost to evaporation. A***bout 1,940 gpm*** (including ***an estimated average flow of 93*** gpm of stormwater collected from the main plant area) would be discharged ***from the proposed facilities to the tailings pond in the Mahanoy Creek valley*** as a blend of treated wastewater and uncontaminated water ***(Table 2.1.2), and about 1,180 gpm would be discharged to the tailings pond as wastewater***

[2] ***This quantity includes an estimated 101 gpm that would be consumed in the existing Gilberton Power Plant. Because this is an existing water use, it is not considered in the subsequent assessment of the net effect of the proposed facilities.***

from culm beneficiation. The effluents discharged to the tailings pond (an average total of about 3,120 gpm) are expected to seep downward into the Boston Run mine pool.

The net effect on ***water flux in the mine pool system*** would be a reduction of ***about 2,225 gpm or 994*** million gal per year (assuming operation of the facilities at an 85% capacity factor). This is ***equal to about 40%*** of the water volume currently pumped to Mahanoy Creek from the Gilberton mine pool to control the mine pool elevation. ***This would allow the Commonwealth of Pennsylvania to reduce its pumping of the mine pool by approximately 40%.*** The discharge of untreated mine pool water to Mahanoy Creek would be reduced by the same percentage. ***Water elevations in the Gilberton mine pool would continue to fluctuate within their current range (Section 3.4.3), but the mine pool water elevation would be lower on average than under current conditions.***

SRBC (2005) has raised questions about the capacity of the Gilberton mine pool to supply sufficient water to meet the needs of the proposed facility and its existing water users on a sustainable basis. This concern is based primarily on an absence of evidence for free flow of water between the Boston Run mine pool (to which project effluents would be discharged) and the Gilberton mine pool (from which water would be withdrawn). If these two mine pools are not well interconnected, project effluents might be slow to replenish the Gilberton mine pool during a drought, causing the water elevation in the Gilberton mine pool to drop below the current range of fluctuation. The SRBC authorization allowing WMPI to withdraw mine pool water for the proposed project includes conditions intended to ensure that the mine pool water level would not drop below 1,084 ft amsl. If the pumping water level in the Gilberton shaft were to drop below 1,087 ft amsl, WMPI would be required to submit an evaluation of the potential for additional drawdown and apply for additional withdrawal locations if the evaluation indicates a potential for the water elevation to decline below 1,084 ft amsl (SRBC 2005). Alternatively, it might be possible to reduce drawdowns by reinfiltrating process effluents at a site directly over the Gilberton or Lawrence mine pools. Possible alternative water sources include other mine pools or a public water supply system. With any alternative supply source, conflicts with other water users are possible, but because water supply in Schuylkill County appears to exceed current demand (Section 3.4.4), it should be possible to avoid such conflicts. Any alternative source would require SRBC approval and construction of a new water supply line. Similarly, development of a new seepage pond for re-infiltration of effluents could require Pennsylvania Department of Environmental Protection approval, as well as construction of both a new pond and an additional effluent discharge line. If delays in these steps or other factors were to delay establishment of a new water supply, it is possible that excessive drawdowns could occur (Section 4.1.3.3).

Reductions in pumping from the mine pool ***for discharge*** to Mahanoy Creek would reduce the ***frequency and duration of high-flow episodes in the stream that are caused by discharges from the mine pool pump. Also, there would be a reduction in the average flow of*** water in the stream. Because the stream is not a source of water supply (Section 3.4.4) due to poor water quality, the potential impacts of ***changes in*** flow are limited to impacts on in-stream conditions. Averaged over a year, streamflow in Mahanoy Creek would be reduced by ***4.2*** ft^3/s***, which is 35%*** of the average flow at Girardville (Section 3.4.1). ***There would be no reduction in streamflow during low-flow periods, when the*** creek's minimum flows would continue to be maintained by continuous discharges from mine openings in upstream portions of the watershed. Peak (flood) flows also are unlikely to be affected because the state's pumps normally would not be operated during flood events. Because the only known uses of Mahanoy Creek are in-stream uses, such as receipt of treated sewage ***and habitat for aquatic organisms,*** no impacts on water availability would be expected from reductions in pumping.

Water Quality. Project operation would affect water quality in both Mahanoy Creek and the mine pool system***, leading to both positive and negative impacts. Facility effluents discharged to the mine pool system would return to the mine pool system with near-neutral pH and less acidity and lower dissolved metal concentrations than were contained in the water withdrawn from the mine pool system. This would result in improvements to the quality of the mine pool water with respect to these contaminants. Treatment and use of mine pool water, generation of liquid process wastes, and treatment of plant wastewater would also contribute to modifying the quality of the water discharged back into the mine pool system. In addition, reduced operation of the pump maintained by the Pennsylvania Department of Environmental Protection would reduce the amount of poor-quality water entering Mahanoy Creek from the mine pool. However, effluents from the proposed facility could introduce new contaminants to the mine pool system, and subsequently to Mahanoy Creek.***

Two principal project-related wastewater streams would be discharged to the tailings pond: (1) wastewater from culm beneficiation and (2) wastewater from the proposed production facilities.

DOE has no data on the chemical characteristics of wastewater effluent that is currently discharged to the tailings pond from the anthracite culm beneficiation facility adjacent to the project site. However, it is reasonable to assume that the concentrations of dissolved solids (such as iron, aluminum, and sulfate) in beneficiation effluents from this facility and from the new or expanded facility would be similar to or slightly higher than the concentrations found in the mine pool water used in the beneficiation process (Table 3.4.2). Suspended solids such as coal fines and rock particles would also be present in this effluent.

The second project-related wastewater stream, effluent from the principal facilities, would be a blend of several different wastewater streams identified in Section 2.1.6.2. The contaminant concentrations included in the wastewater effluent limits that WMPI has proposed to Pennsylvania Department of Environmental Protection for purposes of its Water Quality Management Part II permit application (Chandran 2005), listed in Table 2.1.4, are higher than reported for similar facilities (SAIC 2002). Thus, WMPI–proposed limits provide a conservative basis for assessing potential impacts of effluent discharges. For substances not listed in Table 2.1.4 (such as total dissolved solids and iron), approximate concentrations or total loadings were estimated based on data compiled by SAIC (2002), information about facility production and water treatment

processes, and WMPI's estimates (WMPI 2005c) of the characteristics of some individual wastewater streams prior to treatment.

Mine pool water to be used for cooling water would be treated to reduce its iron concentration to less than 0.5 mg/L using aeration, followed by lime treatment. The water would then be sent to a clarifier and finally filtered. These processes should be effective in removing manganese and aluminum, as well as iron. These metals would be transferred to water treatment sludge, which would be handled as a solid waste (Section 4.1.8.2), and thus would not be present in the wastewater discharged to the mine pool system. Lime treatment and other neutralization processes would balance the water's acidity with an equivalent amount of alkalinity. Assuming 99% removal of iron and manganese from the 2,750 gpm of mine pool water obtained for cooling, 1,400 lb of iron and 300 lb of manganese would be removed daily.

Mine pool water to be supplied to the main plant, including potable water supply for facility workers, would be treated by reverse osmosis to remove most dissolved substances. Water to be used in boilers and other processes would undergo an additional demineralization step to remove almost all dissolved substances. Reverse osmosis and demineralization would produce concentrated wastewater streams containing dissolved minerals removed from the mine pool water. Because WMPI proposes to discharge these concentrated wastewaters without any treatment other than physical settling, sulfates and other soluble constituents removed from the mine pool water would pass untreated into the wastewater discharge.

Following the various treatment steps and processing activities in the facilities (which would concentrate natural minerals in the water), facility effluents could have total dissolved solids levels as high as about 2,000 mg/L, including sulfate concentrations estimated at about 1,400 mg/L. Concentrations of substances such as calcium, magnesium, and sodium would be higher than in the mine pool water, but concentrations of iron and other dissolved metals would be much lower. The average iron concentration could be about 4 mg/L.

Discharge of ***the facility effluents*** to the mine pool ***system*** by seepage from the tailings pond ***would reduce*** concentrations of acidity and dissolved metals in the mine pool system. Consequently, water pumped from the Gilberton mine pool to Mahanoy Creek would also ***have lower concentrations of mine-related contaminants, contributing toward meeting the Pennsylvania Department of Environmental Protection's total maximum daily load targets for these contaminants (Section 3.4.1). Potential reductions in total maximum daily load are discussed quantitatively in the following subsection on "Alternative Water Management Approaches." However, these potential water quality improvements to Mahanoy Creek might not be fully realized due to (1) mixing with untreated effluent from coal beneficiation and (2) the chemical reactions occurring with minerals in the tailings pond sediment, soil, coal, and rock as the water passes from the tailings pond to the mine pool and through the mine pool system before discharge to Mahanoy Creek. While metals are relatively insoluble in water at neutral or alkaline pH, reactions with pyrite and other minerals in the soil and rock would likely deplete the alkalinity in the water, increasing the water's acidity, allowing some dissolution of metals to continue. Such water quality***

changes might be similar to those currently observed near the B-D Mining coal refuse processing and coal ash placement site in Mahanoy Valley near Gilberton. Sampling of monitoring wells in this area and in the mine pool indicates substantially reduced acidity, some reduction in iron and manganese, but little improvement in other water quality parameters (Hornberger et al. 2004).

Additionally, the facilities' wastewater treatment system would be designed to treat organic residues (Section 2.1.6.2), ***but WMPI's proposal for maximum contaminant concentrations for effluent discharges indicates that*** effluents from the facilities could contain ***large*** residual amounts of organic compounds ***and other process residues (Table 2.1.4).*** Toxic and carcinogenic substances, including ***phenols,*** cyanides, and polycyclic aromatic hydrocarbons (PAHs), such as pyrene, might be present in low concentrations ***(Table 2.1.4;*** SAIC 2002). ***Any wastewater constituents that are not successfully treated in the wastewater treatment facility are unlikely to degrade naturally within the mine pool system. The wastewater constituents are conservatively assumed to pass into the creek in the water pumped from the mine pool, although concentrations could be reduced to an unknown extent by dilution within the mine pool. Also, because there would be only minimal treatment of cooling tower blowdown and other non-oily wastewaters (Section 4.1.8.2), biocides, scale inhibitors, and other contaminants in these waste streams are also assumed to pass into the mine pool. Subsequent pumping of mine pool water into Mahanoy Creek would deplete dissolved oxygen in the creek (due to the high levels of biochemical and chemical oxygen demand in the discharged water, as described in Table 2.1.4), thus further degrading the creek as potential habitat for aquatic organisms. Effluents to Mahanoy Creek would also substantially exceed Pennsylvania's statewide ambient water quality standards for chlorine and ammonia in waters whose designated use is warm-water fish habitat (25 Pa. Code Chapter 93) and US EPA's recommended water quality criteria for zinc and sulfide in freshwater aquatic habitats (http://epa.gov/waterscience/criteria/wqcriteria.html, accessed June 16, 2006). Unless extensive mixing occurs within the mine pool, which is unlikely, discharge of mine pool water could cause Mahanoy Creek to exceed these ambient criteria. (Potential impacts to the creek water quality in the absence of additional dilution are discussed in the following subsection on "Alternative Water Management Approaches.") Any adverse effects on Mahanoy Creek from small concentrations of toxic substances such as phenols, cyanides, and PAHs potentially present in the facility effluent would probably be undetectable because of the overriding impacts of acid mine drainage and dissolved oxygen depletion, but the presence of these substances could add to the challenges involved in restoring stream functions. Human exposure to these substances would be unlikely to occur in the site vicinity because people do not use the stream water. Potential downstream impacts of these toxins would be reduced by natural degradation (for example, of cyanides) and dilution in the stream. Concentrations of sulfate, calcium, magnesium, and other natural constituents in the stream could increase, but these increases would not affect attainment of water quality criteria. No water quality criteria exist for sulfate in waters designated for use as aquatic habitat. If the quality of discharged water discharged to Mahanoy Creek is determined to be unacceptable, additional***

treatment steps could be incorporated into the wastewater treatment system to reduce adverse impacts to stream water quality.

Alternative Water Management Approaches. ***As part of its exploration of the potential impacts of the proposal, DOE has considered the potential impacts of two alternative water management approaches: (1) discharge of facility wastewater effluents directly into Mahanoy Creek, rather than into the tailings pond; and (2) recycling of storm water and some other facility effluents for in-plant uses, thus reducing requirements from the mine pool system. These alternative approaches were considered based on comments received on the draft EIS. In addition, an April 20, 2006, letter from Pennsylvania Department of Environmental Protection staff to WMPI's consultant (Hannigan 2006) identified direct discharge to the stream as an option for discharge of effluents from the proposed facilities. The letter also mentioned the possibility of injecting effluents directly into the mine pool using an injection well; DOE has not analyzed the impacts of that approach in detail because it offers no apparent advantages, but would add additional costs and potential impacts, such as subsurface erosion within the mine pool.***

Discharge of facility wastewater effluent directly to Mahanoy Creek would require construction of a longer water discharge line from the proposed facilities. For purposes of assessment, the discharge location in the creek is assumed to be near the location where the Pennsylvania Department of Environmental Protection pump discharges mine pool water to the creek. This discharge location was suggested by Hannigan (2006). Because a large-volume water discharge already enters the creek at this site, the additional discharge would be less likely to adversely affect the physical stability of the stream channel at this location than if it the water were discharged at an upstream location closer to the tailings pond. It is further assumed that land disturbance for construction of the discharge line would be minimized by locating it adjacent to the water intake line for the proposed facilities on the north slope of Broad Mountain and adjacent to the railroad in the Mahanoy Creek valley. Discharges to the creek are assumed to include all stormwater runoff and effluents from production facilities and cooling towers that are currently proposed for discharge to the tailings pond (a total of 1,940 gpm on average), but not coal beneficiation plant wastewater, which would continue to be discharged to the tailings pond. Because less water would be intentionally discharged to the mine pool system, it should be possible for the Pennsylvania Department of Environmental Protection to reduce its pumping and discharge of water from the Gilberton mine pool. The calculated potential reduction in mine-pool pumping requirements resulting from the combination of increased water consumption and discharge directly to the creek is 87% of the current average pumping rate of 4,800 gpm. The actual reduction in pumping requirements could be somewhat smaller because some of the discharged water would seep from the creek bed into the underlying mine pool. However, there would be a substantially larger potential for the pumping water level in the Gilberton mine pool to drop below its current elevation range, potentially resulting in a greater likelihood of underground

mine subsidence below Gilberton (Section 4.1.3.3). Streamflow would be higher on average and less variable than under current conditions or under the proposed action.

Dissolved oxygen in Mahanoy Creek would be severely depleted as a result of the projected high levels of biochemical and chemical oxygen demand in the facility effluent (Table 2.1.4). Because the stream would provide minimal dilution of the high contaminant concentrations in proposed facility effluents (the effluent discharge of 4.3 ft^3/sec would be larger than the measured streamflow of 2.8 ft^3/sec), in-stream concentrations of several contaminants in the effluent would exceed levels appropriate for aquatic life. For example, even assuming complete instantaneous mixing in the stream, the in-stream concentrations of ammonia nitrogen (up to 28 mg/L) and chlorine (up to 0.12 mg/L) would substantially exceed the Pennsylvania statewide ambient water quality standards for warm-water fish habitat (the ammonia nitrogen limit, which must be determined by a complex calculation from stream temperature and pH, generally is well below 5 mg/L, while the chlorine limit is 0.011 mg/L), and the in-stream concentration of zinc (0.92 mg/L) would exceed the EPA recommended water-quality criterion for freshwater aquatic life (0.12 mg/L). Mixing with air and other natural in-stream processes would remove ammonia, chlorine, and oxygen-depleting contaminants from creek water during stream flow, so the adverse effects of oxygen depletion and elevated ammonia levels would extend for a limited distance downstream from the discharge point. Similarly, zinc concentrations would be diminished by dilution and in-stream chemical processes. Because limited data are available on characteristics of the effluent and the creek, DOE has not calculated the flow distance within which adverse impacts could be attenuated.

Wastewater data from operating coal gasification facilities (SAIC 2002) suggest that it may be possible to achieve effluent concentrations well below the values in Table 2.1.4. For example, data from other facilities suggest levels of chemical oxygen demand and zinc could be about 5 times smaller than the values in the table, while levels of ammonia could be about 2 to 3 times smaller than the values presented in the table. Such reductions in pollutant concentrations could reduce adverse impacts to stream water quality. However, due to the low assimilative capacity of Mahanoy Creek in the vicinity of the project and discharge sites, that portion of the stream would have diminished suitability for aquatic life.

Loadings to Mahanoy Creek of iron, manganese, acidity, and aluminum would be reduced more than with effluent discharge to the tailings pond because (1) there would be less pumping from the Gilberton mine pool to the creek and (2) project effluents would not circulate through the mine pool system before being discharged to the stream. Due to the estimated removal of 300 lb/day of manganese in water treatment, manganese loading to Mahanoy Creek would be reduced to below the state's proposed total maximum daily load (water quality) target for manganese in the stream reach, which requires removal of 135 lb/day (Section 3.4.1). The estimated removal of 1,400 lb/day of iron also would be more than sufficient to meet the total maximum daily load target, which requires removal of 309 lb/day. Due to the large variability in reported concentrations of acidity and aluminum in the mine pool water (Table 3.4.2), it is not possible to quantify the effect

of discharge on total maximum daily load targets for these substances, but the removal of these mine pool contaminants from water would also contribute to meeting contaminant-specific water quality goals in the stream. However, because of the depletion of dissolved oxygen and excessive concentrations of other pollutants deleterious to aquatic life, in the vicinity of the discharge the potential for Mahanoy Creek to provide suitable habitat for aquatic life would not improve in spite of the reduced variability of stream flow and reduced loadings of manganese, acidity, aluminum, and iron. If the quality of discharged water is determined to be unacceptable, additional treatment steps could be incorporated into the wastewater treatment system to reduce adverse impacts to stream water quality.

Recycling of storm water and other facility effluents for in-plant uses would decrease the volumes of withdrawals from the mine pool and discharges to the tailings pond. To estimate the magnitude of the potential impacts from effluent recycling, DOE assumed that only non-process wastewaters with total dissolved solids concentrations comparable to or less than mine pool water would be suitable for recycling. These wastewaters include (Table 2.1.2 and WMPI 2005c) stormwater from uncontaminated areas (flow rate of 49 gpm, averaged over a year), purge water from treating mine pool water for cooling-tower use (110 gpm), recovery condensate purge (110 gpm), and boiler blowdown (43 gpm), with a combined average flow of about 310 gpm. By directing these wastewaters to the reverse osmosis and demineralization units (following removal of suspended solids by coagulation and settling), WMPI could reduce the mine-pool water requirement for process supply (1,035 gpm under the WMPI proposal) by about 30% and could reduce total mine-pool pumping requirements (5,446 gpm under the WMPI proposal) by about 6%. Discharges to the tailings pond would be reduced by about 10% compared with the WMPI proposal. Because the consumptive use of water in the facilities would not be affected by recycling, there would be no effect on the amount of water the state would need to pump from the Gilberton mine pool. However, because there would be less pumping from the mine pool to supply the proposed facilities, there would be a slightly smaller chance for the water elevation in the Gilberton mine pool to drop below its current range of fluctuation.

Effects of effluent recycling on the project's impacts on water quality in the mine pool and creek are estimated to be small. Mine-pool contaminants discharged to the tailings pond would be slightly lower than under WMPI's proposal, but overall contaminant concentrations in effluents to the mine pool would be somewhat higher due to the smaller volume of water available for dilution. Other potential impacts of effluent recycling would include lower energy utilization for pumping water and reduced utilization of water filtration media. Minor changes in facility configuration would be needed to facilitate effluent recycling.

4.1.4.2 Groundwater

Construction and operation of the proposed facilities would not change groundwater use on Broad Mountain. Water for the facilities would be drawn from the mine pool, not from sources on Broad Mountain. ***Additionally, withdrawals from the valley mine pool would not reduce groundwater***

availability on Broad Mountain because groundwater moves from the uplands toward the valleys; aquifers on the mountain are upstream from the mine pool. As noted in Section 3.4.2, the large-scale dewatering of valley aquifers that occurred during operation of valley mines in the proposed project area was not reported to have affected groundwater levels in uplands. SRBC (2005) also concluded that mine pool withdrawals for the proposed facilities would not affect existing wells. However, the facilities' development could affect groundwater availability by increasing the area of impervious surface, thus reducing groundwater recharge to the aquifers on Broad Mountain. Water that previously would infiltrate the soil to enter the groundwater under Broad Mountain would instead become stormwater runoff and would be discharged to streams or strip mining pits. Thus, this water would not be available to recharge the aquifers on Broad Mountain.

Assuming that the project would prevent groundwater recharge of 15 in. per year (Section 3.4) over 50 acres of the 75-acre site, the reduction in recharge would be 2.7 million ft^3 per year (39 gpm or almost 56,000 gal per day). Because the onsite septic system for disposal of sanitary wastewater from the proposed facilities would replace some of this recharge by discharging an estimated 4 gpm into the aquifer, the net loss in recharge would be 35 gpm or 50,000 gal per day. For comparison, this is about 60% of the combined volume of groundwater supplied by the wells serving the Gilberton Power Plant and the Morea water system (Section 3.4.4). This reduced recharge should not adversely affect users of the Morea water system. Recharge from areas closer to the Morea well (i.e., within a 1,000-ft radius) is estimated to be almost 4 million ft^3 per year (56 gpm or 80,000 gal per day), which is more than enough to meet the needs of the Morea water system (20,500 gal per day).

The wells serving the Gilberton Power Plant are closer to the proposed main plant site than the Morea well is to the main plant site, and thus would be more likely to experience any impacts from reduced recharge. Because other wells in the area are farther from the proposed facilities than the Morea well is from the proposed facilities, they also should not be affected by reduced recharge.

Most potential impacts to groundwater quality on Broad Mountain would be avoided by implementing standard engineering practices, including collection of potentially contaminated runoff and cleaning up accidental spills in a timely manner. The proposed septic system for sanitary wastewater disposal would discharge effluents to the aquifer, but these effluents should not adversely affect groundwater quality. The septic system would be designed and operated in accordance with permitting requirements and would only receive wastewaters like those generated by households. Silty sand soils, such as the soils found on Broad Mountain, are usually effective in filtering and attenuating contaminants in effluents from properly designed and maintained septic systems. Dilution of the relatively small volume of septic effluent by the much larger volume of natural groundwater recharge would minimize the impacts of any contaminants that do reach groundwater.

4.1.5 Floodplains, Flood Hazards, and Wetlands

4.1.5.1 Floodplains and Flood Hazards

The main plant would be located at an elevation well above the Federal Emergency Management Agency's delineated 100- and 500-year floodplains (Section 3.5.1). A new culm beneficiation plant or expansion of the existing facility in the adjacent valley to the north of the main plant area would also lie above the elevation of the 100- and 500-year floodplains. The following project ancillary facilities, however, would cross the 100- and 500-year floodplains of Mahanoy Creek: (1) two product rundown pipelines to ***the*** railroad siding, (2) an expansion of the coal conveyor from the culm beneficiation plant, and (3) a pipeline for mine pool water. These structures would be placed atop an existing trestle at an elevation above the level of the 100- and 500-year floods (FEMA 1983, 1986). No new construction within the floodplain would be required.

Staff of the Pennsylvania Department of Environmental Protection have identified a concern that the tailings pond, which is anticipated to receive facility effluents, is surrounded by an earthen berm constructed of potentially unstable materials (Hannigan 2006), including coal waste and silt material. Increasing the amount of water discharged to this pond by adding waters related to operation of the proposed facilities could increase the elevation of water within the tailings pond, which would increase the water pressure on the berm and increase the potential for berm failure. If the berm were to fail, the resulting release of water and solids from the pond could cause flooding in the vicinity of the pond (for example, at the beneficiation plant) and downstream (in Gilberton). Some historical failures of mine tailings impoundments have had severe adverse consequences. For example, in February 1972, failure of a coal waste impoundment on the Buffalo Creek in West Virginia resulted in the most destructive flood in West Virginia's history, causing 125 deaths, 1,100 injuries, and extensive property damage. In October 2000 a 72-acre coal tailings impoundment failed in Martin County, Kentucky, releasing approximately 250 million gallons of slurry into local streams and causing significant environmental damage (National Research Council 2002). More recently, in August 2005, the failure of a discharge structure at a fly ash impoundment at a power plant at Martins Creek in eastern Pennsylvania caused 100 million gallons of water containing fly ash to be accidentally released into the Delaware River (PPL Corp. 2007a, 2007b).

The probability and potential consequences of a tailings pond failure at the Gilberton site have not been quantified. However, the Gilberton tailings pond appears to be less susceptible to catastrophic failure than impoundments such as those at Buffalo Creek and Martin County. Unlike the Buffalo Creek impoundment, the Gilberton tailings pond receives surface water runoff from a relatively limited area, so there would be much less potential for a large rainfall event to dramatically increase the water pressure on the pond walls. Unlike the Martin County impoundment, water-filled underground coal workings are not present on the uphill side of the Gilberton tailings pond, making it unlikely that release of water from underground coal workings could increase water pressure on the pond walls. Furthermore, if the pond were to fail, the

relatively low land surface slope in the valley would limit the velocity and distance of travel of the pond contents, thus resulting in less severe consequences than could occur in steeper watersheds.

In addition, the potential for failure of the earthen berm could be reduced, but not eliminated, by discharging facility effluents directly to Mahanoy Creek (bypassing the tailings pond). This would have the effect of reducing the volume of water managed in the pond. The Pennsylvania Department of Environmental Protection (Hannigan 2006) identified direct discharge to the creek as an option that could help address concerns about possible pond instability. Although this potential measure has not been proposed by the industrial participant, it is discussed as an Alternative Water Management Approach in Section 4.1.4.1. The designation of a discharge location would be part of the Pennsylvania Department of Environmental Protection water quality permitting process.

4.1.5.2 Wetlands

Construction and operation of the proposed facilities would have no adverse effects on wetlands because none are present on the project site. ***The proposed project site was examined for presence of wetlands using the criteria of hydrology, hydric soils, and wetland vegetation, as specified in the 1987 Army Corps of Engineers Delineation Manual (Dilley 2003). No wetlands were found during the survey. A splash zone was found beneath an actively releasing steam valve, but the area did not meet the criteria of a wetland. No surface waters were reported on or in the immediate vicinity of the proposed main project site, nor were any expected due to its ridge-top location (Dilley 2003).*** Runoff and spills from the site would be controlled by standard construction engineering practices and spill control procedures (Section 4.1.4).

4.1.6 Ecological Resources

4.1.6.1 Terrestrial Ecology

Construction

Approximately 75 acres of deciduous forest would be permanently lost to construct the main plant. An additional 1.5 acres, which would be cleared for ancillary structures, would revegetate to some extent. Loss of this habitat, increased human activity in the main plant area, increased traffic on local roads, and noise would be the most important factors that would affect wildlife species.

The presence of construction crews and increased traffic would cause some wildlife species to avoid areas next to the construction site during the 30-month construction period. Wildlife inhabiting the area rely on native trees, shrubs, and groundcover for food and shelter and would be affected by vegetation clearing. Burrowing and less mobile species such as amphibians, some reptiles, and some small mammals could be adversely affected during vegetation clearing and grading and other site preparation activities. The loss of deciduous forest during construction would displace some small mammals and songbirds from the construction areas, but would not be expected to eliminate any wildlife species from Broad Mountain because similar habitat is relatively common along, and on both sides of, the ridge. Clearing for support facilities, i.e., product rundown lines, mine pool water source and return lines, and natural gas line, would create additional forest edge and introduce habitat diversity as these areas partially revegetated. This would tend to benefit edge-related wildlife species, while displacing forest-related species from the new habitat.

Construction would temporarily modify the quality of the surrounding habitat in the project area by the creation of noise. Noise levels at a distance of 50 ft typically associated with earthmoving equipment range from 73 to 96 dB(A), and 82 dB(A) for chain saws (FHWA 2005; Revelle and Revelle 1974). Published results from several studies indicate that small mammals and birds might be adversely affected by the maximum noise levels produced by construction equipment (Luz and Smith 1976; Brattstrom and Gondello 1983). White-tailed deer and other skittish larger mammals would not use the areas near the proposed site during construction activities because of noise and the presence of workers. ***Because larger and more mobile species would tend to avoid construction areas due to associated noise, no*** long-term impacts on the hearing ability of ***these*** species would be expected from construction-generated noise.

Some unavoidable impacts on wildlife would occur as a result of increased vehicular traffic. Construction traffic along the new access road would increase the potential for roadkills for animals such as turkeys, squirrels, and chipmunks.

Birds of prey passing through, or possibly otherwise using the area, probably would not be adversely affected by the loss of prey base that would be associated with the clearing of the total of 76.5 acres of vegetation, due to the existence of much similar habitat nearby. However, their foraging in areas next to construction sites might be reduced due to increased human activity.

To mitigate impacts of construction to ecological resources, forest clearing would be minimized to the extent practicable by clearing no more land than absolutely necessary for construction. Best management practices (BMPs) for sediment and erosion control, including use of silt fence, straw bale structures, and geotextile materials would be employed where appropriate. Excavated areas surrounding the proposed facilities would be reseeded following construction, and where practicable, some areas would be allowed to revert to forest.

Operation

The impacts on wildlife and vegetation from air emissions due to routine operations should be minor. For the criteria air pollutants SO_2, NO_2, PM-10, and CO, modeled estimates of increases in ground-level concentrations due to project emissions are generally low (Table 4.1.1), and actual degradation of air quality should be less than the amounts predicted (Section 4.1.2.2). Although no estimates of project-related hazardous air pollutants and trace elements are currently available, the cleaning of synthesis gas would result in a high percentage of removal (Section 4.1.2.2). Trace elements and organic compounds would be released at low concentrations and would be diluted further by atmospheric dispersion over a large geographic area, resulting in deposition amounts that should be below levels known to be harmful to wildlife and vegetation or to affect ecosystems through bio-uptake and biomagnification in the food chain (Will and Suter 1995; Suter and Tsao 1996; Jones, Suter, and Hull 1997; Sample, Opresko, and Suter 1996).

The culm that would be used as feedstock for the proposed facilities would be obtained from culm banks deposited during previous anthracite mining in the region. Pennsylvania law (25 Pa. Code 88.181.243) requires that remined culm banks be graded to minimize erosion and that vegetation be successfully established for at least 5 years. ***Trees would be planted as part of reclamation and revegetation efforts.*** Consequently, operation of the proposed facilities would result in reclamation of anthracite mined lands in the adjacent valley and the region. Actively remining previously abandoned surface or deep mines is encouraged by the Pennsylvania Department of Environmental Protection (2004c) as the most efficient way to reclaim abandoned mine lands at no cost to taxpayers. ***The Pennsylvania Department of Environmental Protection could waive a mine permit requirement for coal obtained from refuse material on abandoned mining property if the proposed project meets the respective applicable technical guidance document requirements and respective federal Office of Surface Mining and Pennsylvania Department of Environmental Protection regulations (Section 7.2).*** Although a reasonable estimate cannot be made of the amount of land that would be reclaimed during the 3-year demonstration period (because of uncertainty in the selection of culm banks to be used and variations in bank dimensions), approximately 1,000 acres would be reclaimed over the ***first half of the 50***-year operating life of the proposed facilities. Over the long term, the terrestrial habitat created on reclaimed lands would offset the 76.5 acres of deciduous forest that would be cleared for the proposed facilities.

4.1.6.2 Aquatic Ecology

Impacts to aquatic habitats and fish from construction of the proposed facilities would be minor to negligible. No surface waters are on or in the immediate vicinity of the proposed project site. Best management practices (BMPs) for sediment and erosion control, including use of silt fences, straw bale structures, and geotextile materials would be employed during construction. Accidental spills of construction materials such as solvents, paints, oil, grease, and hazardous substances would be controlled in accordance with an appropriate Spill Prevention, Control, and Countermeasure Plan. Thus, impacts to the closest surface water body, a tailings pond along Mahanoy Creek more than 0.25 mile from the proposed plant site, would be unlikely.

Operational water for the proposed facilities would be withdrawn from the mine pool. Wastewater, including any contaminated runoff from the project site, would be handled using a combination of stormwater retention, wastewater treatment, oil recovery, biological treatment and solids removal, and disposal. Wastewater treatments would include equalization, API (American Petroleum Institute) separator treatment for oil removal and recovery, dissolved air flotation for additional oil removal, and biological treatment. Spills at the project site and ancillary structures such as the product rundown lines would be controlled consistent with a spill control plan. Product rundown lines would be designed to withstand flooding and earth slides. Potential for spill-related liquid effluents to reach surface water bodies would be low.

As discussed in Section 4.1.4.1, use of mine-pool water in the proposed facilities would reduce the amount of water discharged to Mahanoy Creek from the mine pool, thus reducing the frequency and duration of high-flow episodes in the creek, but not reducing streamflow during low-flow periods. Flow stabilization could improve the physical habitat of the creek for fish and other aquatic biota.

Effluents from the proposed facilities would have near-neutral pH and lower concentrations of acidity and dissolved metals than are contained in the mine pool water that currently is discharged to the creek at Gilberton. However, this water would be expected to contain large residual amounts of organic compounds and other process residues.

The effect of returning some of this effluent, via seepage from the tailings pond to the mine pool and subsequent pumping to Mahanoy Creek, on the aquatic ecology of the creek would depend on the chemical interactions and mixing that occur within the mine pool. Mahanoy Creek is substantially altered due to acid mine drainage. Introduction of facility effluent would tend to increase the pH of mine pool water pumped to the stream and reduce availability of metals to stream organisms. However, the introduction of organic and process residues in the treated wastewater would tend to contribute to oxygen depletion and add other contaminants deleterious to aquatic life (Section 4.1.4.1), thus hindering the reestablishment of aquatic biota in stream reaches below the Gilberton pump.

If the alternative water management approach of discharging the treated wastewater directly to Mahanoy Creek, instead of to the tailings pond, were implemented (Section 4.1.4.1), physical habitat quality in the creek would be improved due to reduced flow variability relative to current conditions or discharge to the mine-pool system. Less acidity and other mine-pool contaminants would enter the creek than under current conditions or with discharge to the mine-pool system. Depletion of dissolved oxygen in the creek and excessive concentrations of other contaminants harmful to aquatic life would, however, severely limit the stream's potential to provide suitable habitat for aquatic life (Section 4.1.4.1).

More extensive wastewater treatment at the proposed facilities (for example, by including additional treatment steps in the wastewater treatment system) could reduce or eliminate the potential for adverse impacts to water quality and aquatic biota from oxygen depletion and other process-related contaminants.

Land reclamation following culm bank removal for project feedstock would be expected to reduce acid mine drainage and pollution of streams and rivers in the anthracite coal region (PDEP 2004c). Removal of culm banks followed by grading and vegetation establishment would act to reduce infiltration of rainwater and snowmelt into pyrite-bearing strata, thus reducing acid mine drainage (Klemow 2000; Hawkins 1995).

4.1.6.3 Threatened and Endangered Species

Because the proposed facilities would not be located within an area that provides habitat for any endangered, threatened, candidate, special concern, or rare species of bird, mammal, reptile, amphibian, fish, aquatic invertebrate, or plant recognized by the state or federal government, except for occasional transient individuals (Section 3.6.3), it is unlikely that any such species would be affected by project construction or operations.

In compliance with Section 7 of the Endangered Species Act of 1973, as amended, DOE requested consultation with the U.S. Fish and Wildlife Service regarding potential impacts of the proposed facilities on threatened and endangered species. The U.S. Fish and Wildlife Service response indicated that, with the exception of occasional transient individuals, no federally-listed or proposed threatened or endangered species are known to occur within the project impact area, and that no biological assessment or further consultation under the Endangered Species Act would be required (Appendix A).

4.1.6.4 Biodiversity

About 75 acres of second-growth deciduous forest typical to the region would be lost due to clearing and construction on the project site. Given the predominance of this forest type in the region it is unlikely that unique genetic information, or rare species or ecosystem components, would be lost. Thus, discernable impacts to biodiversity would not be expected.

4.1.7 Social and Economic Resources

The social and economic impacts of the proposed project would be most noticeable during the 30-month construction period, when an average of 516 workers would be on the site. These impacts would peak during a 6-month period when 1,000 workers would be on the site. The project would also have short-term impacts from employment of 250 workers during the 36-month demonstration period immediately following construction, and long-term impacts from employment of 150 workers for operations after completion of the demonstration (Sullivan 1997). This assessment focuses primarily on the social and economic impacts of project construction and long-term operations because construction would have the largest impacts and operations would have the longest-lasting impacts. The assessment focuses less on the social and economic impacts of the 36-month demonstration period because they would be smaller than those of the construction period and of shorter duration than those of the operations period.

In addition to the direct jobs that would be created by project construction and operations, a number of indirect and induced jobs would be created. Indirect jobs are those created by businesses that provide goods and services essential to the construction and operation of a project. Induced jobs are those created “by the spending of the wages and salaries of the direct and indirect employees on items such as food, housing, transportation, and medical services” (NEPaA 2004b).

Using calculations based on the Northeastern Pennsylvania Alliance *Economic Impact Model*, the average number of direct jobs during project construction (516) could create as many as 181 indirect jobs and 175 induced jobs, for a total of 872 jobs (NEPaA 2004c). The peak number of direct jobs during construction (1,000) could create as many as 351 indirect jobs and 338 induced jobs, for a total of 1,689 jobs (NEPaA 2004c). ***It is important to note that not all of these jobs would be filled by***

current residents of Schuylkill County. However, it is expected that most of the jobs not filled by county residents would be filled by current residents of the east central Pennsylvania region.

Similarly, during long-term operation of the proposed facilities, the 150 direct jobs could create as many as 115 indirect jobs and 173 induced jobs (NEPaA 2004c). Thus, long-term project operations could account for as many as 438 total jobs. The employment multipliers for operational jobs are larger than those for construction jobs because the operating period is much longer than the construction period and, therefore, would likely result in more workers permanently relocating to the area.

The following subsections discuss the potential socioeconomic impacts of the proposed project, particularly those associated with direct, indirect, and induced employment during project construction and operations.

4.1.7.1 Population

Because the proposed facilities would be located within a 1-hour drive of some large labor markets (i.e., Reading, Allentown, and Wilkes-Barre), a minimal number of workers would be expected to move to the project locale during construction and operation. Therefore, this analysis assumes that most of the construction and operations workers already reside in the ***east central Pennsylvania*** region and would commute daily from their homes to the project site. Although workers would be unlikely to relocate from outside the project region, this analysis assumes as a conservative estimate that 10% of the peak construction work force (100 workers) and 60% of the operations work force (90 workers) would relocate. The analysis assumes a lower percentage of relocating workers for construction than for operations because the construction period would last only 30 months (i.e., the shorter the work period, the less likely that workers would relocate).

Past experience with large, multi-year power plant construction and refurbishment projects indicates that approximately 60% of the in-migrating work force is accompanied by family, while the remaining 40% is not (NRC 1996). However, for this relatively small, 30-month construction project, a more reasonable assumption is that only 40% of the construction workers relocating to the area (40 workers) would be accompanied by family. This analysis assumes that a higher percentage of the operational workers relocating to the area (75% or 68 workers) would be accompanied by family because the facilities' operating period would be much longer than the construction period.

Assuming that 60 construction workers would relocate without families and that 40 construction workers would relocate with families, and assuming an average family household size of 2.48 persons for Pennsylvania (U.S. Census Bureau 2004b), the permanent population in the project area would increase by about 160 as a result of direct construction employment. This population growth would represent 0.11% of Schuylkill County's population in 2000.

Similarly, assuming that 68 operations workers would relocate with families and that 22 operations workers would relocate without families, and assuming an average family household size of 2.48 persons, the permanent population in the project area would increase by about 190 as a result of direct operations employment. This population growth would represent 0.13% of Schuylkill County's population in 2000.

The indirect and induced jobs that could be created would be less specialized than the direct construction and operations jobs, and would be even more likely to be filled by existing area residents. Accordingly, this analysis assumes that none of the indirect or induced work force would relocate to the project area during project construction or operations.

The potential impacts of project-related population growth are discussed below in Sections 4.1.7.3 (Housing), 4.1.7.4 (Water and Wastewater Services), and 4.1.7.5 (Public Services).

4.1.7.2 Employment and Income

The 1,689 total jobs (1,000 direct, 351 indirect, and 338 induced) that could be created during the peak construction period (Section 4.1.9) would represent 2.5% of the total labor force in Schuylkill County in 2000. Similarly, the 438 total new jobs (150 direct, 115 indirect, and 173 induced) that could be created during project operations would represent 0.6% of the county's total labor force. Because most of the direct, indirect, and induced jobs during construction and operations would be filled by workers who currently reside within a 1-hour driving distance of the proposed facilities, project construction would have a short-term positive effect on employment in the ***east central Pennsylvania*** region, and project operations would have a long-term positive effect on employment in the region.

Because most of the construction and operations work forces would reside in the project region, project wages would have a positive effect on total and per capita income. Based on the types and numbers of occupations that would make up the construction work force and the average annual salaries for those occupations in Schuylkill County (PDLI 2003), the total direct payroll during the 6-month peak construction period would be close to $20 million. The total direct payroll for the entire 30-month construction period would be at least twice as large as this $20 million figure. Further, assuming only the current minimum wage in Pennsylvania of $5.15 per hour (U.S. Department of Labor 2004) and 2,000 hours per work-year, the total payroll generated by the indirect and induced jobs (356) over the 30-month construction period would be over $9 million.

Similarly, assuming that 150 employees would make up the operations work force, and that the average annual salary for a "power plant operator" in Schuylkill County is $40,014 (PDLI 2003), the annual direct payroll during project operations would be at least $6 million. Further, assuming only the current minimum wage in Pennsylvania ($5.15 per hour) and 2,000 hours per work-year, the annual payroll generated by the indirect and induced jobs (288) during project operations would be nearly $3 million.

Overall, construction of the proposed facilities would have short-term positive effects on employment and income in the ***east central Pennsylvania*** region. Project operations would also have positive effects on employment and income and, provided that the demonstration is successful (Section 5), these effects would last longer than the effects of construction. The project's positive effects on employment and income would contribute to the region's economic viability.

4.1.7.3 Housing

Because most of the direct, indirect, and induced jobs during project construction and operations would be filled by workers who currently reside within a 1-hour driving distance of the proposed facilities, demand for housing in Schuylkill County would not increase appreciably. Housing for the 100 new construction-related households (i.e., the workers relocating with and without families) assumed as an upper bound in this analysis would represent 1.4% of the 7,276 vacant housing units in Schuylkill County in 2000. Similarly, the 90 new operations-related households would represent 1.2% of the county's vacant housing in 2000. These levels of increased demand would not be likely to have an adverse effect on the availability or cost of housing in Schuylkill County, particularly given the county's population decline since 1990.

4.1.7.4 Water and Wastewater Services

Because most of the direct, indirect, and induced jobs during project construction and operations would be filled by workers who currently reside within a 1-hour driving distance of the proposed facilities, demand for water and wastewater services in Schuylkill County would not increase appreciably. Mahanoy Township Authority and the Schuylkill County Municipal Authority have abundant water supplies (Section 3.7.4), which could easily meet the additional demand from 100 new construction-related households and 90 new operations-related households. Because of planned upgrades by the Greater Pottsville Area Sewer Authority, the additional demand from the new households would not exacerbate existing problems with the provision of wastewater services in Pottsville (Section 3.7.4).

4.1.7.5 Public Services

Police Protection

As discussed in Section 4.1.7.1, population growth associated with construction and operation of the proposed facilities would be minimal, representing only about 0.1% of Schuylkill County's population in 2000. Given such a small population increase, particularly in the context of an ongoing population decrease in Schuylkill County (Section 3.7.1), construction and operation of the facilities would not create an additional need for police protection. In the unlikely event of an accident associated with plant operations or the shipment of materials, additional police resources would probably be required, most likely from Pottsville and the Pennsylvania state police.

Fire Protection and Emergency Medical Services

As with police protection, the relatively small population increase and housing demand associated with construction and operation of the proposed facilities would not create an additional need for fire protection or emergency medical services.

In the unlikely event of an accident associated with plant operations or the shipment of materials, additional fire protection and emergency medical services would probably be required. ***The Schuylkill County Emergency Management Agency (SCEMA) would be responsible for evacuating nearby residents if necessary. SCEMA, in conjunction with the Pennsylvania Emergency Management Agency (PEMA), is in the process of developing a hazard mitigation plan for Schuylkill County. The plan will cover the hazards which are most likely to affect the county and pose a threat to its inhabitants, including hazardous materials, transportation, and wildfires (SCEMA 2006).***

Schools

Because population growth associated with construction and operation of the proposed facilities would be minimal, little (if any) effect on local schools would be experienced. This outcome is reinforced by Schuylkill County projections, which indicate that by 2013 the Mahanoy Area School District's total enrollment will decrease by more than 39% for all grade levels, and the Pottsville Area School District's enrollment will decrease by 5% for kindergarten–8th grade and by 23% for 9th–12th grade (Section 3.7.5.3).

Health Care

Given the small population growth associated with construction and operation of the proposed facilities, particularly in the context of an ongoing population decrease in Schuylkill County (Section 3.7.1), construction and operation of the facilities would not create an additional need for health care facilities. In the unlikely event of an accident associated with plant operations or the shipment of materials, the local health care facilities could be strained, and some accident victims might need to be transported out of the immediate area for treatment. The extent of the impact on local health care facilities and the need to transport patients elsewhere would depend on the type and size of the accident.

4.1.7.6 Local Government Revenues

The proposed facilities would be located in ***Mahanoy Township within*** one of Pennsylvania's designated Keystone Opportunity Zones, which are geographical areas that receive local and state approval for tax abatements for the purpose of stimulating economic development. Because of this designation, local real estate taxes (to Schuylkill County, Mahanoy Township, and the Mahanoy Area School District) for the proposed project site and taxable improvements would not be due until ***10 years after the completion of project construction.*** Using 2003 real estate tax rates and a projected assessed value on land and improvements, the facilities' annual real estate tax payments would be ***at least $73,000, but would not start until 2019 at the earliest.***

4.1.7.7 Environmental Justice

As discussed in Section 3.7.7, Schuylkill County and eight of the nine census tracts within 3 miles of the proposed facilities have lower minority percentages than the United States and Pennsylvania. For Census Tract 7, however, significant minority populations reside at the Mahanoy and Frackville State Correctional Institutions. The minority inmate ***populations in these correctional facilities represent "environmental justice" populations to which the adverse impacts of constructing and operating the proposed facilities*** could be distributed disproportionately. ***However, serious*** air quality and health impacts to this population would not be expected, ***as discussed in*** Section 4.1.2.1.

Schuylkill County's population percentage below the poverty level is lower than that of Pennsylvania and the United States. However, two census tracts near the site of the proposed facilities have relatively high poverty rates (Table 3.7.5). Census Tracts 5 and 6 have ***low-income population percentages*** that exceed those of both Pennsylvania and the United States. Therefore, the ***low-income*** populations in Census Tracts 5 and 6 represent "environmental justice" populations to which the adverse impacts of constructing and operating the proposed facilities could be distributed disproportionately. ***However, serious*** air quality, water quality, and health impacts to these populations would not be expected, however, as discussed in Sections 4.1.2, 4.1.4, and 4.1.9. ***Therefore, the proposed action would not result in disproportionately high and adverse impacts to minority or low-income populations.***

4.1.7.8 Transportation

Roads

All of the 1,000 workers during the 6-month peak construction period would access the project site from State Route 1008 (Morea Road). Most of these workers would access State Route 1008 from its intersection with State Route 61 in the town of Frackville. For this assessment, it is assumed that the construction workers would commute to and from the project site each day. ***For the United States, average vehicle occupancy to and from work in 2001 was 1.1 persons per vehicle (DOE 2004). In Pennsylvania, carpools of two or more persons comprise only 12% of total vehicle occupancy for workers, while vehicles with one person comprise 88% (U.S. Census Bureau 2005). For this assessment, however, we assume 2.0 persons per vehicle for the construction work force because (1) many of the workers would be driving from other parts of the region outside of the immediate project vicinity and would be more likely to carpool and (2) the project proponents would encourage carpooling during construction to help reduce impacts to traffic flow and safety on the local road network.*** Thus, as an upper bound, about 1,000 additional vehicle trips (500 to the site and 500 from the site) would be generated each day during the peak construction period.

Average daily traffic (ADT) on State Route 61 in Frackville is 10,186 vehicles, and ADT on State Route 1008 near the Gilberton Power Plant is 4,486 vehicles (Section 3.7.8.1). The 1,000 additional daily vehicle trips for workers during the peak construction period would represent increases of 10%

and 22% over existing traffic on State Route 61 and State Route 1008, respectively. Increases of this size on State Route 61 and State Route 1008 would likely cause traffic congestion and have an appreciable impact on traffic flow and safety during morning and afternoon commutes (Dave Gruber, Pennsylvania Department of Transportation District 5, personal communication to James W. Saulsbury, ORNL, May 26, 2004). In addition to these construction workers' vehicles, the number of construction delivery trucks accessing the project site from State Route 61 and State Route 1008 would increase. Because most of this construction-related traffic would occur during peak morning and afternoon drive times, impacts to traffic flow and safety on State Route 61 and State Route 1008 would be particularly acute. ***Also, this relatively large increase in traffic volume would result in noise, dust, and traffic congestion impacts affecting residents along the transportation corridor and an increased need for maintenance and repair of the local road network.*** WMPI has committed to contacting the Pennsylvania Department of Transportation to discuss potential options ***for mitigating the project's impacts on traffic safety and flow***, including signaling, road widening, and scheduling work hours and/or deliveries to avoid periods of heavy traffic. ***WMPI would also consult with the Pennsylvania Department of Transportation (PennDOT) on minimizing noise, dust, and traffic congestion impacts to residents along the transportation corridor and to providing mitigation for the project's impacts on local road maintenance and repair.***

During the demonstration and long-term project operations, all of the 250 and 150 workers, respectively, would access the facilities from State Route 1008 (primarily via State Route 61 in Frackville). It is assumed for this assessment that each vehicle would carry one operations worker. Thus, as an upper bound, about 500 additional vehicle trips (250 to the site and 250 from the site) would result each day from workers commuting during the demonstration, while about 300 additional vehicle trips (150 to the site and 150 from the site) would result each day from workers commuting during long-term operations. In addition, approximately 104 truck trips per day (52 to the site and 52 from the site) would deliver culm to the site, 40 truck trips per day (20 to the site and 20 from the site) would bring limestone, 22 truck trips per day (11 to the site and 11 from the site) would transport waste material to an offsite landfill***, and 2 truck trips per day (1 to the site and 1 from the site) would transport sulfur from the site (use of petroleum coke as an additional feedstock could increase sulfur transportation requirements to as many as 7 round trips per day)***. Although liquid fuels produced by the proposed facilities are planned to be shipped from the facilities solely by rail, if the fuels ***were to*** be shipped by truck, about 80 vehicle trips would be required daily (40 to the site and 40 from the site). The impacts of operations-related traffic would be less severe than those of construction-related traffic but would be more long lasting. ***As discussed for the construction period, this increase in traffic volume would result in noise, dust, and traffic congestion impacts affecting residents along the transportation corridor and an increased need for maintenance and repair of the local road network.*** WMPI has committed to contacting the ***PennDOT*** to discuss potential options ***for mitigating the project's impacts on traffic safety and flow***, including signaling, road widening, and scheduling work hours and/or deliveries to avoid periods of heavy traffic. ***WMPI would also consult with the PennDOT on minimizing noise, dust, and traffic congestion impacts to***

residents along the transportation corridor and providing mitigation for the project's impacts on local road maintenance and repair.

Railways

The proposed facilities would affect the local rail system because the project's liquid fuels would be shipped by rail. Rail transport would require the construction of product pipelines to transport materials to the nearest railroad siding in Gilberton, about 1 mile from the main plant area, and construction of storage and loading facilities capable of filling approximately eight tank car loads of product per day. Filled tank cars would be stored on a siding. Once a week, a new supply of empty tank cars would be delivered, and a train of filled tank cars would be assembled and moved off the site. Rail shipments of this magnitude would not have adverse impacts on the local rail system (James G. Raffa, Vice President, Traffic, Reading Blue Mountain & Northern Railroad Company, personal communication to James W. Saulsbury, ORNL, September 9, 2004). Potential accidents associated with transport of liquid fuels are discussed in Section 4.1.9.1.

4.1.7.9 Cultural Resources

In compliance with Section 106 of the National Historic Preservation Act of 1966, as amended, DOE has consulted with the Pennsylvania ***State Historic Preservation Office*** (SHPO) regarding a determination of the potential for impacts associated with the proposed facilities on any historic resources that may be listed in or eligible for the *National Register of Historic Places* or that may have local importance. Impacts from construction and operation of the facilities would not be likely because the SHPO has stated that no historic or archaeological properties are listed or eligible for listing on the *National Register* in the project area (Appendix B). The SHPO has further stated that DOE’s responsibility for consultation is complete. However, the SHPO would be notified if any historic or archaeological properties located at or near the project site are detected.

4.1.8 Waste Management

4.1.8.1 Construction

Initial site grading would include land clearing, grubbing, stripping, excavation, and placement of fill to establish rough grading elevations. Excavated soil would be used onsite for fill. Topsoil and other soil containing organic material would be stockpiled on the site and used in final grading. Some timber could be salvaged and sold for pulpwood or firewood, but the majority of the removed vegetation, including tree stumps, would be managed as waste. Open burning on the site would minimize the labor and transportation required to dispose of this material, but would have short-term impacts in the surrounding area due to smoke, odors, and increased airborne particles (Section 4.1.2.1). To minimize the potential for fire to spread to nearby vegetation, burning would not be scheduled during drought conditions in which advisories have been issued by the Pennsylvania Department of Environmental Protection. Alternatively, this material could be taken to a commercial composting facility for recycling. Composting facilities that accept land-clearing debris are located in Robesonia (Berks County), Bethlehem, and the Philadelphia area (Section 3.8).

Waste from construction of the proposed facilities would include excess materials, metal scraps, and pallets, crates, and other packing materials. Excess supplies of new materials would be returned to vendors, retained for future use, or transferred in settlement with subcontractors (who could retain the items for use in future projects). Surplus paint and other consumables, partial spools of electrical cable, and similar leftover materials would also be retained for possible future use in maintenance, repairs, and modifications (Section 2.1.6.3).

Metal scrap not suitable for future use in the facilities would be collected in dumpsters for resale to scrap dealers or recyclers. The volume of metal scrap would be no more than one dumpster per month during the period of peak scrap generation, with less generated during the first six months and last three months of construction (Section 2.1.6.3).

Packaging materials and nonmetal components broken during installation would be collected in dumpsters for offsite disposal. The largest volume of solid waste requiring disposal would be packaging material, including wooden pallets and crates, support cradles used for shipping of large vessels and heavy components, and cardboard and plastic packaging. The rate of generation for packaging waste would be up to two truckloads per month (estimated to be about 18 cubic yards or 18 tons per month) during construction (Section 2.1.6.3). The volume of broken nonmetal components would be much smaller. The quantity and character of other wastes would be typical of any work site. Office waste paper would be collected for recycling, and miscellaneous work site waste (such as garbage from workers' meals) would be collected for offsite disposal.

The commercially available municipal solid waste landfills in the region (Section 3.8) should have ample capacity to receive and dispose of project construction wastes. Because project construction waste quantities would be small in comparison with the landfill capacities and waste quantities routinely handled at these sites, management of these wastes should have negligible impact.

During construction, no hazardous waste generation would be anticipated (Section 2.1.6.3).

4.1.8.2 Operation

Solid Waste

Solid wastes and byproducts generated by the operation of the proposed facilities would include gasifier slag, fine solids, elemental sulfur, sludges from water and wastewater treatment***, and spent catalysts, absorbents, resins, and filtration materials (Section 2.1.6.3). In addition, beneficiation of culm for use in the proposed facilities would generate solid waste consisting of waste rock and soil.***

Slag generated by the gasifier would be a vitrified (glass) silicate material formed when noncombustible solids found in coal and culm are heated past the melting point and then cooled rapidly. No organic compounds would be expected in this material. Slag, which would be black in color and granular (sand-like) in form, would be generated at a rate of ***at least*** 1,600 tons per day (wet weight) or 800 tons per day (dry weight). One day's slag production would cover an acre of land to a depth of about 1 ft. ***(Because of the low ash content of petroleum coke, its use as an additional feedstock, as outlined in Section 2.1.2 and Appendix G, would reduce the facilities' production of gasification slag.)***

Commercial uses would be sought for the gasifier slag, which is projected to have low bulk density, high shear strength, and good drainage and filtering characteristics. Several potential uses have been identified for this material, including lightweight construction aggregate, asphalt roofing shingle granules, blasting grit, and pipe bedding material (SAIC 2002). However, markets for this material have not yet been established ***and the regulatory acceptability of potential beneficial uses has not been determined (Section 7.2).*** Any slag that is not used commercially ***is expected to*** be used as fill material for surface mine reclamation at and near sites where culm would be obtained (Section 2.1.6.3).

Contaminants potentially can leach into groundwater or surface water when solid byproducts are used in the environment. Requirements of the Pennsylvania residual waste management regulations (25 Pennsylvania Code Chapter 287) are intended to prevent or reduce the potential for adverse impacts from leaching of wastes (Strock 1996). ***Residues*** must be characterized for ***physical properties***, chemical composition, and to verify that they meet regulatory criteria for leachability ***(Section 7.2)***. Materials must be retested periodically to demonstrate that they continue to meet the criteria. Coal combustion residues may be used as fill only in coal mining areas (active or abandoned) or coal refuse disposal sites. Placement must be at least 8 ft above the regional water table, but the regulations provide for exemptions (e.g., placement in mine pools) upon demonstration that no groundwater contamination would occur. Compliance with these regulations would minimize the potential for adverse impacts to water quality from management of the slag residue.

Characterization of coal ash from the existing Gilberton Power Plant provides a basis for predicting the characteristics and leaching behavior of coarse slag from the proposed facilities. Because both facilities would use culm from the same sources, the slag and ash should have similar chemical composition, but the vitrified gasifer slag would have different physical and mechanical properties and would be less leachable than the ash, which is formed at lower temperatures. Table 4.1.2 presents results of chemical analysis and leachability testing of Gilberton Power Plant ash. Leachability ***has been*** tested using the Synthetic Precipitation Leaching Procedure (SPLP), which simulates the potential effects of leaching under acidic conditions typical of rainfall in the eastern United States. Testing ***indicates that the ash is highly alkaline (measured leachate pH typically is greater than 10.0, although a few samples have been acidic)***, a desirable characteristic for reclamation of acidic mine wastes. ***Concentrations of*** dissolved constituents in the ash leachate ***usually are*** below maximum acceptable concentrations for beneficial use, as specified under Pennsylvania residual waste management regulations; ***the only exceptions have been the*** aluminum ***concentrations in several ash samples tested between 1988 and 1990 (Hornberger et al. 2004). However, for many constituents the upper end of the range of ash leachate concentrations exceeds*** the applicable drinking water Maximum Contaminant Level Goal (MCLG) or primary or secondary drinking water standards (for substances without MCLGs). Due to the physical differences between slag and ash, leaching of slag from the proposed facilities would be expected to result in much lower contaminant concentrations. Thus, the risk of adverse impacts to groundwater quality from using this material in mine reclamation would be negligible. However, the relatively inert slag also would have less value as a source of alkalinity for acidic mine reclamation.

About 200 tons of fine solids (dry basis) would be generated each day. Some of this material might be captured and returned to the gasifier for energy recovery (SAIC 2002), but the majority ***is expected to*** be used in a permitted ash disposal area on WMPI land as part of mine reclamation (Section 2.1.6.3), subject to the same residual waste regulations that would govern management of the slag. The fine solids would not be as chemically inert as either slag or power plant bottom ash and would contain 11% carbon (dry basis), as either unburned carbon or other coal-derived organic constituents. The potential for impacts to water quality from using this material in mine reclamation would be larger than from similar use of the slag, but compliance with the residual waste regulations would minimize the potential for adverse impacts to water quality. Although it is expected that the majority of fine solids would be applied on land as part of mine reclamation, this assessment also considers the possibility that the material would not meet regulatory criteria for use in mine reclamation, and therefore would be taken for disposal in a commercial landfill, such as the facilities identified in Section 3.8.

Sludges from treatment of raw water and wastewater would total about 24 tons per day. Treatment of cooling water (to remove 1,700 lb per day of iron and manganese) would generate about 11 tons per day of wet sludge, while wastewater treatment would produce about 13 tons per day of wet sludge. Provided that the requirements of the Pennsylvania residual waste management regulations are met, these sludges would be placed in Mahanoy Creek valley on WMPI land that is permitted for disposal of coal byproducts under ***coal surface mining*** permit 54850202, issued ***to B-D Mining*** by the Pennsylvania Department of Environmental Protection (Section 3.8). Although the sludges would likely qualify under Pennsylvania regulations for placement on WMPI land as part of mine reclamation, this assessment also considers the possibility that both types of sludges would be taken for disposal in a commercial landfill.

The placement of the proposed facilities' solid wastes and byproducts***, together with waste rock and soil from culm beneficiation,*** on lands that were previously mined or covered with culm banks would contribute to reclamation of surface-mined lands (i.e., contour grading and vegetation establishment) (Section 4.1.6.1). Reclamation activities and needs in the vicinity could easily absorb the volume of material that would be generated during the 3-year demonstration (Section 5 discusses corresponding potential impacts associated with commercial operation following the demonstration). Standard engineering practices such as silt fencing and straw bales would be employed during reclamation to prevent adverse impacts to surface waters from runoff, erosion, and sedimentation. Earthen berms or dikes could be needed to provide effective management for the large quantities of wet sludge. Periodic inspections by Pennsylvania Department of Environmental Protection personnel would help in monitoring the integrity of engineering controls to assure their effectiveness (Section 3.8).

Table 4.1.2. ***Chemical analysis of Gilberton Power Plant coal ash and Synthetic Precipitation Leaching Procedure (SPLP) leachate***

Constituent	Ash concentration (mg/kg dry weight) [a]	Leachate concentration (mg/L) [a]	***Range of leachate concentration (mg/L)*** [b]	***Median of leachate concentration (mg/L)*** [b]	Maximum acceptable leachate concentration (mg/L)[c]	Applicable drinking water criterion (mg/L)
Aluminum	36,300	3.14	***ND[d] - 23.9***	***2.24***	5.0	0.2[e]
Antimony	4	<0.04	***NA[f]***		0.15	0.006[g]
Arsenic	18.1	0.045	***ND - 0.25***	***0.02***	1.25	***0.01[h]***
Barium	296	0.04	***ND - 0.59***		50	2[g]
Boron	61	0.06	***ND - 0.65***		31.5	—[i]
Cadmium	0.9	<0.005	***ND - 0.05***		0.13	0.005[g]
Chromium	57	0.08	***ND - 0.32***		2.5	0.1[g]
Cobalt	NA	NA	***ND - 0.07***		—	—[i]
Copper	51	0.02	***ND - 0.13***		32.5	1.3[g]
Iron	24,300	0.21	***ND - 1.05***	***0.16***	7.5	0.3[e]
Lead	58	0.05	***ND - 0.31***		1.25	0.005 [j]
Manganese	120	<0.005	***ND - 0.73***		1.25	0.05[e]
Mercury	0.2	<0.0002	***ND***		0.05	0.002[g]
Molybdenum	<1.0	0.05	***ND - 0.72***		4.38	—[i]
Nickel	21	<0.01	***ND - 0.16***		2.5	—[i]
Selenium	8.5	0.018	***ND - 0.21***		1.0	0.05[g]
Silver	NA	NA	***ND - 0.05***		—	0.1[e]
Zinc	37	0.05	***ND - 4.46***		125	5[e]
Chloride	NA	1.78	***NA***		2,500	250[e]
Sulfate	NA	502	***NA***		2,500	250[e]

[a]*Source*: WMPI PTY, LLC. Analysis reported by Hawk Mountain Labs, Inc., West Hazleton, PA, December 12, 2003.

[b]Source: Analysis reported to Pennsylvania Department of Environmental Protection, 1988-1999 (Hornberger et al. 2004).

[c]Pennsylvania residual waste management regulations (25 Pennsylvania Code Chapter 287). For most dissolved metals, maximum acceptable concentrations were set at 25 times the applicable drinking water Maximum Contaminant Level Goal (MCLG; a health-based criterion established by federal and state drinking water regulations) or secondary drinking water standard. For chloride and sulfate, the maximum concentrations are 10 times the secondary drinking water standard.

[d]ND = Not detected.

[e]Secondary drinking water standard.

[f]NA = Not analyzed.

[g]MCLG.

[h]Primary standard effective January 2006 (no MCLG); previously the standard was 0.05 mg/L.

[i] Not currently regulated. For nickel, MCLG and primary standard were set at 0.1 mg/L until remanded in 1995.

[j] Pennsylvania primary drinking water standard (no MCLG).

Several minor waste streams are expected to require disposal in an offsite commercial landfill (Section 2.1.6.3). Additionally, if fine solids or sludges from the facilities failed to meet criteria for land application, they could require disposal in an offsite commercial landfill. Commercial landfill capacity in the region appears to be sufficient to handle the additional waste volume***s*** (Section 3.8). However, management of ***any project residue at a Pennsylvania commercial landfill*** would require ***specific approval*** from the Pennsylvania Department of Environmental Protection (Section 7.2) and could require modifications of operating procedures to avoid adverse effects on landfill operations. ***Disposal of the fine solids, sludges, and other waste streams expected to be sent to a commercial landfill*** would increase average daily waste volumes at either of the two nearest landfills (Section 3.8) by more than 10%. If sludges were transported to commercial landfills routinely, additional dewatering would probably be conducted to reduce weight and the potential for release of water after delivery. Special handling might also be required before shipment or within the landfill to control the release of water, which could affect the quantity and characteristics of landfill leachate. At least 11 daily truck trips would be required to deliver fine solids and sludge to the landfill. Roundtrip travel distance would be more than 20 miles to the nearest landfill (Commonwealth Environmental Services facility in Foster Township) and more than 50 miles to ***another facility.***

At least 13 tons per day of byproduct elemental sulfur would be produced and sold commercially. ***Use of petroleum coke as 25% of the feedstock (Section 2.1.2; Appendix G) would increase the production of byproduct sulfur due to the higher sulfur content of petroleum coke.*** Sulfur has numerous uses in agriculture and industry. More than 10 million tons are consumed in the United States each year. This consumption exceeds domestic production, all of which is byproduct material from environmental control systems (Ober 2002). Given this domestic situation, the market should easily absorb the quantity (about 4,000 tons) that the proposed facilities would generate each year of the demonstration.

None of the proposed facilities' solid wastes and byproducts would be expected to be hazardous as defined under RCRA. The EPA's Toxicity Characteristic Leaching Procedure test would be performed to verify this expectation. Any wastes subject to RCRA hazardous waste regulations would be handled in accordance with standard procedures similar to those currently implemented at the Gilberton Power Plant.

Some toxic metals present in coal as trace constituents are likely to be captured in the catalysts, adsorbents, resins, and filtration materials that would be returned to their manufacturers for regeneration or other processing. Although these materials would not be hazardous wastes, processing of these materials may generate hazardous wastes subject to RCRA. Management of any hazardous wastes generated at a manufacturer's offsite facility would be the responsibility of the manufacturer and would utilize the capacity of existing licensed treatment, storage, or disposal facilities.

Liquid Waste

Operation of the proposed facilities would generate several different liquid wastes requiring treatment or control. Liquid wastes from the gasification and liquefaction processes would hold various impurities collected in processing, off-gas cleaning, and solid waste processing. Process wastewaters would have high organic loadings and would require treatment for substances including methanol and other alcohols, formates, ammonia, formic and acetic acids, cyanides, sulfides, and chlorides. Stormwater runoff collected from the facilities, coal piles, and other areas would require removal of oil and grease and other contaminants. Wastewater from ***reverse osmosis treatment and*** demineralization of mine pool makeup water would have high concentrations ***of*** dissolved substances removed from the mine pool. Contaminants in wastewater released from the cooling water system would include proprietary biocides, corrosion and scale inhibitors (such as phosphates), chlorine, and other substances injected into the makeup and circulating streams to inhibit corrosion and fouling, together with high concentrations of dissolved solids (such as sulfates) not removed during initial water treatment.

Several wastewater collection and treatment units would be used to manage these liquid waste streams, based on technologies used successfully in other industries. Stormwater collected from process areas and stormwater from parking lots and other portions of the site not used for processing or materials storage would be collected in two separate lined retention basins. Wastewater from the gasification and liquefaction processes would be combined with stormwater from process areas in an equalization basin, then routed to a series of oil-water separation units where droplets of oil and grease would be recovered and oily sludge would be collected for disposal or recycling to the gasification process. Effluent from this stage of treatment would ***be*** routed to a biological treatment unit that would combine aeration with clarification in order to treat wastewater with high levels of chemical and ***biochemical*** oxygen demand. ***WMPI (2005c) proposes use of*** the Advent integrated activated sludge system (Dorr-Oliver EIMCO, undated). This unit would be designed to consume the organic compounds and nutrients in the wastewater, yielding treated effluent for discharge and a biological sludge for disposal. Treated effluent would be mixed with non-process-area stormwater ***and non-oily wastewater streams (including cooling tower blowdown, boiler blowdown, and wastewater from reverse osmosis treatment and demineralization of mine pool water)*** in an equalization basin for final settling and testing prior to discharge to a tailings pond in Mahanoy Creek valley.

Potential environmental impacts from liquid waste management would include ***impacts to water resources receiving effluent discharges, particularly of incompletely treated effluents (see Section 4.1.4.1),*** objectionable odors, and the possibility of accidents involving fire or explosion in oil-water separation units. Potential impacts from odor would be controlled by treating all process wastewater within enclosed facilities prior to discharge to the final equalization basin. Treatment system upsets (e.g., if fluctuations in wastewater characteristics were to cause a die-off of microorganisms in the biological treatment unit) could result in release of incompletely treated water, causing odor problems and water quality degradation off the site ***(Section 4.1.4.1)***. The potential for upsets could be minimized by designing the system with ample reserve capacity, selecting treatment units that are demonstrated to tolerate a wide range of wastewater characteristics, and controlling inflows to the treatment system to maintain consistent wastewater characteristics. Potential for explosion in oil-water separation units could be minimized by using a nitrogen gas blanket over these units.

4.1.9 Human Health and Safety

4.1.9.1 Public Health

During construction of the proposed facilities, potential health impacts to the public could result from fugitive dust emissions into the atmosphere (Section 4.1.2.1). However, these emissions would occur over a relatively short time period. WMPI would regularly use water spray trucks to dampen the material in construction areas to suppress the generation of dust.

Another potential health impact to the public would be associated with operational air emissions from the proposed facilities, including SO_2, NO_x, PM-10, CO, and hazardous air pollutants. Schuylkill County currently experiences a higher average annual rate of deaths than surrounding counties and Pennsylvania as a whole (Section 3.9.1). Therefore, any increase in regional air emissions could potentially be harmful to sensitive members of the general population. However, all maximum ambient concentrations of criteria pollutants from the proposed facilities were estimated to be less than their corresponding significant impact levels, and Air Quality Program Permit No. 54-399-034, issued by the Pennsylvania Department of Environmental Protection for the proposed facilities, establishes maximum allowable limits to ensure that the proposed facilities would be a minor new source of hazardous air pollutants (e.g., mercury) under the National Emissions Standards for Hazardous Air Pollutants regulations (Section 4.1.2.2).

The interaction between air emissions and toxic exposures from other sources of pollution depends on the chemical species and the route of exposure. While many potential air pollutants exert their toxic effects via inhalation with the lungs/respiratory system frequently being the target, there are some potential pollutants that exert their toxic effects whether inhaled, contacted with the exposed skin, or ingested. Benzene provides an example of a substance that can be present in both air and water and can manifest toxic effects from skin absorption, ingestion, and inhalation. To estimate the potential risk, an emission factor for benzene from a facility believed to produce similar emissions and EPA's inhalation risk factor were used to calculate the lifetime risk of cancer to an individual from inhaling this benzene emission; that risk is estimated to be a little over 1 in 50 million. Even if all sources of benzene exposure taken together multiplied the risk 50 times (an unlikely circumstance), the lifetime risk would be 1 in 1 million.

The quantities of flammable and hazardous materials produced and stored at the facility increase the potential for accidents during operations. The protection of public health from potential accidents associated with this facility is regulated by EPA and would be addressed as part of compliance with 40 CFR 68 and 29 CFR 1910.119 (Section 7.1). This process includes hazard identification, hazard analysis, accident identification, and accident analysis. These analyses are to

address in detail the potential consequences from a worst-case release scenario from the facility to the nearest off-site member of the public. These investigations and analyses, along with identified process controls, procedures, training, and audits, are to be incorporated into a Risk Management Plan that is submitted to EPA. In addition to the Risk Management Plan, an Emergency Response Program is to be developed and included in the Risk Management Plan. The necessary investigations and analyses required by these regulations have not yet been completed for this facility.

Although unlikely, potential impacts to health and safety of the workers and the public from accidents at the proposed facility could result from releases of toxic or explosive chemicals to the atmosphere. These chemicals could include H_2S, SO_2, CO, HCl, HF, benzene, arsenic, mercury, beryllium, synthesis gas, fuel gas, tail gas, oxygen, methanol, sulfuric acid mist, ammonia, and natural gas. These chemicals are associated with the Shell gasification technology or the SASOL Fischer-Tropsch liquefaction technology. Based on the existing operating experience of the technologies to be utilized in the proposed facility, the potential risks from accidents during facility operations are expected to be greatest to workers. Occupational health and safety standards under 29 CFR 1910.119 require the protection of workers from hazardous chemicals above threshold quantities.

In addition, 40 CFR 68 requires the project operator to develop measures to protect the public from hazardous chemicals above threshold quantities. The Risk Management Plan required by 40 CFR 68 includes an offsite consequence analysis for a worst-case release scenario for each regulated toxic substance above the threshold quantity and an alternative release scenario to represent all regulated flammable substances held above the threshold quantity. The population at risk must be identified in the Risk Management Plan, and appropriate passive and active mitigation must be considered in the analysis. Given these protections, the probability of a catastrophic accident involving a fire or explosion resulting in a release of toxic chemicals affecting members of the public is remote.

The Shell gasification technology has been under commercial development and operation for over 40 years. There are currently over 160 commercial plants operating that utilize this technology. As with most industrial technologies, accidents have occurred over this period of time, some of which have resulted in fatalities to workers. The largest reported accident was associated with an explosion of the air separation unit at a plant in Malaysia with a capacity of 14,500 barrels/day. The plant was closed from 1997-2000 while repairs were made and additional controls were introduced. No reports of injuries or fatalities to the public from catastrophic or industrial accidents associated with the Shell gasification technology have been identified.

The SASOL Fischer-Tropsch liquefaction technology has been under commercial development and operation for over 20 years, primarily in South Africa. The capacity of the plants in South Africa exceeds 150,000 barrels/day. Like the Shell gasification technology, accidents have occurred during this period, with the most recent occurring from a gas leak and fire in 2005 that injured 19 workers. This accident occurred during a transfer of chemicals from the plant to a tanker. The *plant was shut down while an investigation was completed. Following the investigation, additional controls were implemented in response to the findings from the investigation. As with the Shell gasification technology, no reports of injuries or fatalities to the public from catastrophic or industrial accidents associated with industrial operations of the SASOL Fischer-Tropsch liquefaction technology have been identified.*

The proposed facility is designed to have a capacity of 5,000 barrels/day, which is significantly less than the capacities of the commercially sized components being utilized. Consequently, there would be smaller quantities of toxic or hazardous materials than at commercial-sized facilities. While the combination of these two technologies could be considered to lead to an increase in the risk of facility operations, the operations experience of both technologies has not resulted in significant consequences to the public. Since the proposed facility is a demonstration project, additional monitoring and audits by EPA can be expected as part of the Risk Management Plan, which contribute to a reduction in risk of facility operations. Consequently, the risks to the public from facility operations are not anticipated to be significant.

The facility would have firefighting and emergency response capabilities included in the Emergency Response Program to mitigate the consequences of any fires, hazardous materials releases, or medical emergencies. Emergency response personnel would be capable of responding quickly and effectively to minimize personnel injury, environmental damage, and property damage from accidents. Emergency response personnel would also be trained to respond properly in the handling of hazardous chemicals, catalysts and flammable materials utilized and produced in the facility.

While no credible emergencies have been identified at this time that would require the rapid emergency evacuation of the prison, this type of event could be identified in the preparation of the Risk Management Plan and the Emergency Response Program. Should the need for rapid evacuation of the prison be identified in the Risk Management Plan, the necessary procedures and safeguards would be developed to protect public health and safety. An emergency operations plan for Mahanoy State Correctional Institution that includes procedures for evacuation of inmates and employees in the event of an emergency has been developed (Major Dennis Durant, Chief of Security, Pennsylvania Department of Corrections, e-mail to Cheri Bandy Foust, Oak Ridge National Laboratory, March 15, 2006). The evacuation of approximately 2,300 inmates would be accomplished by exercising existing agreements with bus services in the area. Logistical considerations with other prisons for relocating inmates would require approximately 24 hours. The movement of inmates would require an additional 24 to 48 hours (Ed Martin, Superintendent's Assistant, Mahanoy State Correctional Institution, personal communication to Robert Miller, ORNL, March 16, 2006). As noted in Section 4.1.7.5, the Schuylkill County Emergency Management Agency (SCEMA) would be responsible for evacuating nearby residents, in necessary. SCEMA, in conjunction with the Pennsylvania Emergency Management Agency, is in the process of developing a hazard mitigation plan for Schuylkill County.

There is a possibility of accidents associated with off-site rail or truck transport of the liquid fuels and other products and byproducts of the proposed project. Data for rates of accidents, fatalities, and injuries from freight transport are available for individual states for trucks and railroads. Table 4.1.3 summarizes data for surface freight shipments in Pennsylvania and the U.S. The data indicate that rail shipments have significantly fewer accidents, fatalities and injuries than interstate truck shipments. Interstate truck accidents in Pennsylvania occur more frequently, and are more likely to be associated with fatalities and injuries, than the mean values for the U.S. In contrast, railroad accidents for Pennsylvania occur less frequently, and are less likely to be associated with fatalities and injuries than the mean values for the U.S. Pennsylvania's total accident rate for all truck shipments is 6.79×10^{-7} accidents/truck-km and the US median total accident rate for all shipments is 3.52×10^{-7} accidents/truck-km.

4.1.9.2 Electromagnetic Fields

The proposed facilities would tap into the existing Hauto-Frackville #3 69kV transmission line. The new generators would be connected to the 69kV line by constructing a short (less than 100-yard) 69kV interconnect from the new generators to the existing transmission line. The interconnect would operate far from any residence. Because no new transmission line would be built, no perceptible changes to existing EMF levels would occur. Consequently, EMF-related health effects, if they exist, would continue unchanged and small (NRC 1997).

4.1.9.3 Worker Health and Safety

Potential health impacts to workers during construction of the proposed facilities would be limited to the normal hazards associated with construction (i.e., no unusual situations would be anticipated that would make the proposed construction activities more hazardous than normal for a major industrial construction project). Most accidents in the construction industry result from overexertion, falls, or being struck by equipment (NSC 2003). Construction-related illnesses would also be possible (e.g., exposure to chemical substances from spills).

The Bureau of Labor Statistics reported 1,126 fatalities and 408,300 nonfatal occupational injuries and illnesses in the United States in 2003 for the construction industry (Section 3.9.3). During the same year, Pennsylvania recorded 39 construction-related fatalities. Based on the national statistics applied to an average of 516 workers on the site, the proposed project could expect 0.2 fatalities and 79 nonfatal injuries and illnesses during the 30-month period of construction.

The proposed facilities would be subject to the OSHA General Industry Standards (29 CFR Part 1910) and the OSHA Construction Industry Standards (29 CFR Part 1926). During construction and operation of the proposed facilities, risks would be minimized by WMPI's adherence to procedures and policies required by OSHA and the ***Commonwealth*** of Pennsylvania. These standards establish practices, chemical and physical exposure limits, and equipment specifications to preserve employee health and safety. Construction permits and safety inspections would be employed to minimize the frequency of accidents and further ensure worker safety. Construction equipment would be required to meet all applicable safety design and inspection requirements, and personal protective equipment would be used when needed to meet regulatory and consensus standards.

Table 4.1.3. Accident, Fatality and Injury rates for trucks and railroads

Mode of transportation	*Composite accident rate (10^{-7} accidents/truck- or rail car-km)*	*Composite fatality rate (10^{-7} fatalities/truck- or rail car-km)*	*Composite injury rate (10^{-7} injuries/truck- or rail car-km)*
Truck transport on PA interstate highways	*5.18*	*0.135*	*3.83*
Truck transport on U.S. interstate highways (mean)	*3.15*	*0.088*	*2.27*
PA railroad transport	*0.938*	*0.022*	*0.306*
U.S. railroad transport (mean)	*2.74*	*0.078*	*1.17*

Source: Saricks and Tompkins 1999.

The Bureau of Labor Statistics reported 32 fatalities and 24,500 nonfatal occupational injuries and illnesses in the United States in 2003 for the utilities industry (Section 3.9.3). During the same year, Pennsylvania recorded no utilities-related fatalities. Based on the national statistics applied to 250 workers during operations, the proposed project could expect 0.04 fatalities and 32 nonfatal injuries and illnesses during the 36-month period of demonstration. To maximize worker safety, operations would be managed from a control room. All instruments and controls would be designed to ensure safe start-up, operation, and shut down. The control system would also monitor operating parameters and perform reporting functions. Control stations would be placed at remote locations at which operator attention would be required. Therefore, the overall design, layout, and operation of the facilities would minimize human hazards. Compliance with the Federal Occupational Safety and Health Standards, as well as safety standards specified by the ***Commonwealth*** of Pennsylvania and WMPI PTY, LLC, would help maintain occupational safety.

WMPI PTY, LLC, would develop supplemental detailed procedures for inclusion in the proposed facilities' Occupational Safety and Health Program to assure compliance with OSHA and EPA regulations and serve as a guide for providing a safe and healthy environment for employees, contractors, visitors, and the community. These procedures would include job procedures describing proper and safe manners of working within the facilities (e.g., handling and storage of ammonia would comply with 29 CFR 1910.111), appropriate personal protective equipment (complying with 29 CFR 1910.132), and appropriate hearing conservation protection devices. The manual would be used as a reference and training source and would include accident reporting and investigation procedures, emergency response procedures, toxic gas rescue-plan procedures, hazard communication program provisions, material safety data sheet accessibility, medical program requirements, and initial and refresher training requirements. In addition, supplemental provisions would be added to the proposed facilities' Contingency Plan for Hazardous Waste, Spill Prevention Control and Countermeasures Plan, Hazardous Substances Response Procedures, and Air Pollution Emergency Episode Plan.

4.1.9.4 Intentional Destructive Acts

Although concerns have been raised about the vulnerability of nuclear power plants to terrorist attack (Behrens and Holt 2005), the potential for such attacks on coal-based power plants has not been identified as a threat of comparable magnitude. Nuclear materials would not be present at the proposed project, but there is the potential for release of hazardous materials in the event of an intentional destructive act (i.e., terrorism or sabotage). The potential consequences of a hazardous materials release from the proposed gasification, liquefaction, or electric generating facilities would be similar to those from accidental causes. These consequences, and measures to minimize them, are discussed in Section 4.1.9.1 above.

An intentional destructive act could also result in a disruption of power supply to the electrical grid. However, at a capacity of 41 MW, the proposed project would be a small generating unit. Temporary loss of this unit would not be expected to have a substantial effect on regional power supply. Security currently in place to protect the existing Gilberton Power Plant and the nearby Mahanoy State Correctional Institution from such acts would be expected to be sufficient to also protect the proposed project.

4.1.10 Noise

During construction of the proposed facilities, the principal sources of noise would be from construction equipment and material handling. The amount and type of construction equipment would vary depending on the specific construction activity occurring at that time (e.g., site excavation, structural steel/mechanical/electrical equipment erection and installation, piping, fabrication, etc.). Construction activity would primarily occur within 6 acres of the 75-acre main plant site.

The proposed facilities would be built next to the existing Gilberton Power Plant. To mitigate the impacts of construction noise, employees and contractors would be responsible for ensuring that exhaust mufflers and engine enclosures are in place and in good working order for all industrial trucks and other pieces of construction-related equipment. An exhaust muffler is a device that deadens the noise of escaping gases or vapors through which the exhaust gases of an internal-combustion engine are passed. An engine enclosure silences low-frequency noise radiated from the engine. Exhaust mufflers and engine enclosures are commonly used, and are commercially available from many different manufacturers. All construction equipment would be properly maintained.

During operation of the proposed facilities, the principal sound sources would include equipment like the combustion turbine/generator, steam turbine/generator, heat recovery systems, turbine air inlets, exhaust stacks, cooling towers, pumps (e.g., feed, circulating, etc.), and compressors.

These sound sources would be enclosed and acoustically insulated. Noise sources within the buildings would be fitted with sound-attenuating enclosures or other noise dampening measures that would meet all state and federal regulations and WMPI PTY, LLC noise standards (WMPI PTY, LLC, e-mail to Robert L. Miller, ORNL, May 30, 2004). During maintenance or repair events, workers would be required to wear hearing protection equipment.

Noise levels decrease with distance from the source. There are no noise sources anticipated at the proposed facilities that could produce hearing loss 2,600 feet away. The proposed project site's highest sound level measurement was documented at 55 dB(A) in March 2003 (Section 3.10). For comparison, 55 dB(A) is the approximate level of a quiet subdivision during daylight hours. This level is also given by the EPA as a guideline upper limit with an adequate margin of safety for protection from activity interference and annoyance during the daytime in outdoor locations "in which quiet is a basis for use" (EPA 1974).

To analyze the incremental noise effects resulting from the proposed facilities, a doubling rule was used, which provides the most convenient way to perform simple arithmetic functions involving logarithmic measurements, such as dB measurements (MPCA 1999). The doubling rule provides an accurate estimate of the effect of distance and multiple sources on measured sound pressure levels. To estimate the highest sound level during simultaneous operation of the Gilberton Power Plant and the proposed facilities, the sound generated by the two facilities was assumed to be equal. According to Goodfriend and Associates (1971), power plant sound levels are similar due to comparable noise sources such as induced- and forced-draft fans, turbine generators, and air compressors. A doubling of sound energy yields an increase of 3 dB (MPCA 1999), indicating that the proposed site's highest sound level measurement would be 58 dB(A). As a basis for evaluating an increase of 3 dB, a change in sound level of plus or minus 1 dB is not perceptible to the human ear, a change in sound level of plus or minus 3 dB is the threshold of perception to the human ear, and a change of plus or minus 5 dB is clearly noticeable to the human ear (MPCA 1999).

The center of the proposed main plant would be about 2,600 ft west of the Mahanoy State Correctional Institution. The increase in noise levels (i.e., 3 dB) would probably be imperceptible because of (1) the distance between the prison and the proposed project site, (2) planned noise attenuation measures, and (3) natural and man-made terrain features and structures. No perceptible change in noise associated with the proposed facilities would be expected at the nearest ***private*** residence, located 3,600 ft southeast of the proposed main plant, or other offsite locations.

Increased numbers of trucks and rail traffic associated with construction and operation will generate additional noise along the transportation corridors. For example, presently the daily

traffic on State Route 61 near the proposed site averages 10,186 vehicles (Section 3.7.8.1). There would be an estimated 300-500 additional vehicle trips (for workers) and 168 truck trips (to transport raw materials and waste products) each day during operation of the proposed project (Section 4.1.7.8). Transport of the products by rail would occur once per week. Noise from this additional traffic would be more frequent, but the noise levels would be the same as presently occurs from current motor vehicle and rail traffic.

4.2 POLLUTION PREVENTION AND MITIGATION MEASURES

Pollution prevention and mitigation measures have been incorporated by WMPI as part of the design of the proposed project. The proposed facilities' use of anthracite culm as feedstock would allow reclamation of land currently stockpiled with culm and would provide a beneficial use for the material at operating mines. Also, the quality of water returned to the mine pool following use by the proposed facilities would be improved. WMPI plans to sell the coarse slag and elemental sulfur as byproducts to offsite customers. In addition, mitigation measures have been developed to minimize potential environmental impacts. Table 4.2.1 lists the pollution prevention and mitigation measures that WMPI would provide during the construction and operation of the proposed facilities.

Additional mitigation measures have been considered for the concentrated stream of CO_2 exiting the gas cleanup system (the Rectisol unit). The measures considered include the sale of the concentrated CO_2 stream and geologic sequestration of this stream. However, it has been determined that these options would not be feasible during the project demonstration phase. The industrial participant has informed DOE that sale of the CO_2 byproduct would not occur in the foreseeable future. In addition, DOE has considered the potential to reduce project CO_2 emissions using geologic sequestration. This is not a reasonable option because sequestration technology is not sufficiently mature to be implemented at production scale during the demonstration period for the proposed facilities. The future potential for geologic sequestration of CO_2 during commercial operation of the proposed facilities is discussed in Section 5.1.4.

4.3 ENVIRONMENTAL IMPACTS OF NO ACTION

Under the no-action alternative, DOE would not provide cost-shared funding to demonstrate the commercial-scale integration of coal gasification and F-T synthesis technologies to produce electricity, steam, and liquid fuels. At the site of the proposed project, it is reasonably foreseeable that no new activity would occur (Section 2.2.1). Thus, under the no-action alternative, no construction or operation of the proposed facilities would occur. No site preparation would be required, such as clearing of trees and other vegetation, site leveling, and the construction of onsite roads, parking lots, fences, and stormwater drainage areas. No employment would be provided for construction workers in the area or for operators of the proposed facilities. No resources would be required and no discharges or wastes would occur. This scenario would not contribute toward the removal of anthracite culm, which is stacked locally in numerous piles that were set aside during previous mining of anthracite coal because of their inadequate quality.

Current environmental conditions at the site would not change. Specifically, air quality in the area would remain the same, and no changes would occur to existing geologic and soil conditions in the area. No changes would occur to the quantity and quality of surface water and groundwater and the availability of water supplies in the area. Ecological resources would remain the same. No changes would result to the current management of solid and hazardous waste in the proposed project area.

The adjacent Gilberton Power Plant would continue to operate without change. Levels of resources used and emissions, effluents, and wastes discharged would remain the same. The generation and beneficial reuse of bottom ash and other byproducts from the existing plant would continue, including the sale of bottom ash as an anti-skid material for roads and as construction fill or aggregate.

Table 4.2.1. Pollution prevention and mitigation measures developed for the proposed facilities

Environmental issue	Pollution prevention or mitigation measure
Atmospheric resources and air quality	During construction, water spray trucks would dampen exposed soil with water as necessary to minimize the occurrence of fugitive dust during construction activities.
	During site preparation, cleared vegetation and non-hazardous construction waste would be burned. The fire chief of Mahanoy Township would be notified prior to each occurrence. Open burning would ***comply with the requirements of the Mahanoy Township Burning Ordinance and would*** not be conducted during drought conditions in which advisories have been issued by the Pennsylvania Department of Environmental Protection.
	During construction and operation, vehicles and machinery would be equipped with standard pollution-control devices to minimize emissions.
	To reduce particulate emissions from handling and transfer of anthracite culm, petroleum coke, and limestone, the number of handling and transfer points would be minimized, the conveyors and material unloading points would be enclosed, and wetting systems and collection devices (e.g., baghouses) would be installed.
	A very high percentage of trace elements in the synthesis gas would be removed because the integrated technologies would require extensive cleaning of the synthesis gas using wet scrubbing followed by acid gas removal using a Rectisol unit.
	Odorous emissions of hydrogen sulfide (H_2S) should not be perceptible because H_2S would be removed from the shifted synthesis gas in the acid gas removal plant using a Rectisol unit and would be converted to marketable elemental sulfur in a Claus sulfur recovery unit, a process which should remove approximately 99.99% of the sulfur from the gas stream. The gas stream exiting the Rectisol unit would be sent to a thermal oxidizer to oxidize any trace contaminants prior to being released through a stack to the atmosphere.
Geological resources	The proposed facilities would increase the removal and utilization of anthracite culm deposited on the landscape of the surrounding area, which would accelerate the ongoing process of restoring soil productivity and would help to reduce the potential for culm bank fires.
	Product rundown lines would be designed to withstand flooding and earth slides. The potential risks of product line leakage due to gradual subsidence would be reduced by inspecting product lines regularly and repairing any problems.

Table 4.2.1. Continued

Environmental issue	Pollution prevention or mitigation measure
Water resources	During construction, standard engineering practices such as silt fencing, straw bales, and revegetation of graded areas would be implemented to control runoff, erosion, and sedimentation that could affect other watersheds. Accidental spills of construction materials such as solvents, paint, caulk, oil, and grease that could contain hazardous substances would be cleaned up in a timely manner and in accordance with a Spill Prevention, Control, and Countermeasure Plan and Best Management Practices Plan, thus minimizing the potential for overland flow into streams. The Pennsylvania ***Department of Environmental Protection*** would be able to reduce by approximately 3***9%*** its pumping of water from the Gilberton mine pool to Mahanoy Creek to control the mine pool elevation. Discharge of treated effluent to the mine pool would be expected to reduce concentrations of acidity and dissolved metals in the mine pool, and thus also in the water pumped to Mahanoy Creek from the mine pool. Most potential impacts to groundwater quality on Broad Mountain would be avoided by implementing standard engineering practices, including collection of potentially contaminated runoff and cleaning up accidental spills in a timely manner. The proposed septic system would be designed and operated in accordance with permitting requirements and would only receive wastewaters similar to those generated by households.
Ecological resources	Excavated areas surrounding the proposed facilities would be reseeded following construction, and compatible areas would be allowed to revert to forested conditions. During reclamation of culm banks, the land surface would be graded to minimize erosion, and vegetation would be established. Over the long term, the terrestrial habitat created on reclaimed lands would offset the 76.5 acres of deciduous forest that would be cleared for the proposed facilities.
Traffic ***and transportation***	Additional construction- and operations-related traffic, which would affect traffic flow and safety on State Route 61 and State Route 1008, could be mitigated by signaling, road widening, or scheduling work hours and/or deliveries to avoid periods of heavy traffic. ***WMPI would consult with the PennDOT on minimizing noise, dust, and traffic congestion impacts to residents along the transportation corridor and providing mitigation for the project's impacts on local road maintenance and repair.***

Table 4.2.1. Continued

Environmental issue	Pollution prevention or mitigation measure
Waste management (solid)	Excess supplies of new materials would be returned to vendors, retained by the facilities for future use, or transferred in settlement with subcontractors (who could retain the items for use in future projects). Surplus paint and other consumables, partial spools of electrical cable, and similar leftover materials would also be retained for possible future use in maintenance, repairs, and modifications. Metal scrap not suitable for future use in the facilities would be collected for resale to scrap dealers or recyclers. The gasifier slag would be marketed for sale. Potential uses include lightweight construction aggregate, asphalt roofing shingle granules, blasting grit, and pipe bedding material. Any slag not used commercially would be used as fill material for mine reclamation. Compliance with 25 Pennsylvania Code Chapter 287 would minimize the potential for adverse impacts to water quality from beneficial reuse of slag and other byproducts. Some fine solid material could be captured and returned to the gasifier for energy recovery. The majority of the material would be placed on WMPI land that is permitted for disposal of coal byproducts as part of mine reclamation. Sludges from treatment of raw water and wastewater would be placed on WMPI land that is permitted for disposal of coal byproducts as part of mine reclamation. Sulfurous compounds would be converted during processing to marketable elemental sulfur. The proposed facilities' solid wastes and byproducts would not likely be hazardous as defined under RCRA. The EPA's Toxicity Characteristic Leaching Procedure test would be performed to verify this. Any wastes subject to RCRA hazardous waste regulations would be handled in accordance with standard procedures similar to those currently employed at the Gilberton Power Plant.
Waste management (liquid)	Potential impacts from odor would be controlled by treating all process wastewater within enclosed facilities prior to discharge to the final equalization basin. The potential for upsets in biological treatment units could be minimized by designing the system with ample reserve capacity, selecting treatment units that are demonstrated to tolerate a wide range of wastewater characteristics, and controlling inflows to the treatment system to maintain consistent wastewater characteristics. Potential for explosion in oil-water separation units could be minimized by using a nitrogen gas blanket over these units.

Table 4.2.1. Concluded

Environmental issue	Pollution prevention or mitigation measure
Worker health and safety	During construction and operation, risks would be minimized by WMPI's adherence to procedures and policies required by OSHA and the ***Commonwealth*** of Pennsylvania. These standards establish practices, chemical and physical exposure limits, and equipment specifications to preserve employee health and safety.
Noise	Employees and contractors would be responsible for ensuring that exhaust mufflers and engine enclosures are in place and in good working order for all industrial trucks and other pieces of construction-related equipment. During operation, the principal sound sources (i.e., combustion turbine/generator, steam turbine/generator, heat recovery systems, turbine air inlets, exhaust stacks, cooling towers, pumps, and compressors) would be enclosed and acoustically insulated. Noise sources within the buildings would be fitted with sound-attenuating enclosures or other noise dampening measures that would meet all state and federal regulations. During maintenance/repair events, workers would be required to wear hearing protection equipment. ***WMPI would also work with the PennDOT to minimize impacts to residents along the transportation corridor and to provide mitigation for the project's impacts on local road maintenance and repair.***

5. IMPACTS OF COMMERCIAL OPERATION

Following completion of the 3-year demonstration, three scenarios would be reasonably foreseeable: (1) a successful demonstration followed immediately by commercial operation of the facilities at approximately the same production level; (2) an unsuccessful demonstration followed by conversion of the facilities to an integrated gasification combined-cycle power plant; and (3) an unsuccessful demonstration followed by dismantlement of the facilities. ***The following sections discuss the potential environmental consequences of these three scenarios. For*** the first two scenarios, the expected operating life of the facilities ***is assumed to be 50*** years.

5.1 COMMERCIAL OPERATION FOLLOWING DEMONSTRATION

Under the first scenario, the level of ***most*** short-term impacts during commercial operation would not change from those described for the demonstration (Section 4) because the proposed facilities would continue operating 24 hours-per-day with the same operating characteristics. ***There could be differences, however,*** for impacts that accumulate with time (e.***g., resource consumption***, solid waste disposal, ***and buildup of greenhouse gases in the atmosphere). Also, changes in the environmental setting and other changes external to the facilities could result in changes in project impacts.***

5.1.1 Culm Usage

As described in Section 4.1.3.1, anthracite culm availability is more than sufficient for the demonstration period, but the culm reserves controlled by WMPI may not be sufficient to supply the proposed facilities for more than about 15 years. Continued commercial operation might eventually require the use of other fuels. Depending on the fuel, a change in fuel type could result in changes in air emissions, solid wastes, and byproducts. In addition, impacts related to acquiring the fuel, such as mining, beneficiation, and transportation could result. If petroleum coke were to be used as part of a blended feedstock to the gasifier (up to 25%), the expected effectiveness of the facility's gas cleanup system would ensure that air emissions were not significantly affected by the feedstock composition. As a result, air emissions would remain within the permitted levels for criteria pollutants and hazardous air pollutants. Likewise, based on a percentage basis for carbon content, coke and culm would be very similar, and as a result, additional CO_2 ***emissions would not be expected (see Table 2.1.3 and Appendix G).***

5.1.2 Water Supply

Continued progress in reclamation of abandoned mine lands in the watershed, including sealing mine openings, improving surface drainage, and establishing vegetation on barren sites, could reduce the availability of water from the mine pool system by reducing inflow to the mine pools. Sanders & Thomas, Inc. (1975) estimated that more than one-half of the precipitation

falling in mined portions of the Mahanoy Valley watershed entered mine pools, whereas only about one-third of precipitation on undisturbed sites reaches groundwater (Section 3.4). Over the 50-year period, if continuing reclamation in the watershed succeeded in reducing inflows to the Gilberton mine pool, there would be a reduced need to pump water from the mine pool into Mahanoy Creek and an increased likelihood that an alternative water supply source would be needed. Reductions in discharge of mine pool water to Mahanoy Creek would reduce adverse impacts to creek water quality (Section 4.1.4.1). Potential impacts from using an alternative water supply source or from delays in establishing a new water supply are outlined in Section 4.1.4.1; impacts of establishing a new water supply during commercial operations would be the same as described for the demonstration period.

5.1.3 Solid Wastes

As described in Section 4.1.8.2, the coarse slag from gasification would be sold to the extent possible as a byproduct to offsite customers. Any slag not used commercially would be used as fill material for surface mine reclamation. If applicable criteria are met, the fine solids and sludges from treatment of raw water and wastewater would be placed on lands that were previously mined or covered by culm banks (Section 4.1.8.2). Reclamation activities and needs in the vicinity could easily absorb the volume of material that would be generated. However, these materials could possibly require disposal in a commercial landfill (Section 4.1.8.2). Because Pennsylvania Department of Environmental Protection landfill permits provide for an operating life of about 10 years (Section 3.8), no nearby commercial landfills could guarantee capacity to accommodate the facilities' solid wastes throughout the ***50***-year operating lifetime. However, because of the abundant landfill disposal capacity statewide, which exceeds the state's own needs (Section 3.8), Pennsylvania landfills are likely to have sufficient room for solid wastes from the proposed facilities throughout the ***50***-year period.

Commercial sale of elemental sulfur generated by the proposed facilities would continue. However, while sulfur consumption currently exceeds production in the United States, global sulfur production is increasing while global demand is decreasing, and supply already exceeds demand globally (Ober 2002). If this trend continues, marketing sulfur could become difficult in the future, which would result in disposal of some or all of the 13 tons per day generated by the proposed facilities. Elemental sulfur would be a nonhazardous solid waste and would be acceptable for disposal in a commercial landfill (Section 3.8), but treatment or other special handling could be required to prevent generation of acidic leachate that could increase the environmental mobility of contaminants in other disposed wastes. ***Leaching studies on a mixture of elemental sulfur and coal combustion ash found that this combination promotes production of acidic leachate and release of trace metals from the ash, leading to a recommendation to isolate disposed sulfur from other materials in a landfill (Boegly, Francis, and Watson 1986).***

5.1.4 Carbon Dioxide (CO_2) Emissions

Over the 50-year duration of commercial operation, the facilities could release a total of about 114,000,000 tons of CO_2 to the global atmosphere, consisting of about 42,000,000 tons of CO_2 emissions from facility operations and 72,000,000 tons of CO_2 recovered in the Rectisol unit and released through the thermal oxidizer stack. In the long term (following the demonstration phase), the industrial participant may negotiate the sale of the concentrated CO_2 stream for use in other types of industrial or commercial operations. In addition, during the 50-year period it might become feasible to reduce the project's contribution to global climate change by sequestering some of the recovered CO_2 (1,450,000 tons/yr) underground.

Underground storage, or geologic sequestration, of CO_2 is a promising technology [1] being actively investigated and tested nationally and internationally by DOE and other organizations (Davison et al. 2001, IPCC 2005). Most of the research projects being conducted are at a pilot or smaller scale. Large-scale commercial deployment of the most promising carbon sequestration technologies is expected to be technically practicable within the next 15 years (CO_2 Capture and Storage Working Group 2002). During the 50-year duration of commercial operation, a combination of economic incentives and new legal requirements might result in the industrial participant investigating the option to sequester CO_2 recovered from the proposed facilities.

The feasibility of any potential sequestration technology requires the availability of a suitable geologic setting. Based on geologic factors, there are two theoretically possible scenarios for future geologic sequestration of CO_2 from the proposed facilities: (1) sequestration at a regional sequestration site and (2) sequestration in the Schuylkill County area.

In the first scenario, regional sequestration could occur in Western Pennsylvania, where the Midwest Regional Carbon Sequestration Partnership has identified a potential for geologic sequestration of 76 gigatonnes (83 billion tons) of CO_2 in saline formations, depleted oil and gas fields, and coal seams (Battelle 2005). The region's sequestration capacity would be more than sufficient for the 72,000,000 tons of CO_2 that would be recovered during the facilities' 50-year operating life. A buried pipeline (similar to a natural gas pipeline) or extensive rail transportation (about 14,500 100-ton or 10,360 140-ton rail tanker cars per year) would be required to transport the CO_2 to an injection site in Western Pennsylvania (150 miles or more from Gilberton). Multiple injection wells would need to be installed and operated to receive the CO_2; multiple extraction wells

[1] Potential geologic sequestration technologies include injection into depleted oil and gas fields (to enhance recovery of residual hydrocarbons in addition to trapping CO_2); injection into deep saline formations (in which CO_2 is trapped physically and also reacts chemically with dissolved substances in ground water, precipitating to form solid compounds that remain in the formation); and injection into unmineable coal seams (in which adsorption of CO_2 onto the coal displaces trapped methane, which can be extracted for sale as natural gas). The basic technologies for sequestration are similar to proven technologies routinely used in the petroleum and natural gas industries for purposes such as enhanced oil recovery, underground storage of natural gas, and production of coal-bed methane for sale as natural gas.

also would be needed for CO_2 sequestration in depleted oil and gas fields or methane-bearing coal beds.

In the second scenario, sequestration could occur in the Schuylkill County area, in deep unmineable coal seams, while producing coal bed methane for sale as natural gas. While Midwest Regional Carbon Sequestration Partnership geologic mapping did not extend into Eastern Pennsylvania (Gupta 2006), analyses of the region's geology, geologic history, geologic structure, mining history, and measurements on coal samples suggest a considerable potential to recover methane from unmineable coals in the anthracite region (Milici 2004a and 2004b, Milici and Hatch 2004). DOE estimates[2] that a local carbon sequestration and coal bed methane production operation could sequester only a portion of the facilities' concentrated CO_2 stream, as the potential sequestration capacity in Schuylkill County could not accommodate the facilities' lifetime CO_2 production (72,000,000 tons).

Under either scenario, carbon sequestration operations could have environmental impacts from the use and disturbance of land (for exploration activities, well fields, and CO_2 pipelines) and possibly from rail or truck transportation of CO_2. Any oil or gas production associated with CO_2 sequestration would produce local economic benefits along with potential environmental impacts from refining, storing, and transporting the hydrocarbon fuels. In addition, sequestration combined with coal bed methane recovery could result in impacts from the pumping and disposing of water from the methane-bearing coal beds. In extracting coal bed methane, water is pumped from the coal beds to lower the pressure that keeps methane adsorbed to the surface of the coal, thus stimulating desorption of methane (USGS 2000). In the anthracite region, unmineable coal

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2 ***The presence of methane in the area's coal is indicated by measurements on coal samples and by a history of "fire-damp" (methane) explosions in anthracite mines during the early years of mining (Milici 2004b). While the anthracite region's complex geologic structure would inhibit coal bed methane recovery, the U.S. Geological Survey has identified several areas in the Southern Anthracite Field (i.e., central Schuylkill County) where coal bed methane recovery might be feasible because rock strata are subhorizontal to gently inclined. Total coal bed thicknesses of 50 to 100 ft within the interval about 500 to 2,000 ft below the ground surface (Milici 2004a and 2004b) and in-place gas content expected to average around 300 ft^3/ton may support future development of a commercially viable natural gas production operation, particularly if angled drill holes are used (Milici 2006).***

To estimate potential sequestration capacity in Schuylkill County, DOE assumed the coal has an average gas-in-place methane content of 100 ft^3/ton (USGS data suggest that this is a conservative estimate); the density of CO_2 gas is 17,250 ft^3/ton; 90% of the methane contained in the coal could be extracted and replaced by CO_2 and the volume of CO_2 sequestered would be twice the volume of methane extracted (Battelle 2005). Based on these assumptions, if one year's production of CO_2 from the proposed facilities (1,450,000 tons/year, or about 25 billion ft^3/year as gas) were injected, the injected material would utilize the CO_2 storage capacity of about 140,000,000 tons of in-place coal, while producing about 12.5 billion ft^3/year (about 34,000,000 ft^3/day) of natural gas (methane). Assuming that anthracite coal has a density of 1,500 kg/m^3 (93 lb/ft^3) and the average total thickness of suitable coal is 50 ft, sequestration of one year's CO_2 production would utilize the coal under 1,380 acres.

To sequester the entire 72,000,000 tons of CO_2 generated over the proposed facilities' 50-year operating life would require 6.9 billion tons of in-place coal, which exceeds the total unrecoverable coal reserve in Schuylkill County (Section 3.3.3).

and surrounding rock layers are likely to contain abundant groundwater, which would contribute to the potential for impacts (Milici 2004b).

5.2 CONVERSION TO INTEGRATED GASIFICATION COMBINED-CYCLE PLANT AFTER UNSUCCESSFUL DEMONSTRATION

The types of impacts associated with the second scenario (an unsuccessful demonstration followed by conversion of the facilities to an integrated gasification combined-cycle power plant) would be similar to those in the first scenario for the proposed facilities, but at a somewhat reduced level. The F-T synthesis technology would no longer be required, and equipment associated with this technology, including storage tanks for liquid fuels, would likely be dismantled and removed from the site, which would result in minor impacts (e.g., fugitive dust and emissions from engines during dismantlement and offsite transport of unneeded equipment, additional traffic associated with hauling the equipment off the site). A temporary period of time would exist with negligible operational impacts because the facilities would not be operating during the conversion. Because no liquid fuels would be generated, impacts associated with production and transport of the fuels would not occur. Generation of electricity could be maximized by attempting to upgrade the capacity of the gas turbine and steam turbine. Otherwise, less feedstock and flux would be required to power the turbines without the concurrent production of liquid fuels. Correspondingly, slightly smaller amounts of discharges and wastes would be generated, and reclamation activities would be conducted at a slightly lower rate.

5.3 FACILITIES DISMANTLED AFTER UNSUCCESSFUL DEMONSTRATION

Impacts associated with the third scenario (an unsuccessful demonstration followed by dismantlement of the facilities), would be greatly reduced because the facilities would no longer operate. Minor impacts would result from dismantling and removing the equipment associated with the proposed facilities (e.g., fugitive dust and emissions from engines during dismantlement and offsite transport of plant equipment, temporary traffic associated with hauling the equipment off the site). Following dismantlement and removal, the impacts would become negligible. No electricity, steam, or liquid fuels would be produced. No resources would be required and no discharges or wastes would occur. No anthracite culm would be removed from piles in the local area as feedstock for the proposed facilities, and no associated reclamation of these lands would occur.

6. CUMULATIVE EFFECTS

This section discusses potential impacts resulting from other facilities, operations, and activities that in combination with potential impacts from the proposed project may contribute to cumulative impacts. Cumulative impacts are impacts on the environment that result from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions regardless of the agency (federal or non-federal) or person that undertakes such other actions (40 CFR 1508.7). An inherent part of the cumulative effects analysis is the uncertainty surrounding actions that have not yet been fully developed. The CEQ regulations provide for the inclusion of uncertainties in the EIS analysis, and state that "(w)hen an agency is evaluating reasonably foreseeable significant adverse effects on the human environment in an EIS and there is incomplete or unavailable information, the agency shall always make clear that such information is lacking" (40 CFR 1502.22). The CEQ regulations do not say that the analysis cannot be performed if the information is lacking. Consequently, the analysis contained in this section includes what could be reasonably anticipated to occur given the uncertainty created by the lack of detailed investigations to support all cause and effect linkages that may be associated with the proposed project, and the indirect effects related to construction and long-term operation of the facilities.

Because cumulative impacts accrue to resources, the analysis of impacts must focus on specific resources or impact areas as opposed to merely aggregating all of the actions occurring in and around the proposed facilities and attempting to form some conclusions regarding the effects of the many unrelated actions. Narrowing the scope of the analysis to resources where there is a likelihood of reasonably foreseeable impacts accruing supports the intent of the NEPA process, which is "to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and alternatives" [40 CFR 1500.2(b)]. The resources and impact areas that were identified with a likelihood of such impacts are (1) ***air quality, including hazardous air pollutants and*** greenhouse gases, including CO_2 emissions contributing to global climate change, (2) water resources and related issues, such as water consumption and water quality, and (3) socioeconomic resources and related issues, such as ***the flow and safety of vehicular traffic and the effects on*** water and wastewater services. The lack of impacts to other resources directly ***or indirectly*** affected by the proposed project precludes other resources from this cumulative effects analysis.

Each resource analyzed has an individual spatial (geographic) boundary, although the temporal ***boundary*** (time frame) can generally be assumed to equal the ***50***-year life expectancy of the proposed facilities. ***For air quality, a radius of 30 miles from the proposed facilities was used for the spatial boundary.*** For greenhouse gases, including CO_2 emissions, a global spatial boundary was used in the analysis; for water ***quantity***, the Susquehanna River watershed was used as the spatial boundary; ***for water quality, the Mahanoy Creek watershed was used;*** and for socioeconomic resources, Schuylkill County was used.

6.1 Air Quality

6.1.1 Multiple Air Pollutant Sources

For air quality, although the analysis in Section 4.1.2.2 indicated that maximum predicted concentrations would be less than the significant impact levels, an additional analysis was performed to evaluate potential cumulative impacts. The analysis consisted of modeling six existing sources in addition to the proposed facilities, and included background concentrations (which incorporate other existing sources in the atmosphere that have not been modeled). Modeled sources included the proposed coal-to-oil facilities and six existing power plants (Gilberton, Schuylkill, Wheelabrator, Northeastern, Mt. Carmel, and Panther Creek). (See Figure 3.1.1). The analysis used the same approach and assumptions that have been described in Section 4.1.2.2. The proposed and planned developments discussed in Section 6.3 were not included in this analysis. Because of the nature of the activities carried out there (regional distribution centers and wind farms), their potential air pollutant emissions, including vehicle emissions from increased traffic, are expected to be small in comparison to the proposed facilities, existing power plants, and regulatory thresholds typically used to determine whether further air quality impact analysis is necessary [such as 40 CFR 93.153(b)]. The proposed biofuels production plant described later in this section has not yet been constructed, and estimates of its air emissions are not available. Consequently, we were unable to quantify the potential contribution of the proposed biofuels plant to air pollutants in the cumulative effects assessment.

The results of the modeling indicate that the total impact (the sum of modeled concentrations and background concentrations) would be no greater than 42% of the respective NAAQS (Table 6.1). Consequently, significant cumulative air quality impacts from the sum of the proposed facilities and existing sources would not be expected. Maximum concentrations for all pollutants were predicted to occur at the same location on top of Locust Mountain, an undeveloped, forested area slightly over 3 miles north of the proposed site.

As discussed in Section 4.1.2.2, a high percentage of hazardous air pollutants and trace elements in the synthesis gas of the proposed facilities would be removed, but no firm estimates of the proposed facilities' emissions of these pollutants are currently available, with the exception of estimates of 38.6 lb per year of mercury and 2.4 lb per year of arsenic.

WMPI has estimated that the actual sum of hazardous air pollutant emissions would possibly be about 1.5 tons per year. (Details on this estimate are provided in Section 4.1.2.2.) Consequently, the quantity of a single hazardous air pollutant would likely be less than 1 ton per year. As a measure of cumulative impacts associated with combining the proposed facilities with existing sources of mercury, beryllium, and arsenic emissions in the area, including the existing power plants, the projected emissions from the proposed facilities were compared with EPA's 1999 National-Scale Air Toxics Assessment: 1999 Data Tables http://www.epa.gov/ttn/atw/nata1999/tables.html) database that provides (1) modeled concentrations of existing sources within about 30 miles of the site and (2) background

concentrations based on monitored values for mercury (because outdoor concentrations of mercury and 27 other air toxics should include background components attributable to long-range transport, unidentified emission sources, and natural emission sources). No background concentrations are available in the EPA database for beryllium or arsenic. Background concentrations are the contributions to outdoor air toxics concentrations resulting from natural sources, persistence in the environment of past years' emissions, and long-range transport from sources beyond the 30-mile radius. To assess the health implications of exposures to outdoor air toxics, estimated concentrations were compared to reference concentrations published by EPA. Reference concentrations define exposure levels that will not cause significant risks of non-cancer health effects. According to EPA (1991), long-term exposures to levels below reference concentrations are assumed to produce no ill effects.

Table 6.1. Cumulative impact analysis combining potential impacts from the proposed facilities, six existing power plants, and background concentrations[a]

Pollutant	Averaging period[b]	Modeled concentration[c] ($\mu g/m^3$)	Background concentration[d] ($\mu g/m^3$)	Total impact ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	Total impact as a % of NAAQS
SO_2	1-hour	107	--	--	--	--
	3-hour	96	152	248	1,300	19
	24-hour	43	71	114	365	31
	Annual	9	19	28	80	34
NO_2	1-hour	92	--	--	--	--
	Annual	7	35	42	100	42
PM-10	1-hour	9	--	--	--	--
	24-hour	4	60	64	150	42
CO	1-hour	77	3,220	3,297	40,000	8
	8-hour	54	1,610	1,664	10,000	17

[a]Modeled sources include the proposed coal-to-oil facilities and 6 existing power plants (Gilberton, Schuylkill, Wheelabrator, Northeastern, Mt. Carmel, and Panther Creek).
[b]The ISCST3 model was used to predict maximum 1-hour concentrations of each pollutant. Conversion factors from the 1-hour predictions were used to estimate concentrations for longer averaging periods: 3-hour = 0.9, 8-hour = 0.7, 24-hour = 0.4, and annual = 0.08 (EPA 1992).
[c]Because no quality-assured wind data have been archived from a location near enough to be representative of the proposed site, maximum concentrations were calculated using the ISCST3 model for the same full range of 54 potential meteorological conditions used by the SCREEN3 model.
[d]Background data were obtained from the monitoring stations closest to the site. For SO_2 and CO, Shenandoah background concentrations were used. For NO_2 and PM-10, Reading background concentrations were used. (For further information on the background data, see Section 3.2.2.)

For mercury, the National-Scale Air Toxics Assessment lists the annual-average background concentration in Schuylkill County, Pennsylvania, as 0.0015 $\mu g/m^3$, whereas modeled countywide annual-average ambient concentrations from major stationary sources such as the existing Gilberton Power Plant are listed as 3.2×10^{-5} $\mu g/m^3$ and from multiple other sources (e.g., dry *cleaners, small manufacturers, wildfires) as 4.6 x 10^{-5} μg/m^3, for a total existing countywide annual average of 0.001578 μg/m^3 for mercury. These values in EPA's 1999 National-Scale Air Toxics Assessment are averaged spatially throughout Schuylkill County. The total value (0.001578 μg/m^3) would be approximately 0.5% of the reference concentration of 0.3 μg/m^3 for mercury. Consequently, the small amount added to this total value by the proposed facilities (i.e., the estimate of 38.6 lb per year of mercury emissions prior to dilution in the ambient air) (Section 4.1.2.2) would result in a minimal increase in ambient concentrations of mercury, whereas about 99.5% of the reference concentration is available. This evaluation using EPA's National-Scale Air Toxics Assessment database indicates that the cumulative impact of mercury emissions from the proposed facilities and emissions from existing facilities would pose no threat to human health in the area.*

For beryllium, the National-Scale Air Toxics Assessment lists no annual-average background concentration in Schuylkill County, Pennsylvania, or elsewhere throughout the United States; modeled countywide annual-average ambient concentrations from major stationary sources such as the existing Gilberton Power Plant are listed as 4.3 x 10^{-7} μg/m^3, from multiple other sources (e.g., dry cleaners, small manufacturers, wildfires) as 2.9 x 10^{-5} μg/m^3, and from non-road mobile sources as 7.4 x 10^{-8} μg/m^3, for a total existing countywide annual average of 3.0 x 10^{-5} μg/m^3 for beryllium. These values in EPA's 1999 National-Scale Air Toxics Assessment are averaged spatially throughout Schuylkill County. The total value (3.0 x 10^{-5} μg/m^3) would be approximately 0.2% of the reference concentration of 0.02 μg/m^3 for beryllium. Consequently, the small amount added to this total value by the proposed facilities would result in a minimal increase in ambient concentrations of beryllium, whereas about 99.8% of the reference concentration is available. This evaluation using EPA's National-Scale Air Toxics Assessment database indicates that the cumulative impact of beryllium emissions from the proposed facilities and emissions from existing facilities would pose no threat to human health in the area.

For arsenic, the National-Scale Air Toxics Assessment lists no annual-average background concentration in Schuylkill County, Pennsylvania, or elsewhere throughout the United States; modeled countywide annual-average ambient concentrations from major stationary sources such as the existing Gilberton Power Plant are listed as 1.2 x 10^{-5} μg/m^3, and from multiple other sources (e.g., dry cleaners, small manufacturers, wildfires) as 1.0 x 10^{-4} μg/m^3, for a total existing countywide annual average of 1.1 x 10^{-4} μg/m^3 for arsenic. These values in EPA's 1999 National-Scale Air Toxics Assessment are averaged spatially throughout Schuylkill County. The total value (1.1 x 10^{-4} μg/m^3) would be approximately 0.2% of the reference concentration of 0.05 μg/m^3 for arsine (arsenic trihydride) (EPA has not established a reference concentration for inorganic arsenic). Consequently, the small amount added to this total value by the proposed facilities (i.e., the estimate of 2.4 lb per year of arsenic emissions prior to dilution in the ambient air) (Section 4.1.2.2) would result in a minimal increase in ambient concentrations of arsenic, whereas about 99.8% of the reference concentration is available. This evaluation using EPA's National-Scale Air

Toxics Assessment database indicates that the cumulative impact of arsenic emissions from the proposed facilities and from existing facilities would pose no threat to human health in the area.

GREEN Renewable Energy, Ethanol & Nutrition Holding LLC has proposed the construction of a biofuels (corn-to-ethanol) production plant in Frailey and Porter townships in Schuylkill County (about 10-15 miles southwest of Pottsville, or about 20 miles from the site of the proposed facilities). The biofuels facility is expected to produce 100 million gallons of ethanol each year from 40 million bushels of corn; operation is expected by late 2008[1]. Air emissions estimates for the proposed facility are not yet available. Because steam for the biofuels plant would be supplied from an existing co-generation plant located nearby, the proposed plant would cause a smaller increase in area emissions of air pollutants than if steam were produced onsite. However, the facility can be expected to add to local emissions of PM and possibly other criteria pollutants. Also, on April 11, 2007 the Pennsylvania Department of Environmental Protection issued an air permit for the storage of ethanol produced by the facility. The permit allows no more than 8.17 tons/year of volatile organic compounds (VOCs) to be released from the storage tanks. The permitted releases would increase Schuylkill County VOC emissions (7,840 tons per year in 1999; see Section 4.1.2.2) by just 0.1%. As discussed in Section 4.1.2.2, this small increase could slightly increase ozone (O_3) concentrations, but any increase would be insufficient to cause a violation of the ambient air quality standard.

6.1.2 Greenhouse Gas Emissions

As discussed in Section 4.1.2.2, ***the operation of the*** proposed facilities would increase global CO_2 emissions by about ***2,280,000*** tons per year, ***adding to global emissions of CO_2 resulting from fossil fuel combustion, which are estimated to have averaged 29,000,000,000 tons per year during the period 2000 to 2005 (IPCC 2007).***

In addition, the successful demonstration of the integration of coal waste gasification and F-T synthesis of liquid hydrocarbon fuels at a commercial scale may encourage the development of similar facilities producing liquid hydrocarbon fuels from coal. Therefore, another consideration for evaluating potential cumulative impacts from the proposed facilities on greenhouse gas emission totals was to compare the greenhouse-gas contribution from the coal-to-liquids (CTL) technology to be demonstrated with the greenhouse-gas contribution from conventional technologies for producing liquid transportation fuels. Because coal has a higher carbon-to-hydrogen ratio than crude oil, production of liquid hydrocarbon fuel from coal generates more excess carbon (released as CO_2) than production of the same quantity of liquid fuel from petroleum.

Over the entire fuel lifecycle (from production of the raw material in a coal mine or oil well through utilization of the fuel in a vehicle) and considering all greenhouse gases, production and delivery of liquid transportation fuels from coal has been estimated to result in about 80% more

[1] Pottsville Republican & Herald, April 13, 2007. http://www.republicanherald.com/site/news.cfm?newsid=18205685

greenhouse-gas emissions than from production and delivery of conventional petroleum-derived fuels (Marano and Ciferno 2001, Williams and Larson 2003, Williams et al. 2006). DOE is aware that other life-cycle analyses, using differing assumptions have resulted in differing greenhouse gas emission estimates. These fuel life-cycle emission estimates can vary depending on the assumptions made about the transportation of raw materials and liquid fuels, process efficiency, electricity production at the CTL conversion facility, and other factors. Recently the U.S. Environmental Protection Agency (EPA)[2] reported an estimate that greenhouse gas emissions from CTL could be as much as 119% higher than those from conventional petroleum fuels.

Recovery and sequestration of CO_2 at a CTL production facility (Section 5.1.4) could greatly reduce greenhouse gas emissions from CTL fuel production, possibly to levels below conventional petroleum-derived fuel production (Marano and Ciferno 2001). Because CO_2 recovery can be integrated into the gas cleanup step in CTL facilities (such as the proposed facilities considered in this EIS), the potential technical and economic feasibility of CO_2 recovery is much greater for CTL production than for conventional petroleum fuel production (IPCC 2005). Based on a conceptual analysis of potential CO_2 capture and sequestration at facilities that produce liquid fuels from coal using technologies similar to those included in the proposed project, it has been estimated that CO_2 sequestration could reduce total fuel-cycle greenhouse gas emissions to 8% more than from the conventional petroleum-derived fuel cycle (Williams et al. 2006). Likewise, the EPA analysis cited above estimated that carbon capture and sequestration could reduce greenhouse gas emissions to 3.7% above the conventional petroleum-derived fuel cycle. With technology advancements, future large-scale CTL facilities are expected to be able to achieve higher rates of CO_2 capture and sequestration (Larson and Tingjin 2003, Southern States Energy Board 2006), potentially resulting in life-cycle greenhouse-gas emissions that are lower than those resulting from use of conventional petroleum refineries that are not equipped for CO_2 capture and sequestration.

In estimating how increased use of CTL technology could affect total greenhouse gas emissions associated with liquid transportation fuels, DOE considered forecasts of the potential extent of CTL utilization in 2030. Using reference case assumptions, the Energy Information Administration (2007) has forecast that by 2030 U.S. CTL production will consume 55,000,000 tons of coal annually (3.1% of the nation's coal use) and produce the equivalent of 440,000 barrels of crude oil per day, supplying 1.6% of the nation's liquid fuel consumption. Based on this forecast and assuming the CTL fuel cycle generates 80% more greenhouse-gas emissions than production and delivery of conventional petroleum-derived fuels (Marano and Ciferno 2001, Williams and Larson 2003, Williams et al. 2006), the use of CTL technology for producing transportation fuels would cause the life cycle greenhouse gas releases of the U.S. liquid fuel sector to be 1.3% higher in the year 2030 than if the same quantity of liquid fuel was produced from petroleum. If all CTL facilities employed carbon sequestration that reduced greenhouse-gas emissions from the CTL to about 8% more than the petroleum-derived liquid fuel cycle, the greenhouse-gas emission

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[2] US Environmental Protection Agency, Greenhouse Gas Impacts of Expanded Renewable and Alternative Fuels Use, EPA420-F-07-035, April 2007. [*http://www.epa.gov/otaq/renewablefuels/420f07035.htm*](http://www.epa.gov/otaq/renewablefuels/420f07035.htm)

contribution of the U.S. liquid fuel sector in that same year would be about 0.1% higher than if the same quantity of liquid fuel was produced from petroleum. If fuel-cycle emissions from CTL technologies were reduced to 10% less than conventional petroleum technologies due to a combination of more efficient carbon capture and sequestration at CTL production facilities, increased capture of the methane released during coal mining, and other potential mitigation measures (Marano and Ciferno 2001), the greenhouse-gas emission contribution of the U.S. liquid fuel sector would be about 0.2% less than if the same quantity of liquid fuel was produced from petroleum.

Using high-range estimates of future oil prices (high oil prices would encourage more CTL production), the Energy Information Administration (2007) has forecast that in the year 2030 U.S. CTL production would consume 199,000,000 tons of coal (9.8% of the nation's coal use) and produce the equivalent of 1,650,000 barrels of crude oil per day, supplying 6.7% of the nation's liquid fuel consumption. Based on this forecast and assuming the CTL fuel cycle generates 80% more greenhouse-gas emissions than production and delivery of conventional petroleum-derived fuels, expanded use of CTL technology to produce liquid fuels could cause the U.S. liquid fuel sector to release about 5% more greenhouse gas emissions than if the same quantity of fuel was produced from petroleum. However, carbon sequestration that reduces greenhouse-gas emissions from the CTL fuel cycle to about 8% more than the petroleum-derived liquid fuel cycle could reduce this greenhouse-gas emission increment to about 0.5% more than if the same quantity of liquid fuel was produced from petroleum. If fuel-cycle emissions from CTL technologies were reduced to 10% less than conventional petroleum technologies due to more efficient CO_2 ***capture and sequestration and other measures, as discussed above, the greenhouse-gas emission contribution of the U.S. liquid fuel sector would be about 0.7% less than if the same quantity of liquid fuel was produced from petroleum.***

6.2 Water Resources

Water consumption by the proposed facilities would contribute to a trend of increasing diversion and consumptive use of water from the Susquehanna River Basin.[3] The Susquehanna River Basin Commission (2003) found that diversions and consumptive uses of water from the 27,510-square-mile Susquehanna River watershed increased 85% between 1970 and 2000 (from a daily maximum of 270 million gal per day in 1970 to a maximum of about 500 million gal per day in 2000) and could increase an additional 55% by 2020. In this region, consumptive uses and diversions that affect surface waters could adversely affect the maintenance of minimum stream flows needed to sustain aquatic habitats or dilute treated wastewater effluents. Langland et al. (2001) did not find any long-term trend in Susquehanna River stream flow during the period from 1985 to 1999, but reported large variability in flow. Increased industrial use of mine pool water has been a small contributor to the basin-wide trend toward increased consumptive use. Veil et al. (2003) identified 5 power plants,

[3] Diversion refers to the transfer of water to a different watershed. Water is considered to be used consumptively when evaporated, transpired by plants, or incorporated into manufactured products.

including the Gilberton Power Plant, in the anthracite coal mining region that began operation after 1980 and use mine pool water from the Susquehanna River Basin for cooling and other purposes. These plants withdraw a total of about 3,600 gpm (more than 5 million gal per day); the majority of this water is discharged after use, but a fraction is used consumptively. The proposed facilities' net consumption of 2,290 gpm (about 3.3 million gal per day) from the Susquehanna River watershed would contribute to the general trend of increased water consumption, adding about 1% to the region's total water consumption as of 1970 or about 0.7% to consumption as of 2000. The 1985–99 stream flow record suggests that the watershed could accommodate this added consumption.

Several initiatives to enhance water quality are ongoing, planned, or proposed for the Mahanoy Creek watershed and the adjacent Shamokin Creek watershed, which is interconnected by underground mine workings with downstream portions of the Mahanoy Creek watershed. Initiatives being undertaken by government, voluntary groups, and private entities include (1) construction and maintenance of artificial wetlands and other passive treatment systems at sites where acid mine drainage emerges from abandoned mines; (2) filling of abandoned surface mine pits; and (3) removal of abandoned coal refuse piles with subsequent grading and planting of vegetation at the site to reduce the amounts of sediments, acid mine drainage, and coal waste runoff entering streams (PDEP 2004d). The proposed project would contribute to efforts to improve water quality in the Mahanoy and Shamokin Creek watersheds by reducing the discharge of Gilberton mine pool water to Mahanoy Creek, removing anthracite culm piles, filling mine pits, and reclaiming mined lands. ***However, effluents from the proposed facilities could deplete dissolved oxygen in Mahanoy Creek and introduce other contaminants deleterious to aquatic life, as discussed in Section 4.1.4.1, potentially causing the creek to remain unsuitable for aquatic life.***

The planned and proposed developments described in Section 6.3 are not likely to be important sources of cumulative impacts to water quantity or quality. Construction-related site clearing, erosion, and stormwater runoff would be the main potential sources of water-resources impacts from these projects. The proposed ethanol plant discussed in Section 6.1.1 could contribute to projected future increases in use of water from the Susquehanna River Basin. However, any water effluents from the plant would enter other tributaries of the river, so the proposed ethanol plant would not affect water quality in Mahanoy Creek.

6.3 Social and Economic Resources

Construction and operation of the proposed facilities would have socioeconomic impacts that could contribute to cumulative impacts on the area's socioeconomic resources. The Pennsylvania Department of Environmental Protection recently identified 2 areas of proposed future growth, the Interstate 81 corridor and the State Route 61 corridor, located within a few miles of the proposed project site in Schuylkill County (PDEP 2002). Along the Interstate 81 corridor, the Schuylkill Economic Development Corporation is attracting industrial development to the Schuylkill Highridge Business Park and Mahanoy Business Park. The Schuylkill Highridge Business Park is the largest mixed-use business park in Pennsylvania, with a 2,000-acre corridor along Interstate 81 between exits

116 and 119. The Park's first major tenant, Lowe's Companies, Inc., has constructed a 1.2 million square ft regional distribution center on a 165-acre parcel. Similar developments are either underway or will begin construction in the Highridge Business Park within the next few years (SEDCO 2004):

- Wegman's Food Markets, Inc., distribution complex (1 million square ft of building space to be constructed by 2008);
- Robert Patillo Properties, Inc., (455,000 square ft of building space already constructed; another 1.8 million square ft to be constructed in the near future for a Sears, Inc., distribution center); and
- Wal-Mart, Inc., frozen foods distribution center (900,000 square ft of building space to be constructed).

The 500-acre Mahanoy Business Park is located near exit 131 of Interstate 81 on Morea Road near Mahanoy City, about 3 miles east of the proposed project site. Although no buildings have been constructed in the Mahanoy Business Park, the site is serviced by water, wastewater, and gas lines and is likely to be developed in the future. The Mahanoy Business Park could accommodate 2 million square ft of building space (SEDCO 2004). Except for these ongoing and planned industrial developments within the Schuylkill Highridge Business Park and Mahanoy Business Park, no plans exist for large-scale industrial, commercial, or residential developments within the next few years in Schuylkill County (Frank Zukas, Schuylkill Economic Development Corporation, personal communication to J. W. Saulsbury, ORNL, September 22, 2004). ***The Locust Ridge Wind Farm recently constructed near Mahanoy City consists of thirteen 400-ft-tall wind turbines that will generate up to 26 MW of electricity.[4] Construction of additional wind turbines is currently proposed.[5] There is a potential for cumulative socioeconomic and transportation-system impact from future wind farm construction, but after construction is complete wind farm operation requires few employees or other resources. Because operating wind turbines do not produce air emissions or water effluents, the operation of the existing wind farm would not contribute to cumulative impacts on air or water quality in the region.***

The Pennsylvania Department of Transportation has identified 9 future road projects in Schuylkill County (PDOT 2004), but 6 of them are far enough removed from the proposed project site that cumulative impacts are not likely. However, 3 of the 9 road projects could contribute to cumulative impacts because they are in close proximity to the proposed project site or are large enough to have countywide impacts: (1) Mahanoy City Pipe Replacement (under State Route 54 near the Mahanoy City line); (2) Interstate 81 Bridge Replacement Phase 2 (near Pine Grove Township); and (3) State Route 924 Rock Scaling (on a 1-mile section north of Frackville) (PDOT 2004).

[4]***Global Wind Energy Leader Iberdrola Announces Power Purchase Agreement For First U.S. Wind Project. September 27, 2006. http://www.communityenergy.biz/pr/cei_pr_iberdrola-ppa.html***
[5]***Pottsville Republican & Herald, March 15, 2007. http://www.republicanherald.com/site/news.cfm?newsid=18081496***

Construction of the proposed project could combine with ongoing and planned activities, particularly industrial development in the Schuylkill Highridge Business Park and Mahanoy Business Park to create cumulative impacts to socioeconomic resources. The largest contribution to cumulative impacts from the proposed facilities would be the presence of 1,000 workers during the 6-month peak construction period. Such a large work force could combine with other activities to adversely affect water and wastewater services and the flow and safety of vehicular traffic. The proposed facilities' contributions to cumulative socioeconomic impacts would continue during project operations, but at a smaller scale because fewer workers would be present.

7. REGULATORY COMPLIANCE AND PERMIT REQUIREMENTS

Under 40 CFR Part 1502.25, an EIS is required to list all federal permits, licenses, and other entitlements which must be obtained in implementing the proposal. This section lists federal, state, and local regulatory compliance and permit requirements for the proposed facilities.

7.1 FEDERAL REQUIREMENTS

CLEAN AIR ACT (CAA)

- Enacted by the Air Quality Act of 1967, Pub. L. No. 90-148 (codified as amended at 42 USC 7401 et seq.).
- Amended by the Clean Air Act Amendments of 1990, Pub. L. No. 101-549.
- Applicable titles:

  — Title I—Air Pollution Prevention and Control. This Title is the basis for air quality and emission limitations, Prevention of Significant Deterioration (PSD) permitting program, State Implementation Plans, New Source Performance Standards (NSPS), and National Emissions Standards for Hazardous Air Pollutants (NESHAP).

  — Title IV—Acid Deposition Control. This Title establishes limitations on sulfur dioxide and nitrogen oxide emissions, permitting requirements, monitoring programs, reporting and record keeping requirements, and compliance plans for emission sources. This Title requires that emissions of sulfur dioxide from utility sources be limited to the amounts of allowances held by the sources.

  — Title V—Permitting. Although a Title V Operating Permit may not be required, this Title provides the basis for the Operating Permit Program and establishes permit conditions, including monitoring and analysis, inspections, certification, and reporting. Authority for implementation of the permitting program is delegated to authorized states, including Pennsylvania.
- Regulations implementing the Clean Air Act are found in 40 CFR Parts 50–95.

40 CFR Part 68, Chemical Accident Prevention Provisions – This regulation includes the requirements for owners or operators of stationary sources concerning the prevention of accidental releases. Subpart B describes the requirements for a Hazard Assessment and Subpart G describes the requirements of a Risk Management Plan (RMP). The Hazard Assessment that must be incorporated into the RMP is required to address the following topics:

- ***A worst-case release scenario analysis that is estimated to disperse toxic substances from covered processes the greatest distance in any direction from an accidental release.***
- ***A worst-case release scenario analysis that is estimated to disperse flammable substances from covered processes the greatest distance in any direction from an accidental release.***

- ***Additional worst-case release scenarios for a hazard class if a worst-case release from other covered processes potentially affects public receptors different from the previous analyses. This requirement would apply to the nearby Mahanoy State Correctional Institution.***

The worst-case conditions include a wind speed of 1.5 m/s with F-stability with the highest maximum daily temperature from the previous three years and average humidity for the site. The modeled release is to be at ground level, accounting for dense or neutrally buoyant gases and surface roughness. The release quantity is the greatest quantity held in a vessel or pipe. For gases, the modeled accidental release is to occur over 10 minutes, and for liquids, the release is to occur instantaneously. For flammable gases, the release vaporizes and forms a vapor cloud explosion with a yield factor of 10 percent of the energy released.

These analyses are to be documented in the RMP and are to be used to define

- ***the offsite population affected by the worst-case releases, and***
- ***the offsite environmental receptors affected by the worst-case releases***

The offsite consequence analysis is to be updated at least once every five years and is to include an accident history of all accidental releases from covered processes that result in deaths, injuries or property damage either on site or offsite. For accidental offsite releases, the history must also include evacuations, sheltering in place, and environmental damage.

CLEAN WATER ACT (CWA)

Enacted by the Federal Water Pollution Control Act Amendments of 1972, Pub. L. No. 92-500 (codified as amended at 33 USC 1251 et seq.).

- Amended by the Clean Water Act of 1977, Pub. L. No. 95-217, and the Water Quality Act of 1987, Pub. L. No. 100-4.
- Applicable titles:
  - Title III—Standards and Enforcement.
    - Section 301, Effluent Limitations, is the basis for establishing a set of technology-based effluent standards for specific industries.
    - Section 302, Water Quality Related Effluent Limitations, addresses the development and application of effluent standards based on water quality goals for the waters receiving the effluent.
    - ***Section 303, Water Quality Standards and Implementation Plans, addresses the development of water quality standards based on the designated uses of the waters.***

- ***Section 304, Information and Guidelines, addresses the development of water quality criteria related to the effects of pollutants on health, welfare, and biological communities.***

— Title IV—Permits and Licenses.

- Section 402, National Pollutant Discharge Elimination System (NPDES), regulates the discharge of pollutants to surface waters. Regulations implementing the NPDES program are found in 40 CFR Part 122. ***A facility that intends to discharge into the nation's waters must obtain a permit before initiating a discharge. NPDES permits set forth the conditions and effluent limitations under which a facility may make a discharge. Effluent limitations in specific permits can be based on industry-specific, technology-based standards and/or water-quality-based standards.*** Authority for implementation of the NPDES permit program is delegated to authorized states, including Pennsylvania.
- Section 404, Permits for Dredged or Fill Material, regulates the discharge of dredged or fill material in the jurisdictional wetlands and waters of the United States. The U.S. Army Corps of Engineers has been delegated the responsibility for authorizing these actions.

- ***Federal*** regulations implementing the Clean Water Act are found in 40 CFR Parts 104–140. Regulations that affect the permitting of this project include

  — 40 CFR Part 112—Oil Pollution Prevention. This regulation requires the preparation of a Spill Prevention, Control, and Countermeasure Plan.

  — 40 CFR Part 122—NPDES. This regulation requires the permitting and monitoring of any discharges to waters of the United States.

- ***State regulations implementing the Clean Water Act are discussed in Section 7.2.***

EXECUTIVE ORDERS 11988 AND 11990

Executive Order No. 11988, 42 FR 26951 (May 24, 1977), “Floodplain Management,” directs federal agencies to establish procedures to ensure that they consider potential effects of flood hazards and floodplain management for any action undertaken. Agencies are to avoid impacts to floodplains to the extent practical. Executive Order 11990, 3 CFR 121 (1977), 42 FR 26961 (May 24, 1977), “Protection of Wetlands,” requires federal agencies to avoid short- and long-term impacts to wetlands if a practical alternative exists. DOE regulation 10 CFR Part 1022 establishes procedures for compliance with these Executive Orders. Where no practical alternatives exist to development in floodplain and wetlands, DOE is required to prepare a floodplain and wetlands assessment discussing the effects on the floodplain and wetlands, and consideration of alternatives. In addition, these regulations require DOE to design or modify its actions to minimize potential damage in floodplains or harm to wetlands. DOE is also required to provide opportunity for public review of any plans or proposals for actions in floodplains and new construction in wetlands under these regulations.

The floodplain and wetlands effects anticipated from this proposed project are provided in the following sections of the EIS: Section 3.5.1 (Floodplains—Existing Environment), Section 3.5.2 (Wetlands—Existing Environment), Section 4.1.5.1 (Floodplains— Environmental Consequences), and Section 4.1.5.2 (Wetlands—Environmental Consequences).

SURFACE MINING CONTROL AND RECLAMATION ACT OF 1977 (SMCRA)

- Enacted by the Surface Mining Control and Reclamation Act of 1977, Pub. L. No. 95-87 (codified as amended at 30 USC 1234 et seq.).
- The Act provides for the federal regulation of surface coal mining operations and the acquisition and reclamation of abandoned mines.
- Applicable title:
  - — Title V— Control of the Environmental Impacts of Surface Coal Mining. This Title authorizes the implementation of and federal funding for state regulatory programs that meet the minimum standards specified by the statute. The Pennsylvania Department of Environmental Protection is authorized to administer the regulatory program under this Act***. See Section 7.2 infra***.
- ***Federal regulations implementing the Surface Mining Control and Reclamation Act of 1977 are found in 30 CFR Parts 700-955.***

RESOURCE CONSERVATION AND RECOVERY ACT OF 1976 (RCRA)

- Enacted as an amendment to the Solid Waste Disposal Act of 1965, RCRA was enacted by the Resource Conservation and Recovery Act of 1976, Pub. L. No. 94-580 (codified as amended at 42 USC 6901 et seq.).
- Amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), Pub. L. No. 98-616, and the Land Disposal Flexibility Act of 1996, Pub. L. No. 104-119.
- ***Federal regulations implementing Subtitle C of RCRA for hazardous waste management are found in 40 CFR Parts 260-279.***
- Applicable title:
  - — Title II—Solid Waste Disposal (the Solid Waste Disposal Act of 1965). This Title regulates the disposal of solid wastes. Title II, Subtitle C—Hazardous Waste Management, provides for a regulatory system to ensure the environmentally sound management of hazardous wastes from the point of origin to the point of final disposal. Pennsylvania has delegated authority to administer most elements of the RCRA Subtitle C program within the state. Title II, Subtitle D—State or Regional Solid Waste Plans, allows states to plan for managing and permitting the disposal of solid wastes and requires each state to develop and implement a regulatory program to ensure that municipal solid waste landfills and other facilities that receive household hazardous waste or conditionally exempt small quantity generator hazardous waste meet federal

minimum standards (40 CFR Part 258) for the location, design, operation, closure, and post-closure care of municipal solid waste landfills.

- Project participants would be required to identify any residues that require management as hazardous waste under RCRA (40 CFR Part 261). For some waste streams, this includes testing waste samples using the toxic characteristic leaching procedure or other procedures that measure hazardous waste characteristics. ***Because the facilities would be expected to generate small quantities of hazardous waste, WMPI would need to apply a for an EPA Identification Number by submitting U.S. Environmental Protection Agency Form No. 8700, "Notification of Regulated Waste Activity."***

ENDANGERED SPECIES ACT OF 1973 (ESA)

- Enacted by the Endangered Species Act of 1973, Pub. L. No. 93-205 (codified as amended at 16 USC 1531 et seq.).
- Applicable title:
  - — Section 7, Interagency Cooperation, [consistency] requires any federal agency authorizing, funding, or carrying out any action to ensure that the action is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat of such species. Consequently, the U.S. Fish and Wildlife Service will conduct a consultation, in compliance with Subsection (a)(2) of Section 7 of the Act, with regard to the impacts of the proposed project on threatened and endangered species listed by the U.S. Fish and Wildlife Service and any critical habitat of such species in the vicinity of the proposed facilities.
- ***Regulations implementing Section 7 of the Endangered Species Act are found in 50 CFR Part 402.***

Pursuant to Section 7 of the Act, DOE has consulted with the U.S. Fish and Wildlife Service. *See* Appendix A infra.

NATIONAL HISTORIC PRESERVATION ACT OF 1966 (NHPA)

- Enacted by the National Historic Preservation Act of 1966, Pub. L. No. 89-665, (codified as amended at 16 USC 470 et seq.).
- ***The regulations implementing Section 106 of the National Historic Preservation Act are found in 36 CFR Part 800.***
- Under Section 106, the head of any federal agency having direct or indirect jurisdiction over a proposed federal or federally assisted undertaking in any state and the head of any federal department or independent agency having authority to license any undertaking shall, prior to the approval of the expenditure of any federal funds on the undertaking or prior to the issuance of any license, as the case may be, take into account the effect of the undertaking on any district, site,

building, structure, or object that is included in or eligible for inclusion in the National Register. In accordance with 36 CFR 800, the head of any such federal agency shall afford the state-run Advisory Council on Historic Preservation (ACHP) established under Title II of the Act a reasonable opportunity to comment with regard to such undertaking.

Pursuant to Section 106 of the Act, DOE has consulted with Pennsylvania's State Historic Preservation Officer. *See*Appendix B *infra*.

OCCUPATIONAL SAFETY AND HEALTH ACT (OSHA)

- Enacted by the Occupational Safety and Health Act of 1970, Pub. L. No. 91-596 (codified as amended at 29 USC 300 et seq.).
- ***The Occupational Safety and Health Act is implemented by OSHA Construction Industry Standards (29 CFR Part 1926) and OSHA General Industry Standards (29 CFR Part 1910).***

Occupational Health and Safety Standards under 29 CFR Part 1910 list the necessary requirements for the management of hazardous materials. Subpart H specifically addresses hazardous materials and Subpart Z addresses toxic and hazardous substances. The requirements for specific materials are extensive. For all hazardous materials, 29 CFR 1910.119 addresses Process Safety Management of Highly Hazardous Chemicals, which is applicable to this project. The section contains the requirements for preventing or minimizing the consequences of catastrophic releases of toxic, fire or explosion hazards. The following are requirements:

- ***Hazard evaluation using one or more of the standardized methods;***
- ***Preparation of a Process Hazard Analysis that addresses each of the hazards of the process, the identification of any previous incidents that could lead to catastrophic consequences, engineering and administrative controls, the consequences of failure of engineering and administrative controls, facility siting, human factors, and a qualitative evaluation of a range of the possible safety and health effects of failure of controls on employees in the workplace;***
- ***Preparation of written procedures that address steps for each stage of operations, operating limits for operations, safety and health considerations and safety systems and their functions;***
- ***Training for in-process operations and operating procedures that emphasize specific safety and health hazards and emergency operations;***
- ***Contractor management to ensure contractors are fully informed of potential fire, explosion or toxic release hazards and the emergency action plans for the facility.***

Additional requirements address the pre-startup safety review, mechanical integrity, nonroutine work authorizations, management of change, incident investigation, and emergency planning and response. These requirements focus on worker safety and health. They are

complementary to the Chemical Accident Prevention Provisions in 40 CFR 68 which were promulgated pursuant to the CAA. See p. 7-1 supra.

FEDERAL AVIATION ACT OF 1958 (FAA)

- Enacted by the Federal Aviation Act of 1958, Pub. L. No. 85-726 (codified as amended at 49 USC 1101 et seq.).
- Regulations implementing this Act are found in 14 CFR Part 77 and are enforced by the U.S. Department of Transportation, Federal Aviation Administration.
- These regulations require submittal of a notice identifying any structures that, because of construction or alteration, may be a hazard to air transportation. WMPI would submit to the Federal Aviation Administration Agency Form No. 7460-1, "Notice of Proposed Construction or Alteration."

7.2 STATE REQUIREMENTS

- On March 18, 2005, the Pennsylvania Department of Environmental Protection issued Air Quality Program Permit No. 54-399-034 for the proposed facilities. The permit, which expires on March 31, 2010, establishes maximum allowable limits for total facility emissions during any consecutive 12-month rolling period. *See* Section 4.1.2.2 *supra*.
- ***Earth disturbance activities associated with tree clearing, site preparation, and construction of the proposed facilities would require Pennsylvania Department of Environmental Protection authorization through an NPDES Permit for Stormwater Discharges Associated with Construction Activities, either under General NPDES Permit PAG-2 or individual NPDES permits. Under either type of permit, an Erosion and Sediment Control Plan and a Post-Construction Stormwater Management Plan would be required for the project. The Erosion and Sediment Control Plan must show how land would be protected against accelerated erosion through the use of best management practices such as silt fencing, mulch, and sediment traps and basins. The Post-Construction Stormwater Management Plan would identify best management practices to be implemented to manage storm water discharges to protect water quality after construction. A Preparedness, Prevention, and Contingency Plan may also be required if toxic, hazardous, or other polluting materials would be stored or used during construction. Pennsylvania regulations applicable to stormwater management permits are found at 25 PA. CODE Ch. 92, National Pollutant Discharge Elimination System; 93, Water Quality Standards; and 102, Erosion and Sediment Control.***
- Treated wastewater from the existing Gilberton Power Plant, which is discharged to a tailings pond in the Mahanoy Creek valley, is regulated by Pennsylvania NPDES industrial wastewater discharge permit ***PA0061697,*** issued in 1997. ***DOE expects that*** discharge of treated effluent ***from operation of*** the proposed facilities would also require an NPDES permit issued by the

Pennsylvania Department of Environmental Protection***, whether the discharge is to Mahanoy Creek or to the tailings pond (25 PA. CODE Section 91.51 prohibits the discharge of inadequately treated wastes, except coal fines, into the underground workings of active or abandoned mines).*** A new set of effluent standards would be established for ***discharges from*** the new facilities. ***A Water Quality Management Part II permit would be needed for construction of the wastewater treatment facilities required for the proposed project. WMPI submitted a Water Quality Management Part II permit application on February 17, 2005 (WMPI 2005c), and submitted proposed effluent limits for a discharge permit on October 4, 2005 (Chandran 2005). Pennsylvania State regulations applicable to NPDES and Water Quality Management Part II permitting for the proposed facilities are found at 25 PA. CODE Ch. 16, Water Quality Toxics Management Strategy–Statement of Policy; 91, General Provisions for Water Resources; 92, NPDES Permitting, Monitoring, and Compliance; 93, Water Quality Standards; 95, Wastewater Treatment Requirements; and 96, Water Quality Standards Implementation. In addition, appropriate federal regulations under the Clean Water Act are incorporated by reference. 25 PA. CODE Ch. 92 provides that effluent limitations for discharges are to be based on whichever of the applicable state or Federal water quality standards, treatment requirements, and effluent limitations are most stringent.***

- ***On September 14, 2005, the Susquehanna River Basin Commission approved the withdrawal of up to 7,000,000 gallons per day (30-day average) and consumptive use of up to 3,470,000 gallons per day (peak day use) of water from the Gilberton mine pool for the operation of the proposed facilities (SRBC 2005).*** The Susquehanna River Basin Commission, which was established in 1972 by the Susquehanna River Basin Compact, Pub. L. 91575, 84 Stat. 1509 et seq., is composed of representatives from the federal government and the states of New York, Pennsylvania, and Maryland. Article 11 of the Compact authorizes the river basin commission to regulate and control withdrawals and diversions from surface waters and ground waters of the basin. In Pennsylvania, the river basin commission coordinates actions on specific projects with the Pennsylvania Department of Environmental Protection. The facilities' water use would need to be reported ***annually*** to the river basin commission and the Pennsylvania Department of Environmental Protection, as required by the Pennsylvania Water Resources Planning Act (Act 220 of 2002) and implementing regulations at 25 PA. CODE Ch. 110.
- ***Pennsylvania regulates the installation and operation of aboveground and underground storage tank systems and facilities under 25 PA. CODE Ch. 245, administered by the Pennsylvania Department of Environmental Protection. The regulations require that storage tanks be installed and inspected periodically by certified installers, registered with the Department of Environmental Protection, and subjected to tightness tests after they are installed. In addition, site-specific installation permits are required for installation of some types of underground storage tanks or for aboveground storage tanks with capacity over 21,000 gallons, either in an individual tank or a group of tanks. On January 14, 2005, WMPI applied to the Pennsylvania Department of Environmental Protection for a site-specific installation***

permit for the aboveground storage tanks that would be included in the proposed facilities on Broad Mountain (WMPI 2005a). A similar application for a site-specific installation permit for aboveground storage tanks in the proposed off-site loading area and tank farm in the Mahanoy Valley was submitted on August 10, 2005 (WMPI 2005b). Spill Prevention and Response Plans were included in both permit applications, as required by 25 PA. CODE Ch. 245.

- Beneficial use or disposal of slag, ash, or water and wastewater treatment sludges, including use in mine reclamation, would be subject to the requirements of Pennsylvania's residual waste management regulations at 25 PA. CODE Ch. 287. Chemical ***and physical analyses, leach testing, and other evaluations of the materials would be required to determine allowable uses or disposal requirements. Beneficial reuse would require either a co-product determination under Section 287.8 or a general permit under Subpart H of Chapter 287.*** No permit is needed for use of coal combustion products in concrete manufacture, or for use of slag or bottom ash as a construction aggregate, anti-skid material, or road surface preparation material ***(Sec. 287.661 - 287.665), but to qualify for this exemption project, residues would need to be demonstrated to be chemically and physically similar to a typical coal ash produced in Pennsylvania. Landfill disposal of project residues would require a Form U, "Request to Process or Dispose of Residual Waste," approval from the Pennsylvania Department of Environmental Protection, following characterization of physical properties, chemical composition, and a determination that the material is not a hazardous waste (Subchapter B of Ch. 287).***
- Mining and mine reclamation activities associated with the proposed facilities ***would*** require permits or approvals from the Pennsylvania Department of Environmental Protection under State regulations ***administering the regulatory program of SMRCA. The principal applicable State regulations are found*** at 25 PA. CODE Ch. 86,Surface and Underground Coal Mining: General, and 88, Anthracite Coal. ***Chemical and physical analyses, leach testing, and other evaluations would be required for materials to be used in reclamation, reclamation plans would include specifications for densities and other parameters, and testing and monitoring would be required. If coal were to be*** obtained from refuse material on an abandoned mining property, the Pennsylvania Department of Environmental Protection could waive the permit requirement and sign a government-financed construction contract allowing the acquisition of coal in exchange for land reclamation and abatement of mine drainage. ***Procedures and requirements for government-financed construction contracts are contained in Pennsylvania Department of Environmental Protection Technical Guidance Document 563-2000-001, "Government-Financed Construction Contracts." Although no formal permit is issued for these contracts, contracts must meet regulatory criteria and they require public notice, Pennsylvania Department of Environmental Protection technical review and approval, performance bonding, and monthly inspections.***
- Any ***Pennsylvania*** landfill used for disposal of solid waste generated by the proposed project must have an appropriate license from the Pennsylvania Department of Environmental Protection. Regulations for the siting, design, and operation of municipal solid waste landfills are at 25 PA.

CODE Ch. 273. Regulations for construction/demolition waste landfills are at 25 PA. CODE Ch. 277. Licensed municipal solid waste landfills may receive construction wastes and residual waste in addition to normal municipal refuse, but specific approval from Pennsylvania Department of Environmental Protection would be required for disposal of residual wastes such as sludge or ash. To be approved for disposal in a municipal solid waste landfill, residual waste from the proposed facilities would need to meet several criteria: (1) the waste must be compatible with the liner system and other wastes received by the facility, (2) the leachate generated by the waste must be adequately treated by the landfill's leachate treatment facility, and (3) the physical characteristics of the waste must not cause or contribute to structural instability or other operational problems at the landfill site.

- ***With regard to Pennsylvania transportation requirements (67 PA. CODE Ch. 179),the need for special permits and advanced planning refers to the use of state highways to truck heavier components to the site from the rail siding approximately one mile away. Each component would need to be disassembled to the smallest size that would not destroy the usefulness of the component upon re-assembly at the site. A truck shipment would be considered a super load if (1) the gross weight (including the truck) exceeds 201,000 lb; (2) the total length exceeds 160 ft; or (3) the total width exceeds 16 ft. A super load would require an escort by at least one state trooper. The permitting process for a super load requires two steps. First, a preliminary application must be submitted at least three weeks prior to the anticipated initial move date. The preliminary application must include documentation of a physical route survey performed to ensure that the super load can negotiate all turns on the proposed route. The preliminary approval is valid for 12 months. Second, upon approval of a preliminary application, a final application should be submitted for each move five full working days before each move to allow adequate time for coordinating the state escort.***

7.3 LOCAL REQUIREMENTS

- WMPI would be required to comply with environmental and zoning regulations specified by Mahanoy ***Township*** and Schuylkill County***, including the Schuylkill County Conservation District,*** for construction and operation of the proposed facilities.
  - Building and grading permits would need to be obtained from Mahanoy ***Township*** before commencing ***land clearing and*** construction. ***Under the Township Subdivision and Land Development Ordinance (Ord. No. 06-01, adopted March 15, 2001) the Township Planning Commission would need to approve of site plans prior to land clearing. Site plans would be required to show compliance with relevant standards and include provisions for traffic circulation, drainage, stormwater management, and erosion and*** sediment control. Facility designers would need to verify ***ordinance and*** building code requirements, including requirements related to seismic safety, with ***the Township Supervisors and other*** local permitting agencies before commencing detailed design.

- ***Any*** open burning for disposal of land-clearing debris would be ***subject to the requirements of Township Ordinance 2006-3, known as the Mahanoy Township Burning Ordinance, which regulates and restricts outdoor fires.***
- Construction of an onsite septic system for treatment and disposal of sanitary wastewater would require a permit from Mahanoy ***Township***, as required by the Pennsylvania Sewage Facilities Act (Act 537 of 1966).

8. IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

For the proposed project, some of the resource commitments would be irreversible and irretrievable; that is, the resources would be neither renewable nor recoverable for future use. Resources that would be irreversibly or irretrievably committed by construction and demonstration of the proposed facilities include trees and other vegetation destroyed at the site, construction materials that could not be recovered or recycled, and fuel and flux consumed.

Resources used during construction of the proposed facilities would include crushed stone, sand, lumber, water, diesel fuel, gasoline, and iron ore and coal used to produce steel. Resources used during the demonstration would include anthracite culm (which is an energy resource that is also considered a coal waste), natural gas, limestone, water, ***and possibly petroleum coke***. None of these resources is in short supply relative to the size and location of the proposed project.

The proposed project would require a commitment of human and financial resources that would prevent use of the resources for alternative projects or federal activities. However, the commitment is consistent with the purpose of and need for the proposed action (Section 1).

9. THE RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

The proposed facilities' main plant site would occupy about 75 acres, and ancillary facilities and pipeline corridors would occupy a few additional acres. The facilities would consume resources including anthracite culm, natural gas, limestone, water, ***and possibly petroleum coke*** (Section 8). The proposed facilities would use some of the existing Gilberton Power Plant's facilities (e.g., possibly expanding the existing beneficiation plant) and infrastructure (e.g., roads, electric transmission lines and towers), which would reduce duplication of facilities and infrastructure. The project would generate air emissions, liquid effluents, and solid wastes. However, the proposed facilities' use of anthracite culm as feedstock would allow reclamation of land currently stockpiled with culm. In addition, water returned to the mine pool ***system*** following use by the proposed facilities would ***have lower concentrations of mining-related contaminants, and water use by the proposed facilities would reduce the amount of contaminated mine-pool water discharged into Mahanoy Creek.***

The long-term benefit of the proposed project would be to demonstrate the commercial viability of integrated technologies using coal waste to produce electricity, steam, and liquid hydrocarbon fuels that can reduce U.S. dependence on imported oil. The ability to show prospective domestic and overseas customers an operating facility rather than a conceptual or engineering prototype would provide a persuasive inducement to purchase advanced coal utilization technology. Data obtained on operational characteristics during the demonstration would allow prospective customers to assess the potential of the integrated technologies for commercial application. Successful demonstration would enhance prospects of exporting the integrated technologies to other nations and may provide the single most important advantage that the United States could obtain in the global competition for new markets.

The design size for the proposed project was selected to convince potential customers that the technology, once demonstrated at this scale, could be commercialized without further scale-up to verify operational or economic performance. Therefore, although the proposed facilities would consume resources and generate emissions, effluents, and solid wastes, they would demonstrate a technology that, once commercialized, would decrease coal waste and reduce U.S. dependence on imported oil.

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13. LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS TO WHOM COPIES OF THIS STATEMENT ARE SENT

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The Honorable Joe Barton
Ranking Member
Committee on Energy and Commerce
U.S. House of Representatives

The Honorable Jeff Bingaman
Chairman
Committee on Energy and Natural Resources
United States Senate

The Honorable Barbara Boxer
Chairman
Committee on Environment and Public Works
United States Senate

The Honorable Robert A. Brady
U.S. House of Representatives

The Honorable Robert C. Byrd
United States Senate

The Honorable Christopher Carney
U.S. House of Representatives

The Honorable Robert A. Casey, Jr.
United States Senate

The Honorable John D. Dingell
Chairman
Committee on Energy and Commerce
U.S. House of Representatives

The Honorable Pete V. Domenici
Ranking Member
Committee on Appropriations
Subcommittee on Energy and Water
United States Senate

The Honorable Pete V. Domenici
Ranking Member
Committee on Energy and Natural Resources
United States Senate

The Honorable Byron Dorgan
Chairman
Committee on Appropriations
Subcommittee on Energy and Water
United States Senate

The Honorable Chaka Fattah
U.S. House of Representatives

The Honorable Jim Gerlach
U.S. House of Representatives

The Honorable Bart Gordon
Chairman
Committee on Science and Technology
U.S. House of Representatives

The Honorable Ralph Hall
Ranking Member
Committee on Science and Technology
U.S. House of Representatives

The Honorable David L. Hobson
Ranking Member
Committee on Appropriations
Subcommittee on Energy and Water Development, and Related Agencies
U.S. House of Representatives

The Honorable Tim Holden
U.S. House of Representatives

The Honorable James M. Inhofe
Ranking Member
Committee on Environment and Public Works
United States Senate

The Honorable Paul E. Kanjorski
U.S. House of Representatives

The Honorable John P. Murtha
U.S. House of Representatives

The Honorable Joseph R. Pitts
U.S. House of Representatives

The Honorable Todd R. Platts
U.S. House of Representatives

The Honorable John D. Rockefeller, IV
United States Senate

The Honorable Allyson Schwartz
U.S. House of Representatives

The Honorable Joe Sestak
U.S. House of Representatives

The Honorable Bill Shuster
U.S. House of Representatives

The Honorable Arlen Specter
United States Senate

The Honorable Peter J. Visclosky
Chairman
Committee on Appropriations
Subcommittee on Energy and Water Development, and Related Agencies
U.S. House of Representatives

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Advisory Council on Historic Preservation
Mr. Don Klima

U.S. Army Corps of Engineers
Office of Water Project Review, Civil Works Policy and Policy Compliance Division
Mr. John Furry

U.S. Department of Agriculture
Mr. Tim Emenheiser

U.S. Department of Agriculture
Natural Resources Conservation Service
Ms. Andree DuVarney

U.S. Department of Commerce
Economic Development Administration
Dr. Frank Monteferrante

U.S. Department of Homeland Security
USM/Administrative Services
Mr. David Reese

U.S. Department of Interior
Office of Environmental Policy and Compliance
Mr. Willie R. Taylor

U.S. Department of Interior
Regional Environmental Officer
Mr. Michael T. Chezik

U.S. Department of Interior
U.S. Fish and Wildlife Service
Mr. Jared Branwein

U.S. Department of Interior
U.S. Fish and Wildlife Service
Mr. David Densmore

U.S. Department of Interior
U.S. Fish and Wildlife Service
Mr. Paul Nickerson

U.S. Department of Interior
Office of Surface Mining
John F. Mack

U.S. Department of Interior
Office of Surface Mining
Mr. Brent Wahlquist

U.S. Department of Energy
National Energy Technology Laboratory
Mr. David Anna

U.S. Department of Energy
Ms. Georgia Benjamin

U.S. Environmental Protection Agency
NEPA Program Team Leader
Mr. William Arguto

U.S. Environmental Protection Agency
Office of Federal Activities
Ms. Anne Norton Miller

U.S. Environmental Protection Agency
Mr. Kevin Magerr

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The Honorable Joe Manchin, III
Governor of West Virginia

The Honorable Edward G. Rendell
Governor of Pennsylvania

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Mr. Jack Buckwalter

Pennsylvania Department of Environmental Protection
Mr. John Dernbach

Pennsylvania Department of Environmental Protection
Mr. Gary Greenfield

Pennsylvania Department of Environmental Protection
Mr. Timothy A. Leon Guerrero

Pennsylvania Department of Environmental Protection
Mr. Raymond Kempa

Pennsylvania Department of Environmental Protection
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Pennsylvania Department of Environmental Protection
Ms. Kelley Heffner
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Secretary
Ms. Kathleen McGinty

Pennsylvania Department of Environmental Protection
Mr. Tom Owen

Pennsylvania Department of Environmental Protection
Mr. Michael D. Sherman

Pennsylvania Department of Environmental Protection
Ms. Arleen Shulman

Pennsylvania Department of Environmental Protection
Mr. Joe Sieber

Pennsylvania Department of Environmental Protection
Mr. Bob Wallace

Pennsylvania Department of Environmental Protection
Mr. Mark Weskszner

Pennsylvania Department of Transportation
Mr. Dave Gruber

Pennsylvania Historical and Museum Commission
Mr. Kurt Carr

Pennsylvania Historical and Museum Commission
State Historic Preservation Officer
Dr. Brent Glass

Pennsylvania Historical and Museum Commission
Ms. Susan Zacher

Susquehanna River Basin Commission
Mr. Thomas W. Beauduy
Deputy Director

The Honorable Neal P. Goodman
Pennsylvania House of Representatives

The Honorable Jim Rhoades
Pennsylvania Senate

The Honorable Tim Seip
Pennsylvania House

West Virginia Development Office
Mr. John F. Herholdt, Jr.
Manager, Energy Efficiency Program

Local Officials

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Mr. Ray Sajone

Schuylkill County Chamber of Commerce
Mr. David Donlin

Schuylkill County Chamber of Commerce
Ms. Lori Kane

Schuylkill County Commissioners
Mr. Frank J. Staudenmeier

Schuylkill County Office of Community and Economic Development
Mr. Mark Scarbinsky

Schuylkill County Office of Solid Waste
Mr. Dan Grow

Schuylkill County Planning and Zoning Commission
Mr. Charles Ross

West Mahanoy Township Board of Supervisors

Libraries

Frackville Free Public Library
Ms. Joan Farrell

Mahanoy City Public Library
Mr. Tom Seiberling

Mahanoy State Correctional Institute
Mr. Edward Martin, Assistant Superintendent

Pottsville Free Library
Ms. Becky White

Nongovernmental Organizations

Action PA
Mr. Mike Ewall

American Association of Blacks in Energy
Mr. Robert L. Hill
President

American Boiler Manufacturers Association
Mr. Randy Rawson
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American Coal Ash Association
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American Gas Association
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American Petroleum Institute
Mr. Steven Crookshank

American Petroleum Institute
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Government Relations Representative

Citizens for Pennsylvania's Future
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Mr. Daniel Pascavage

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Ms. Mia Light

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Mr. Bob Hoppe

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