4 SUMMARY OF ENVIRONMENTAL CONSEQUENCES

4.1 COMPARATIVE IMPACTS OF ALTERNATIVES

As described in Section 2.4.1, the specific manner in which AEP would ultimately implement the Mountaineer CCS II Project is dependent upon a combination of factors. These factors include, but are not limited to, the results of the geologic characterization study, pipeline routing constraints, UIC permitting conditions, and various cost factors. To assess the potential range of impacts that could occur from implementation of the project, several scenarios have been considered in this EIS, as shown in Table 4.1-1. These scenarios present combinations of pipeline corridors and injection well sites/properties that are representative of a reasonable range of potential options that could be implemented. These are not intended to provide an exhaustive list of options, but rather to illustrate reasonable and plausible combinations, and to properly bound the impact analysis.

Table 4.1-1. Project Implementation Scenarios

Injection Well Property	Alternative Route	Scenario A "Lower Bound"	Scenario B	Scenario C "Upper Bound"
		Number of Injection Wells per Property		
Mountaineer Plant (MT-1 Location)	Plant Routing	2	0	0
Borrow Area	Borrow Area Route	2	2	2
Eastern Sporn Tract	Eastern Sporn Route 1	0	2	2
	Eastern Sporn Route 2			
	Eastern Sporn Route 3			
	Eastern Sporn Route 4			
Jordan Tract	Jordan Route 1	0	2	2
	Jordan Route 2			
	Jordan Route 3			
	Jordan Route 4			
Western Sporn Tract	Western Sporn Route	0	0	2

Assuming geologic characteristics are favorable at all locations, Scenario A would be AEP's preferred scenario and Scenario C would be AEP's least preferred scenario. This preference is based largely on cost, effort to implement, and environmental considerations. Scenario A would minimize these elements; Scenario C would maximize them. As such, Scenario C is the least preferable and considered to be the upper bound or "worst case" from an impact perspective because it would involve the greatest length of pipelines, the greatest number of required injection wells, and the greatest number of properties involved with the project. The number of injection wells on any one site would be based on the final design and could require more than two wells; however, AEP does not anticipate that the total number of wells required for the project would exceed eight (upper bound).

Table 4.1-2 summarizes the potential unavoidable impacts of the project for three project implementation scenarios in comparison to the No Action Alternative. The baseline conditions that are relevant to the No Action Alternative are described in Chapter 3 for each resource area. Potential impacts to each environmental resource area under the No Action Alternative and the Proposed Action are analyzed in depth in Chapter 3. The scenario impact analyses presented in Table 4.1-2 use the same characterizations for impacts as outlined in Section 3.0.2 as follows:

- ***Beneficial*** – Impact would improve or enhance the resource.
- ***Negligible*** – No apparent or measurable impacts are expected; may also be described as "none" if the resource is not present.
- ***Minor*** – The action would have a barely noticeable or measurable adverse impact on the resource.
- ***Moderate*** – The action would have a noticeable or measurable adverse impact on the resource. This category could include potentially significant impacts that would be reduced to a lesser degree by the implementation of mitigation measures.
- ***Substantial*** – The action would have obvious and extensive adverse effects that could result in potentially significant impacts on a resource despite mitigation measures.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

<table>
<tr><th>No Action Alternative</th><th>Scenario A
(Lower Bound)
2 Wells at Mountaineer Plant
2 Wells at Borrow Area</th><th>Scenario B
2 Wells at Borrow Area
2 Wells at Eastern Sporn Tract
2 Wells at Jordan Tract</th><th>Scenario C
(Upper Bound)
2 Wells at Borrow Area
2 Wells at Eastern Sporn Tract
2 Wells at Jordan Tract
2 Wells at Western Sporn Tract</th></tr>
<tr><td colspan="4">Air Quality and Climate</td></tr>
<tr><td><u>CONSTRUCTION AND OPERATIONS</u>
None. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to air quality.</td><td><u>CONSTRUCTION</u>
• Minor. Emissions of criteria pollutants would occur during the construction of the CO_2 capture facility, pipelines, and injection wells from the operation of vehicles, construction equipment, and land-disturbing activities. Impacts from these would be short term, localized, and minor.
CO_2 Capture Facility
• Estimated emissions include:
<table><tr><th><u>Pollutant</u></th><th><u>tons (total)</u></th></tr><tr><td>CO</td><td>32.7</td></tr><tr><td>NO_x</td><td>60.5</td></tr><tr><td>PM_{10}</td><td>69.4</td></tr><tr><td>$PM_{2.5}$</td><td>10.6</td></tr><tr><td>SO_2</td><td>0.1</td></tr><tr><td>VOC</td><td>5.3</td></tr></table>Pipeline Corridors
• Estimated emissions include:
<table><tr><th><u>Pollutant</u></th><th><u>tons (total)</u></th></tr><tr><td>CO</td><td>1.2</td></tr><tr><td>NO_x</td><td>2.9</td></tr><tr><td>PM_{10}</td><td>2.3</td></tr><tr><td>$PM_{2.5}$</td><td>0.4</td></tr><tr><td>SO_2</td><td>0.01</td></tr><tr><td>VOC</td><td>0.3</td></tr></table>Injection Well Sites
• Estimated emissions include:
<table><tr><th><u>Pollutant</u></th><th><u>tons (total)</u></th></tr><tr><td>CO</td><td>26.08</td></tr><tr><td>NO_x</td><td>65.2</td></tr><tr><td>PM_{10}</td><td>11.2</td></tr><tr><td>$PM_{2.5}$</td><td>7.24</td></tr><tr><td>SO_2</td><td>0.12</td></tr><tr><td>VOC</td><td>4.72</td></tr></table></td><td><u>CONSTRUCTION</u>
Same as Scenario A.
CO_2 Capture Facility
Same as Scenario A.
Pipeline Corridors
• Estimated emissions include:
<table><tr><th><u>Pollutant</u></th><th><u>tons (total)</u></th></tr><tr><td>CO</td><td>10.8</td></tr><tr><td>NO_x</td><td>26.4</td></tr><tr><td>PM_{10}</td><td>21.5</td></tr><tr><td>$PM_{2.5}$</td><td>3.7</td></tr><tr><td>SO_2</td><td>0.1</td></tr><tr><td>VOC</td><td>2.3</td></tr></table>Injection Well Sites
• Estimated emissions include:
<table><tr><th><u>Pollutant</u></th><th><u>tons (total)</u></th></tr><tr><td>CO</td><td>39.1</td></tr><tr><td>NO_x</td><td>97.8</td></tr><tr><td>PM_{10}</td><td>16.8</td></tr><tr><td>$PM_{2.5}$</td><td>10.9</td></tr><tr><td>SO_2</td><td>0.2</td></tr><tr><td>VOC</td><td>7.1</td></tr></table></td><td><u>CONSTRUCTION</u>
Same as Scenario A.
CO_2 Capture Facility
Same as Scenario A.
Pipeline Corridors
• Estimated emissions include:
<table><tr><th><u>Pollutant</u></th><th><u>tons (total)</u></th></tr><tr><td>CO</td><td>13.7</td></tr><tr><td>NO_x</td><td>33.7</td></tr><tr><td>PM_{10}</td><td>27.4</td></tr><tr><td>$PM_{2.5}$</td><td>4.7</td></tr><tr><td>SO_2</td><td>0.1</td></tr><tr><td>VOC</td><td>2.9</td></tr></table>Injection Well Sites
• Estimated emissions include:
<table><tr><th><u>Pollutant</u></th><th><u>tons (total)</u></th></tr><tr><td>CO</td><td>52.2</td></tr><tr><td>NO_x</td><td>130.4</td></tr><tr><td>PM_{10}</td><td>22.4</td></tr><tr><td>$PM_{2.5}$</td><td>14.5</td></tr><tr><td>SO_2</td><td>0.2</td></tr><tr><td>VOC</td><td>9.4</td></tr></table></td></tr>
</table>

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Air Quality and Climate *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to air quality.	**OPERATIONS** **CO_2 Capture Facility** • *Beneficial.* Overall emissions from the Mountaineer Plant, including SO_2, SO_3, and PM would be reduced through the operation of the *CO_2* capture facility. • Estimated increase (decrease) of emissions during operations would be: Pollutant — tpy NH_3 48.7 SO_2 (1,886.6) SO_3 (623.2) PM_{10} (97) • *Minor*. Ammonia concentrations in the flue gas could increase from 2 ppmv to approximately 3.3 ppmv; however, no regulatory standards would be exceeded. Increased ammonia concentrations could have the potential to increase secondary particulate formation; however, filterable PM reductions would result in an overall net PM reduction of 98.4 tpy. Changes in flue gas characteristics are not expected to impact dispersion. **Pipeline Corridors** • *Negligible.* Emissions of VOCs, CO, NO_x, SO_2, and particulates would occur from routine maintenance on the pipeline. These emissions would be minimal when compared to regional sources and would have a negligible impact on air quality	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Air Quality and Climate *(Cont'd)*			
	Injection Well Sites • *Negligible.* Emissions of VOCs, CO, NO_x, SO_2, and particulates would occur from routine maintenance at the injection well sites. These emissions would be minimal when compared to regional sources and would have a negligible impact on air quality.	**Injection Well Sites** *Same as Scenario A.*	**Injection Well Sites** *Same as Scenario A.*
Greenhouse Gases			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to GHG emissions.	**CONSTRUCTION** **CO_2 Capture Facility** • *Minor.* See Section 4.2 Potential Cumulative Impacts. Construction of the CO_2 capture facility would generate GHGs amounting to approximately 10,124 metric tons of CO_2-eq. **Pipeline Corridors** • *Minor.* See Section 4.2 Potential Cumulative Impacts. Construction of the pipeline corridors would generate GHGs amounting to approximately 513 metric tons CO_2-eq. **Injection Well Sites** • *Minor.* See Section 4.2 Potential Cumulative Impacts. Construction of the injection wells would generate GHGs amounting to approximately 26,609 metric tons of CO_2-eq.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** • *Minor.* See Section 4.2 Potential Cumulative Impacts. Construction of the pipeline corridors would generate GHGs amounting to approximately 4,713 metric tons of CO_2-eq. **Injection Well Sites** • *Minor.* See Section 4.2 Potential Cumulative Impacts. Construction of the injection wells would generate GHGs amounting to approximately 39,913 metric tons of CO_2-eq.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** • *Minor.* See Section 4.2 Potential Cumulative Impacts. Approximately 6,017 metric tons of CO_2-eq would be generated during construction of the pipeline corridors. **Injection Well Sites** • *Minor.* See Section 4.2 Potential Cumulative Impacts. Construction of the injection wells would generate GHGs amounting to approximately 53,218 metric tons of CO_2-eq.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Greenhouse Gases *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to GHG emissions.	**OPERATIONS** **CO_2 Capture Facility** • *Beneficial.* See Section 4.2 Potential Cumulative Impacts. Operations would capture and store approximately 1.5 million metric tpy of CO_2-eq. **Pipeline Corridors** • *Negligible.* During operations, no GHGs are generated by the pipelines, except for negligible vehicle emissions during maintenance. **Injection Well Sites** • *Negligible.* During operations, no GHGs are generated by the pipelines, except for negligible vehicle emissions during maintenance.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*
Geology			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to geologic resources.	**CONSTRUCTION** **CO_2 Capture Facility** • *Negligible.* The facility would be constructed on an existing industrial site. **Pipeline Corridors** • *Minor.* Construction would occur along existing electrical transmission lines, and underground as much as possible. Tractor ripping and blasting may be used to place the pipeline within bedrock. • *Negligible.* Pipelines would not cross surface or underground mining operations.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Minor.* The longer length of pipeline required for this scenario may require additional bedrock excavation.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenarios A & B unless otherwise noted below.* • *Minor.* The longer length of pipeline required for this scenario may require additional bedrock excavation.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Geology *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to geologic resources.	**Injection Well Sites** • *Minor.* The potential impacts associated with local CO_2 geologic storage are largely associated with the possibility of CO_2 migrating through fractures in the caprock seal; however, vertical migration of CO_2 would be highly unlikely. • *Minor.* Studies of the target injection formations show that they may have sufficient porosity and permeability to contain expected volumes of the CO_2, and sufficient caprock layers to prevent the CO_2 from moving upward. • *Minor.* Preliminary CO_2 plume analysis shows that the CO_2 may extend 2 miles from the Rose Run injection wells and 3 miles from the Copper Ridge wells. • *Minor.* The operation of injection wells would not preclude coal mining in the ROI.	**Injection Well Sites** • *Minor.* The additional wells would increase the total size of the CO_2 plume within the ROI. The plume radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.	**Injection Well Sites** • *Minor.* The additional wells would increase the total size of the CO_2 plume within the ROI. The plume radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.
	OPERATIONS **CO_2 Capture Facility** • *Negligible.* Operations would occur in an existing disturbed area and would not produce additional, new impacts.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.*
	Pipeline Corridors • *Negligible.* The pipeline would not disturb geologic media during operation.	**Pipeline Corridors** *Same as Scenario A.*	**Pipeline Corridors** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Geology *(Cont'd*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to geologic resources.	**Injection Well Sites** • *Minor.* The potential impacts associated with local CO_2 geologic storage are largely associated with the possibility of CO_2 migrating through fractures in the caprock seal; however, vertical migration of CO_2 would be highly unlikely. • *Minor.* Studies of the target injection formations show that they may have sufficient porosity and permeability to contain expected volumes of the CO_2, and sufficient caprock layers to prevent the CO_2 from moving upward. • *Minor.* Preliminary CO_2 plume analysis shows that the CO_2 may extend 2 miles from the Rose Run injection wells and 3 miles from the Copper Ridge wells. • *Minor.* The operation of injection wells would not preclude coal mining in the ROI.	**Injection Well Sites** *Same as Scenario A unless otherwise noted below.* • *Minor.* The additional wells would increase the total size of the CO_2 plume within the ROI. The plume radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.	**Injection Well Sites** *Same as Scenarios A & B unless otherwise noted below.* • *Minor.* The additional wells would increase the total size of the CO_2 plume within the ROI. The plume radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.
Physiography and Soils			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to physiography and soils.	**CONSTRUCTION** **CO_2 Capture Facility** • *Negligible to Minor.* Up to 33 acres of previously disturbed urban land would be disturbed. • *Negligible.* No HEL/PHEL or prime farmland/farmland of statewide importance mapped in study area, and soils have been previously disturbed. • *Minor.* During construction, increased potential for soil erosion and compaction, although reduced by BMPs; creation of impermeable surfaces.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
	Physiography and Soils *(Cont'd)*		
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to physiography and soils.	**Pipeline Corridors** • *Negligible to Minor.* Land-disturbing activities conducted to support the construction of the pipeline corridors would disturb sensitive or high productivity soils: ▪ Acres of prime farmland: 6 ▪ Acres of farmland of statewide importance: 13 ▪ Acres of HEL: 15 ▪ Acres of PHEL: 11 • *Negligible*. No pipeline soil disturbance associated with the wells at Mountaineer Plant.	**Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Moderate.* Land-disturbing activities conducted to support the construction of the pipeline corridors would temporarily disturb large areas of sensitive or high productivity soils up to (depending on route option): ▪ Acres of prime farmland: 13 ▪ Acres of farmland of statewide importance: 44 ▪ Acres of HEL: 97 ▪ Acres of PHEL: 22 • *Minor.* During construction, project would be done in phases thereby reducing the overall impact to the construction ROW soils. • *Moderate.* Large areas of HEL soils would be disturbed by construction activities increasing the potential for soil erosion.	**Pipeline Corridors** *Same as Scenarios A & B unless otherwise noted below.* • *Moderate.* Land-disturbing activities conducted to support the construction of the pipeline corridors would temporarily disturb large areas of sensitive or high productivity soils up to (depending on route option): ▪ Acres of prime farmland: 18 ▪ Acres of farmland of statewide importance: 83 ▪ Acres of HEL: 155 ▪ Acres of PHEL: 29
	Injection Well Sites • *Negligible to Minor.* Land-disturbing activities conducted to support the construction of the injection well sites would temporarily disturb sensitive or high productivity soils: ▪ Acres of farmland of statewide importance: 3.4 ▪ Acres of HEL: 4.9 • *Minor.* Land-disturbing activities conducted to support the local CO_2 injection well site would temporarily increase soil erosion potential. Compaction of soils would reduce future soil productivity. • *Negligible.* Only small areas impacted; BMPs would be used to reduce soil erosion	**Injection Well Sites** *Same as Scenario A unless otherwise noted below.* • *Minor.* Construction of the 6 injection well sites would temporarily disturb up to 15.3 acres of farmland of statewide importance and 13.5 acres of HEL.	**Injection Well Sites** *Same as Scenarios A & B unless otherwise noted below.* • *Minor.* Construction of the 8 injection well sites would temporarily disturb up to 19.5 acres of farmland of statewide importance and 17.1 acres of HEL.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Physiography and Soils *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to physiography and soils.	**OPERATIONS** **CO_2 Capture Facility** • *Negligible.* Areas not covered with impermeable surfaces would be landscaped and maintained for minimal erosion. **Pipeline Corridors** • *Minor*: Higher probability of erosion of disturbed soils, especially combined with many HEL and PHEL soils along the pipeline corridors **Injection Well Sites** • *Negligible.* Operation activities would impact less than an acre of either prime farmland, farmland of statewide importance, HEL, or PHEL.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A unless otherwise noted below.* • *Minor.* Potentially productive farmland would not be accessible for future farming; higher potential of erosion from operational activities. • *Negligible.* Individual injection well sites impact less than an acre of sensitive soils each.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*
Groundwater			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states andthere would be no changes to groundwater resources.	**CONSTRUCTION** **CO_2 Capture Facility** • *Negligible.* The system would be constructed on an open industrial site. Construction activities would be covered under the Plant NPDES permit and a project Stormwater Construction Permit. **Pipeline Corridors** • *Negligible.* Construction would occur along existing electrical transmission lines, and underground as much as possible. Pipelines would be constructed above the water table.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Negligible.* The longer length of pipelines required for this scenario would increase the potential groundwater exposure to construction operations. However, spills would be cleaned in accordance with construction spill plans.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Negligible.* The longer length of pipelines required for this scenario would increase the potential groundwater exposure to construction operations. However, spills would be cleaned in accordance with construction spill plans.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Groundwater *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to groundwater resources.	**Injection Well Sites** • *Negligible.* Injection wells would be constructed so that drilling mud does not interact with local groundwater. The injection wells would be constructed under the appropriate UIC permit	**Injection Well Sites** *Same as Scenario A.*	**Injection Well Sites** *Same as Scenario A.*
	OPERATIONS **CO_2 Capture Facility** • *Negligible.* Operations would occur in an existing disturbed area and would not produce additional, new impacts. • *Minor.* The project would require potable water for 38 new employees, which is 0.7 percent of the unused capacity of the supplying sanitary district. **Pipeline Corridors** • *Negligible.* The pipeline would not impact groundwater during operation. **Injection Well Sites** • *Minor.* The potential impacts associated with local CO_2 geologic storage are largely associated with the possibility of CO_2 migration through fractures in the caprock seal; however, vertical migration of CO_2 would be highly unlikely. The injection wells would be operated and monitored in accordance with the appropriate UIC permit. *(Cont'd)*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A unless otherwise noted below* • *Minor.* The additional wells would increase the total size of the CO_2 foot print within the ROI. The CO_2 radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A* **Injection Well Sites** *Same as Scenario A unless otherwise noted below* • *Minor.* The additional wells would increase the total size of the CO_2 foot print within the ROI. The CO_2 radius would increase the surface area between the CO_2 and the caprock, but would lower the formation pressure over a greater area.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Groundwater *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to groundwater resources.	**Injection Well Sites** *(Cont'd)* • *Minor.* Vertical migration of CO_2 would be highly unlikely, as the target formation is over 7,000 feet from the deepest USDW. • *Negligible.* The potential for aquifer acidification is low because the dissolved CO_2 would be trapped within the target formation and not reach the deepest USDW. • *Negligible.* There is no aquifer management plan for Mason County.		
Surface Water			
CONSTRUCTION AND OPERATIONS *None.* The site and corridors would remain in their existing states and there would be no changes to surface waters.	**CONSTRUCTION** **CO_2 Capture Facility** • *Minor.* During storm events, the Ohio River may experience an increased sediment load due to the erosion of exposed soils during construction. • *Minor.* Potential for surface water contamination from hazardous material spills that could occur during construction activities. **Pipeline Corridors** • *Minor.* Potential for surface water contamination from hazardous material spills that could occur during construction activities. *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Minor to moderate.* Potential surface water impacts during construction of CO_2 pipeline crossings using trenching methods includes stream diversion/piping flows around the crossing, increased turbidity and sedimentation during streambed disturbance, change of flow or velocity, and removal of streambank vegetation: *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenarios A & B unless otherwise noted below.* • *Minor to moderate. P*otential surface water impacts during construction of CO_2 pipeline crossings using trenching methods includes stream diversion/piping flows around the crossing, increased turbidity and sedimentation during streambed disturbance, change of flow or velocity, and removal of streambank vegetation: *(Cont'd)*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Surface Water *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The site and corridors would remain in their existing states and there would be no changes to surface waters.	**Pipeline Corridors** *(Cont'd)* • *Minor.* Potential surface water impacts during construction of CO_2 pipeline crossings using trenching methods includes stream diversion/piping flows around the crossing, increased turbidity and sedimentation during streambed disturbance, change of flow or velocity, and removal of streambank vegetation: ▪ Number of perennial stream/creek Crossings: 1 ▪ Number of intermittent stream/creek crossings: 2 ▪ Number of ephemeral stream crossings: 4 ▪ Number of pond/lake crossings: 0 **Injection Well Sites** • *Minor.* Temporary adverse impacts to adjacent surface waters, such as sedimentation and surface water turbidity from runoff could occur during construction of the wells. • *Minor.* Drilling of wells would possibly require the discharge of well water to the surface; temporary impacts to surface waters could occur as a result of well installation. • *Minor.* Potential for surface water contamination from spills that could occur during construction activities.	**Pipeline Corridors***(Cont'd)* ▪ Maximum number of perennial stream/creek crossings: 10 ▪ Maximum number of intermittent stream/creek crossings: 24 ▪ Maximum number of ephemeral stream crossings: 32 ▪ Number of pond/lake crossings: 0 **Injection Well Sites** *Same as Scenario A unless otherwise noted below.* • *Minor.* Potential surface water impacts during construction of CO_2 pipeline spur crossings using trenching methods includes stream diversion/piping flows around the crossing, increased turbidity and sedimentation during streambed disturbance, change of flow or velocity, and removal of streambank vegetation: ▪ Number of perennial stream/creek crossings: 0 ▪ Min/Max number of intermittent stream/creek crossings: 2/4 ▪ Min/Max number of ephemeral stream crossings: 3/7 ▪ Number of pond/lake crossings: 0	**Pipeline Corridors***(Cont'd)* ▪ Maximum number of perennial stream/creek crossings: 12 ▪ Maximum number of intermittent stream/creek crossings: 35 ▪ Maximum number of ephemeral stream crossings: 60 ▪ Number of pond/lake crossings: 0 **Injection Well Sites** *Same as Scenario B.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Surface Water *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The site and corridors would remain in their existing states and there would be no changes to surface waters.	**OPERATIONS** **CO_2 Capture Facility** • *Minor.* Permanent establishment of 11.5 acres of impervious cover in former grassy areas would increase the amount of pollutants and runoff into receiving waters. • *Minor.* Potential for surface water contamination from hazardous materials spills that could occur during operational activities. **Pipeline Corridors** • *Negligible.* Occasional maintenance may require access to buried pipelines; normal operations would not affect surface waters. • *Negligible.* Potential for surface water contamination from hazardous materials spills could occur during maintenance activities. **Injection Well Sites** • *Negligible.* Potential for surface water contamination from hazardous materials spills that could occur during maintenance activities.	**OPERATIONS** **CO_2 Capture Facility** Same as Scenario A. **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*
Wetlands and Floodplains			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to wetlands and floodplains.	**CONSTRUCTION** **CO_2 Capture Facility** • *Wetlands - Minor*. No wetlands exist at the CO_2 capture facility and barge unloading area; however, a wetland near the barge unloading area may experience minor impacts of sedimentation. *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Wetlands and Floodplains *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to wetlands and floodplains.	**CO_2 Capture Facility** *(Cont'd)* • *Floodplains - Minor*. Entire 33-acre area is considered floodplain (13 acres of which is 100-year), though site changes since the flood mapping occurred have resulted in most of the site being elevated above the base flood elevation. In addition, the land area for upgrades to the existing barge unloading area is located entirely within 100-year floodplain below the base flood elevation. Presence of construction equipment and materials would represent minor obstructions to flood flows. • *Floodplains - Minor*. Upgrades to the barge unloading area would be expected to cause a negligible impact on flood hazards as the lowered river bank may allow a marginal increase in onsite floodwaters over a relatively small area during a flooding event. Structures in 100-year floodplains would be elevated or flood proofed as per the Mason County Floodplain Ordinance to protect the safety of workers at the facility.		

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Wetlands and Floodplains *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to wetlands and floodplains.	**Pipeline Corridors** • *Wetlands - Minor*. Construction would cause soil disturbances and compaction that can alter wetland hydrology. Riverine wetlands would be temporarily disturbed for pipeline installation; however, these features would be restored after construction. Palustrine wetlands would incur long-term type conversions due to vegetation clearing. (Wetland areas affected in construction ROWs: 5.23 acres of palustrine; 0.13 acres of riverine). • *Floodplains - None*. No mapped floodplains would be crossed by the pipeline corridors.	**Pipeline Corridors** *Same as Scenario A unless otherwise noted.* • *Wetlands - Minor*. Palustrine wetlands would incur long-term type conversions due to vegetation clearing. (Wetland areas affected in construction ROWs: 5.51 acres of palustrine; between 0.62 and 0.83 acres of riverine). • *Floodplains* – Same as Scenario A.	**Pipeline Corridors** *Same as Scenario A unless otherwise noted.* • *Wetlands - Minor*. Palustrine wetlands would incur long-term type conversions due to vegetation clearing. (Wetland areas affected in construction ROWs: 5.51 acres of palustrine; between 1.01 and 1.22 acres of riverine). • *Floodplains - Minor*. The Western Sporn Route would cross a 100-year floodplain (Zone A) associated with Broad Run (1.35 acres affected in construction ROW outside of permanent ROW). • *Floodplains - Minor*. The temporary presence of construction equipment and spoil piles would cause a minor temporary direct impact of placing materials within the floodplain that could redirect flood flows in the event a flooding incident occurred during construction in the floodplain.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
	Wetlands and Floodplains *(Cont'd)*		
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to wetlands and floodplains.	**Injection Well Sites** • *Wetlands - Minor.* Construction could cause sedimentation to riverine wetlands in access road construction ROWs. (Wetland areas affected in construction ROWs outside of permanent ROWs: up to 0.001 acre of riverine). Impacts could be none if injection well site infrastructure is ultimately developed that would not impact wetlands per AEP's siting criteria. • *Floodplains - None*. No mapped floodplains would be affected.	**Injection Well Sites** • *Wetlands - Minor.* Construction would cause soil disturbances and compaction that can alter wetland hydrology. Riverine wetlands would be temporarily disturbed for pipeline spur installation; however, these features would be restored after construction. (Wetland areas affected in construction ROWs outside of permanent ROWs: up to 0.029 acre of riverine). Construction could cause sedimentation to riverine wetlands in well construction laydown areas. (Wetland areas affected in laydown areas outside of operational areas: up to 0.033 acre of riverine). Construction could cause sedimentation to riverine wetlands in access road construction ROWs. (Wetland areas affected in construction ROWs outside of permanent ROWs: up to 0.002 acre of riverine). Impacts could be none if injection well site infrastructure is ultimately developed that would not impact wetlands per AEP's siting criteria. • *Floodplains - None*. No mapped floodplains would be affected.	**Injection Well Sites** • *Wetlands - Minor.* Construction would cause soil disturbances and compaction that can alter wetland hydrology. Riverine wetlands would be temporarily disturbed for pipeline spur installation; however, these features would be restored after construction. (Wetland areas affected in construction ROWs outside of permanent ROWs: up to 0.029 acre of riverine). Construction could cause sedimentation to riverine wetlands in well construction laydown areas. (Wetland areas affected in laydown areas outside of operational areas: up to 0.033 acre of riverine). Construction could cause sedimentation to riverine wetlands in access road construction ROWs. (Wetland areas affected in construction ROWs outside of permanent ROWs: up to 0.002 acre of riverine). Impacts could be none if injection well site infrastructure is ultimately developed that would not impact wetlands. • *Floodplains - Negligible.* The Western Sporn Tract injection well location (WS-1) would be outside, but close to a 100-year floodplain (Zone A) associated with Tenmile Creek. Ground disturbing activities could cause negligible amounts of sedimentation to the floodplain. Impacts could be none if injection well site infrastructure is ultimately developed further from the floodplain area.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Wetlands and Floodplains *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to wetlands and floodplains.	**OPERATIONS** **CO_2 Capture Facility** • *Wetlands - Minor*. No wetlands exist at the CO_2 capture facility. • *Floodplains - Minor*. The entire CO_2 capture facility would be located within mapped floodplains (though most of the area has been elevated above the mapped base flood elevation), which would cause obstructions that could increase flood elevations upstream and redirect flood flows; within 100-year floodplain would be the Refrigeration Area (approximately 22,400 square feet in land area) and a small portion of the Electric / Control Room / Lab Building (the Cooling Tower and Reagent Storage structures may also be present). **Pipeline Corridors** • *Wetlands - Minor*. No operational impacts would be expected for riverine wetlands, unless a pipeline had to be exposed for maintenance. Palustrine wetlands could incur permanent type conversions due to vegetation clearing (Wetland areas affected in permanent ROWs: 2.59 acres of palustrine; 0.04 acre of riverine). • *Floodplains - None*. No mapped floodplains would be crossed by the pipeline corridors.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** • *Wetlands - Minor*. No operational impacts would be expected for riverine wetlands, unless a pipeline had to be exposed for maintenance. Palustrine wetlands could incur permanent type conversions due to vegetation clearing. (Wetland areas affected in permanent ROWs: 2.70 acres of palustrine; between 0.26 and 0.33 acre of riverine). • *Floodplains - None*. No mapped floodplains would be crossed by the pipeline routes.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** • *Wetlands - Minor*. No operational impacts would be expected for riverine wetlands, unless a pipeline had to be exposed for maintenance. Palustrine wetlands could incur permanent type conversions due to vegetation clearing (Wetland areas affected in permanent ROWs: 2.70 acres of palustrine; between 0.46 and 0.52 acres of riverine). • *Floodplains - Negligible.* The Western Sporn Route would cross a 100-year floodplain (Zone A) associated with Broad Run (0.51 acre affected in permanent ROW). No impacts would be expected as no aboveground features would be developed that could change flood elevations or redirect flood flows.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Wetlands and Floodplains *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to wetlands and floodplains.	**Injection Well Sites** • *Wetlands - None*. No wetlands would be affected in permanent ROWs or well pad areas. • *Floodplains - None*. No mapped floodplains would be affected.	**Injection Well Sites** • *Wetlands - Minor.* No operational impacts would be expected for riverine wetlands, unless a pipeline had to be exposed for maintenance. (Wetland areas affected in permanent ROWs: up to 0.03 acre of riverine). One well pad could require filling riverine wetlands, though the footprint of the potentially impacting well pad (ES-1) would be adjusted to avoid impacts if practicable (Wetland area potentially affected in well pad area: up to <0.001 acre of riverine). • One access road could require filling riverine wetlands, though the footprint of the potentially impacting access road (to ES-2) would be adjusted to avoid impacts if practicable (Wetland area potentially affected in access road permanent ROW: up to 0.001 acre of riverine). Impacts could be none if injection well site infrastructure is ultimately developed that would not impact wetlands per AEP's siting criteria. • *Floodplains - None*. No mapped floodplains would be affected.	**Injection Well Sites** *Same as Scenario B unless otherwise noted.* • *Floodplains - Negligible.* The Western Sporn Tract injection well location (WS-1) would be outside, but close to a 100-year floodplain (Zone A) associated with Tenmile Creek. Ground disturbing activities could cause negligible amounts of sedimentation to the floodplain. Impacts could be none if injection well site infrastructure is ultimately developed that further from the floodplain area.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Biological Resources			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to biological resources.	**CONSTRUCTION** **CO_2 Capture Facility** • *Negligible.* Up to 33 acres of disturbed industrial developed open space (i.e., grassy areas) would be disturbed; developed open space area is of low wildlife habitat quality. • *Minor.* Site preparation activities associated with the proposed upgrades to the existing barge unloading area could cause temporary indirect impacts to aquatic species from sedimentation, however, implementation of erosion and sedimentation measures would be employed during construction to reduce the potential for adverse impacts. The use of temporary piles during unloading has the potential for minor localized impacts to aquatic habitat and the potential for adverse impacts to less mobile aquatic species (e.g., mussels). **Pipeline Corridors** • *Minor.* Land-disturbing activities conducted to support the construction of the pipeline corridors would disturb vegetated habitats from use by wildlife: ▪ Acres of Agricultural Land: 0 – 12.5 ▪ Acres of Forest: 10.4 – 36.7 ▪ Acres of Grassland and Shrub/scrub: 13.5 – 105.1 • *Negligible.* Habitat fragmentation would be avoided through the use of existing ROWs to the extent practicable. • *Minor to Moderate.* Following construction, an increased potential exists for the introduction and spread of invasive species, particularly in areas once forest. *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Moderate.* Land-disturbing activities conducted to support the construction of the pipeline corridors would disturb vegetated habitats from use by wildlife: ▪ Acres of Agricultural Land: up to 10.0 ▪ Acres of Forest: up to 47.9 ▪ Acres of Grassland and Shrub/scrub: up to 118.3 • *Minor.* During construction, potential exists for temporary disturbance to streams and aquatic habitat at locations where the pipeline would cross streams.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenarios A & B unless otherwise noted below.* • *Moderate.* Land-disturbing activities conducted to support the construction of the pipeline corridors would disturb vegetated habitats from use by wildlife: ▪ Acres of Agricultural Land: up to 22.5 ▪ Acres of Forest: up to 62.4 ▪ Acres of Grassland and Shrub/scrub: up to 160.0

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Biological Resources *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to biological resources.	**Pipeline Corridors** *(Cont'd)* • *Minor.* Accidental mortality of wildlife could occur due to collisions with construction vehicles and equipment; a majority of the wildlife would avoid construction sites due to human presence and noise generated. • *Negligible.* If the potential exists for adverse impacts to migratory birds, AEP would coordinate with the USFWS to develop appropriate measures to minimize impacts to assure compliance with the MBTA. **Injection Well Sites** • *Negligible.* Land-disturbing activities conducted for the injection well sites would be located in developed locations. • *Negligible.* Due to the developed nature of the sites, the clearing of vegetation would not be anticipated to affect migratory bird nesting.	**Injection Well Sites** • *Minor.* Land-disturbing activities conducted for the injection well sites would temporarily remove up to 11.3 acres of forest. • *Negligible.* If the potential exists for adverse impacts to migratory birds, AEP would coordinate with the USFWS to develop appropriate measures to minimize impacts to assure compliance with the MBTA.	**Injection Well Sites** • *Minor.* Land-disturbing activities conducted for the injection well sites would temporarily remove up to 16.4 acres of forest.
	OPERATIONS **CO_2 Capture Facility** • *Negligible.* Operations would occur in an existing disturbed area and would not produce additional, new impacts.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenarios A & B.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Biological Resources *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to biological resources.	**Pipeline Corridors** • *Negligible to Minor.* During operations, biological resource impacts within the pipeline corridors would be limited to permanent habitat conversion and maintenance activities within the permanent ROW: ▪ Acres of Agricultural Land: 0 ▪ Acres of Forest: 4.3 ▪ Acres of Grassland and Shrub/scrub: 5.5 • *Negligible.* Soil invertebrates or plant roots could experience elevated CO_2 soil concentrations close to the segment of the pipeline if a rupture or leak occurred. **Injection Well Sites** • *Negligible.* Operations would be located in previously developed locations. • *Negligible.* CO_2 sequestration has the potential to alter localized microbial communities by changing the pH of the underground environment; however, impacts would likely have negligible to minor impacts to microbial communities.	**Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Moderate.* During operations, biological resource impacts within the pipeline corridors would be limited to permanent habitat conversion and maintenance activities within the permanent ROW: ▪ Acres of Agricultural Land: up to 8.3 ▪ Acres of Forest: up to 32.5 ▪ Acres of Grassland and Shrub/scrub: Up to 84.6 • *Moderate.* Localized habitat fragmentation would occur from establishment of permanent ROWs within new areas. **Injection Well Sites** *Same as Scenario A unless otherwise noted below.* • *Negligible.* During operations, biological resource impacts within the injection well sites would be limited to permanent habitat conversion and maintenance activities within the injection well sites: 2.1 acres of grassland and shrub/scrub habitat and 4.7 acres of forest. • *Minor.* Indirect impacts would occur from the increased potential of introduction and spread of invasive species due to human activity.	**Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Moderate.* During operations, biological resource impacts within the pipeline corridors would be limited to permanent habitat conversion and maintenance activities within the permanent ROW: ▪ Acres of Agricultural Land: up to 12.0 ▪ Acres of Forest: up to 38.5 ▪ Acres of Grassland and Shrub/scrub: up to 126.7 **Injection Well Sites** *Same as Scenarios A & B unless otherwise noted below.* • *Negligible.* During operations, biological resource impacts within the injection well sites would be limited to permanent habitat conversion and maintenance activities within the injection well sites: 2.1 acres of grassland and shrub/scrub habitat and 5.2 acres of forest.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Cultural Resources			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to cultural resources.	**CONSTRUCTION** **CO_2 Capture Facility** • *None.* Construction of the CO_2 capture facility would result in the disturbance of previously disturbed land; therefore, no impact to archaeological resources would occur. • *None.* No impact to the two historic resources identified by DOE would occur as a result of construction of the CO_2 capture facility. **Pipeline Corridors** • *None.* A Phase I identified no archaeological sites within the APE for the pipeline corridors; therefore, no impacts to archaeological resources would be expected. • *None.* No historic resources are located within the APE for the pipeline corridors; therefore, no impacts to historic resources are anticipated. **Injection Well Sites** • *None.* A Phase I identified no archaeological sites within the APE; therefore, no impacts to archaeological resources would be expected. • AEP would likely be required to install monitoring wells as part of the permitting process. Should wells be installed on portions of the property that have not been surveyed, a Phase I archaeological survey would be conducted for the monitoring well sites. Based on siting criteria, it is anticipated that archaeological resources would be avoided	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Cultural Resources *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to cultural resources.	**OPERATIONS** **CO_2 Capture Facility** • *None.* No impact to archaeological resources would occur during operation of the CO_2 capture facility. • *Negligible.* A negligible impact to the two historic resources identified by DOE could occur from the operation of the CO_2 capture facility. **Pipeline Corridors** • *None.* A Phase I identified no archaeological sites within the APE; therefore, no impacts to archaeological resources would be expected. • *None.* No historic resources are located within the APE of the pipeline corridors; therefore, no impacts to historic resources are anticipated. **Injection Well Sites** • *None.* No impact to archaeological resources would occur during operation of the injection wells. • *Negligible.* A negligible impact to the two historic resources identified by DOE could occur from the operation of the injections wells.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Land Use and Aesthetics			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to land use.	**CONSTRUCTION** **CO_2 Capture Facility** • *Negligible.* Construction at the 33-acre project site would impact previously-disturbed, industrial open space (grassy areas). Adjacent areas are developed/disturbed lands. • *Negligible.* Construction would have a negligible short-term impact on land use and aesthetic resources on neighboring residential properties. Nearest residence is 2,600 feet to the west. **Pipeline Corridors** • *Negligible.* Land-disturbing activities conducted to support the construction of pipeline corridors would not permanently impact land use along an existing power transmission easement. No agricultural land use would be impacted. • *Negligible.* Construction of the pipeline corridors would result in negligible short-term impacts on land use and aesthetic resources in the surrounding area, which is industrial land owned by AEP. No residential receptors are located within 1,000 feet of the pipeline. No new ROW through private property would be created. • *Negligible.* Land within temporary ROW could revert back to previous land use after construction. **Injection Well Sites** • *Negligible.* Construction of wells, pipeline spurs, and access roads would impact natural ground cover and previously disturbed land. No agricultural land would be affected. *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Minor.* Land-disturbing activities conducted to support the construction of the pipeline corridors would temporarily impact up to 19.6 acres of agricultural land use. • *Minor.* Construction of pipelines would cause short-term impacts on land use and aesthetic resources on up to 31 nearby residential receptors from construction noise, truck traffic, and emissions, mainly fugitive dust. • *Minor.* Construction would impact land use along route options that include the creation of new ROW through private property. Up to 4.0 miles of new ROW would be created. **Injection Well Sites** *Same as Scenario A unless otherwise noted below. (Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenarios A & B unless otherwise noted below.* • *Minor.* Land-disturbing activities conducted to support the construction of the pipeline corridors would temporarily impact up to 32.1 acres of agricultural land use. • *Minor.* Construction of pipelines would cause short-term impacts on land use and aesthetic resources on up to 73 nearby residential receptors from construction noise, truck traffic, and emissions, mainly fugitive dust. • *Minor.* Construction would impact land use along route options that include the creation of new ROW through private property. Up to 5.2 miles of new ROW would be created. **Injection Well Sites** *Same as Scenario A unless otherwise noted below. (Cont'd)*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Land Use and Aesthetics *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to land use.	**Injection Well Sites** *(Cont'd)* • *Negligible.* Construction at the injection well sites would result in negligible short-term impacts on land use and aesthetic resources in the surrounding area, which is industrial land owned by AEP. No residential receptors are located within 1,000 feet of the injection well sites.	**Injection Well Sites** *(Cont'd)* • *Minor.* Construction at the injection well properties would result in minor short-term impacts on land use and aesthetic resources at nearby residential properties from construction noise, truck traffic, and emissions, mainly fugitive dust. The nearest residence to an injection well site at the Eastern Sporn Tract is 380 feet and to the Jordan Tract is 1,210 feet.	**Injection Well Sites** *(Cont'd)* • *Minor.* Construction at the injection well properties would result in minor short-term impacts on land use and aesthetic resources at nearby residential properties from construction noise, truck traffic, and emissions, mainly fugitive dust. The nearest residence to an injection well site at the Eastern Sporn Tract, Jordan Tract, and Western Sporn Tract is 380 feet, 1,210 feet, and 580 feet, respectively.
	OPERATIONS **CO_2 Capture Facility** • *Negligible.* Operation of the CO_2 capture facility would have a negligible long-term impact on the industrial land use within the Mountaineer Plant property. The CO_2 capture facility would be compatible with land use on the surrounding lands, also owned by AEP. • *Negligible.* Operation of the CO_2 capture facility would have a negligible long-term impact on land use and aesthetic resources on neighboring residential properties due to the distances involved (2,600 ft). **Pipeline Corridors** • *Negligible.* Land-disturbing activities conducted to support the construction of the pipeline corridors would permanently impact land along an existing electrical transmission easement. No agricultural land use would be permanently impacted. *(Cont'd)*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenario A unless otherwise noted below.* • *Minor.* Land-disturbing activities conducted to support the construction of the pipeline corridors would permanently impact up to 8.3 acres of agricultural land. *(Cont'd)*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* **Pipeline Corridors** *Same as Scenarios A & B unless otherwise noted below.* • *Minor.* Up to 12.0 acres of agricultural land would be included in a permanent easement. *(Cont'd)*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Land Use and Aesthetics *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to land use.	**Pipeline Corridors** *(Cont'd)* • *Negligible.* Operations within the pipeline corridor would result in negligible long-term impacts on land use and aesthetic resources on the surrounding property, which is industrial land owned by AEP. No residential receptors are located within 1,000 feet of the pipeline. No new ROW through private property would be created. • *Negligible.* Land within temporary ROW could revert back to previous land use after construction. **Injection Well Sites** • *Negligible.* Operations conducted to support the local CO_2 injection well site would result in permanent loss of natural land cover. No agricultural land would be impacted. • *Minor.* Operations at both injection well sites would have a minor long- term impact as the permanent land use would be used for CO_2 injection. • *Negligible.* Operations at both injection well sites would have a negligible impact on aesthetic resources on neighboring properties that are owned by AEP. No residential properties are located within 1,000 feet of the injection well sites.	**Pipeline Corridors** *(Cont'd)* • *Minor.* Operation of the pipelines corridors would result in minor long-term impacts on land use and aesthetic resources on up to 31 nearby residential receptors, due to concern for concern for human health and safety, which is discussed in Section 3.14, Human Health and Safety. • *Minor.* Operations within the pipeline corridors would result in minor long-term impacts to land use along route options that include the creation of new ROW through private property. Up to 4.0 miles of new ROW would be created. • *Minor.* Lands above the pipeline would return to the current land use after construction; restrictions would apply to the ROWs requiring access for maintenance and would limit construction of permanent structures above the pipelines. **Injection Well Sites** *Same as Scenario A unless otherwise noted below.* • *Minor.* Operations at the injection well sites would result in minor long-term impacts on land use and aesthetic resources at nearby residential properties, due to concern for human health and safety, which is discussed in Section 3.14, Human Health and Safety. The nearest residence to an injection well site at the Eastern Sporn Tract is 380 feet and to the Jordan Tract is 1,210 feet.	**Pipeline Corridors** *(Cont'd)* • *Minor.* Operation of the pipeline corridors would result in minor long-term impacts on land use and aesthetic resources on up to 73 nearby residential receptors, due to concern for human health and safety, which is discussed in Section 3.14, Human Health and Safety. • *Minor.* Operations within the pipeline corridors would result in minor long-term impacts to land use along route options that include the creation of new ROW through private property. Up to 5.2 miles of new ROW would be created. **Injection Well Sites** *Same as Scenarios A & B unless otherwise noted below.* • *Minor.* Operations at the injection well properties would result in minor short-term impacts on land use and aesthetic resources at nearby residential properties, due to concern for human health and safety, which is discussed in Section 3.14, Human Health and Safety. The nearest residence to an injection well site at the Eastern Sporn Tract, Jordan Tract, and Western Sporn Tract is 380 feet, 1,210 feet, and 580 feet, respectively.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Traffic and Transportation			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to traffic and transportation.	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Moderate*. During peak construction conditions (2014), percent increase (from No-Build to Build conditions) in total daily traffic volumes on State Route 62 would range from 12 to 79 percent; percent increase in peak one-way hour traffic volumes would range from 62 to 429 percent. LOSs on State Route 62 would temporarily degrade one to three levels; LOSs would range from C to D.	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Moderate*. Because the majority of new vehicle trips are associated with the construction of the CO_2 capture facility and would be the same for all scenarios, traffic impacts under scenario B would be similar to those under scenario A. During peak construction conditions (2014), percent increase (from No-Build to Build conditions) in total daily traffic volumes on State Route 62 would range from 12 to 85 percent; percent increase in peak one-way hour traffic volumes would range from 66 to 453 percent. LOSs on State Route 62 would temporarily degrade one to three levels; LOSs would range from C to D.	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Moderate*. Because the majority of new vehicle trips are associated with the construction of the CO_2 capture facility and would be the same for all scenarios, traffic impacts under scenario C would be slightly higher than scenario A. During peak construction conditions (2014), percent increase (from No-Build to Build conditions) in total daily traffic volumes on State Route 62 would range from 13 to 87 percent; percent increase in peak one-way hour traffic volumes would range from 69 to 477 percent. LOSs on State Route 62 would temporarily degrade one to three levels; LOSs would be around D.
	OPERATIONS **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Minor*. Percent increase (from No-Build to Build conditions) in total daily traffic volumes on State Route 62 would range from 1 to 5 percent; percent increase in peak one-way hour traffic volumes would range from 4 to 27 percent. LOSs on State Route 62 would remain similar to baseline conditions (A to C).	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Noise			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline routes, and injection well properties would remain in their existing states and there would be no changes to noise levels.	**CONSTRUCTION** **CO_2 Capture Facility (Stationary Noise Impacts)** • *Minor to Moderate*. Construction of the CO_2 capture facility could be audible at all identified receptor locations, with projected increases in noise levels in the range of 8.9 to 15 dBA. Predicted noise levels at nearby receptors analyzed based on one AEP study may exceed EPA guideline threshold (L_{eq} of 48.6 dBA), but within or near levels classified by HUD as "acceptable" (L_{eq} of 58.6 dBA) Discernable increases in sound levels could occur at all receptors. **Pipeline Corridors (Stationary Noise Impacts)** • *Minor*. Extent of impacts dependent on proximity to the construction site, but impacts would be temporary and limited to daylight hours. No sensitive noise receptors are known to be located within 1,000 feet of the pipeline routes. Beyond 1,000 feet, noise levels expected to be within levels classified by HUD as "acceptable."	**CONSTRUCTION** **CO_2 Capture Facility (Stationary Noise Impacts)** *Same as Scenario A.* **Pipeline Corridors (Stationary Noise Impacts)** • *Minor to Moderate*. Extent of impacts primarily dependent on proximity to the construction site, but impacts would be temporary and limited to daylight hours. • For receptors located 500 feet from construction site, predicted noise levels without and with horizontal directional drilling are 64 and 67 dBA, respectively. The following lists the number of receptors within 500 feet for each pipeline route: ▪ BA Route – 0 ▪ ES Route 1 – 1 ▪ ES Route 2 – 2 ▪ ES Route 3 – 1 ▪ ES Route 4 – 3 ▪ JT Route 1 – 4 ▪ JT Route 2 – 3 ▪ JT Route 3 – 5 ▪ JT Route 4 – 4 *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility (Stationary Noise Impacts)** *Same as Scenario A.* **Pipeline Corridors (Stationary Noise Impacts)** • *Minor to Moderate*. Extent of impacts primarily dependent on proximity to the construction site, but impacts would be temporary and limited to daylight hours. • For receptors located 500 feet from construction site, predicted noise levels without and with horizontal directional drilling are 64 and 67 dBA, respectively. The number of receptors within 500 feet for each pipeline would be the same as those listed under Scenario B, with the addition of 19 receptors for WS Route. • For receptors located 1,000 feet from construction site, predicted noise levels without and with horizontal directional drilling are 58 and 61 dBA, respectively. *(Cont'd)*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Noise *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline routes, and injection well properties would remain in their existing states and there would be no changes to noise levels.	**Injection Well Sites (Stationary Noise Impacts)** • *Moderate*. No receptors would be located within a distance that would result in substantial, short-term noise impacts (i.e., within 2,000 feet). The closest noise receptor is located approximately 2,500 feet (from MT-1 well) and could experience a predicted noise level of 56.1 dBA, but would be within levels classified by HUD as "acceptable." If AEP's noise evaluation determines that ambient sound levels at a receptor would experience a change greater than 5 dBA, AEP would evaluate sound mitigation measures to reduce noise levels.	**Pipeline Corridors** *(Cont'd)* **(Stationary Noise Impacts)** • For receptors located 1,000 feet from construction site, predicted noise levels without and with horizontal directional drilling are 58 and 61 dBA, respectively. The following lists the number of receptors within 1,000 feet for each pipeline route: ▪ BA Route – 0 ▪ ES Route 1 – 2 ▪ ES Route 2 – 12 ▪ ES Route 3 – 5 ▪ ES Route 4 – 16 ▪ JT Route 1 – 11 ▪ JT Route 2 – 11 ▪ JT Route 3 – 15 ▪ JT Route 3 – 15 **Injection Well Sites (Stationary Noise Impacts)** • *Minor to Moderate*. Extent of impacts primarily dependent on proximity to the construction site. Sound levels could reach 70.0, 64.0, and 58.0 dBA for receptors located within 500, 1,000, and 2,000 feet of the well construction site, respectively. If AEP's noise evaluation determines that ambient sound levels at a receptor would experience a change greater than 5 dBA, AEP would evaluate sound mitigation measures to reduce noise levels. *(Cont'd)*	**Pipeline Corridors** *(Cont'd)* **(Stationary Noise Impacts)** • The number of receptors within 1,000 feet for each pipeline would be the same as those listed under Scenario B, with the addition of 42 receptors for WS Route. **Injection Well Sites (Stationary Noise Impacts)** • *Minor to Moderate*. Extent of impacts primarily dependent on proximity to the construction site. Sound levels could reach 70.0, 64.0, and 58.0 dBA for receptors located within 500, 1,000, and 2,000 feet of the well construction site, respectively. If AEP's noise evaluation determines that ambient sound levels at a receptor would experience a change greater than 5 dBA, AEP would evaluate sound mitigation measures to reduce noise levels. *(Cont'd)*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
	Noise *(Cont'd)*		
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline routes, and injection well properties would remain in their existing states and there would be no changes to noise levels	**Combined (Mobile Noise Impacts)** • *Negligible*. Overall baseline noise levels along State Route 62 would increase slightly (by 0.3 to 1.5 dBA), but is generally not expected to be detectable.	**Injection Well Sites** *(Cont'd)* **(Stationary Noise Impacts)** • The following lists the number of receptors for each injection well site that could experience short-term, substantial noise impacts (within 2,000 feet and without noise mitigation measures): ▪ BA-1 – 0 ▪ ES-1, ES-2, & ES-3 – 12 ▪ JT-1 – 3 **Combined (Mobile Noise Impacts)** • *Negligible*. Overall baseline noise levels along State Route 62 would increase slightly (by 0.3 to 1.7 dBA), but is generally not expected to be detectable.	**Injection Well Sites** *(Cont'd)* **(Stationary Noise Impacts)** • The number of receptors within 2,000 feet for each injection well site that could experience short-term, substantial noise impacts (within 2,000 feet and without noise mitigation measures) would be the same as those listed under Scenario B, with the addition of 39 receptors for WS. **Combined (Mobile Noise Impacts)** • *Negligible*. Overall baseline noise levels along State Route 62 would increase slightly (by 0.4 to 1.8 dBA), but is generally not expected to be detectable.
	OPERATIONS **CO_2 Capture Facility (Stationary Noise Impacts)** • *Minor*. Predicted noise levels may exceed the EPA guidelines threshold at Receptors 1, 4, and 5, but within levels classified by HUD as "acceptable." Sound levels would range from 47.2 to 53.2 dBA at these receptors. It is not expected that clearly discernable increases in sound levels would occur at any of the receptors. Upon review of final equipment noise evaluations, AEP would incorporate sound enclosures, barriers, and/or sound dampening materials, as appropriate, to ensure that changes in noise levels at receptors do not exceed detectable levels (i.e., 5 dBA).	**OPERATIONS** **CO_2 Capture Facility (Stationary Noise Impacts)** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility (Stationary Noise Impacts)** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Noise *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline routes, and injection well properties would remain in their existing states and there would be no changes to noise levels.	**Pipeline Corridors (Stationary Noise Impacts)** • *Negligible*. The pipeline would primarily be buried, negligible noise impacts are expected. **Injection Well Sites (Stationary Noise Impacts)** • *Negligible to Moderate*. During normal operations, operation of wells expected to result in negligible noise impacts. During maintenance activities, temporary noise increase could result in moderate impacts, depending on distance to closest receptor. **Combined (Mobile Noise Impacts)** • *Negligible.* Overall baseline noise levels along State Route 62 would increase slightly, but is generally not expected to be detectable.	**Pipeline Corridors (Stationary Noise Impacts)** *Same as Scenario A.* **Injection Well Sites (Stationary Noise Impacts)** *Same as Scenario A.* **Combined (Mobile Noise Impacts)** *Same as Scenario A.*	**Pipeline Corridors (Stationary Noise Impacts)** *Same as Scenario A.* **Injection Well Sites (Stationary Noise Impacts)** *Same as Scenario A.* **Combined (Mobile Noise Impacts)** *Same as Scenario A.*
Materials and Waste Management			
	CONSTRUCTION **CO_2 Capture Facility** • *Negligible.* Construction materials are available locally and nationally. The capacity of suppliers would not be exceeded. • *Negligible.* Clearing, grubbing, and excavating would generate excess soils, sub-soils, rock, brush, and timber. The materials would be re-used by AEP or reused as raw material (timber) in the ROI to the extent possible. Otherwise, the debris would be properly disposed of in a licensed landfill. • *Negligible.* C&D debris would be generated. Recycling options would be targeted. Landfill use is at 47.9 percent of permitted capacity in West Virginia. Landfills within the ROI have sufficient capacity to accept these wastes.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Materials and Waste Management *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well sites would remain in their existing states and there would be no changes to materials and waste management.	**Pipeline Corridors** • *Negligible*. Clearing, grubbing, and excavating would generate excess soils, sub-soils, rock, brush, and timber. The materials would be re-used by AEP or reused as raw material (timber) in the ROI to the extent possible. Otherwise, the debris would be properly disposed of in a licensed landfill. **Injection Well Sites** • *Negligible*. Drill cuttings, drilling mud, and water would require treatment, recycling, or disposal. Treatment, recycling, or disposal options are available in the ROI and would be temporary.	**Pipeline Corridors** *Same as Scenario A with additional material and waste volume.* **Injection Well Sites** *Same as Scenario A with additional material and waste volume.*	**Pipeline Corridors** *Same as Scenario A with additional material and waste volume.* **Injection Well Sites** *Same as Scenario A with additional material and waste volume.*
	OPERATIONS **CO_2 Capture Facility** • *Minor.* Industrial wastewater would be generated in the CAP process and treated in the new WWTP or use existing WWTP capacity. Additional sludge would be generated at the new Mountaineer WWTP from the CAP process. The relatively small amount of additional waste sludge would be disposed of in the existing AEP landfill that has capacity for the life of the project. *(Cont'd)*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Materials and Waste Management *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well sites would remain in their existing states and there would be no changes to materials land waste management.	**CO_2 Capture Facility** *(Cont'd)* • *Beneficial to Moderate*. The ammonium sulfate by-product impact would be beneficial long-term if the material is used for commercial purposes, as additional energy and materials would not be required to produce this common commercial product. If the material would be landfilled, there are multiple receiving facilities available with unused capacity and a relatively long-life span that could accept this non-hazardous material (as a solid). The impact is considered moderate because of the long-term disposal requirement, if it is not beneficially used. • *Minor*. Solid waste related mainly to miscellaneous facility (worker) trash, including paper, cardboard, aluminum, and glass would be generated. A recycling program would be implemented for these non-hazardous waste streams.		

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Materials and Waste Management *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well sites would remain in their existing states and there would be no change to materials and waste management.	**Pipeline Corridors** • *Negligible*. Along the pipeline routes, additional materials would not be required. Vegetation cut during maintenance activities along the corridors would be re-used as mulch or compost on the AEP property to the extent possible. Otherwise, the debris would be properly disposed of in a licensed landfill. **Injection Well Sites** • *Minor*. Intermittent, long-term maintenance of the wells would be required, generating solid and liquid wastes. Facilities are available for treatment and disposal within the regional or national ROI.	**Pipeline Corridors** *Same a Scenario A with additional material and waste volume.* **Injection Well Sites** *Similar to Scenario A with additional material and waste volume.*	**Pipeline Corridors** *Same as Scenario A with additional material and waste volume.* **Injection Well Sites** *Similar to Scenario A with additional material and waste volume.*
Human Health and Safety			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to human health and safety.	**CONSTRUCTION** **CO_2 Capture Facility** • *Minor.* Potential for construction accidents and injuries to workers; based on industry data could result in 13 to 16 recordable incidents over the entire 32-month construction period, but no fatalities would be anticipated.	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

<table>
<tr><th>No Action Alternative</th><th>Scenario A
(Lower Bound)</th><th>Scenario B</th><th>Scenario C
(Upper Bound)</th></tr>
<tr><td colspan="4">Human Health and Safety (Cont'd)</td></tr>
<tr><td rowspan="4"><u>CONSTRUCTION AND OPERATIONS</u>
None. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to human health and safety.</td><td>Pipeline Corridors
• Minor. Potential for construction accidents and injuries to workers from construction of pipeline.
Injection Well Sites
• Minor. Potential for construction accidents and injuries to workers from construction of injection wells.</td><td>Pipeline Corridors
• Minor. Same as Scenario A, but with up to 18.33 miles of additional pipeline.
Injection Well Sites
• Minor. Same as Scenario A, but with addition of 2 injection wells.</td><td>Pipeline Corridors
• Minor. Same as Scenario A, but with up to 24.02 miles of additional pipeline.
Injection Well Sites
• Minor. Same as Scenario A, but with addition of 4 injection wells.</td></tr>
<tr><td colspan="3"><u>OPERATIONS</u>
CO_2 Capture Facility
Minor. Potential impacts would be the same for all scenarios. Consequences of release scenarios vary with wind direction; therefore, the impacts summary below has been prepared for three different wind directions.

The release scenarios for the operation of the CO_2 capture facility all represent unlikely events; events estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1 x 10^{-2}/yr to 1 x 10^{-4}/yr).</td></tr>
<tr><td colspan="3">Rupture of Refrigerated Anhydrous Ammonia Tank
Rupture of refrigerated anhydrous ammonia tank could result in release of 250,000 pounds of anhydrous ammonia, and potentially expose human populations to gas containing high concentrations of ammonia. Populations exposed from such a release would be dependent on the location of the releases, the meteorological conditions (including atmospheric stability and wind speed and direction) and other factors.

<table>
<tr><th>W/SSW Wind Direction</th><th>E/SE Wind Direction</th><th>NW Wind Direction</th></tr>
<tr><td><u>Type of Effect No. Individuals</u></td><td><u>Type of Effect No. Individuals</u></td><td><u>Type of Effect No. Individuals</u></td></tr>
<tr><td>Transient and reversible <187</td><td>Transient and reversible <1,765</td><td>Transient and reversible <704</td></tr>
<tr><td>Irreversible adverse <7</td><td>Irreversible adverse <6</td><td>Irreversible adverse <6</td></tr>
<tr><td>Life-threatening <4</td><td>Life-threatening <3</td><td>Life-threatening <3</td></tr>
</table></td></tr>
<tr><td colspan="3">Rupture of Liquefied Pressure Anhydrous Ammonia Tank
Rupture of liquefied pressure anhydrous ammonia tank could result in release of 250,000 pounds of anhydrous ammonia, and potentially expose human populations to gas containing high concentrations of ammonia. Populations exposed from such a release would be dependent on the location of the releases, the meteorological conditions (including atmospheric stability and wind speed and direction) and other factors

<table>
<tr><th>W/SSW Wind Direction</th><th>E/SE Wind Direction</th><th>NW Wind Direction</th></tr>
<tr><td><u>Type of Effect No. Individuals</u></td><td><u>Type of Effect No. Individuals</u></td><td><u>Type of Effect No. Individuals</u></td></tr>
<tr><td>Transient and reversible <408</td><td>Transient and reversible<2,858</td><td>Transient and reversible <828</td></tr>
<tr><td>Irreversible adverse <13</td><td>Irreversible adverse <153</td><td>Irreversible adverse <10</td></tr>
<tr><td>Life-threatening <13</td><td>Life-threatening <11</td><td>Life-threatening <11</td></tr>
</table></td></tr>
</table>

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Human Health and Safety *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to human health and safety.	**Rupture of 29-percent Aqueous Ammonia Tank** Rupture of aqueous ammonia tank could result in release of 400,000 pounds of aqueous ammonia, and potentially expose human populations to gas containing high concentrations of ammonia. Populations exposed from such a release would be dependent on the location of the releases, the meteorological conditions (including atmospheric stability and wind speed and direction) and other factors.		
	W/SSW Wind Direction Type of Effect — No. Individuals Transient and reversible — <25 Irreversible adverse — <2 Life-threatening — <3	**E/SE Wind Direction** Type of Effect — No. Individuals Transient and reversible — <634 Irreversible adverse — <2 Life-threatening — <2	**NW Wind Direction** Type of Effect — No. Individuals Transient and reversible — <659 Irreversible adverse — <2 Life-threatening — <2
	Unloading of 80-Ton Rail Car with Anhydrous Ammonia The release of anhydrous ammonia during unloading of an 80-ton rail car could result in potential exposure of human populations to high concentrations of NH_3. The end point distances for such a release are found in Table 3.14-9. Populations exposed from such a release would be dependent on the location of the releases, the meteorological conditions (including atmospheric stability and wind speed and direction) and other factors.		
	W/SSW Wind Direction Type of Effect — No. Individuals Transient and reversible — <161 Irreversible adverse — <8 Life-threatening — <9	**E/SE Wind Direction** Type of Effect — No. Individuals Transient and reversible — <2,410 Irreversible adverse — <7 Life-threatening — <7	**NW Wind Direction** Type of Effect — No. Individuals Transient and reversible — <857 Irreversible adverse — <7 Life-threatening — <7
	Unloading of 116-Ton Rail Car with 29-percent Aqueous Ammonia The release of aqueous ammonia during unloading of a 116-ton rail car could result in potential exposure of human populations to high concentrations of ammonia. Populations exposed from such a release would be dependent on the location of the releases, the meteorological conditions (including atmospheric stability and wind speed and direction) and other factors.		
	W/SSW Wind Direction Type of Effect — No. Individuals Transient and reversible — <224 Irreversible adverse — <11 Life-threatening — <7	**E/SE Wind Direction** Type of Effect — No. Individuals Transient and reversible — <2,576 Irreversible adverse — <133 Life-threatening — <6	**NW Wind Direction** Type of Effect — No. Individuals Transient and reversible — <857 Irreversible adverse — <95 Life-threatening — <6
	Unloading of 18-Ton Tank Truck with Anhydrous Ammonia The release of anhydrous ammonia during unloading of an 18-ton tank truck could result in potential exposure of human populations to high concentrations of ammonia. Populations exposed from such a release would be dependent on the location of the releases, the meteorological conditions (including atmospheric stability and wind speed and direction) and other factors.		
	W/SSW Wind Direction Type of Effect — No. Individuals Transient and reversible — <27 Irreversible adverse — <2 Life-threatening — <2	**E/SE Wind Direction** Type of Effect — No. Individuals Transient and reversible — <312 Irreversible adverse — <2 Life-threatening — <2	**NW Wind Direction** Type of Effect — No. Individuals Transient and reversible — <223 Irreversible adverse — <2 Life-threatening — <2

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Human Health and Safety *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to human health and safety.	**Unloading of 26-Ton Tank Truck with 29-percent Aqueous Ammonia** The release of aqueous ammonia during unloading of a 26-ton tank truck could result in potential exposure of human populations to high concentrations of ammonia. Populations exposed from such a release would be dependent on the location of the releases, the meteorological conditions (including atmospheric stability and wind speed and direction) and other factors.		
	W/SSW Wind Direction Type of Effect / No. Individuals Transient and reversible <31 Irreversible adverse <2 Life-threatening <2	**E/SE Wind Direction** Type of Effect / No. Individuals Transient and reversible <789 Irreversible adverse <2 Life-threatening <1	**NW Wind Direction** Type of Effect / No. Individuals Transient and reversible <641 Irreversible adverse <2 Life-threatening <1
	Pipeline Corridors • **CO_2 Release due to leakage from catastrophic failure of caprock or through lateral migration.** This event estimated to occur less than one time in 1 million years of facility operations. • CO_2 concentrations in ambient air for this hypothetical would be less than established health criteria, and no effects to the public would be expected. • **CO_2 Release due to pipeline rupture or puncture during operation.** These events are estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1 x 10^{-2}/yr to 1 x 10^{-4}/yr); unlikely. • The rupture or puncture of a pipeline would release gas containing high concentrations of CO_2, and potential trace concentrations of ammonia, and could potentially expose populations to potential health effects: *(Cont'd)*	**Pipeline Corridors** • **CO_2 Release due to leakage from catastrophic failure of caprock or through lateral migration.** This event estimated to occur less than one time in 1 million years of facility operations. *Same as Scenario A.* • **CO_2 Release due to pipeline rupture or puncture during operation.** These events are estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1 x 10^{-2}/yr to 1 x 10^{-4}/yr); unlikely. • The rupture or puncture of a pipeline would release gas containing high concentrations of CO_2, and potential trace concentrations of ammonia, and could potentially expose populations to potential health effects: *(Cont'd)*	**Pipeline Corridors** • **CO_2 Release due to leakage from catastrophic failure of caprock or through lateral migration.** This event estimated to occur less than one time in 1 million years of facility operations. *Same as Scenario A.* • **CO_2 Release due to pipeline rupture or puncture during operation.** These events are estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1 x 10^{-2}/yr to 1 x 10^{-4}/yr); unlikely. • The rupture or puncture of a pipeline would release gas containing high concentrations of CO_2, and potential trace concentrations of ammonia, and could potentially expose populations to potential health effects: *(Cont'd)*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Human Health and Safety *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to human health and safety.	**Pipeline Rupture** Type of Effect — No. Individuals Transient and reversible — <1 Irreversible adverse — <1 Life-threatening — <1	**Pipeline Rupture** Type of Effect — No. Individuals *Transient and reversible* Borrow Area Route — < 1 Eastern Sporn Routes — < 5 Jordan Routes — < 4 *Irreversible adverse* All routes — <1 Life-threatening All routes — <1	**Pipeline Rupture** Type of Effect — No. Individuals *Transient and reversible* Borrow Area Route — < 1 Eastern Sporn Routes — < 5 Jordan Routes — < 4 Western Sporn Route — < 3 *Irreversible adverse* All routes — <1 Life-threatening All routes — <1
	Pipeline Puncture Type of Effect — No. Individuals *Transient and reversible* Irreversible adverse — 0 Life-threatening — 0	**Pipeline Puncture** Type of Effect — No. Individuals *Transient and reversible* All segments — <1 *Irreversible adverse* All segments — <1 Life-threatening All segments — <1	**Pipeline Puncture** Type of Effect — No. Individuals *Transient and reversible* All segments — <1 *Irreversible adverse* All segments — <1 Life-threatening All segments — <1
	Injection Well Sites • **CO_2 release from failure of an injection well during operation.** Estimated to occur between once in 10,000 years and once in 1 million years of facility operations (frequency from 1 x 10^{-4}/yr to 1 x 10^{-6}/yr); Extremely Unlikely. • Release of gas containing high concentrations of CO_2, and potential trace concentrations of ammonia, could expose individuals to potential health effects within 50 feet of wellhead. These effects are expected to be primarily limited to workers. Effects on non-involved workers would be transient effects from CO_2 if present within approximately 50 - 180 feet of wellhead at time of release. Potential effects to offsite receptors at the Borrow Area well from CO_2 would be: *(Cont'd)*	**Injection Well Sites** • **CO_2 release from failure of an injection well during operation.** Estimated to occur between once in 10,000 years and once in 1 million years of facility operations (frequency from 1 x 10^{-4}/yr to 1 x 10^{-6}/yr); Extremely Unlikely. • Release of gas containing high concentrations of CO_2, and potential trace concentrations of ammonia, could expose populations to potential health effects within 50 feet of wellhead. These effects are expected to be primarily limited to workers. Effects on non-involved workers would be *same as Scenario A.* Potential effects to offsite receptors from CO_2 would be: *(Cont'd)*	**Injection Well Sites** • **CO_2 release from failure of an injection well during operation.** Estimated to occur between once in 10,000 years and once in 1 million years of facility operations (frequency from 1 x 10^{-4}/yr to 1 x 10^{-6}/yr); Extremely Unlikely. • Release of gas containing high concentrations of CO_2, and potential trace concentrations of ammonia, could expose populations to potential health effects within 50 feet of wellhead. These effects are expected to be primarily limited to workers. Effects on non-involved workers would be *same as Scenario A.* Potential effects to offsite receptors from CO_2 would be: *(Cont'd)*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Human Health and Safety *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to human health and safety.	**Injection Well Sites (***Cont'd)* Type of Effect No. Individuals Transient and reversible 0 Irreversible adverse 0 Life-threatening 0 • **Post injection CO_2 release due to leakage from: abandoned or undocumented deep wells; existing faults; unknown structural or stratigraphic connections.** This event is estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1 x 10^{-2}/yr to 1 x 10^{-4}/yr); unlikely. • Release of CO_2 through these mechanisms would not be expected to result in concentrations in ambient air in excess of established health criteria; no effects to the public would be expected.	**Injection Well Sites (***Cont'd)* Type of Effect No. Individuals *Transient and reversible* Borrow Area Tract 0 Eastern Sporn Tract <1 Jordan Tract <1 *Irreversible adverse (all)* 0 *Life-threatening (all)* 0 • **Post injection CO_2 release due to leakage from: abandoned or undocumented deep wells; existing faults; unknown structural or stratigraphic connections.** This event is estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1 x 10^{-2}/yr to 1 x 10^{-4}/yr); unlikely. *Same as Scenario A.*	**Injection Well Sites (***Cont'd)* Type of Effect No. Individuals *Transient and reversible* Borrow Area Tract 0 Eastern Sporn Tract <1 Jordan Tract <1 Western Sporn <1 *Irreversible adverse (all) 0* *Life-threatening (all) 0* • **Post injection CO_2 release due to leakage from: abandoned or undocumented deep wells; existing faults; unknown structural or stratigraphic connections.** This event is estimated to occur between once in 100 years and once in 10,000 years of facility operations (frequency from 1 x 10^{-2}/yr to 1 x 10^{-4}/yr); unlikely. *Same as Scenario A.*
Utilities			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no change to utilities.	**CONSTRUCTION** **CO_2 Capture Facility** • *Minor.* Increased demand for potable water for construction workers on entire Mountaineer CCS II Project would consume between 0.5 percent and 16 percent of the unused capacity of the NHWF. *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
	Utilities *(Cont'd)*		
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to utilities.	**CO_2 Capture Facility** *(Cont'd)* • As such, potential impacts to potable water and wastewater treatment utilities would be short term and minor. • *Negligible.* Increased demand for process water and electricity for construction of the CO_2 capture facility would be provided by the existing Mountaineer river water loop and Mountaineer Plant, respectively, and would not affect local utilities. **Pipeline Corridors** • *Negligible.* Potable water and wastewater impacts for construction workers associated with the pipeline are negligible and included in the totals presented above. Any potential impacts would be negligible. • *Negligible.* Construction water and electrical demand would not be provided by nor affect public utilities for the construction of pipelines and injection wells. **Injection Well Sites** • *Negligible.* Potable water and wastewater impacts for construction workers associated with the injection well sites are negligible. Any potential impacts would be negligible. *(Cont'd)*	**Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.* • However, if the Mountaineer Plant provides all the water required for drilling, the demand would represent between 4 to 6 percent of the NHWF's unused capacity.	**Pipeline Corridors** *Same as Scenario A.* **Injection Well Sites** *Same as Scenario A.* • However, if the Mountaineer Plant provides all the water required for drilling, the demand would represent between 5 to 9 percent of the NHWF's unused capacity.

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
	Utilities *(Cont'd)*		
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to utilities.	**Injection Well Sites** *(Cont'd)* • *Negligible.* The primary source of water for drilling has not yet been determined. If the ash pond or Ohio River are used as sources, there would be no effect on the utilities. If the Mountaineer Plant provides all the water required for drilling, the demand would represent between 2 to 4 percent of the NHWF's unused capacity. Electricity would be supplied from the closest appropriate source and impacts would be negligible.		.
	OPERATIONS **CO_2 Capture Facility** • *Minor.* An increased labor force would raise potable water consumption by 2,166 gpd, which represents 0.7 percent of the unused capacity of the NHWF. Increased sanitary wastewater generation would consume 0.9 percent of the unused capacity of the NHSWF. • *Negligible.* Increased daily demand for process water and electricity would be satisfied by the existing Mountaineer river water loop and Mountaineer Plant, respectively, and would not affect local utilities. **Pipeline Corridors** • *Negligible.* The pipeline corridors would have no independent operational utility demands and would not affect local utilities.	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* . **Pipeline Corridors** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility** *Same as Scenario A.* . **Pipeline Corridors** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Utilities *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to utilities.	**Injection Well Sites** • *Negligible.* Injection well sites would have no independent operational demand for potable water, process water, or wastewater treatment. If electricity is provided through the impact to construction material resources and suppliers it would be negligible. • *Negligible to Minor.* If electricity at the injection well sites is provided by AEP it would have a negligible impact . If connection to public electrical utilities would occur, potential impacts are expected to be minor.	**Injection Well Sites** *Same as Scenario A.*	**Injection Well Sites** *Same as Scenario A.*
Community Services			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to community services.	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Negligible.* The construction of the Mountaineer CCS II Project would not displace any community services, impact any law enforcement, fire protection, and emergency service access, or conflict with local and regional plans for community services. • *Negligible to Minor*. The temporary increase in construction workers would have a short-term negligible to minor impact on community facilities and services.	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Community Services *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to community services.	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Negligible.* The operation of the Mountaineer CCS II Project would not displace any community services, impact any law enforcement, fire protection, and emergency service access, or conflict with local and regional plans for community services. • *Negligible to Minor.* Once operational, the Mountaineer CCS II Project could result in an increase in population of approximately 95 residents. This increase would have a negligible to minor impact on community services as it represents only a 0.04 percent increase in population.	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*
Socioeconomics			
	CONSTRUCTION **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Negligible to Minor*. Some construction workers hired for the project would be expected to commute to the construction site on a daily basis, while others would relocate to the area for the duration of the construction period. Therefore, a negligible to minor increase in population may occur. • *Beneficial*. The minor temporary increase in population would increase local housing demand commensurately, and would have a minor beneficial short-term impact on the ROI's housing market. *(Cont'd)*	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Socioeconomics *(Cont'd)*			
	CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites *(Cont'd)* • *Beneficial.* There would be moderate, short-term beneficial impact to economy and employment within the ROI from construction of the Mountaineer CCS II Project. • *Beneficial.* There would be a moderate, short-term beneficial impact to taxes and revenue within the ROI from construction of the Mountaineer CCS II Project		
	OPERATIONS **Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Negligible to Minor.* There would be a negligible to minor impact to population and housing from operation of the Mountaineer CCS II Project . • The project would require an increase in staff of approximately 38 full-time employees. It is anticipated that many of these workers would be drawn from the regional labor pool and already reside within the ROI. • *Beneficial.* The operational phase of the project would have annual operation and maintenance needs that would benefit the ROI. The operational phase of the project would also have a direct and beneficial impact on employment by creating 38 permanent jobs in the ROI.	**OPERATIONS** **Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*	**OPERATIONS** **Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Socioeconomics *(Cont'd)*			
	• *Negligible to Minor.* Once operational, the project could result in an increase in population of approximately 95 residents. This increase would have a negligible to minor impact on community services as it represents only a 0.04 percent increase in population. • *Negligible*. There would be a negligible, long-term impact to taxes and revenue within the ROI from operation of the project.		
Environmental Justice			
CONSTRUCTION AND OPERATIONS *None*. The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to environmental justice.	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Negligible*. There are no areas of minority population located within the ROI. Therefore, no disproportionately high and adverse impacts to minority populations are anticipated during construction. • *Beneficial.* Although there are low-income individuals living within the ROI, the percentage of low-income individuals living within Census Tract 954800 is lower than both the remainder of Mason County and the state. Therefore, no disproportionately high and adverse impacts to low-income populations are anticipated. Potential impacts would be temporary in nature. Conversely, short-term beneficial impacts may include an increase in employment opportunities and potentially higher wages or supplemental income through jobs created during construction of the Mountaineer CCS II Project.	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*	**CONSTRUCTION** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*

Table 4.1-2. Summary Comparison of Unavoidable Impacts of the Mountaineer CCS II Project

No Action Alternative	Scenario A *(Lower Bound)*	Scenario B	Scenario C *(Upper Bound)*
Environmental Justice *(Cont'd)*			
CONSTRUCTION AND OPERATIONS *None.* The Mountaineer Plant property, pipeline corridors, and injection well properties would remain in their existing states and there would be no changes to environmental justice.	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** • *Negligible.* There are no areas of minority population located within the ROI. Therefore, no disproportionately high and adverse impacts to minority populations are anticipated during operation. • *Beneficial.* Although there are low-income individuals living within the ROI, the percentage of low-income individuals living within Census Tract 954800 is lower than both the remainder of Mason County and the state. Therefore, no disproportionately high and adverse impacts to low-income populations are anticipated. In addition, a minor long-term beneficial impact to low-income populations would include an increase in employment opportunities and potentially higher wages or supplemental income through jobs created during operation (i.e., up to 38 jobs) of the Mountaineer CCS II Project.	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*	**OPERATIONS** **CO_2 Capture Facility, Pipeline Corridors, and Injection Well Sites** *Same as Scenario A.*

AEP = American Electric Power Service Corporation; APE = Area of Potential Effect; BMP = best management practice; C&D = construction & demolition; CAP = chilled ammonia process; CO = carbon monoxide; CO_2 = carbon dioxide; CO_2-eq = carbon dioxide equivalent; dBA = A-weighted decibel; DOE = U.S. Department of Energy; EPA = U.S. Environmental Protection Agency; GHG = greenhouse gas; gpd = gallons per day; HEL = highly erodible land; HUD = U.S. Department of Housing and Urban Development; mgd= million gallons per day; L_{eq} = continuous equivalent sound level; LOS = level of service; MBTA = Migratory Bird Treaty Act; NH_3 = ammonia; NHSWF = New Haven Sanitary Waste Facility; NHWF = New Haven Water Facility; NO_x = nitrogen oxides; NPDES = National Pollutant Discharge Elimination System; PHEL = potentially highly erodible land; PM_{10} = particulate matter of diameter 10 microns or less; $PM_{2.5}$ = particulate matter of diameter 2.5 microns or less; ppmv = parts per million by volume; ROI = region of influence; ROW = right-of-way; SO_2 = sulfur dioxide; SO_3 = sulfur trioxide; tpy = tons per year; UIC = Underground Injection Control; USFWS = U.S. Fish and Wildlife Service; VOC = volatile organic compound; WWTP = wastewater treatment plant; E = east; SSW = south, southwest; NW = northwest; SE = southeast; W = west

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4.2 POTENTIAL CUMULATIVE IMPACTS

4.2.1 Background and Requirements

This section analyzes potential cumulative impacts of the proposed project. Cumulative impacts include the potential environmental impacts from other existing or proposed actions that, in combination with potential environmental impacts from the Mountaineer CCS II Project, could result in collectively significant (i.e., cumulative) effects. The CEQ defines "cumulative impact" in regulations implementing the procedural provisions of NEPA (40 CFR 1508.7) as, *"...the impact on the environment which results from the incremental impact of the [proposed] action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."* CEQ has provided guidance to NEPA analysts conducting cumulative impacts analyses within "*Considering Cumulative Effects under the National Environmental Policy Act*" (CEQ, 1997b).

Cumulative effects analysis captures the impacts that result from a project in combination with the effects of other actions taken during the duration of the project in the same ROI (i.e., at the same time and place). Cumulative effects may be accrued over time or in conjunction with other pre-existing effects from multiple activities in an area (40 CFR 1508.25); therefore, pre-existing impacts and multiple smaller impacts should also be considered. Overall, assessing cumulative effects involves defining the scope of the other actions and their interrelationship with the project to determine if they overlap in space and time. Because of the extensive influences of multiple forces, cumulative effects are the most difficult to analyze.

The NEPA, CEQ, and DOE NEPA regulations require the analysis of cumulative environmental effects of a Proposed Action on resources that may often be manifested only at the cumulative level, such as traffic congestion, air quality, noise, biological resources, cultural resources, socioeconomic conditions, utility system capacities, and others. Cumulative effects can result from individually minor, but collectively significant actions taking place at the same time and place, over time. Therefore, this cumulative effects analysis must determine if the project has the potential to result in either significant adverse or beneficial incremental impacts when considering other past, present, and future actions in the ROI.

An inherent aspect of the cumulative impacts analysis is the uncertainty surrounding future proposed actions within the Proposed Action's ROI. Most of these future proposed actions are not yet fully developed, lack supporting environmental investigations, or may not have been publicly announced. Consequently, the analysis contained in this section focuses on what could be reasonably anticipated based on available data. In addition, this analysis relies on past trends within the ROI that establish a reasonable baseline and anticipated future trajectory of proposed activities within the ROI. As many of the future proposed activities lack detailed environmental investigation data (i.e., necessary to fully identify cause-and-effect linkages to the Proposed Action), this analysis presents a reasonable, good faith effort to identify such actions, their potential effects, and the inter-relationships with the Proposed Action. These include both environmental linkages and the indirect effects related to the long-term operation of the Mountaineer CCS II Project.

Because impacts could accumulate in one or more specific resource areas, the analysis of impacts must focus on particular resources or impact areas, as opposed to merely aggregating all of the actions occurring in the ROI and attempting to form some conclusions regarding the cumulative effects of the many unrelated impacts. On this basis, the analysis of cumulative environmental impacts in this section emphasizes the resource areas for which the combination of impacts from the project and impacts from one or more other actions would potentially result in greater adverse impacts than in the case of each action separately (i.e., synergistic effects). Other resource areas, which would not experience

substantially greater impacts from the combination of the Mountaineer CCS II Project and one or more other actions, receive less emphasis in this analysis, as appropriate.

4.2.2 Approach

When analyzing cumulative effects, it is paramount to establish spatial and temporal parameters for the analysis (CEQ, 1997b). ROIs for each resource area have been identified in Chapter 3. The DOE established these ROIs based on the potential for direct, indirect, and cumulative effects of the project to manifest, considering both the context and intensity of each effect (40 CFR 1508.27).

The largest of these geographically defined ROIs (see Section 3.17, Socioeconomics) included the seven-county area surrounding the location of the project. This seven-county area includes Mason County, West Virginia (in which the project would be located) as well as immediately contiguous counties. These include Cabell, Putnam, and Jackson Counties in West Virginia, and Meigs and Gallia Counties in Ohio (see Figure 4.2-1). ROIs for other technical resource areas generally lie within this larger ROI. It is noted that the ROI for global climate change, for example, extends well beyond this boundary, and is discussed accordingly within this section.

Various factors influence the resource-specific spatial boundary, or ROI, of potential cumulative effects. For example, potential cumulative impacts to vegetation and archeological resources would be limited generally to the locations of anticipated construction and their immediate vicinities (e.g., the viewshed around historic properties). Cumulative visual and noise impacts would be limited generally to line-of-sight and hearing range from the project. In contrast, cumulative impacts from air emissions may extend miles beyond the project sites, as could impacts from discharges to a stream or river. The potential effects of GHG emissions would be global. The ROI shown in Figure 4.2-1 has been carefully established to capture those geographic areas most likely to experience meaningful and tangible (i.e., significant) cumulative effects, fully recognizing that less intense effects may occur beyond those boundaries. This clear definition is in accordance with the guidance provided by the CEQ (CEQ, 1997b). This "framing" is a necessary step to spatially bound the cumulative impact analysis, as directed by CEQ (CEQ, 1997b).

From a temporal perspective, the majority of the project's effects would be associated with the proposed 32-month construction period, extending from approximately January 2013 to August 2015. However, effects would also be associated with operation of the project over its anticipated 20-year life. As shown throughout Chapter 3, the potential effects of the project on each resource area would vary from short to long term. Relying on that project-specific effects' analysis and the temporal requirements of the project, this cumulative impacts analysis focuses on both the short term (32-month construction period) and the long term (20-year operation period) of the project to identify potential significant cumulative effects.

Past and present projects and activities within the ROI are effectively captured within the description of the affected environment of each resource area in Chapter 3. That affected environment discussion identified existing trends in resource conditions, such as population growth, other geologic resource effects (from past and ongoing mining operations), fragmentation of habitats, and the like within the ROI.

For the purposes of conducting a meaningful cumulative effects analysis, the DOE included and analyzed future proposed actions in the ROI based on their location (i.e., proximity to the project), their potential to result in environmental effects to each resource area based on the project's ROI for each resource area, and the timeframe in which they are planned. The DOE identified these future proposed actions through scoping; conversations with regulatory agencies, local municipal and county governments, and county economic development organizations; reviews of published and on-line resources, including local policies, land use plans, and other plans from agencies at various levels of government; reviews of published media accounts; conversations with private organizations; and other data available from reliable internet sources.

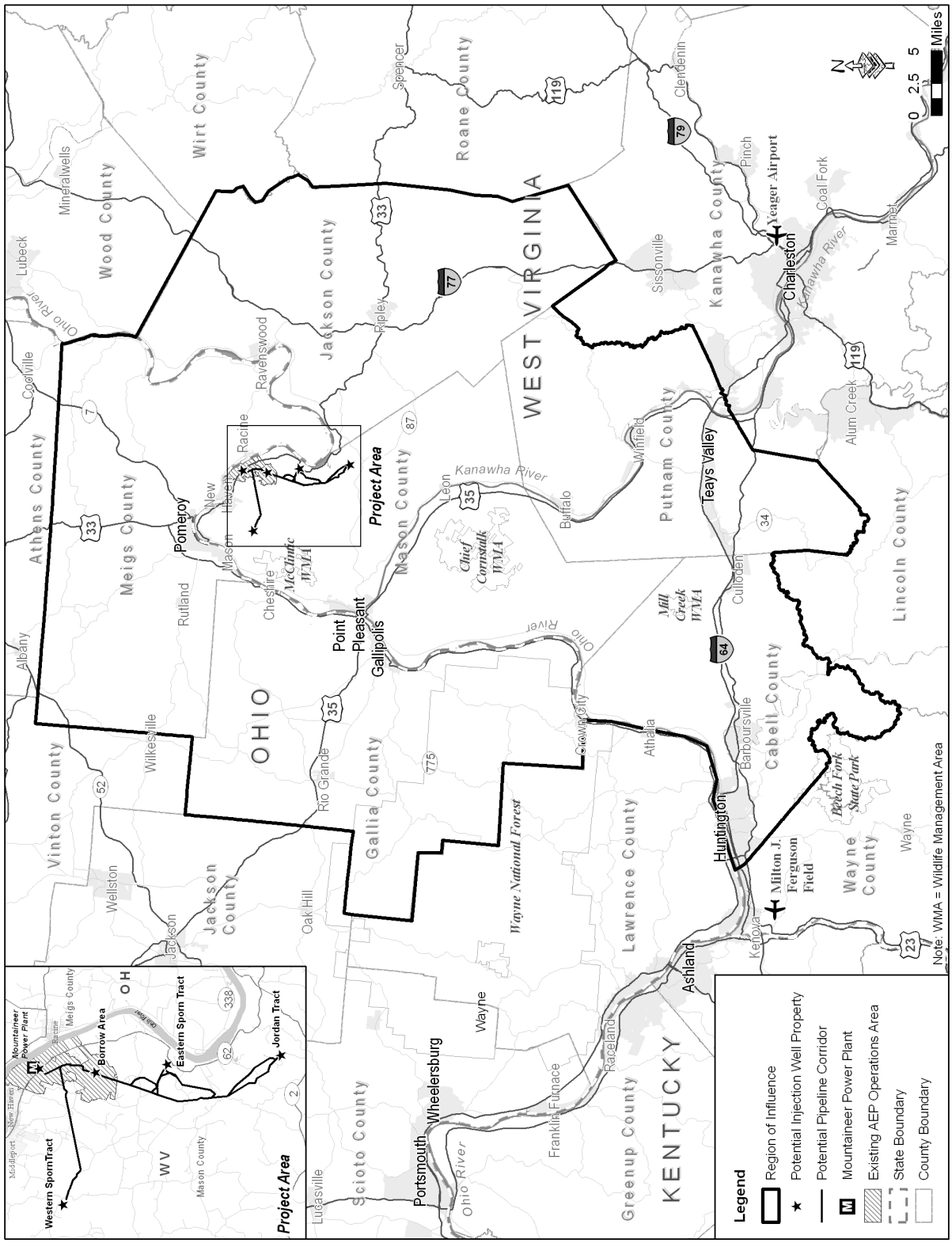

Figure 4.2-1. Region of Influence for Cumulative Impacts

In addition, the DOE equally considered past resource area trends, as these trends typically closely correlate with possible future changes and conditions. The potential impacts of the project's resultant reduction in existing GHG emissions are addressed from a regional and global perspective. This is important, as one of the primary purposes of the project would be designed to effectively demonstrate technologies to reduce air emissions, notably GHGs, to the environment.

Within the defined ROI for cumulative impacts, the DOE identified future proposed actions that could have impacts coinciding in time and space with those of the project. Descriptions of these actions are provided in Table 4.2-1. As shown in Table 4.2-1, planned future actions within the ROI generally include additional mining and energy production facilities, as well as infrastructure improvement projects. These proposed future actions are entirely consistent with the historic trends within the ROI; that is, a trend of past, ongoing, and proposed future mining and energy production activities, as well as various infrastructure improvements to improve the quality of life of the ROI's residents.

4.2.3 Cumulative Impacts by Resource Area

4.2.3.1 Introduction

This section analyzes the potential for collectively significant cumulative impacts on specific resource areas from the project in combination with the actions listed in Table 4.2-1. Concurrently, the below analyses identify resource areas for which such cumulative impacts are not anticipated, and provide the basis for such a determination. As further described below, significant (beneficial) cumulative effects on air quality and GHG emissions are anticipated through implementation of the project in conjunction with other DOE-sponsored actions in the U.S. over the long term, including broader scale implementation of this CO_2 sequestration process. Also as described below, potential short-term moderate cumulative traffic impacts on State Route 62 (i.e., during the 32-month construction period) and long-term moderate cumulative noise effects (i.e., during operation of the proposed CO_2 capture facility at the Mountaineer Plant) may occur; however, mitigation measures and BMPs proposed in this EIS would reduce these effects to the extent possible. No significant cumulative effects are anticipated to any other resource area analyzed within this EIS.

4.2.3.2 Air Quality and Climate

Construction and operation of the project in combination with the ongoing and potential future proposed actions listed in Table 4.2.1 would result in changes to air emissions within the ROI. During the 32-month construction phase of the project, air emissions from the involved sites would increase over the short term. However, over the long term, the project annually would remove approximately 1.5 million metric tons of GHGs that would otherwise be emitted to the atmosphere.

Air emissions within the ROI are regulated by the States of Ohio and West Virginia, in accordance with the SIP for each state. Through ongoing permitting and monitoring under applicable air quality regulatory programs and authorities, these cumulative actions are anticipated to have a negligible cumulative impact on air quality in the ROI. This cumulative effect would be further reduced through implementation of the project, as the project would reduce emissions from the existing Mountaineer Plant. Given the magnitude of this proposed reduction, a net beneficial cumulative air quality effect within the ROI would be expected. Further, with ongoing implementation of similar DOE sponsored actions in the U.S., a significant long-term cumulative beneficial air quality effect would be anticipated on a national scale.

Table 4.2-1. Regional Projects Identified for Consideration in the Cumulative Impacts Analysis

Site	Location	Distance (miles)	Status	Description	Additional Information
Yellowbush Coal Mine	Meigs County, OH	1.5	Active; Potential Future Expansion	Yellowbush Coal Mine is located in Meigs County, Ohio and operated by Gatling Ohio LLC. In January 2009, the USACE issued a Section 404 permit for the Yellowbush Mine docking facility (Meigs Point Dock) on the Ohio River. Yellowbush mine is on the ODNR Pending Coal Application list (7/31/10).	http://www.dnr.state.oh.us/Portals/11/mining/pdf/pending.pdf (ODNR, 2010b)
Green Global, LLC	New Haven, WV	0	Ongoing; Permit to Construct (R13-2845) Issued from WVDEP - July 2010	Mining and quarrying of non-metallic minerals. Green Global, LLC constructed and operates a portable crushing and screening plant using water-based gravity separation to recover manganese slag.	http://www.dep.wv.gov/daq/Documents/August%2013,%202010/Eval%202845.pdf (WVDEP, 2010e) http://www.dep.wv.gov/daq/Documents/August%2013,%202010/2845.pdf (WVDEP, 2010f)
AEP Mountaineer CCS II Geologic Characterization Study	New Haven, WV	0	Ongoing; Scheduled to be completed by June 2011	As part of the characterization studies, AEP plans to initially install geologic characterization wells at the Borrow Area and the Jordan Tract in order to collect data of both caprock and target injection formations. If sufficient data is not obtained from these wells to determine injection well placement and design parameters, then additional characterization wells could be installed at one or more of the remaining injection well properties.	See Section 2.3.5.1
AEP Mountaineer CCS II PVF	New Haven, WV	0	Ongoing; To be decommissioned before project is brought online	Ongoing small-scale PVF at the existing Mountaineer Plant. With implementation of the project, the PVF would be decommissioned with long-term monitoring conducted as part of the overall project and in accordance with the WVDEP UIC permit.	See Section 2.3.3.1
Broad Run Coal Mine	New Haven, WV	0	Potential Closure	Broad Run Coal Mine continues to remain inactive after April 2010 layoffs, and may be closed in the future. Current operations include at least one MMU. The underground mine is operated by Big River Mining.	

Table 4.2-1. Potential Actions Identified for Consideration in the Cumulative Impacts Analysis (Continued)

Site	Location	Distance (miles)	Status	Description	Additional Information
American Municipal Power	Letart Falls, OH (Meigs County)	5	Potential Future	Proposed 600-MW natural gas power plant announced on August 19, 2010. No natural gas pipelines in the area. Same location as cancelled 1,000-MW coal power plant. Proposed to be operational by 2014.	http://www.meigscountyohio.com/cgi-bin/NewsScript/newsscript.pl?record=4 (Meigs County Economic Development Office, 2010)
Byrd Dam	Gallipolis, OH (Gallia County)	18	Potential Future	Proposed 48-MW hydroelectric power plant. FERC license application may be submitted in 2010. The application approval process can take 2 years or more.	
Mason County Airport Runway	Mason County, WV	9	Ongoing Construction	$2 million FAA grant for redevelopment of runway. The Mason County Development Authority identified this project as currently underway.	
Armstrong Mineral Wool Plant	Jackson County, WV	15	Ongoing Construction	Armstrong World Industries is constructing an environmentally friendly mineral wool plant on 35 acres in the Jackson County Industrial Center in Millwood, WV.	http://www.jacksonwvassessor.com/ (Thomas, 2010) http://www.jacksonnewspapers.com/news/x294028130/Armstrong-plant-will-employ-45-provide-200-construction-jobs (Jackson County Newspapers, 2010).
U.S. Route 35	Putnam County, WV	30	Ongoing Construction	Approximately 14 miles of U.S. Route 35 remains to be constructed. When complete, this road will extend 35 miles from Crooked Creek (Putnam Co.) to Point Pleasant (Mason Co.).	http://planning.putnamcounty.org/infrastructure.htm (Mellert, 2010) http://www.transportation.wv.gov/communications/Press-Release/Pages/EightAdditionalMilesofRoute35toOpenToTraffic.aspx (WVDOT, 2010a) http://www.wsaz.com/political/newsreleasesheadlines/30806214.html (WSAZ News Channel 3, 2008)
Kenna Ridge Business Park	Jackson County, WV	21	Ongoing Construction	New business park on 64 acres in Kenna, WV.	http://jcda.org/Kenna_Ridge_Business_Park.html (Kenna Ridge Business Park, 2010)

Proposed Sewer Improvements	Leon and New Haven, WV; Gallia County, OH	0-60	Ongoing Construction/Potential Future	Various local sewer improvement projects within the ROI. Potential cumulative beneficial effect to groundwater and surface water.	http://www.epa.state.oh.us/LinkClick.aspx?fileticket=VqY6zYpXuMA%3D&tabid=2202 (OEPA, 2009) http://www.mydailyregister.com/view/full_story/2024430/article-Plans-progress-for-New-Haven-sewer-project? (Fields, 2009)
Proposed Road Improvements	Gallia County, OH; Mason County, WV	15-20	Ongoing Construction/Planned	Various local WVDOT and ODOT road improvement projects, including widening of existing roads. Potential cumulative beneficial effect to transportation and traffic.	http://www.dot.state.oh.us/projects/Pages/default.aspx (Ohio Department of Transportation, 2010) http://www.transportation.wv.gov/communications/Highways-Projects/US_35/Pages/default.aspx (WVDOT, 2010b)

FAA = Federal Aviation Administration; MMU = mobile mining unit; MW = megawatt; ODNR = Ohio Department of Nature Resources; ODOT = Ohio Department of Transportation; OH = Ohio; PVF = product validation facility; ROI = region of influence; UIC = Underground Injection Control; U.S. = United States; USACE = U.S. Army Corps of Engineers; WV = West Virginia; WVDEP = West Virginia Department of Environmental Protection; WVDOT = West Virginia Department of Transportation

4.2.3.3 Greenhouse Gases

Impacts of Greenhouse Gases on Climate

Climate is usually defined as the "average weather" of a region, or more scientifically as the statistical description of a region's weather in terms of the means and variability of relevant parameters over periods ranging from months to thousands of years. The relevant parameters include temperature, precipitation, wind speed and direction, and dates of meteorological events such as first and last frosts, beginning and end of rainy seasons, and appearance and disappearance of pack ice. Greenhouse gases in the atmosphere absorb energy that would otherwise radiate into space, increasing the possibility that anthropogenic (human-caused) releases of these gases could result in warming that might eventually alter climate (IPCC, 2007). Potential impacts of GHGs on climate are essentially cumulative impacts, because no single source of GHG emissions is substantial enough to affect climate independently.

Changes in climate are difficult to detect because of the complex variability in natural meteorological patterns over long periods of time and across broad geographical regions. There is much uncertainty regarding the extent of global warming caused by anthropogenic GHGs, the climate changes this warming will produce, and the appropriate strategies for stabilizing the concentrations of GHGs in the atmosphere. The World Meteorological Organization and United Nations Environment Programme established the IPCC to provide an objective source of information about global warming and climate change. The IPCC's reports are generally considered an authoritative source of information on these issues.

According to the IPCC Fourth Assessment Report, "*Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level*" (IPCC, 2007). The IPCC report found that the global average surface temperature has increased by about 1.3°F in the last 100 years; global average sea level has risen about 6 inches over the same period; and cold days, cold nights, and frosts over most land areas have become less frequent during the past 50 years. The report concluded that most of the temperature increase since the middle of the 20th century "*is very likely due to the observed increase in anthropogenic [GHG] concentrations*."

The 2007 report estimated that, at present, CO_2 accounts for about 77 percent of the global warming potential attributable to anthropogenic releases of GHGs, with the vast majority (74 percent) of this CO_2 coming from the combustion of fossil fuels. Although the report considers a wide range of future scenarios regarding GHG emissions, CO_2 would continue to contribute more than 70 percent of the total warming potential under all of the scenarios. The IPCC therefore believes that further warming is inevitable, but that this warming and its effects on climate could be mitigated by stabilizing the atmosphere's concentration of CO_2 through the use of (1) "low-carbon technologies" for power production and industrial processes; (2) more efficient use of energy; and (3) management of terrestrial ecosystems to capture atmospheric CO_2 (IPCC, 2007).

Environmental Impacts of Climate Change

The IPCC and the USGCRP, formerly the U.S. Climate Change Science Program, have examined the potential environmental impacts of climate change at global, national, and regional scales. The IPCC report states that, in addition to increases in global surface temperatures, the impacts of climate change on the global environment may include

- more frequent heat waves, droughts, and fires;
- rising sea levels and coastal flooding;
- melting glaciers, ice caps, and polar ice sheets;
- more severe hurricane activity and increases in frequency and intensity of severe precipitation;
- spread of infectious diseases to new regions;

- loss of wildlife habitats; and
- heart and respiratory ailments from higher concentrations of ground-level ozone (IPCC, 2007).

On a national scale, average surface temperatures in the U.S. have increased, with the last decade being the warmest in more than a century of direct observations (CCSP, 2008). Potential impacts on the environment attributed to climate change observed in North America include

- extended periods of high fire risk and large increases in burned area;
- increased intensity, duration, and frequency of heat waves;
- decreased snow pack, increased winter and early spring flooding potentials, and reduced summer stream flows in the western mountains; and
- increased stress on biological communities and habitat in coastal areas (IPCC, 2007).

The USGCRP recently reported the following impacts and trends in the northeast region of the U.S., including West Virginia, associated with climate change (USGCRP, 2009):

- Extreme heat and declining air quality are likely to pose increasing problems for human health, especially in urban areas.
- Agricultural production is likely to be adversely affected as favorable climates shift.
- Projected reduction in snow cover will adversely affect winter recreation and industries that rely upon it.

Addressing Climate Change

Concern regarding the relationship between GHG emissions from anthropogenic sources and changes to climate has led to a variety of federal, state, and regional initiatives and programs aimed at reducing or controlling GHG emissions from human activities as discussed in Section 3.2, Greenhouse Gases. It is generally accepted that any successful strategy to address GHG reductions would require a global approach to controlling these emissions.

Because climate change is considered a cumulative global phenomenon, it is generally accepted that any successful strategy to address climate change must rest on a global approach to controlling these emissions. In other words, imposing controls on one industry or in one country is unlikely to be an effective strategy. In addition, because GHGs remain in the atmosphere for a long time, and industrial societies will continue to use fossil fuels for at least the next 25 to 50 years, climate change cannot be avoided. As the IPCC report states: "*Societies can respond to climate change by adapting to its impacts and by reducing [GHG] emissions (mitigation), thereby reducing the rate and magnitude of change*" (IPCC, 2007).

According to the IPCC, there is a wide array of adaptation options. While adaptation will be an important aspect of reducing societies' vulnerability to the impacts of climate change over the next two to three decades, "*adaptation alone is not expected to cope with all the projected effects of climate change, especially not over the long term as most impacts increase in magnitude*" (IPCC, 2007). Therefore, it will also be necessary to mitigate climate change by stabilizing the concentrations of GHGs in the atmosphere. Because these gases remain in the atmosphere for long periods of time, stabilizing their atmospheric concentrations will require societies to reduce their annual emissions. The stabilization concentration of a particular GHG is determined by the date that annual emissions of the gas start to decrease, the rate of decrease, and the persistence of the gas in the atmosphere. The IPCC report predicts the magnitude of climate change impacts for a range of scenarios based on different stabilization levels of GHGs. "*Responding to climate change involves an iterative risk management process that includes both*

mitigation and adaptation, taking into account actual and avoided climate change damages, co-benefits, sustainability, equity, and attitudes to risk" (IPCC, 2007).

Climate Change, Greenhouse Gases, and the Proposed Mountaineer CCS II Project

The capture and geological storage of existing GHG emissions by the project would produce a beneficial cumulative effect on a national and global scale. As discussed in this section, the project would remove approximately 1.5 million metric tpy of CO_2 that would otherwise be emitted to the atmosphere. With this project, AEP would reduce CO_2 emissions from the Mountaineer Plant from approximately 8.5 million metric tpy to approximately 7 million metric tpy.

These reductions in emissions alone, however, would not appreciably reduce global concentrations of GHG emissions. However, these emissions changes would incrementally affect (reduce) the atmosphere's concentration of GHGs, and, in combination with past and future emissions from all other sources, contribute incrementally to future change in atmospheric concentrations of GHGs. At present there is no methodology that would allow DOE to estimate the specific effects (if any) this increment of change would produce near the project area or elsewhere.

Climate Change, Greenhouse Gases, and the DOE CCPI Financial Assistance

As described in more detail in Section 1.2, the DOE selected the project for further, more detailed consideration for financial assistance. The project would serve the DOE's CCPI Round 3 objective to demonstrate advanced coal-based technologies that capture and sequester CO_2 emissions. DOE believes that accelerated commercial use of new or improved technologies will help sustain economic growth, yield environmental benefits, and produce a more stable and secure energy supply.

Demonstration and advancement of technologies that increase efficiency, facilitate carbon capture, and sequester CO_2 are important steps in developing strategies for controlling GHG emissions. The IPCC report states that there is "high agreement" that atmospheric concentrations can be stabilized by *"deployment of a portfolio of technologies that are either currently available or expected to be commercialized in coming decades assuming that appropriate and effective incentives are in place for their development."* The IPCC identifies CCS for coal-fired power plants as one of the "key mitigation technologies" for development before 2030 (IPCC, 2007). The IPCC notes that energy efficiency will also play a key role in stabilizing atmospheric concentrations of GHGs.

The DOE believes that the objectives of the CCPI cost-shared effort between the U.S. Government and industry fulfill, in part, these recommendations of the IPCC. The DOE further believes that by providing financial assistance for the project, the DOE would be providing appropriate incentives for developing technologies that can reduce GHG emissions and climate change concerns. Therefore, the project, in combination with its successful demonstration, broader scale application, and other similar DOE-sponsored GHG-reducing initiatives in the region and across the U.S., would be expected to result in a significant long-term cumulative (beneficial) effect by reducing GHG emissions and addressing climate change concerns.

4.2.3.4 Geology

While other past, present, and planned future activities have, continue to, and would affect geological resources within the ROI (e.g., coal mining), the project would not noticeably affect similar geological resources (i.e., the same geological formation). The project generally would affect geological resources substantially deeper than any other non-AEP past, present, or planned activity within the ROI. As such, the project would not produce a cumulative effect to these more shallow geological resources.

With regard to past, present, and planned future AEP actions within the ROI, the impacts of the project combined with the impacts of the geologic characterization work (i.e., the work AEP would conduct to determine the location of the potential injection well sites) and the existing PVF injection wells would result in a minor cumulative impact to deeper geological resources. Any geological impacts resulting from constructing the characterization wells would be similar to those described for the project. If the

Mountaineer Plant is chosen to host an injection well, there is a potential for the plumes from the project and the PVF to interact with each other. Although the PVF would be decommissioned before injection would occur at the Mountaineer Plant, the proposed injection wells at the site would be within the plume radius of the PVF. The design of the existing and potential wells would ensure that the CO_2 would not degrade the well casings; a MVA program would be used to ensure that the subsurface pressure remains within safe operating levels in accordance with the UIC permit. Therefore, the potential cumulative impacts of all of AEP's existing and proposed activities relative to the Rose Run and Copper Ridge Formations within the ROI would be minor.

4.2.3.5 Physiography and Soils

Soils and physiography within the ROI have historically been altered by human activities over the last 200 years. Previous human activities, in particular farming, mining, and industrial use, have altered soil formations and numerous soil properties, including soil structure and soil fertility. Due partly to these human activities, and partly to natural, geological conditions, many of the soils within the ROI are highly erodible, and have little value for agricultural production besides forestry. More recent disturbances, such as grading in connecting with new construction, additional mining activities, and installation of utility transmission corridors, have resulted in localized, severely decreased soil quality.

The project, in combination with the ongoing and proposed future power plant, mining, and infrastructure proposed actions within the ROI listed in Table 4.2-1, as well as their possible future expansion, would result in regionally minor, generally localized cumulative effects to physiographic and soils resources. With implementation of the BMPs identified in this EIS, the effects of the project would be further minimized, resulting in a negligible cumulative effect.

4.2.3.6 Groundwater

The project would not contribute to significant cumulative effects to groundwater quality or quantity, as the project would result in only negligible effects to this resource. As described in this EIS, potable groundwater supplies within the ROI are ample to support current and future proposed development. The project, during both construction and operation, would result in a negligible increased demand on groundwater quantity; this demand would be greater during the proposed construction period when up to 800 construction workers may be present. Over the long term, the project would add up to 38 new full-time staff (and potentially their families) to the ROI, producing a negligible increased demand on groundwater resources. Coupled with proposed future activities within the ROI over the potential 20-year operational life of the project, significant cumulative effects to groundwater quantity are not anticipated.

In terms of groundwater quality, the project, in combination with the ongoing and future proposed actions listed in Table 4.2-1, could result in minor cumulative groundwater quality impacts. Other ongoing and future activities in the ROI have a similar potential for accidental spills as those described for the project. In addition, the project could require hydraulic stimulation (see Section 3.5, Groundwater); however, such activity would not affect potable groundwater supplies within the ROI, as these activities would affect deeper regions. The aggregate of such accidental spills and effects to groundwater would not constitute a cumulatively significant impact to regional or local groundwater quality or potable water aquifer integrity. In addition, various proposed sanitary sewer improvement projects within the ROI would serve to improve groundwater quality by reducing the reliance on septic systems. Septic systems have the potential to locally degrade groundwater quality due to infiltration of waste into the aquifer. Therefore, any cumulative impacts would be negligible to minor.

4.2.3.7 Surface Water

The project would not contribute to significant cumulative effects to surface water quality or quantity, as the project would result in only negligible effects to this resource. Although the project would affect surface waters during construction (e.g., stream crossings of potential pipelines), compliance with Section

404 of the CWA and the NPDES program, including associated permitting and mitigation requirements, would reduce the likelihood of cumulative effects to negligible levels.

The ROI for potential cumulative impacts to surface waters consists of the Middle Ohio South watershed, drained by the Ohio River. Although the project would not be expected to degrade surface water quality directly, indirect impacts from the project, the development of other projects as identified in Table 4.2-1, and general development anticipated to occur within the ROI could incrementally impact surface water quality. The aggregate increase in impervious surface areas associated with this future development could increase the amount of stormwater distributed to surface water channels and could potentially increase the frequency and severity of high-flow events. The increased impervious area could also contribute to the degradation of water quality through the increase in the quantity of pollutants attributable to runoff. However, these stormwater effects, in terms of quality and quantity, of the project would be effectively mitigated through the NPDES permitting process via the WVDNR. As such, the project would not be expected to contribute to cumulative effects. Compliance with applicable local, state, and federal surface water regulations in association with other proposed future proposed actions equally would ensure the cumulative effects are maintained at acceptable levels.

Several areas of the Ohio River are currently impaired and are included on the EPA list of impaired waters (CWA Section 303(d)) due to dioxin, bacteria, and iron. The project would not contribute additional amounts of these constituents to the Ohio River. Some water quality issues impacting the Ohio River include nonpoint source pollution from urban runoff, agricultural activities, and abandoned mines. Studies have pinpointed elevated levels of bacteria from such sources as combined sewer overflows. A cumulative increase in impervious areas could contribute more nonpoint source pollution to the Ohio River. Ongoing improvements within the ROI to sewer infrastructure would serve to decrease these adverse effects. Therefore, cumulative impacts of the project on surface water quality would be negligible.

Water quality could also be affected by potential hazardous material spills from the project and other ongoing and future proposed actions within the ROI. As the number of roadway travel lanes, traffic volume, and the density of development increase within the ROI, the risk of spills could increase. An accidental spill of a large quantity of a hazardous material could affect surface waters if the spill was not immediately contained and cleaned up. However, the project would only negligibly contribute to this potential cumulative effect, as BMPs incorporated into the project would minimize this potential.

4.2.3.8 Wetlands and Floodplains

Past human development in the ROI has resulted in considerable amounts of development within wetlands and floodplains. In particular, previous development along the Ohio River, such as New Haven, Hartford, and the Mountaineer Plant itself, have altered flood flow characteristics of the Ohio River floodplain. These historic changes in the ROI have generally resulted in higher flood elevations in upstream portions of the floodplain. In addition, past development near the banks of the Ohio River has resulted in the filling of considerable amounts of wetlands; palustrine wetlands are typically more prevalent along the river than inland. Past, generally more limited, inland development within the ROI has resulted in filling of wetlands; Riverine wetlands are typically more prevalent than Palustrine wetlands within inland areas.

The Yellowbush Coal Mine proposes to construct a docking facility in Meigs County along the Ohio River. Development of this facility could result in the redirection of flood flows and could require filling of wetlands. The other future proposed actions identified in Table 4.2-1 could result in additional incremental effects to wetlands and floodplains in the ROI. However, each proposed action, like the Mountaineer CCS II Project, would be required to comply with Section 404 of the CWA, NPDES permitting requirements, and other applicable local, state, and federal regulations affording protection to wetlands and floodplains. Compliance with these requirements, including oversight by pertinent

regulatory agencies tasked with the stewardship of these resources, would ensure cumulative effects are maintained at acceptable levels.

The AEP Mountaineer CCS II Geologic Characterization Study would not be expected to cause filling of wetlands or adverse effects to floodplains because AEP's well siting criteria preclude this from occurring. In addition, no mapped 100-year floodplain areas are located within the Borrow Area or the Jordan Tract where the study will occur. The project itself would negligibly affect wetlands and floodplains within the ROI as described in this EIS. All such effects would be very localized, limited, and controlled through the permitting process, ensuring no net loss of these resources and maintenance of the quality of these resources during both the proposed construction and operation phases. Overall, the project would contribute negligibly to cumulative wetland and floodplain effects within the ROI.

4.2.3.9 Biological Resources

Previous human activities, primarily including industrial, mining, energy production, utility transmission, residential, and agricultural development, have produced major past and ongoing effects to biological resources within the ROI. These activities have led to a regional decline of historical ecosystems and conversion of once forested ecosystems into human-altered landscapes (e.g., row crops, pasture land, developed space, transmission ROWs, etc.). These activities have also contributed to a decline in the extent and quality of aquatic habitats (i.e., increased sedimentation and nutrients in surface waters, increased stream temperatures, and decreased dissolved oxygen). In addition, past actions, including roadway construction and placement of utility transmission lines have caused fragmentation of once contiguous forested habitat.

The project, in combination with the ongoing and proposed future power plant, mining, and infrastructure proposed actions within the ROI listed in Table 4.2-1, as well as their possible future expansion, would result in regionally minor, generally localized cumulative effects to biological resources. The project, notably due to construction and maintenance of the pipeline corridors and injection well sites, would contribute to both short- and long-term removal of vegetative cover, localized reduction in wildlife habitat, and additional fragmentation of habitat. With implementation of the BMPs identified in this EIS, however, the effects of the project would be further minimized, and would not contribute to a significant cumulative impact to biological resources within the ROI.

4.2.3.10 Cultural Resources

The project would not contribute to significant cumulative effects to cultural resources within the ROI, as the project would result in only negligible effects (and likely no effects) to such resources. As described in this EIS, the DOE conducted extensive surveys and found no potential for adverse effects to cultural resources protected under Section 106 of the NHPA.

4.2.3.11 Land Use and Aesthetics

The project would not contribute to significant cumulative effects to land use or aesthetics within the ROI, as the project would result in only negligible (or no) effects to such resources. Since Mason County does not have a planning commission to oversee and manage land development and land use in areas lying outside of municipalities, land use within this portion of the ROI has occurred without any planning or zoning constraints. Previous and current land use activities in the region have primarily included industrial development, agriculture, and mining. A small number of rural residential properties are also present in the ROI. In addition, roadways have been constructed and utility transmission lines have been installed. This prior development has caused fragmentation of once contiguous parcels of land, and has led to the current mixed-use land development pattern characteristic of the ROI today.

Overall, the project is generally consistent with local land use and would not dramatically alter the aesthetics of the ROI. Aboveground components of the project would be limited to changes in vegetation along potential pipeline corridors and injection well sites, installation of minor equipment at the relatively

isolated injection well sites, and the addition of infrastructure at the developed Mountaineer Plant. The project, in combination with the ongoing and proposed future power plant, mining, and infrastructure proposed actions within the ROI listed in Table 4.2-1, as well as their possible future expansion, would result in minor, generally localized cumulative effects to land use and aesthetics.

4.2.3.12 Traffic and Transportation

The project would not contribute to long-term significant cumulative effects to transportation and traffic within the ROI, as the project would result in only negligible long-term effects to such resources. As identified in Section 3.11, Traffic and Transportation, the project would result in project-specific, moderate short-term traffic effects due to construction traffic in the vicinity of the proposed project sites, and most notably on State Route 62. Implementation of BMPs and mitigation measures identified in this EIS would serve to reduce these short-term effects during the proposed 32-month construction period to the extent possible.

During the anticipated 20-year operation of the project, it is expected that State Route 62 would be able to handle the cumulative traffic requirements of all current and future proposed actions within the ROI, including the project. Long-term traffic and transportation effects of the project, as described in this EIS, would be negligible. As shown in Table 4.2-1, the DOE identified no major proposed developments that would place additional, long-term, substantial demands on the involved sections of State Route 62 (i.e., Green Global LLC would result in a minor amount of long-term, operational traffic). Also as shown in Table 4.2-1, the Ohio Department of Transportation and WVDOT plan to continue roadway infrastructure upgrades within the ROI to accommodate existing and anticipated future traffic conditions. These improvements are anticipated to continue on an as-needed basis throughout the ROI, including on State Route 62 (as and when appropriate), ensuring local roadways are capable of servicing traffic demands. Therefore, the project, over the long term, would contribute negligibly to cumulative transportation and traffic effects within the ROI.

4.2.3.13 Noise

During construction, noise impacts associated with the project would be very localized and temporary, and would not contribute to a long-term cumulative increase in noise within the ROI. This ROI is generally limited to the immediate vicinity of the proposed project sites. These project-specific effects would be reduced to the extent possible as described in Section 3.12, Noise.

The project could contribute to long-term significant cumulative noise effects in the vicinity of the Mountaineer Plant. Baseline noise levels in the vicinity of the Mountaineer Plant could increase by as much as 3.6 dBA at potentially sensitive noise receptors near the existing plant (Receptors 1, 4, and 5, as demonstrated in Section 3.12.2.1). Although this change in noise level would be barely detectable, existing noise levels at these locations may already be near or above the EPA guideline threshold of L_{eq} 48.6 dBA, according to one study. However, existing noise levels were found to be within levels classified by HUD as "acceptable" for outdoor levels at residential properties (L_{eq} of 58.6 dBA). Thus, by adding additional noise to this location, a significant long-term cumulative noise impact could result (i.e., through combining existing noise levels from the Mountaineer Plant with the project). Noise mitigation measures and BMPs identified within this EIS would serve to lessen this effect to the maximum extent possible.

As shown in Table 4.2-1, no future proposed actions would occur within the very confined noise impact ROI of the project, including in the vicinity of the Mountaineer Plant. As such, no additional long-term cumulative noise impacts are expected.

4.2.3.14 Materials and Waste Management

The project would not contribute to significant cumulative materials and wastes effects within the ROI, as the project would result in only minor effects to such resources. The project, in combination with the

ongoing and future proposed actions listed in Table 4.2-1, could result in slightly increased demand and thus a potential cumulative impact on suppliers of construction materials, operational materials, and waste disposal. However, most of these actions involve mineral extraction and would not be additive to the specific materials requirements of the project. Green Global LLC generates a recyclable product for the marketplace. Also, the existing ROI market capacities for implementation of these actions would not be exceeded, so the synergistic cumulative impacts would be minor.

Waste generation and offsite waste transportation and disposal would be required during the construction period. Waste generation and offsite disposal would also result from operation. The cumulative impacts are considered minor because, in combination with the other foreseeable actions, available landfill capacities within the ROI would not be exceeded. Most of the wastes generated by the project would be disposed of without using disposal capacity external to AEP. Therefore, the project's contribution to cumulative materials and wastes effects would be minor.

4.2.3.15 Human Health and Safety

The project, in combination with the ongoing and future proposed actions listed in Table 4.2-1, would not result in cumulative impacts to human health and safety because none of the other identified proposed actions present similar accident risks. None of these other actions use or produce ammonia, so there would be no cumulatively higher probabilities of an ammonia release affecting the ROI. As the PVF would be decommissioned prior to the operation of the project, no cumulative human health and safety effects related to accident risks associated with ammonia release are identified.

With regard to potential cumulative impacts to human health and safety associated with the CO_2 pipelines and injection well sites, no significant cumulative effects are anticipated. The future proposed actions that are of most relevance to this analysis are related to increased coal mining or possible oil and gas exploration, although there are no current plans for such increased or expanded activities in Mason County, West Virginia (see Table 4.2-1). The potential pipelines and injection well sites would have to be taken into consideration for future mining activities. The currently inactive Broad Run underground coal mine underlies portions of some of the pipeline corridors. Thus, future activity at the Broad Run mine (not currently proposed, closure possible; see Table 4.2-1) would need to consider the potential impact on the pipelines and the estimated extent of the CO_2 plumes below ground, depending on the injection well sites selected, when siting new shafts or air vents.

Increased activity at the Yellowbush Coal Mine in Meigs County, Ohio, or the Green Global mining operation in New Haven would not affect the proposed pipelines, injection well sites, or CO_2 plume. Equally, none of the other actions identified in Table 4.2-1 would affect these specific locations, with the exception of the AEP characterization wells. Characterization wells that are not proposed to be used as monitoring wells would be properly plugged as prescribed by UIC regulations. Therefore, no long-term cumulative human health and safety effects are anticipated.

4.2.3.16 Utilities

The project would not contribute to significant cumulative utilities effects within the ROI, as the project would result in only minor effects to such resources. The project, in combination with the ongoing and future proposed actions listed in Table 4.2-1, would result in an increased demand and thus a minor cumulative impact to all local utilities. However, the existing utility capacities within the ROI would not be exceeded during either construction or operation. Ongoing sewer (and other utility infrastructure) improvements within the ROI (see Table 4.2-1) would continue to ensure that adequate capacity remains available over the operational life of the project.

4.2.3.17 Community Services

The project would not contribute to significant cumulative community services effects within the ROI, as the project would result in only negligible effects to such resources during both the construction and

operation phases. The project, in combination with the ongoing and future proposed actions listed in Table 4.2-1, would result in an increased demand and thus a minor cumulative impact to community services. Although community services needs are anticipated to increase as the ROI continues to slowly grow, community services should commensurately grow with the increasing population. Presently, services are not being strained and maintain ample capacity to service the current and projected future needs of the ROI. However, in the future, additional services or capacity may be required, depending upon the long-term growth of the ROI. Construction of the project would add only negligibly to these cumulative impacts.

4.2.3.18 Socioeconomics

The project, in combination with the ongoing and future proposed actions listed in Table 4.2-1, would result in the creation of revenue for the state, county, and local governments. In addition, these actions would have a beneficial impact on the economy, employment, and revenues in the ROI. Over the long-term, the project would add negligibly to these cumulative impacts, which generally are beneficial. Given the economic conditions of the ROI, the project's contribution to the local economy, coupled with other planned actions, would result in a cumulative beneficial effect. This beneficial effect would be most noticeable during the proposed construction period.

4.2.3.19 Environmental Justice

The project, in combination with the ongoing and future proposed actions listed in Table 4.2-1, would not be expected to disproportionately affect minority or low-income populations within the ROI. Ongoing, although conservative, development of the ROI would continue to provide increased economic opportunities to local low-income populations, thus providing a beneficial cumulative environmental justice effect. No significant cumulative environmental justice impacts would occur.

4.2.4 Cumulative Impacts of the No Action Alternative

Under the No Action Alternative, DOE would not provide cost-shared funding for the Mountaineer CCS II Project. Although AEP may still elect to construct and operate the project in the absence of DOE cost-shared funding, for the purposes of the analysis in this EIS, DOE assumed that the No Action Alternative is equivalent to a No-Build Alternative. The project would not be constructed and would not contribute to any cumulative effects within the ROI. The moderate cumulative short-term traffic and long-term noise effects (i.e., generally within the immediate vicinity of the Mountaineer Plant) would not occur. However, the beneficial cumulative local, regional, and national air quality and GHG emission effects would not occur. In addition, no contribution to cumulative beneficial effects to the ROI's socioeconomic environment or environmental justice concerns would occur.

4.3 MITIGATION MEASURES

4.3.1 Introduction

For all environmental resources, the minimization and mitigation of potential adverse impacts from project activities would be achieved through the implementation of BMPs and compliance requirements contained in facility permits and other applicable federal, state, or municipal regulations and ordinances. This section provides a consolidated summary of the minimization and mitigation measures that would be implemented for each resource area. Per established protocols, procedures, and requirements, AEP would implement BMPs and would satisfy all applicable regulatory requirements in association with the design, construction, and operation of the project. These minimization and mitigation measures are described in this EIS under each technical resource area in Chapter 3, and listed in Table 4.3-1 below, and are included as components of the project. BMPs are measures that AEP regularly implements as part of their operations, including complying with regulatory requirements.

4.3.2 Mitigation Measure Summary, by Resource Area

For each environmental resource area, the reduction of potential adverse impacts from project activities would be achieved, at least in part, through the implementation of standard methods and BMPs. As described above, these are generally required by federal, state, or municipal regulations and ordinances, as well as associated permitting processes. AEP has committed within the Cooperative Agreement with DOE to implement BMPs and complying with applicable legal requirements. Therefore, this EIS analyzed the impacts of the proposed Mountaineer CCS II Project with these BMPs in place.

If, after these BMPs and restrictions are applied, this EIS's analysis identified the potential for residual adverse impacts, additional mitigation measures are recommended and identified. Table 4.3-1 summarizes, by environmental resource area, these legal (regulatory) requirements, as well as project-specific additional mitigation measures recommended for the proposed Mountaineer CCS II Project. DOE will determine whether specific additional mitigation measures would be required for implementation of the Proposed Action, and will document these requirements and this decision-making in the ROD.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Air Quality and Climate	**Construction** **Additional Measures Required by Laws, Regulations, Permits, and Ordinances:** • Construct the project in compliance with the Mountaineer Plant revised air permit, which would stipulate applicable controls and practices to minimized potential emissions. • Section 3.1.12 of the existing Title V Permit for the Mountaineer Plant. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Control vehicle speeds on all roads and exposed areas. • Sweep or remove spilled material from paved surfaces. • Maintain all engines in good working order. • Remove excess soil from truck tires before traveling on public roads. **Additional Measures Identified to Further Reduce Impacts:** • Treat unpaved roads with water or surfactants to minimize dust emissions. • Stage site construction to limit the amount of land area disturbed at any given time. • Surface unpaved access roads with stone whenever appropriate. • Re-vegetate disturbed areas as soon as possible after disturbance. • Cover construction materials and stockpiled soils as feasible to reduce fugitive dust, • Cover dump trucks before traveling on public roads. • Minimize the use of diesel or gasoline generators for operating construction equipment. • Minimize idling of equipment while not in use. **Operations** **Additional Measures Required by Laws, Regulations, Permits, and Ordinances:** • Operate the project in compliance with the Mountaineer Plant's revised air permit, which would stipulate applicable controls and practices to minimize emissions. • Section 2.13.1, Section 4.1.1, and Section 3.1.12 of the existing Title V Permit for the Mountaineer Plant. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • Use appropriate BMPs to minimize equipment and vehicle emissions by such practices as maintaining engines according to manufacturers' specifications, minimizing idling of equipment while not in use, and minimizing as practicable the use of diesel or gasoline generators during operations.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Greenhouse Gases	**Construction** **Additional Measures Required by Laws, Regulations, Permits, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Use appropriate BMPs to minimize equipment and vehicle emissions by such practices as maintaining engines according to manufacturers' specifications, minimizing idling of equipment while not in use, and minimizing as practicable the use of diesel or gasoline generators for operating construction equipment. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, Permits, and Ordinances:** • Develop and implement an EPA-approved site-specific MVA plan for CO_2 injection wells per Subpart RR of the Mandatory Reporting of Greenhouse Gases Rule. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Use appropriate BMPs to minimize equipment and vehicle emissions by such practices as maintaining engines according to manufacturers' specifications and minimizing idling of equipment while not in use. **Additional Measures Identified to Further Reduce Impacts:** • None.
Geology	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Obtain UIC and Well Works permits from the EPA or WVDEP, whichever has primacy. The wells would be constructed in accordance with these permits. The terms and conditions of the UIC and Well Works permits would ensure that the wells are designed to utilize the appropriate materials, monitoring equipment, and safety systems. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • Use standard pipeline construction BMPs to minimize geologic resource effects. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Obtain a UIC permit from the EPA or WVDEP that specifies operating and monitoring criteria for the CO_2 injection. The wells would be operated in accordance with the UIC Permit, which would also ensure that CO_2 is stored appropriately and that no leakage occurs. Additionally, a monitoring system during the 20-year injection process, as detailed in Section 2.3.6, would be implemented. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Physiography and Soils	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Develop and implement a WVDEP-approved SWPPP (to address erosion prevention measures, sediment control measures, permanent stormwater management, dewatering, environmental inspection and maintenance, and final stabilization) as required by the WVDEP DWWM, in accordance with the Mountaineer Plant's General NPDES Permit number WV0048500. The SWPPP would include erosion and sedimentation control measures recommended in West Virginia's Erosion and Sediment Control Best Management Practice Manual 2006. • Develop and implement an SPCC plan to prevent, control, and respond to releases of petroleum products that could potentially contaminate soils per the Oil Pollution Prevention regulation under the CWA. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Preservation of natural vegetation, where possible, to prevent soil erosion and sedimentation into adjacent water bodies or wetlands. • Stabilization of temporary access roads, haul roads, parking areas, laydown areas, material storage, and other onsite vehicle transportation routes immediately after grading. • Mechanically roughen the soil surface to create horizontal depressions on the contour, or by leaving slopes in a roughened condition by not fine-grading them. • Application of straw, hay or other suitable materials to the soil surface. • Use temporary seeding and mulching, or matting to produce a quick ground cover to reduce erosion on exposed soils that may be redisturbed or permanently stabilized at a later date. • Use permanent seeding to establish perennial vegetative cover on disturbed areas to reduce erosion and decrease sediment yield from disturbed areas and to permanently stabilize disturbed areas. **Additional Measures Identified to Further Reduce Impacts:** • The following BMPs would be employed by AEP, as necessary, to mitigate and minimize potential impacts during pipeline and well construction: ▪ Use wattles/fiber rolls to reduce and disperse runoff velocity and capture sediment. ▪ Remove topsoil and temporarily store onsite separately from other excavated material. ▪ Compact stored topsoil so that it would not erode. ▪ Return the majority of the excavated material to the excavated ditch. ▪ Replace the topsoil as the upper most soil layer following construction. ▪ Restore the site to its original grade. • The following BMPs would be employed by AEP, as necessary, to mitigate and minimize potential impacts during pipeline construction in areas of severe slopes and HEL: ▪ Avoid potential trouble areas, such as natural temporary drainage ways, unstable soils like high shrink-swell potential soils, highly erodible soils, etc. ▪ Avoid constructing roads on extremely steep slopes to prevent the potential for erosion. ▪ Avoid constructing close to streams and open waters to prevent the potential for sedimentation. ▪ Where construction access road crossings of stream cannot be avoided, use appropriate temporary improvements at stream crossings (adhering to Section 404 permit requirements). ▪ When construction of access roads on steep slopes cannot be avoided, water-bars should be built across the road at an angle. ▪ Clear as little vegetation as possible for construction, and replanting of vegetation as soon as possible in areas not permanently disturbed by construction.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Physiography and Soils (continued)	**Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Develop and implement an SPCC plan and a WVDEP-approved SWPPP to minimize operational impacts to soils. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • For permanent pipeline corridor ROWs, re-vegetate with appropriate grass mixes chosen for their value in increasing soil stability and decreasing probability of soil erosion.
Groundwater	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Develop and implement an SPCC plan during construction to minimize potential for groundwater contamination. This includes, enclosing fuel and chemical storage areas to minimize the potential for releases/spills to occur that could impact groundwater. • Comply with the UIC and Well Works permits during the construction of wells. This includes the requirement of using CO_2-resistant casings at the base of each well. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Develop and implement an SPCC plan during operations to minimize potential for groundwater contamination. • Comply with the UIC permit, which regulates CO_2 injection and storage. This includes complying with monitoring requirements as listed under the permit. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.
Surface Water	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Avoid, minimize, and mitigate impacts to surface waters through the CWA 404 permitting process under the regulatory purview of the USACE Huntington District; the NPDES and Section 401 Water Quality Certification permitting process via the WVDEP; Stream Activity permitting process via the WVDNR; and the CWA requirement for the development and implementation of an SPCC plan and SWPPP during construction. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Preserve natural vegetation as much as possible, but especially in critical areas such as on steep slopes and in areas adjacent to watercourses, swales, or wetlands. • Maximize use of existing roads and trails in planning site access. • Keep construction materials, debris, construction chemicals, construction staging, fueling, etc. at a safe distance from surface waters. Remove spoil, debris, piling, construction materials, and any other obstructions resulting from or used during construction following construction. **Additional Measures Identified to Further Reduce Impacts:** • The following BMPs would be employed by AEP, as necessary, to mitigate and minimize potential impacts:

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Surface Water (continued)	• Stabilize temporary access roads, haul roads, parking areas, laydown areas, material storage areas, and other onsite vehicle transportation routes with stone immediately after grading. ▪ Use temporary seeding and mulching or matting to produce a quick ground cover. ▪ Design pipeline crossings using the most direct route, construct water crossings during periods of low flow conditions, and use crossing sites that have low, stable banks, a firm stream bottom, and minimal surface runoff when possible. ▪ Where practical, consider weather and ground conditions when scheduling construction activities to minimize potential impacts to surface waters, such as erosion and the spread of contaminants that may be exacerbated by sheet flow during storm events. ▪ Use areas disturbed by past activities later in construction for staging, parking, and equipment storage. ▪ Use water conservation measures to the maximum extent practicable (e.g., efficient landscaping and recycling wastewater). ▪ For stream crossings using wet trenching, complete stream bed and bank stabilization before returning flow to the water body channel. **<u>Operations</u>** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Develop and implement an SPCC plan and a WVDEP-approved SWPPP to minimize operational impacts to surface water resources. • The project would operate under the Mountaineer Plants existing NPDES Permit. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.
Wetlands and Floodplains	**<u>Construction</u>** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Avoid, minimize, and mitigate impacts to wetlands through the CWA 404 permitting process under the regulatory purview of the USACE Huntington District; the NPDES permitting process via the WVDEP; and the CWA requirement for the development and implementation of an SPCC plan and SWPPP requirements during construction. • Wetland mitigation would follow the USACE Huntington District Compensatory Mitigation Policy for West Virginia and would be determined through coordination with USACE Huntington District **Measures Incorporated into Proposed Action to Reduce Impacts:** • If proposed injection site option ES-1 or the proposed access road to ES-2 is constructed, adjust the footprint of the well pad and/or access road to locate it outside of wetlands. • Design the CO_2 capture facility to locate the Cooling Tower and Reagent Storage structure, as well as all other facilities, outside of the designated 100-year floodplain. • Construct pipelines to minimize permanent changes in land contours that would affect floodplains. • During construction within floodplains, monitor weather conditions in anticipation of possible flooding events to ensure that workers and equipment are removed from the flood hazard area prior to the event. **Additional Measures Identified to Further Reduce Impacts:** • Avoid wetland areas within temporary construction ROWs to the extent practicable during the placement of equipment or materials. • Stockpile excavated soils in reverse order from which it was excavated (i.e., the deepest soils excavated would be stored at the top of the stockpile) during construction of pipeline corridors within wetlands. Following construction of the pipelines, backfill trenches with the deepest soils excavated first.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Wetlands and Floodplains (continued)	**Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Obtain all necessary permits and operate in compliance with all regulatory requirements to minimize potential surface water and wetland impacts. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.
Biological Resources	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Comply with NPDES permitting requirements and conditions, including erosion and sedimentation control measures, to minimize sedimentation to aquatic resources. Use these measures during in-stream construction activities and within locations adjacent to streams to minimize onsite and downstream impacts to aquatic habitat. • Comply with all SWPPP requirements. • Restore aquatic habitat to original grade and streambed substrate following in-stream trenching activities, as required by permits and regulation. Restore stream banks using appropriate stabilization measures and revegetate following specifications outlined in Section 404 permitting. • To meet the no "take" of native mussel species policy of the WVDNR, a mussel survey, and potentially relocation efforts, would be performed of the potential area of disturbance associated with the H-piling supports for the spud barge within the Ohio River. • To meet the no "take" requirement of the MBTA, perform migratory bird screenings prior to any land clearing activities during the migratory bird nesting season (April through July). The screenings would be performed by qualified biologists and would consist of searching the areas to be cleared for migratory bird nests and birds exhibiting nesting behaviors. Should any nests be found, avoid disturbing the nest, if practicable, or coordinate with USFWS on an appropriate course of action. In addition, train construction personnel to recognize nests and birds exhibiting nesting behaviors. Should construction crews encounter nests or other bird issues (e.g., deceased or injured birds), stop work until the concerns can be appropriately investigated. For any potential MBTA issues encountered during construction either avoid the area, if practicable, or coordinate with USFWS to determine the appropriate course of action. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Limit activities to the minimum area required to emplace project components. • Re-contour and re-seed all temporarily disturbed areas with a state-approved grass seed mixture appropriate to the area. **Additional Measures Identified to Further Reduce Impacts:** • To the extent practicable, confine disturbance to streambeds and banks to areas within the permanent ROW (only). To the extent practicable, confine construction staging areas to upland areas. Limit the temporary ROW within streams and wetlands. • Should a proposed project component need to be relocated, follow the siting criteria listed in Section 2.3.1. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Cultural Resources	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None, presuming the WVSHPO concurs with DOE's "no adverse effect" determination under Section 106 of the NHPA. **Measures Incorporated into Proposed Action to Reduce Impacts:** • In the event that monitoring wells would be sited on a portion of the injection well property that has not been surveyed by DOE, additional archaeological surveys would be conducted and archeological resources would be avoided to the extent practicable. **Additional Measures Identified to Further Reduce Impacts:** • If buried cultural materials are encountered during construction activities, work will cease in that area until appropriate review is undertaken to determine the nature and significance of the discovery. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.
Land Use and Aesthetics	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • For the siting of pipeline, adhere to 49 CFR 195 (Transportation of Hazardous Liquids by Pipeline) West Virginia Code Chapter 22 (Environmental Resources) and Chapter 24B (Gas Pipeline Safety). • Select pipeline ROWs to avoid, as far as practicable, areas containing private dwellings, industrial buildings, and places of public assembly per 49 CFR 195.210 (Pipeline Location). • Do not locate a pipeline within 50 feet of any private dwelling, or any industrial building or place of public assembly in which persons work, congregate, or assemble, unless it is provided with at least 12 inches of soil cover in addition to that prescribed in 49 CFR 195.248 (Cover Over Buried Pipeline). • Obtain all necessary ROWs for utility corridors per 49 CFR 195 and West Virginia Code Chapters 22 and 24B. **Measures Incorporated into Proposed Action to Reduce Impacts:** • In cases where a new pipeline corridor would bisect a property, include into the project design a suitable crossing of the pipeline, if required, to support vehicle crossings and maintain property owner access throughout the entire property. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • Incorporate landscaping into project design to reduce visual and audible impacts on surrounding property owners to the extent practicable.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Traffic and Transportation	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Comply with all local and WVDOT requirements for design and construction of any improvements to existing roadways. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Maintain public roadway traffic during construction. • Provide appropriate signage alerting and instructing traffic, barricades around the construction zone, and a flagger at either end of the construction zone during construction within road ROWs that require temporary lane closures. • If required, alternate traffic from each direction at regular intervals as needed along the open lane to avoid significant delays. • To the extent practicable, use trenchless construction methods across existing roads (e.g., directional boring) to avoid major traffic disruption on those roadways. • Stage construction across driveways so that vehicle access to property is maintained at all times. **Additional Measures Identified to Further Reduce Impacts:** • During peak construction periods, provide traffic guards on State Route 62 during workday start and end times to manage traffic flow to and from the site. • Encourage carpooling to limit the number of daily car trips. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.
Noise	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Comply with all local and state noise ordinances as applicable. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • Take noise measurements prior to construction and during initial drilling of injection and monitoring wells. Where substantial noise increases occur, use acoustic shields on equipment and implement other appropriate noise mitigation measures. • Develop and implement a blasting plan for safety purposes and notify occupants of nearby buildings, residences, agricultural areas, and other areas of public gathering sufficiently in advance of any blasting event. • Limit the noisiest construction activities (e.g., directional drilling for pipeline segments and pile driving activities if needed) to daytime hours. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Incorporate the following noise control measures into the CO_2 capture facility: locate and orient plant equipment to minimize sound emissions; provide buffer zones; enclose noise sources within buildings; and include silencers on plant vents and relief valves.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Noise (continued)	**Additional Measures Identified to Further Reduce Impacts:** • None.
Materials and Waste Management	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Transport construction materials and wastes in accordance with DOT regulations pertaining to proper packaging, labeling, and response to releases. • Manage construction materials and wastes in compliance with RCRA regulations pertaining to storage, labeling, containment, and disposal. • Develop and implement an SPCC plan per the Oil Pollution Prevention regulation under the CWA to prevent, control, and respond to releases of petroleum products. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Minimize the storage of hazardous materials at construction sites to the extent practicable, remove C&D waste materials from construction sites on a regular basis, and recycle C&D waste whenever possible. • Provide secondary containment and cover all liquid hazardous material storage areas. • Ensure qualified individuals trained to implement the construction SPCC Plan and spill kits are present at each work site during each work shift. • Include adequate valving, interlocks, safety systems (fogging, foaming, secondary containment, berms, spill prevention, instrumentation, ambient monitoring systems, alarms, etc.) in the design and engineering of reagent and other chemical feed storage systems. • Install process drains, sumps, and secondary containment structures to capture any inadvertent spills, leaks, and washdown of the area and/or equipment. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Conduct operational materials and wastes transportation in accordance with DOT regulations pertaining to proper packaging, labeling, and response to releases. • Manage operational materials and wastes in compliance with RCRA regulations pertaining to storage, labeling, containment, and disposal. • Develop and implement an SPCC plan per the Oil Pollution Prevention regulation under the CWA to prevent, control, and respond to releases of petroleum products during operations. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Pursue opportunities for beneficial use, rather than disposal, of secondary byproducts such as ammonium sulfate. **Additional Measures Identified to Further Reduce Impacts:** • None.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Human Health and Safety	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Protect worker safety during construction in conformance with provisions of the Occupational Safety and Health Act and the Office of Pipeline Safety guidelines. • Develop and implement an OSHA Process Safety Management Standard/EPA Risk Management Plan (PSMS/RMP) per 29 CFR 1910.119 and 40 CFR 68 to address onsite controls, protective measures, and emergency response procedures. • For pipelines carrying supercritical CO_2 fluids, select materials in consideration of the corrosive nature of CO_2 and trace gases and the potential for phase changes per pipeline safety guidelines. • Include appropriate pipeline siting and increase the depth of cover of the pipeline to reduce the potential for inadvertent contact from excavation or construction activities per 49 CFR 195. • Comply with the UIC permit and Well Works Permit to protect public health and safety. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Comply with the existing Site Construction Safety Program. This Program emphasizes risk identification and mitigation during pre-planning site activities to prevent accidents. • Comply with the existing hazardous communication program, monitoring procedures, a risk management program, site safety operating procedures, and process hazard analysis. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • Protect worker safety during operations in conformance with provisions of the Occupational Safety and Health Act and the Office of Pipeline Safety guidelines. • Implement the PSMS/RMP in conformance with OSHA and EPA requirements set forth in 29 CFR 1910.119 and 40 CFR 68. • Comply with the UIC permit. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Implement a facility health and safety plan requiring training on the operating procedures and other requirements for safe operation of the project facilities. Provide annual refresher training for employees. • Monitor the system continuously so that it can be shut down quickly and isolated before a significant release could occur. • Install monitoring for piping systems as well as monitoring systems, rupture disks and water traps to trap any released vapor. **Additional Measures Identified to Further Reduce Impacts:** • Comply with DOT standard pipeline protection and safety measures (49 CFR 195) to minimize CO_2 pipeline failures, including: ▪ Internal pipeline inspection methods using smart pigs to detect corrosion, pitting, or other pipe imperfections; ▪ Frequent visual inspection and aerial surveys along pipeline ROWs to identify signs of damage or encroachment by vegetation or structures; ▪ A public awareness program to inform people how to identify the locations of pipelines and who to notify before conducting excavation work or digging, especially near the pipeline ROW; and ▪ Training of pipeline operator staff on emergency and maintenance procedures.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Utilities	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • Conduct pre-construction locating and demarcating of existing underground utilities (e.g., electric, telephone, cable, water, gas, and sewer) within the proposed pipeline alignments. • Prior to construction, perform a utility mark out (a survey to determine the location and depth of existing utilities) to ensure that the pipelines could be installed safely and to reduce the probability of equipment making contact with or damaging existing utilities. • Locate new pipelines within existing AEP transmission corridors to prevent the need to establish new ROWs to the extent possible. • Continue to coordinate with affected utility providers throughout final engineering and design phases. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.
Community Services	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.

Table 4.3-1. Mitigation Measures for the Proposed Mountaineer CCS II Project

Resource	Mitigation Measures
Socio-economics	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.
Environmental Justice	**Construction** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None. **Operations** **Additional Measures Required by Laws, Regulations, and Ordinances:** • None. **Measures Incorporated into Proposed Action to Reduce Impacts:** • None. **Additional Measures Identified to Further Reduce Impacts:** • None.

AEP = American Electric Power Service Corporation; BMP = best management practice; C&D = construction and demolition; CFR = Code of Federal Regulations; CO_2 = carbon dioxide; CWA = Clean Water Act; DOE = U.S. Department of Energy; DOT = U.S. Department of Transportation; DWWM = Division of Water & Waste Management; EPA = U.S. Environmental Protection Agency; HEL = highly erodible land; MVA = monitoring, verification, and accounting; NHPA = National Historic Preservation Act; NPDES = National Pollutant Discharge Elimination System; OSHA = Occupational Safety and Health Administration; PSMS = Process Safety Management Standard; RCRA = Resource Conservation and Recovery Act; RMP = Risk Management Plan; ROW = right-of-way; SHPO = State Historic Preservation Office; SPCC = Spill Prevention, Control, and Countermeasures; SWPPP = Stormwater Pollution Prevention Plan; UIC = Underground Injection Control; USACE = U.S. Army Corps of Engineers; WVDEP = West Virginia Department of Environmental Protection; WVDNR = West Virginia Division of Natural Resources

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4.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This section describes the amounts and types of resources that would be irreversibly and irretrievably committed for the proposed project. A resource commitment is considered *irreversible* when primary or secondary impacts from its use by the project would limit future use options. Irreversible commitment applies primarily to nonrenewable resources, such as minerals or cultural resources, and to those resources that are renewable only over long spans of time (i.e., generally greater than 100 years), such as soil productivity. A resource commitment is considered *irretrievable* when the use or consumption of the resource by the project would only be renewable or recoverable for use by future generations. Irretrievable commitment applies to the loss of production, harvest, or renewable natural resources that would be lost for a period of time (i.e., generally less than 100 years), but would recover or be available for use by future generations over time.

The principal resources that would be committed are the lands required for the construction of the project. These lands include the proposed CO_2 capture facility site at the Mountaineer Plant, the pipeline corridors requiring new construction, and the injection and monitoring well sites, as well as the target formations proposed for permanent CO_2 storage. Other resources that would be committed to the project include construction materials (e.g., steel, concrete) and process materials (e.g., ammonia, sulfuric acid) used for operations.

The amount of land that would be committed during construction of the project would include construction staging and laydown areas, pipeline construction ROWs, injection and monitoring well construction sites, and to a lesser extent, access road construction sites. The CO_2 capture facility would occupy 33 acres, the construction ROWs for pipeline corridors would occupy up to 400 acres, and the injection/monitoring well construction sites would require up to 120 acres. Collectively, up to 553 acres would be irretrievably committed during the 32-month construction phase.

The amount of land that would be committed during operation of the project would include the CO_2 capture facility site, permanent pipeline ROWs, injection/monitoring well sites, and new access roads. Collectively, up to 277 acres could be irretrievably committed during the operation phase of the project, which has a potential to last 20 years. These commitments are not viewed as irreversible, as lands would be allowed to return to prior uses after the potential 20-year operational life of the project is over, and the project is decommissioned. For this analysis, it is presumed that decommissioning would involve the removal or the proper closure and abandonment in place of project components.

All of the land proposed for the CO_2 capture facility and injection/monitoring well sites is already owned by AEP; therefore, there would be no loss of these lands as they would be used for their intended purpose by AEP. Temporary easements would be required during pipeline construction, and permanent easements would be maintained for the pipeline ROWs. The pipeline corridors would preclude farming only during construction, as any land currently being used for agricultural use would be returned to agricultural use after construction. Temporary and permanent easement lands would not be considered as an irreversible commitment of resources because lands in the ROWs would be returned to agricultural production with few restrictions. However, the loss of agricultural use of these lands during the proposed construction period would be an irretrievable commitment.

Natural habitat would be lost primarily where pipeline ROWs would cross wooded areas mainly along the Blessing Road Corridor and the East Corridor. The pipeline corridors would result in the loss of up to 100 acres of wooded areas primarily where new corridors would be required; however, only 39 acres would be maintained over the operational life of the project, while the remainder would be allowed to revert back to woods. After the project is concluded, the operational ROW could revert back to woods as well. This loss of wooded area is, therefore, considered an irretrievable commitment.

Injection of CO_2 into the subsurface would irreversibly commit portions of the Rose Run and Copper Ridge Formations to CO_2 storage. These formations within the injection zone would lose their ability to serve any other function, and would be dedicated to CO_2 storage. At more than 1.5 miles below the ground surface, these formations are situated substantially below potential coal seams in the area. Hence, the coal could be recovered in the future, during CO_2 injection operations or afterward, provided safeguards would be followed to avoid wells developed for injection and monitoring. Once CO_2 injection is completed, some wells and equipment at the injection well site could still be used for long-term monitoring purposes, but after removal of surface facilities, the land could return to other uses. As such, the short-term and limited commitment of coal resources is irretrievable, only during the construction period.

The project would use up to 1.9 mgd of process water (i.e., from the existing river water loop via the Ohio River) that would be committed for the potential 20-year operational lifespan of the project. Most of the water would be cycled through the evaporative condensers, where most of it would evaporate, and the balance would include chiller blowdown and purge water that would be treated at the project's WWTP before returning it to the river. Potable water from the New Haven Municipal Water and Sewer Department would also be consumed during construction (up to 0.05 mgd) and operation (up to 0.002 mgd). The only portion of the water that would not discharge directly back to groundwater or surface water would be the water that evaporates from the evaporative condensers (approximately 1.6 mgd). This water would not be available to the local area. These are considered irretrievable commitments of water resources.

Material and energy resources committed for the project would include construction materials (e.g., steel, concrete), electricity, and fuel (e.g., diesel, gasoline). All energy used during construction and operation would be irreversible. During operation, the project would use up to 3.2 million pounds of ammonia and up to 3.3 million pounds of sulfuric acid annually, which would be irreversibly committed.

The construction and operation of the project would require the obligation of human resources that would not be available for other activities during the commitment period. This would be an irretrievable commitment of resources.

Finally, the construction and operation of the project would require the commitment of fiscal resources by AEP, its investors and lenders, and DOE for the construction, demonstration, and operation of the project. This fiscal investment would be an irreversible commitment.

As described above, the project would result in irretrievable (i.e., lost for a period of time) commitments of primarily renewable natural and human resources. The project would also result in irreversible (i.e., permanently lost) commitment of portions of geologic storage formations, fiscal resources, energy, material resources, and fuel. However, DOE believes these commitments would reduce the overall, long-term environmental effects (i.e., GHG emissions) of using fossil energy resources and would fulfill national objectives as identified by the CCPI Program.

4.5 RELATIONSHIP BETWEEN SHORT-TERM USES OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

During the planned 20-year operational life of the Mountaineer CCS II Project, up to 277 acres of land would be used for the proposed CO_2 capture facility, pipeline corridors, injection and monitoring wells, and associated access roads. Easements would be required for the pipeline ROWs. The CO_2 capture facility would consume resources, including ammonia, sulfuric acid, water, and small quantities of process chemicals, paints, degreasers, and lubricants. The ammonium sulfate by-product would be recovered and marketed or properly disposed if no adequate market could be found.

A long-term benefit of the project from the perspective of DOE would be to achieve lower emissions of GHGs by capturing and storing up to 1.5 million metric tpy of CO_2. The widespread acceptance and employment of this technology could foster the overall long-term reduction in the rate of CO_2 emissions from coal-fueled power plants across the U.S., thereby reducing national GHG emissions. If the project is successful, the short term use of land, materials, water, energy, and labor to construct and operate the project would have long-term positive impacts on reducing GHG emissions both in the U.S. and abroad.

The project would reduce emissions of CO_2, as well as regulated pollutants (e.g., SO_x) from the existing Mountaineer Plant. The project would result in a net reduction of approximately 18 percent in CO_2 emissions from the Mountaineer Plant (see Section 3.2, Greenhouse Gases). The project would support the objectives of the CCPI Program to demonstrate an advanced coal-based technology that captures and sequesters CO_2 emissions from a coal-fired power plant.

The project would enhance long-term productivity in the ROI through the direct, indirect, and induced creation of up to 800 jobs during the 32-month construction period. In addition, the project would result in a beneficial impact to the economy, employment, and tax base within the ROI over its operational life as a result of the 38 permanent jobs that would be created, as well as, the indirect and induced jobs created as a result of these permanent jobs (see Section 3.17, Socioeconomics).

Short-term uses of the environment would include the activities and associated impacts during the proposed construction and the operational lifespan of the project. Potential impacts to various resources have been described throughout Chapter 3. Potential resources impacts evaluated include the following:

- Air quality impacts as described in Section 3.1, Air Quality and Climate, including fugitive dust emissions during construction
- Erosion and sedimentation impacts on surface waters during construction as described in Section 3.4, Physiography and Soils, and Section 3.6, Surface Water
- Vegetation and wildlife habitat impacts caused by land-clearing activities, as described in Section 3.7, Wetlands and Floodplains, and Section 3.8, Biological Resources
- Aesthetic impacts from construction and operations affecting nearby residents as described in Section 3.10, Land Use and Aesthetics
- Traffic impacts during construction attributable to temporary detours and the movement of heavy equipment, plus increased traffic on local roadways during construction and operation, as described in Section 3.11, Traffic and Transportation
- Noise impacts from construction activities and operations, as described in Section 3.12, Noise

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