Environmental Assessment

Installation of a Solar Photovoltaic Array

Yeager Airport

Central West Virginia Regional Airport Authority
100 Airport Road, #175
Charleston, WV 25311

This Environmental Assessment becomes a federal document when evaluated and signed and dated by the responsible Federal Aviation Administration official.

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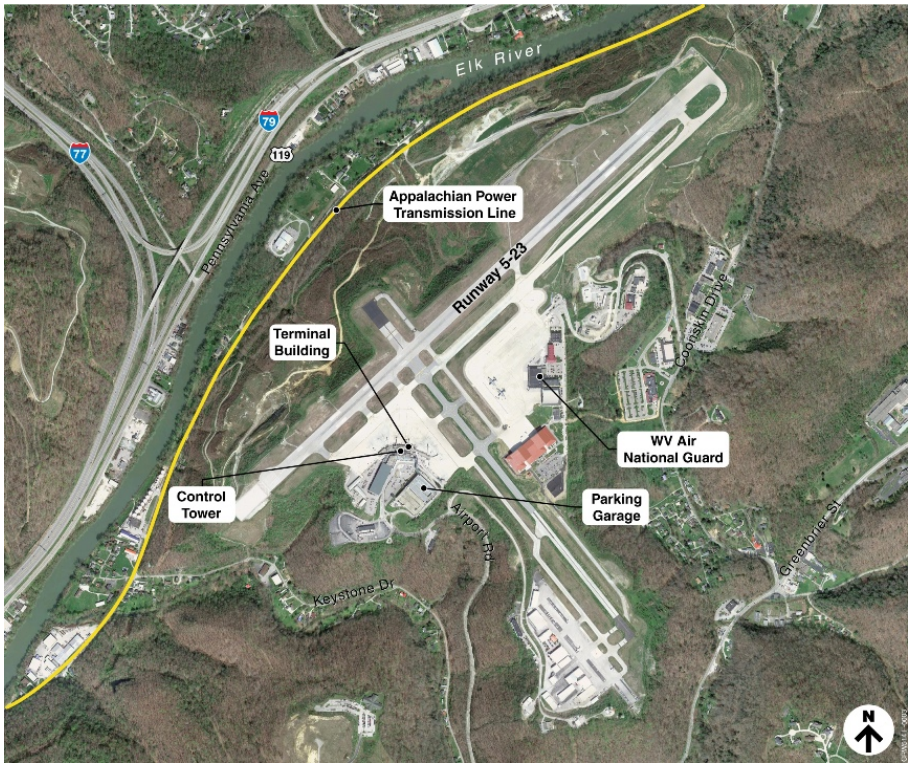
1.0 BACKGROUND

The Central West Virginia Regional Airport Authority (the Authority) is pursuing an airport-wide initiative that focuses on energy efficiency and self-sufficiency (the Green Energy Initiative, or the Initiative) at Yeager Airport (the Airport). The Airport is situated on the top of a small mountain, approximately two miles northeast of downtown Charleston, West Virginia and is bordered to the west and north by the Elk River and Interstate Highways 77 and 79 and by mountains to the east, as shown in Figure 1. Based on an average of the Airport's utility bills for 2012 and 2013, it is estimated that the Airport consumes about 4,735 megawatt-hours (MWh) of electricity per year. With the recent addition of electric preconditioned air and ground power units at the gates to service parked passenger aircraft, the Airport's total electrical consumption is expected to be about 5,005 MWh on an annual basis beginning in 2016.

While the Authority has identified a number of potential energy efficiency projects, the proposed Initiative focuses on the installation of a solar photovoltaic (PV) array appropriately sized to allow the Airport to be carbon-neutral. The first step in developing the Initiative would be the installation of solar PV arrays (totaling approximately 4-MW) that would annually generate approximately 5,295 MW-hours (MWh) of electricity (the Proposed Action). The electricity generated by these arrays would almost offset the total annual electricity consumed at the Airport, which would result in a savings for the Authority of more than $440,000 per year in reduced utility costs.

Figure 1
LOCATION OF YEAGER AIRPORT
Yeager Airport



Source: LeighFisher, August 2015.

It is important to note that because installation of the proposed solar PV arrays would involve an update to the existing airport layout plan, the Authority is seeking FAA review and approval of this Environmental Assessment (EA) in accordance with the National Environmental Policy Act and Federal Aviation Administration (FAA) Orders 5050.4B and 1050.1E.

A solar PV feasibility study, which considered installation costs, existing land use, and potential for glare impacts, was performed in May 2014 (see Appendix A, *Solar PV Siting Study*). As shown in Figure 2, six possible sites were considered for the feasibility study and three sites were preliminarily identified as the most suitable locations—a large open area northwest of Runway 5-23 (Site A), a large open area below the embankment from Site A (Site C), and on the top of the existing parking garage (Site E)—to support the Proposed Action. It was expected that the solar PV arrays at Sites A and C would provide electricity directly to the local power grid and the array at Site E would provide electricity directly to the Airport terminal area.

Figure 2
LOCATIONS OF POTENTIAL SOLAR PV SITES
Yeager Airport

Source: LeighFisher, August 2015.

During subsequent project formulation there were some modifications made to the original project configuration considered in the May 2014 study. Specifically, it was determined that installing a solar PV array at Site A could impact the function of the existing Airport navigational aids. After consultation with the FAA, a new site, Site A1, was identified as an alternate location suitable to support a similar sized solar PV array. As shown in Figure 2, Site A1 is situated at the threshold of, and in the runway safety area (RSA), of closed Runway 15 and would provide approximately the same land area for development. In

addition, electricity generated by the solar PV array at Site A1 would now be routed to the local utility grid. Site A1 was not initially identified for consideration because the site is covered with runway pavement and emphasis was placed on minimizing site preparation costs. However, since Site A was found to involve significant potential impacts to Airport navigational aids, Site A1 was added as a possible development alternative. Factors affecting the selection of Site A1 location included: potential impacts associated with glare, availability of contiguous land area similar to Site A to preserve power generation capacity, existing use of the land, distance from navigational aids, potential for environmental impacts, and installation costs.

Table 1 summarizes the characteristics of the seven sites considered during the survey effort.

Table 1
SUMMARY OF POTENTIAL SOLAR PV SITES
Yeager Airport

Site	Size (acres) *(a)*	Array Capacity (MW)	Shading	Glare Hazard at Tower
A	8.6	2.7	No	No
A1	9.6	2.3	No	No
B	4.4	1.3	Morning	No
C	4.4	1.2	Morning	No
D	1.0	0.3	Morning and Evening	No
E	2.4	0.6	No	No
F	1.5	0.5	Winter	No

Source: LeighFisher, August 2015.

(a) Size estimates were preliminary in nature and may not correlate with geotechnical surveys performed at a later date.

During the site selection process, it was determined that the eastern portion of Site C experienced shading in the morning and that the southern half of Site E was structurally unsound to support the weight of the solar PV panels. Accordingly, Sites C and E were subsequently broken out and identified as Site C East and West and Site E North and South.

As part of furthering the Proposed Action, the Authority recently completed and received approval from FAA for a glare hazard analysis of the solar PV arrays, which indicated no potential of glare impacts to Air Traffic Control Tower (Tower) personnel and glare with low potential for after-image from all sites on the approaches to Runways 5 and 23 for pilots (see Appendix F). Additionally, the Authority is requesting FAA grant funding assistance through the *Energy Efficiency of Airport Power Sources Program* (often referred to as "Section 512").

Baseload and Peaking Power

Baseload power sources that serve the local Appalachian Power Company (APCO) electrical grid (generating plants that supply power for routine, daily demand) are fueled by coal and peaking power sources (generating plants that supply power in times of high demand) are fueled by natural gas and hydroelectric power. Baseload plants account for 97.9% of the total power generated by APCO on an annual basis and peaking plants account for the remaining 2.1%. The proposed solar PV panels would

generate baseload electricity. It is understood that the Section 512, *Energy Efficiency of Airport Power Sources Program*, only provides grant assistance for energy efficiency projects that reduce baseload power consumption. Given that the nearly 98% of the electricity the Airport consumes is generated by baseload power plants (coal-fired), only 2% of the solar PV array would be ineligible for funding. However, if the amount of available FAA funding falls short of the requested amount, the Authority has prioritized locations for development: (1) Site E North (713-MWh, or 14% of the total load), (2) Site C West (1,532-MWh, or 31% of the total load), and (3) Site A1 (3,050-MWh, or 61% of the total load). Site E North would be prioritized given the lower installation and supporting infrastructure costs and while Site C West and A1 would produce a higher percentage of the Airport baseload requirements, they have higher site preparation and supporting infrastructure costs. It is important to note that while solar PV power production is expected to exceed the Airport's baseload power requirements by about 290-MWh, or about 5.5%, the grant funding request has been reduced by 5.5% to ensure that FAA funding does not cover power production in exceedance of the Airport's baseload requirements. The grant request has also factored in a 2.1% reduction in funding eligibility based on the profile of baseload and peaking power sources that supply electricity to the Airport.

Airport Energy Efficiency Initiatives

The Authority recently performed an energy assessment of the heating/ventilation/air conditioning (HVAC)-related systems at the Airport. The assessment recommended the following energy efficiency improvements be implemented at the Airport:

- Replacement of aging and inefficient rooftop HVAC units with modern, energy efficient counterparts
- Installation of a direct, digital-control building management system, which will enable Authority staff to remotely monitor and control HVAC systems
- Replacement of existing building and runway lighting systems with high efficiency fluorescent and LED light bulbs

The Authority intends to begin implementing these energy efficiency strategies in FY 2016. It is estimated that the HVAC energy efficiency improvements will reduce annual electricity consumption by approximately 321-MWh. The Authority was recently awarded a grant through the FAA's Voluntary Airport Low Emission (VALE) Program for the procurement of electric preconditioned air (PCA) and ground power equipment. Aircraft operating at the Airport currently rely on their auxiliary power units (APUs) for power and PCA. The VALE Program grant will help the Authority purchase and install the electric equipment so that aircraft could forego the use of their APUs while parked at the gate. It is expected that the PCA and ground power equipment will consume approximately 591-MWh of electricity per year and will be fully operational in 2017.

By using the following equation, it is expected that the Airport's future annual electricity consumption will be approximately 5,005-MWh:

(Current Consumption) + (PCA Unit Consumption) – (HVAC Improvements) = Future Energy Consumption

or

4,735-MWh + 591-MWh – 321-MWh = 5,005-MWh

Upon FAA approval of this EA, the Authority would continue with additional planning steps, including preparing an official request for grant funding. Completion of the Proposed Action would occur within approximately one year of FAA funding approval.

1.1 Purpose and Need

The purpose of the Proposed Action is to advance the Authority's Green Energy Initiative, which seeks to: (1) maximize the economic contribution from non-aviation uses on Airport property, (2) maximize Airport energy efficiency and self-sufficiency, (3) minimize the carbon footprint of the Airport, and (4) support economic and sustainable development at the Airport. Meeting these objectives can further the Airport and its support of the national aviation system.

The Proposed Action is necessary because: (1) the Airport is located in a region with poor air quality and the use of clean energy generated by the solar PV arrays would significantly decrease the demand for and reliance on electricity generated by local fossil-fuel power plants, and (2) the Airport has a limited operating budget and the use of solar-generated electricity would help significantly reduce the Airport's operating costs and promote Airport-wide sustainability, which in turn would enable the Authority to fund other critical development projects.

2.0 PROPOSED ACTION

The Proposed Action involves the installation of (1) a 2.3-MW solar PV array at Site A1, which would cover approximately 9.6 acres of land, (2) a 1.2-MW solar PV array at Site C West, which would cover approximately 6.5 acres, and (3) a 579-kilowatt (kW) solar PV array at Site E North, which would cover approximately 1.5 acres over a portion of the existing parking garage, as shown in Figure 3. It is important to note that the actual acreages of the three sites (discussed below), which were precisely measured during the subsequent survey and design process, differ from the acreages estimated earlier during the preliminary planning process. Additionally, Site A1 was not included in the original site survey, but was included as a reasonable alternative shortly thereafter. The initial size estimates, which are included in Table 1 and in Appendix A, were developed using an online mapping tool. The refined size estimates are provided in this section and in subsequent sections and reflect the actual acreages required to install the proposed solar PV arrays.

The three proposed sites are entirely located on Airport property and are large enough to support the solar PV arrays.

Site A1, which was not included in the original site survey, would cover approximately 9.6 acres adjacent to the northeastern edge of Runway 23 and would include a 2.3-MW solar PV array. The Site A1 solar PV array would be comprised of a ground-mounted racking system with 6,996 modules and four inverters. The arrays would generate approximately 3,050 MWh of electricity per year. Power generated at Site A1 would be routed to a nearby transmission line for distribution into the local power grid, both of which are managed by APCO. Modules would be oriented 180 degrees and horizontally tilted 25 degrees to maximize energy production.

Site C West, with a size estimate refined from 4.4 acres to 6.5 acres, would be located down the Runway 5-23 embankment and would include a 1.2 MW solar PV array. The Site C West solar PV array would be comprised of a ground-mounted racking system with 3,608 modules and two inverters. The arrays would generate approximately 1,532 MWh of electricity per year. Power generated at Site C West would be routed to the APCO transmission line for distribution into the local grid. Modules would be oriented 180 degrees and horizontally tilted 25 degrees to maximize energy production. Although Site C West is situated at the bottom of the Runway embankment, its location is far enough west to avoid nearly all of the shading in the early morning hours caused by the embankment.

The arrays at Sites A1 and C West would utilize a standard ground-mounting system where the modules are attached to a support structure with piers secured to a depth of 10 to 15 feet below ground. A recent geotechnical investigation of Sites A1 and C West indicates that the ground is capable of

adequately supporting the vertical mounting components. Both sites are located outside of the Object Free Area of Runway 5-23 and the solar PV arrays would be installed at each site in a manner that minimizes shading during energy-producing hours

Site E North, with a size estimate refined from 2.4 acres to 1.5 acres would be located on the roof of the Parking Garage A and would include a 579-kilowatt array. The Site E North solar PV array would be comprised of an overhead racking system, 1,782 modules and a single inverter. The arrays would generate approximately 713 MWh of electricity per year. Modules would be oriented 235 degrees (to align with the existing garage footprint) and horizontally tilted 5 degrees. Aligning the solar PV array with the footprint of the parking garage would reduce physical stresses to the structure caused by wind. While maintaining this alignment, a "saw tooth" design was found to better maximize power production as compared to the standard smaller, multi-row design typically used for most solar PV arrays. Power generated at this site would be routed to a transformer located adjacent to the southwest corner of the parking garage. The "saw tooth" pattern would consist of three large sheets of modules that would span the entire width of the Parking Garage.

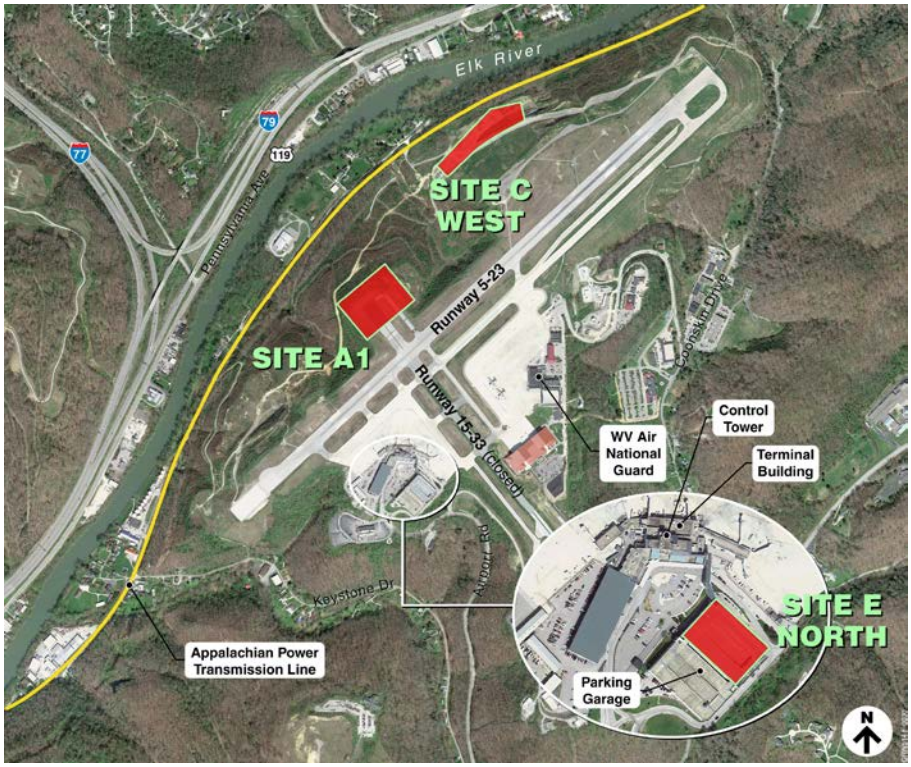
For Sites A1 and C West, direct current (DC) electricity generated by each solar PV panel would be converted into alternating current (AC) electricity by inverters adjacent to the arrays. The AC electricity would then be transmitted via underground feeder lines to an above-ground substation and transformer (an approximately 1,000-foot run to the west of both sites) located near an existing 12-kilovolt APCO transmission line that runs parallel to Barlow Drive and the Elk River. The transformer would "step-up" the AC electricity into a form more suitable for long distance transmission. The stepped up AC electricity would then be distributed directly to the nearby APCO power transmission line. A short (approximately 50 feet) above-ground electrical line would run from the substation and transformer to the APCO transmission line.

At Site E North, the DC electricity would be converted to AC by inverters located in the basement of the parking garage. The AC electricity would then be routed, via an underground feeder line, to an existing transformer approximately 100 feet to the east of the parking garage, where the power would be stepped-up and distributed to the local grid. The locations of the panels, the feeder lines, and interconnection locations are show in Figure 4.

Site A1 would involve the (1) removal of pavement associated with the threshold of closed Runway 15, and (2) grading and removal of the underlying earth to a depth of approximately 15 to 20 feet. A portion of the disturbed earth would be graded laterally to provide a uniform, level bed on which to install the solar PV panels. It is estimated that approximately 220,000 cubic yards of excess earth would need to be relocated to an existing fill site, via an existing haul road, approximately a thousand feet to the southwest, as shown in Figure 4. It is expected that the grading of Site C West would generate approximately 45,000 cubic yards of excess earth, which would also be relocated to the same fill site.

It is expected that the Authority would receive a credit on its monthly utility bill from APCO for all power transmitted to the local grid.

Figure 3
SOLAR PV ARRAY LOCATIONS
Yeager Airport



Source: LeighFisher, August 2015.

Site A1 includes developing part of the threshold and RSA of closed Runway 15. Site C West previously served as a fill borrow site for various Airport development projects and is mostly vacant and provides no revenue for the Authority, although a small natural gas extraction well is located at the southwestern portion of the site. Site E North is a multi-story parking garage for passenger automobiles. The Proposed Action would allow the Authority to maximize the economic value of the three sites and would be compatible with existing aeronautical uses of the land. Development of Site A1 would require pavement removal and moving approximately 220,000 cubic yards of earth. Site C West is relatively flat requiring grading and moving approximately 45,000 cubic yards of earth would be necessary for installation of the solar PV panels.

3.0 ALTERNATIVES

3.1 Alternatives Eliminated from Consideration

The previously-described solar PV feasibility study evaluated key siting parameters including proximity to utility transmission lines and on-Airport electrical load centers, potential for glare impacts, energy production efficiency, and appearance. As previously shown in Figure 2, six potential sites at the Airport were considered (Sites A through F), including three remote sites located to the west of Runway 5-23 (Sites A, B, and C), and three sites adjacent to the Airport terminal (Sites D, E, and F). The study originally assumed that the three remote sites would feed solar-generated electricity directly to the local power grid managed by APCO and the three terminal sites would feed electricity directly to on-Airport load centers.

Site A

Site A is situated northwest of, parallel to, and level with the end of Runway 23. There are no obstructions that would shade the array. The site is located a considerable distance from on-Airport electrical load centers near the Terminal Building. However, an APCO transmission line is located just to the northwest of the site, therefore, it is expected that it could be directly tied into the local utility grid. The site is relatively flat and thus standard solar ground mounts could be used. Site A was initially identified as a suitable site to support solar PV.

However, as previously mentioned, planning efforts subsequent to the initial site feasibility study identified potential impacts on the Airport navigational aids located in the vicinity of Site A, including the glideslope and localizer antennae and the automated surface observing system. Thus, installing solar PV panels at Site A would likely require extensive coordination with FAA and the National Weather Service, including possibly relocating navigational equipment and conducting equipment interference studies, which could incur significant costs to the Airport and delays to the Proposed Action.

Due to concerns related to potential interference with Airport navigational aids, Site A was eliminated from further consideration.

Site B

Site B is situated to the northwest of and parallel to the end of Runway 5, approximately 100 feet below the elevation of the runway. Electricity production at the site would be significantly impacted by shading as the adjacent Runway 5-23 embankment blocks sunlight until late morning. Although the site is located close to the Terminal Building, an APCO transmission line is located immediately to the west of the site, making a direct connection to the grid more desirable.

Due to the likelihood of significant shading impacts throughout the day and year caused by topography, Site B was eliminated from further consideration.

Site C East

The eastern half of the original Site C is situated northwest of Site A, approximately 80 feet below Runway 5-23. Electricity production at the site would be impacted by shading as the adjacent Runway 5-23 embankment blocks sunlight until mid-morning. As an APCO transmission line is located just to the west of the site, it is expected that electricity produced on this site could be directly tied into the local utility grid.

Due to the likelihood of significant shading impacts throughout the day and year caused by topography, Site C East was eliminated from further consideration.

Site D

Site D currently houses the rental car garage and is situated directly southwest of the Terminal Building. Because of its close proximity to the Terminal Building, it is expected that electricity from arrays mounted on the roof of the garage would be routed directly to an Airport load center. Site D would experience minor shading in the morning and evening from the public parking garage located to the northeast. As the garage roof is unable to structurally support a solar PV array, an extensive elevated racking system would need to be constructed.

Due to shading concerns caused by the parking garage and the potentially high costs associated with strengthening the rental car garage roof, Site D was eliminated from further consideration.

Site E South

The southern half of the original Site E is on the top of the Parking Garage and is situated directly south of the Terminal Building. Because of its close proximity to the Terminal Building, it is expected that electricity from an array mounted on the roof of the Parking Garage could be routed directly to an Airport load center. In order to preserve current vehicle parking capacity at the site, an elevated racking system would need to be constructed. This site would provide an excellent opportunity for public visibility and aesthetic design.

Due to concerns regarding structural stability of the garage, Site E South was eliminated from further consideration.

Site F

Site F, which is currently used as a short term parking lot, is located directly south of the Terminal Building between the rental car garage and the public parking garage. Because of its close proximity to the Terminal Building, it is expected that electricity from this site could be routed directly to an Airport load center. The southern portion of Site F may experience some shading during the winter months from the adjacent parking garage. In order to preserve the current vehicle parking on the site, an extensive elevated racking system (i.e., parking canopies) would need to be constructed.

Due to possible seasonal shading caused by the parking garage an extensive supporting infrastructure costs, Site F was eliminated from further consideration.

3.2 Other Reasonable Alternatives

No other reasonable solar PV development alternatives were identified that would meet the project's Purpose & Need. There are no other on-Airport locations that are large enough to accommodate a solar PV array sized to meet the Airport's electricity needs. Additionally, no other on-Airport locations provide a suitable location for a cost-effective connection to an on-Airport load center or to the local utility grid.

No other reasonable alternative energy alternatives were identified. Wind power requires the use of large turbines, which have the potential to interfere with radar and communication transmissions and pose a safety hazard to aircraft operating in the area. Hydroelectric power requires the use of submerged turbines in rivers and coastal areas and would not be a cost-effective measure to reduce the Airport's operating expenses. Additionally, the mountainous topography of central West Virginia is not suitable to support a cost-effective geothermal heating and cooling system and the National Renewable Energy Laboratory has classified the region as "least favorable" to support geothermal resource utilization.[1]

The Authority is always interested in potential revenue-generating non-aviation uses of Airport property but has not identified any alternative commercial activities suitable for the sites of the Proposed Action.

[1] http://www.nrel.gov/gis/images/geothermal_resource2009-final.jpg

3.3 No Action Alternative

Sites A1 and C West are currently vacant and neither generates revenue for the Authority nor provides an apparent land-use for the Authority to offset Airport operating costs. Site E North, which is located on the existing parking garage, provides revenue for the Authority, but the economic potential of the property would not be maximized.

The No Action Alternative does not satisfy the project's Purpose and Need, and therefore is not a viable alternative. It is being retained as required by NEPA for consideration in order to provide a baseline against which to evaluate the Proposed Action Alternative.

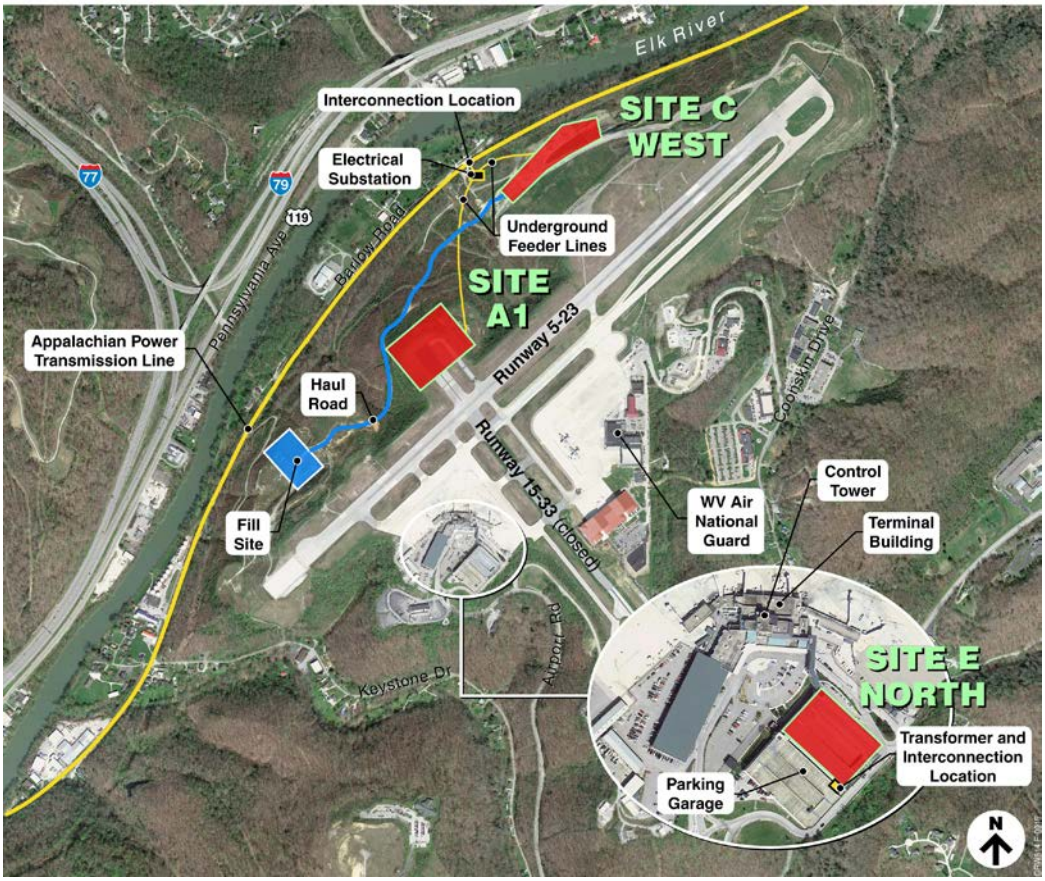
3.4 Proposed Action Alternative

The Proposed Action Alternative would involve the installation of (1) a 2.3-MW solar PV array at Site A1, located in the threshold and RSA of closed Runway 15, (2) a 1.2-MW solar PV array at Site C West located down the embankment west of the Runway 23 threshold, and (3) a 579-kW solar PV array at Site E North on the top of the existing parking garage. Sites C West and E North are large enough in size to accommodate the solar PV panels. The individual panels at Sites A1 and C West would be affixed to support poles drilled approximately 10 to 15 feet into the earth. The panels would be oriented to optimize electricity production with an azimuth of 180 degrees and a tilt of 25 degrees from horizontal. The panels would be wired to each other in a series of rows, spaced approximately 12 feet apart. Electricity from each row would be routed to centralized locations, which would ultimately be connected to the inverters. Inverters convert solar-generated electricity from DC (the form of energy created by solar panels) to AC (the form of energy suitable for transmission and practical uses). After being converted to AC, the electricity would be routed to a substation prior to interconnection with the existing APCO transmission line that runs parallel to and near the Elk River, as shown in Figure 4.

The panels at Site E North would be arranged in a three-row saw-tooth pattern of panels that span the width of the parking garage, but would be affixed to the garage by an overhead racking system. The panels would be oriented with an azimuth of 235 degrees and a tilt of 5 degrees. While this orientation is not optimal (e.g., not facing due south), it is necessary to avoid glare impacts in the air traffic control tower and structural stresses to the parking garage. The overhead canopy would be designed to withstand hurricane-force winds without compromising the integrity of the parking garage structure. The canopy would be mounted approximately 10 to 15 feet over the top deck of the garage and would not prevent passenger vehicles from parking on the top level. Once passing through the inverters, the electricity generated at Site E North would be routed to the APCO power grid via a transformer located east of the parking garage, as shown in Figure 4.

The Proposed Action Alternative would meet the project's Purpose and Need by: (1) generating electricity that would reduce the Airport's operating costs, (2) serving as a reliable source of electricity, (3) significantly reducing carbon and criteria air pollutant emissions in the region, and (4) promoting sustainable development at the Airport.

Figure 4
SOLAR PV INTERCONNECTION LOCATIONS
Yeager Airport



Source: LeighFisher, August 2015.

4.0 AFFECTED ENVIRONMENT

4.1 Categories with No Impact

The Proposed Action would not result in environmental consequences with respect to the impact categories found in this section; therefore, mitigation related to these categories would not be required.

Coastal Resources

Environmental impacts associated with coastal resources from federally approved actions must comply with three statutes: (1) the Coastal Barrier Resources Act (CBRA), (2) the Coastal Zone Management Act, and (3) Executive Order 13089, Coral Reef Protection. The sites of the Proposed Action are not located in the CBRA System, as the state of West Virginia is not adjacent to any coastal areas or identified coral reef systems. Accordingly, the Proposed Action would not affect any coastal or coral reef resources.

Compatible Land Use

The compatibility of land uses surrounding airports in the United States is regulated by the Aviation Safety and Noise Abatement Act. As described in Section 5.5 of this EA, the Proposed Action would not result in a cumulative increase in noise levels at the Airport as solar PV arrays do not generate noise. Additionally, developing Sites A1, C West, and E North, the fill site, and installing the supporting electrical infrastructure (underground feeder lines, inverters, and transformers) would be compatible with existing and future aeronautical uses of Airport property. Accordingly, the Proposed Action would not result in impacts to surrounding land use.

Department of Transportation Act: Section 4(f)

Section 4(f) of the Department of Transportation Act prohibits the use of any publicly-owned land from a park, recreation area, historic site, or wildlife and waterfowl refuge of national, State, or local significance, unless there is no feasible alternative. Sites A1 consists mainly of pavement from closed Runway 15, Site C West is currently an unused field adjacent to Runway 5-23, and Site E North is located on the top of the existing parking garage. None of the sites are designated for any purpose outlined in Section 4(f). Accordingly, it is not expected that the Proposed Action would result in impacts to Section 4(f) lands.

Farmlands

Site A1 is located at the threshold of closed Runway 15, Site C West is located on a previously-disturbed area that is covered by grass, and Site E North is located on the top of an existing parking garage. The National Resources Conservation Service's online mapping tool, *Web Soil Survey*, did not indicate the presence of prime or unique farmlands at Site C West (see Appendix B, *Soil Survey Data*). Accordingly, the Proposed Action would not result in impacts to prime or unique farmland.

Fish, Wildlife, and Plants

The United States Fish and Wildlife Service (USF&WS) has described the Indiana Bat's habitat as "…riparian, bottomland, or upland forests and old fields or pastures with scattered trees." Sites A1 and C West are located in a large, flat open areas devoid of any sizeable vegetation such as trees, but do contain scrub brush and patches of grass located on the periphery of both sites. Site E North is located on the top of a concrete parking garage. None of the locations are suitable to support the Indiana Bat. Additionally, the fill site would be located and the electrical infrastructure would be installed in areas that have been previously disturbed contain only small scrub brush and grasses. Accordingly, it is not expected that the Proposed Action would result in impacts to protected fish, wildlife, or plant species.

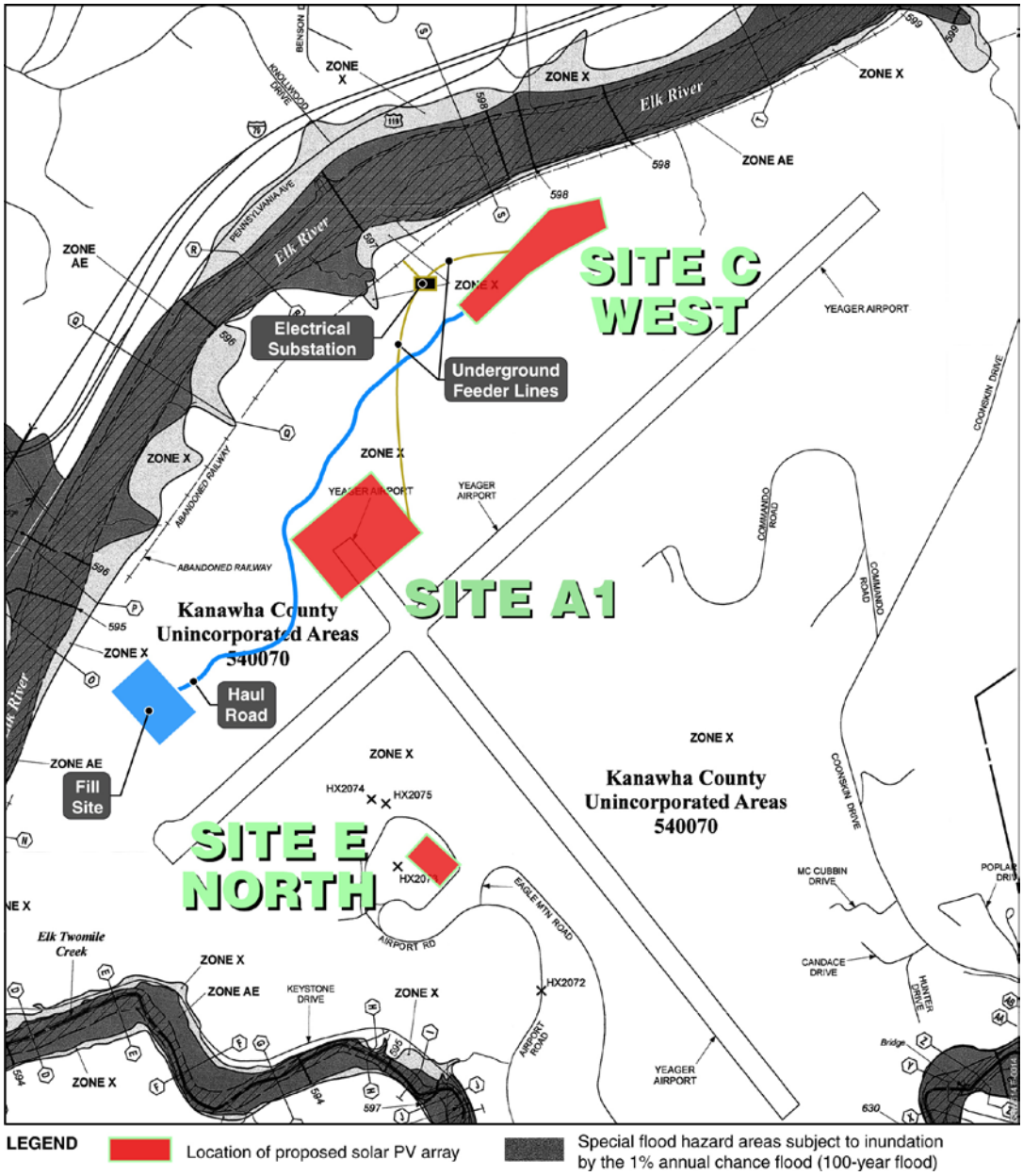
A "no impact" finding letter from USF&WS, which includes both Sites A1 and C West, is included in Appendix C.

In the unlikely event that any threatened or endangered species are encountered during construction, all activities would cease until the Authority had coordinated with USF&WS.

Floodplains

As per federal guidance (7 CFR 650.25), the proposed location for a federally-approved project must be re-evaluated if the site would encroach on a base floodplain based on a 100-year flood. Figure 5 depicts the location of the Proposed Action superimposed on Federal Emergency Management Agency Flood Insurance Rate Maps of the area, which shows that Sites A1, C West, and E North, the fill site, and the supporting electrical infrastructure are not located in the flood hazard area subject to inundation by a 100-year flood. Accordingly, it is not expected that the Proposed Action would be impacted by 100-year floods.

Figure 5
FLOODPLAIN MAP
Yeager Airport



Source: LeighFisher, adapted from information from Federal Emergency Management Agency Flood Insurance Rate Maps, August 2015.

Hazardous Materials, Pollution Prevention, and Solid Waste

The West Virginia Department of Environmental Protection (WVDEP) maintains an underground storage tank database, which shows that two underground storage tanks are currently located at the Airport—one maintained by the Authority (Facility ID 2002400) and one maintained by the West Virginia Air National Guard (Facility ID 2002402). The most recent leak occurred at the Air National Guard facility in 2005 and was fully remediated by 2008. Additionally, no known sites have been identified in the vicinity of the Airport that are currently being remediated under the Comprehensive Environmental Response, Compensation and Liability Act of 1980.

Given that (a) Sites A1 and C West, the fill site, and the supporting electrical infrastructure are located several hundred feet away from either tank and (2) Site E North would be located on the top of an existing structure, it is unlikely that the construction of the Proposed Action would result in the exposure of any existing hazardous materials. It is also unlikely that the Proposed Action would generate any meaningful quantities of hazardous or solid wastes.

In the unlikely event that contaminated soil is exposed at Sites A1 or C West or the fill site, all activities would cease until the Authority has coordinated with WVDEP.

If any hazardous or solid waste is generated during construction of the Proposed Action, it would be disposed of in a manner that is in accordance with all applicable local, state, and federal regulations.

Historical, Architectural, Archeological, and Cultural Resources

The properties involved in the Proposed Action are not listed in the U.S. National Register of Historic Places database and no Indian lands are known to be located within Kanawha County, as shown in Figure 6. Sites A1 and C West are located in an area that has been previously disturbed and Site E North is located over an existing parking garage. Accordingly, it is unlikely that the Proposed Action would impact any such resources.

A “no impact” finding letter from the West Virginia Division of Culture and History, which includes both Sites A1 and C West, is included in Appendix C.

In the unlikely event that any historical, architectural, archaeological, or cultural resources are encountered during construction, all activities would cease until the Authority had coordinated with the West Virginia Division of Culture and History.

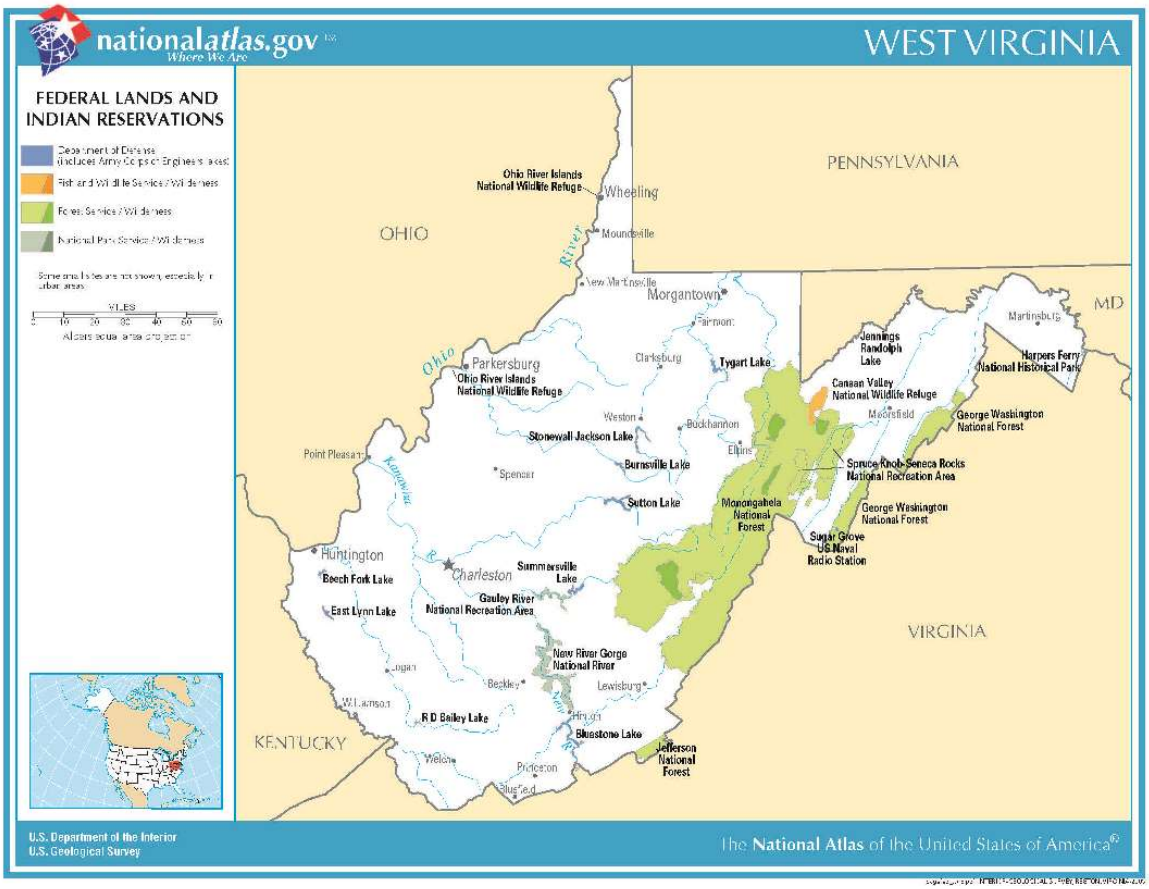
Secondary (Induced) Impacts

No significant secondary impacts would occur as a result of the Proposed Action. The installation of the proposed solar PV arrays would not negatively affect the general population and therefore would not result in secondary impacts such as changes in local business and economic activity. Because renewable energy sources, such as solar and wind, generally do not affect the base-load generation of electricity at conventional power plants, the Proposed Action is unlikely to affect local economies based on the mining and handling of coal and coal-related resources.

A positive impact on the local and national economy would result from the Proposed Action, derived from (1) the requirement of the local labor force necessary to assist with equipment installation, and (2) the clean energy generation impact associated with the solar PV arrays.

Airport Road is the primary vehicular access route to the Airport. Although traffic volumes would increase slightly during the construction phase, once the Proposed Action has been completed, neither traffic volumes nor traffic flow would noticeably differ from existing conditions.

Figure 6
FEDERAL LANDS AND INDIAN RESERVATIONS IN WEST VIRGINIA
Yeager Airport



Source: National Atlas of the United States of America, U.S. Department of the Interior, accessed August 2015.

Socioeconomic Impacts, Environmental Justice, and Children's Environmental Health and Safety Risks

The Proposed Action would not adversely affect any portion of the local population, including minorities, low-income individuals, and children, since no subsistence patterns or other changes in local environmental relationships would be affected. In addition, the Proposed Action would not require the acquisition of property or the relocation of individuals.

Wetlands

An initial wetlands field survey was performed on July 3, 2014 and is included in this EA as Appendix D, Wetland and Waterbody Delineation Report. Once Site A1, the fill site, and the supporting electrical infrastructure was added as part of the Proposed Action, an additional survey of wetlands and jurisdictional waters was performed on October 10, 2014 that included Site A1 and the fill site. No potential wetlands, streams, or other water bodies were identified in the vicinities of the Proposed Action. The entire construction limits were delineated for wetlands and waterbodies. The construction limits include the sites for construction of the proposed solar PV arrays, haul road, fill site, and electrical infrastructure. Accordingly, it is not expected that the Proposed Action would impact any wetlands areas.

In the unlikely event that any wetland habitats are encountered during construction, all activities would cease until the Authority had coordinated with the United States Army Corps of Engineers.

Wild and Scenic Rivers

Protected rivers in West Virginia, as defined by the National Wild and Scenic Rivers System, include more than 70 designated river segments, none of which run through Kanawha County, the location of the Proposed Action. Therefore, the Proposed Action would cause no impact to the National Wild and Scenic River System.

4.2 Air Quality

The site of the Proposed Action is located in Kanawha County, West Virginia. The area is designated by the United States Environmental Protection Agency's (EPA's) National Ambient Air Quality Standards as in maintenance for ozone, precursors of which are nitrogen oxides (NO_x) and volatile organic compounds (VOC), and for particulate matter with an aerodynamic diameter of less than 2.5 microns ($PM_{2.5}$). The area is designated as attainment for carbon monoxide (CO), particulate matter with an aerodynamic diameter of less than 10 microns (PM_{10}), and sulfur oxides (SO_X).

4.3 Construction Impacts

There are no planned construction projects that would occur in the vicinity of the sites of the Proposed Action, although the Runway 5 runway safety area (RSA) has failed and slid into the valley below. It is possible that significant construction activities will be required to rehabilitate the RSA, but additional geotechnical planning is required to determine the precise level and timing of any efforts to restore the RSA. Excluding aircraft noise, the ambient noise level in the area is driven by light commercial business activities. Local ground vehicle traffic is generally comprised of passenger vehicles and light-duty transport trucks.

4.4 Light Emissions and Visual Impacts

The existing light emissions from the Airport are commensurate with those from light commercial enterprises, which include navigational lights, overhead ramp lighting, and lighting for buildings.

4.5 Natural Resources, Energy Supply, and Sustainable Design

Site A1 is currently neither producing nor depleting natural resources or energy supply, as the location is in an area with no commercial or agricultural development. Site E North, the location of the existing parking garage, consumes modest amounts of electricity for overhead lighting and parking toll collection. Electricity, which is supplied to the Airport by APCO, is generated by fossil fuel-fired power plants in the region. There is an existing gas well in the vicinity of Site C West.

4.6 Noise

Current noise levels in the vicinity of the Proposed Action are those associated with the operation of propeller and jet-powered aircraft and local vehicular traffic, generally comprised of passenger vehicles and light-duty transport trucks.

4.7 Water Quality

It can be inferred from Figure 3 that there are no sole-source aquifers in the vicinity of the Proposed Action. Additionally no streams or other bodies of water and drinking wells have been identified to exist in the vicinity of the Proposed Action.

Figure 7
APPROXIMATE BOUNDARIES OF EPA REGION 3 SOLE SOURCE AQUIFERS
Yeager Airport

Source: U.S. Environmental Protection Agency, August 2015.

5.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATION

5.1 Air Quality

Proposed Action

The Proposed Action would result in no direct emissions other than the temporary emissions associated with the construction of the project (construction activities are discussed in detail in Section 5.2). Because Sites A1 and C West would require only earthmoving (approximately 265,000 cubic yards in total) and grading, indirect emissions of $PM_{2.5}$ are expected to be minimal. The Proposed Action would decrease the demand for electricity generated from regional fossil fuel power plants, which would improve regional air quality. Because there is a high level of uncertainty as to where the power plant emission reductions may occur, it is unknown if the positive air quality impact would occur in the local Kanawha County maintenance area.

Because the Airport is located in maintenance areas for ozone and $PM_{2.5}$, the Proposed Action is required to meet General Conformity requirements under the Clean Air Act, including the determination of whether the Proposed Action would result in emissions that exceed the *de minimis* thresholds outlined in 40 CFR 93 Section 153. Additionally, under the National Environmental Policy Act (NEPA), an air quality analysis is generally required to determine whether the Proposed Action would violate the NAAQS. It was assumed that the air quality analysis performed in this EA satisfies both General Conformity and NEPA requirements.

The only expected increase in emissions would result from construction activities related to installing the solar PV panels, which would be temporary, and would remain well below the *de minimis* thresholds for each maintenance criteria air pollutant (100 tons for NO_X, VOC, and $PM_{2.5}$). As illustrated in Table 2, it is estimated that the Proposed Action would result in the following emissions:

Table 2
TOTAL ESTIMATED EMISSIONS
Yeager Airport

Emissions associated with the Proposed Action (tons)					
NO_X	VOC	CO	PM_{10}	$PM_{2.5}$	SO_X
4.843	0.408	2.195	0.356	0.328	0.018

Source: LeighFisher, August 2015.

A detailed inventory of construction emissions can be found in Appendix E.

Climate Change

Nearly 98% of the electricity that the Airport receives is generated by coal-fired power plants. Coal is a carbon-intensive fuel source and plays a significant role in driving climate change. The use of solar PV panels would reduce the need for electricity generated by coal-fired power plants. Accordingly, implementation of the Proposed Action would significantly reduce the carbon footprint of the Airport. Additionally, if funded, the Authority's project could serve as a blueprint to enable other airport sponsors to reduce their own carbon footprints and reduce the effects of climate change.

No Action

The No Action alternative would not improve regional air quality as APCO would continue to supply coal-generated electricity to the Airport, but would otherwise not impact local air quality.

5.2 Construction Impacts

Proposed Action

The Proposed Action entails construction-related activities, which include the transportation of the solar PV array equipment to the sites of the Proposed Action, grading, and relocation of fill materials (approximately 220,000 cubic yards of earth from Site A1 and 45,000 cubic yards from Site C West). Typical construction equipment would likely include:

- Flat-bed semi-trailer trucks (for panel delivery)
- Forklifts for unloading trailers
- Small cranes for panel manipulations
- Small pickup trucks for construction personnel
- Large trucks for tools and equipment
- Generators to provide power for tools and lighting
- Graders and dozers for earthmoving
- Dump trucks for hauling fill materials
- Drill rigs to bore holes for panel supports
- Cement trucks to stabilize panel supports

Equipment types and operating data were provided by Suniva, a leading solar panel manufacturer, and by EPA's NONROAD2008a air quality model for non-road emission sources, and are shown in Table 3.

Emissions from construction equipment would create a slight, but temporary, impact to the local air quality, due to the emissions associated with the construction vehicles. The emissions associated with the haul road, fill site, and installing the underground feeder lines are included within each Site listed below. The detailed emissions inventory is included in Appendix E, *Air Quality Analysis*.

It is likely that ambient noise levels would slightly increase during working hours, but would be short in duration, temporary in nature, and would not occur near residential areas.

Construction vehicles transporting materials to and from the sites may potentially create a slight, but temporary, impact to local traffic patterns during working hours.

Site A1 would involve the (1) removal of pavement associated with the threshold of closed Runway 15, and (2) grading and removal of the underlying earth to a depth of approximately 15 to 20 feet. Site A1 is located near the end of a mountain spur, with terrain sloping down in three directions. Accordingly, a portion of the disturbed earth would be graded laterally to provide a uniform, level bed on which to install the solar PV panels. It is estimated that approximately 220,000 cubic yards of excess earth would need to be relocated to an engineered fill site, which already exists but would be improved to increase stability, approximately a thousand feet to the southwest, as shown in Figure 8. The haul road already exists, therefore no additional efforts would be required to develop this area.

It is important to note that a significant majority of Site A1 would be excavated to bedrock and grading activities would be required. Accordingly, a catastrophic failure of Site A1, similar to the Runway Safety Area (RSA) failure, would be highly unlikely to occur. Additionally, the feeder lines from the solar PV array to the inverters and APCO interconnection location would be buried underground in the bedrock.

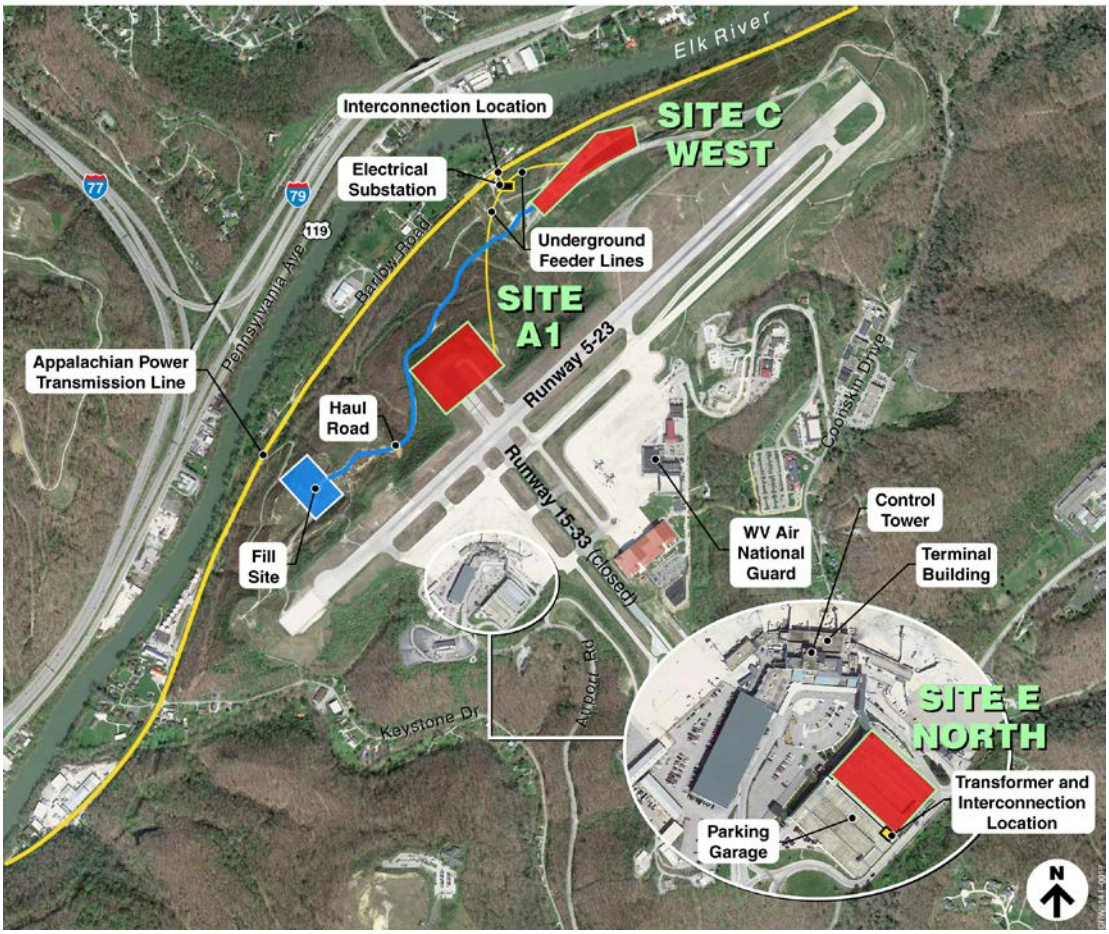
Table 3
CONSTRUCTION VEHICLE OPERATING PARAMETERS
Yeager Airport

Equipment Type	Number of Vehicles/day	Total Operating Hours	Average Rated HP	Load Factor *(a)*
Site A1				
Forklift	2	160	100	0.59
Pickup Trucks	10	640	175	0.43
Crane	0	160	300	0.43
Flatbed Semi	4	80	600	0.59
Tool Truck	4	80	600	0.59
Generator	1	640	40	0.43
Grader	1	160	220	0.51
Dozer	2	320	300	0.65
Dump Truck	4	2,500	600	0.59
Drill Rig	1	480	150	0.51
Cement Truck	1	480	600	0.59
Site C West				
Forklift	2	160	100	0.59
Pickup Trucks	10	480	175	0.43
Crane	0	160	300	0.43
Flatbed Semi	4	80	600	0.59
Tool Truck	4	80	600	0.59
Generator	1	480	40	0.43
Grader	1	320	220	0.51
Dozer	2	320	300	0.65
Dump Truck	2	500	600	0.59
Drill Rig	1	320	150	0.51
Cement Truck	1	320	600	0.59
Site E North				
Forklift	2	160	100	0.59
Pickup Trucks	10	160	175	0.43
Crane	1	160	300	0.43
Flatbed Semi	4	80	600	0.59
Tool Truck	4	80	600	0.59
Generator	1	320	40	0.43

(a) Load factor represents the average proportion of rated power used.

Source: Suniva and NONROAD2008a, August 2015.

Figure 8
LOCATION OF FILL SITE
Yeager Airport



Source: LeighFisher, August 2015.

As Site C West is relatively flat, and rock- and grass-covered, earthmoving to grade and level the site and clear-cutting to remove scrub brush on the periphery of the site would be required. It is expected that the grading of the site would generate approximately 45,000 cubic yards of excess earth, which would be relocated to the existing fill site. Surplus excavated material generated from Site A1 and C West would be placed in an engineered fill site using generally accepted geotechnical engineering practices, including quality assurance and quality control measures.

Site E North is the existing parking garage and would require no earthmoving activities.

Trenching activities would be required at the sites (to lay down the underground feeder lines), but it is not expected that construction activities would result in transporting fill material to the fill site, thereby minimizing impacts to local water quality from erosion or runoff, and minimizing fugitive dust emissions.

All construction-related activities would be performed in accordance with FAA Advisory Circular 150/5370-10A, Standards for Specifying Construction of Airports.

No Action

The No Action alternative would not impact the Airport's existing development schedule.

5.3 Light Emissions and Visual Impacts

Proposed Action

The sites of the Proposed Action would not be equipped with overhead lighting or other sources of active light emissions. The only possible concern would be effects of glare from the sun reflecting off the solar panels. To assess potential light impacts, a glint and glare analysis of the solar PV array was performed in accordance with FAA guidance to ensure no hazardous light impacts to pilots and Tower personnel would occur using the Solar Glare Hazard Analysis Tool (SGHAT). The SGHAT analysis showed no potential glare impacts to Tower personnel and low potential for glare impacts to pilots resulting from the Proposed Action and, accordingly, no mitigation of potential light impacts would be required.

A summary of the results of the glare analysis can be found in Appendix F, *Solar Glare Hazard Analysis Results*.

No Action

The No Action alternative would not result in a change in existing light emissions and visual impacts at the Airport.

5.4 Natural Resources, Energy Supply, and Sustainable Design

Proposed Action

Natural resources would not be depleted through the implementation of the Proposed Action; rather, the Proposed Action would result in the generation of clean energy throughout the useful life of the solar PV arrays. The Proposed Action would result in an increase in energy supply, acting as an environmental mitigating factor itself, and would result in no negative impacts to natural resources that would require additional mitigation. It is estimated that the solar PV arrays, totaling approximately 4-MW in capacity, would generate approximately 5,295-MWh of electricity on an annual basis.

A buffer zone of approximately 50 feet would be established between the panels and the existing gas well housing and 10 feet between the panels and the pipeline at Site C West to avoid any disruptions to on-going natural gas extraction and the gathering line. It is important to note that the gas gathering line will be easily and inexpensively relocated at no cost to the project. The gas gathering line will be relocated without noticeably impacting natural gas extraction or project costs. Site C - Grading and Drainage plan (Sheet C-5) and Site C - Site Plan (Sheet ES-1) both illustrates the existing and proposed relocated gas gathering line. The Site Plans for all three proposed sites and the grading and drainage plan for Site C West are included in Appendix G. The relocated gas gathering line is well within the current project area.

No Action

The No Action alternative would result in a continuation of existing energy and natural resource consumption patterns, including the continuing consumption of coal to fuel regional baseload power plants.

5.5 Noise

Proposed Action

The Proposed Action would require flatbed trucks to deliver the panels to the three proposed sites utilizing existing roadways during daylight hours. These vehicles would be similar in size to large delivery and maintenance vehicles currently operating in the vicinity of the Airport and surrounding community. Preparation of Sites A1 and C West would require site grading and moving approximately 265,000 cubic yards of earth near the Runway 5-23 embankment, which would likely involve small dozers and graders. The closest residential areas (noise receptors) to the embankment are more than 1,000 feet downhill from Site A1 and 700 feet from Site C West.

Both Sites A1 and C West construction involve similar land clearing and solar PV panel installation activities, so the noise generated would be similar. Noise levels at Site E North would be similar to the panel installation activities at Sites A1 and C West. As shown in Table 4 "Estimated Construction Noise Levels", a conservative approximation is used – all pieces of construction equipment to simultaneously operate at the predicted usage factor. Table 4 shows that the closest noise receptors to Sites A1 (1,000 feet away) and C West (700 feet away) would experience a composite noise level of approximately 71.5 dBA and 73.9 dBA, respectively. The composite noise level is derived by combining the sound pressure levels logarithmically for each piece of construction equipment. Although construction noise does not have a defined impact threshold of significance in FAA Order 1050.1F like it does for aircraft noise, it is important to consider potential impacts to sensitive noise receptors given that the Proposed Action is considered a federal action. Likewise, it is difficult to compare this to the Federal Highway Administration construction noise standard of 67 dBA Leq (h) specified in Table 1, of 23 CFR 772, since this standard is for average annual noise level, and not for a noise level that only occurs during a short duration construction period.

Construction Schedule

Construction activities at Sites A1 and C West are expected to last approximately three months—one month for site preparation and two months for panel delivery and installation. The site preparation phase is expected to be a continuous effort, meaning that work crews arrive in the morning, work throughout the day, and leave in the early evening. The panel installation phase, however, is expected to have activity peaks and troughs that occur on a daily, weekly, and monthly basis. For example, panel delivery (requiring flatbed semis) may occur every two weeks or every month, whereas forklifts would likely be required throughout each day to move panels from equipment marshalling areas to the site of installation, and pickup trucks may be used by work crews only when they arrive in the morning and depart in the evening. Additionally, work crews would likely only work during daylight hours (approximately 7 AM to 6 PM) on weekdays.

Importantly, in light of project phasing, the composite noise levels for the panel installation phase are estimated to be below the 67 dBA standard. At Site A1, the composite noise level is estimated to be 66.7 dBA at 1,000 feet during the two-month panel installation phase and at Site C West, the noise level is estimated to be 66.9 dBA at 700 feet. Accordingly, only the site preparation phase exceeds the 67 dBA standard, which lasts approximately one month in duration.

Table 4
ESTIMATED CONSTRUCTION COMPOSITE NOISE LEVELS
Yeager Airport

Equipment Type	Number of Vehicles	Acoustical Usage Factor (%) *(a)*	L_{MAX} (dBA) 50 ft. *(a)*	250 ft.	500 ft.	750 ft.	1000 ft.
Site A1							
Forklift	2	20	75	61	55	52	49
Pickup Trucks	10	40	75	61	55	52	49
Crane	0	16	81	67	61	58	55
Flatbed Semi	4	40	74	60	54	51	48
Tool Truck	4	50	85	71	65	62	59
Generator	1	50	81	67	61	58	55
Grader	1	40	85	71	65	62	59
Dozer	2	40	82	68	62	59	56
Dump Truck	4	40	76	72	66	63	60
Drill Rig	1	20	79	75	69	66	63
Cement Truck	1	40	79	75	69	66	63
Composite Noise Level			94.5	83.5	77.5	74.5	71.5
Site C West							
Forklift	2	20	75	61	55	52	49
Pickup Trucks	10	40	75	61	55	52	49
Crane	0	16	81	67	61	58	55
Flatbed Semi	4	40	74	60	54	51	48
Tool Truck	4	50	85	71	65	62	59
Generator	1	50	81	67	61	58	55
Grader	1	40	85	71	65	62	59
Dozer	2	40	82	68	62	59	56
Dump Truck	2	40	76	72	66	63	60
Drill Rig	1	20	79	75	69	66	63
Cement Truck	1	40	79	75	69	66	63
Composite Noise Level			94.4	82.9	76.9	73.9	70.9
Site E North							
Forklift	2	20	75	61	55	52	49
Pickup Trucks	10	40	75	61	55	52	49
Crane	1	16	81	67	61	58	55
Flatbed Semi	4	40	74	60	54	51	48
Tool Truck	4	50	85	71	65	62	59
Generator	1	50	81	67	61	58	55
Composite Noise Level			93.0	79.0	73.0	70.0	67.0

(a) Acoustical usage factors and L_{MAX} values at 50 ft. provided by the Roadway Construction Noise Model (2006).

Source: LeighFisher, August 2015.

Noise Mitigation

Because large swaths of dense vegetation and rugged topography are located between both sites and the noise receptors, it is possible that the composite noise levels could be lower. However, given this uncertainty, the Proposed Action may include a series on noise mitigation efforts to reduce potential impacts to sensitive noise receptors, including:

- Enforcement of a curfew that limits work to daylight hours
- Erecting a temporary noise wall (e.g., plywood or hay bales) along the periphery of the work sites
- Use of equipment outfitted with mufflers and other sound-reducing/dampening technologies
- Deployment of noise shields around specific stationary equipment (e.g., generators)
- Use of electric equipment in lieu of diesel-powered or hydraulic equipment
- Use of newer generation equipment, which tends to be quieter than older generation equipment

Once the panels are installed, the ambient noise level would return to the same levels as those experienced prior to the Proposed Action, as the panels do not emit noise.

No Action

The No Action alternative would result in no change to existing noise sources or patterns at the Airport.

5.6 Water Quality

Proposed Action

The proposed Action involves site grading and moving approximately 265,000 cubic yards of earth at Sites A1 and C West. Both sites have been previously disturbed—Site A1 was previously disturbed when closed Runway 15/33 was constructed and Site C West serves as both a fill/borrow site and a site for natural gas extraction. Accordingly, it is unlikely that developing the sites would affect hydraulic profiles, thus making it unlikely that local drinking water, surface water, or ground water would be affected. Additionally, because the Proposed Action would not require pavement and support piers would be the only increase in impermeable surfaces, it is anticipated that storm water runoff would not increase or be noticeably diverted from existing drainage pathways. The underground feeder lines would be buried several inches below ground, thus the lines are not expected to impact existing water runoff patterns.

As discussed in Section 5.2, the Proposed Action would result in the generation of 220,000 cubic yards of excess earth at Site A1 and 45,000 cubic yards of excess earth at Site C West. The excess fill material would be relocated to a site approximately 1,000 feet southwest of Site A1. The proposed fill site is currently serving as a fill/borrow site for other projects at the Airport. Additionally, the haul road is currently being used for Airport access vehicles and no additional improvements to the road are expected to support the construction vehicles.

The erosion and sedimentation plan would be designed to divert clean water around the construction sites and to utilize approved methods to control construction water before it flows offsite. Collection ditches are designed at Site A1 to direct construction water to five sedimentation traps before flowing offsite. These traps are designed to accommodate approximately 25 acres at Site A1. Clean water diversions are designed to route all upstream water around Site C West, eliminating any co-mingling of

clean and construction water. Collection ditches would be designed to convey construction water from approximately five acres to one sedimentation trap at Site C West. Both sites would utilize filter sock and riprap dissipaters for additional protection. The access roads and haul road would utilize a construction entrance, filter socks, and rock check dams to control construction water before it flows offsite.

It is important to note that Site C West would be located on bedrock, thus any changes to existing hydraulic gradients and runoff patterns would be highly unlikely to cause a catastrophic failure of the supporting earth in a manner similar to the Runway RSA failure.

Following installation of the solar PV arrays, there would be no contamination from the solar array, therefore it is not expected that contamination of nearby water resources would occur.

No Action

The No Action alternative would not impact existing water usage or drainage patterns in the vicinity of the Airport.

6.0 CUMULATIVE IMPACT ANALYSIS

The Proposed Action is unlikely to individually create any significant, long-term, or permanent environmental impacts. Additionally, the Proposed Action is unlikely to contribute any environmental impacts in a cumulative manner. The Airport is currently undergoing a Drainage Improvements Project that will span several years. In 2015, pipe and structure replacement will be completed around the Terminal Loop Road and on the north side of Runway 5-23 between the Echo Pad and the Fire Training Area. In 2016, piping and structures will be replaced in the areas between the runway and taxiways and around the Airport Terminal Apron. Then, in 2017 and beyond, all pipe out falls and channels on the Airport will be cleaned, widened and stabilized with erosion protection.

The Airport is also performing a pavement rehabilitation/replacement project. Work will include removing several of the existing access taxiways between the parallel taxiway and Runway 5-23 and constructing new access taxiways to meet the current FAA Standards. Additionally, Taxiway B from the Terminal Apron to the GA Apron will be reconstructed and widened to meet FAA standards. Design is being completed in 2014/15 and construction will be completed in 2016.

As previously discussed, a portion of the Runway 5 RSA recently experienced a catastrophic failure and will likely require rehabilitation; although it is unknown what level of effort will be required in the future. Given the complex geotechnical planning required for this effort, it is possible that the Proposed Action would be completed prior to any construction activities being initiated.

The Authority is unaware of any development projects located off-Airport that are scheduled to be implemented near the sites of the Proposed Action. However, given the slight and temporary nature of the currently identified potential environmental impacts, it is unlikely that they would noticeably contribute to impacts associated with future development projects in the Airport vicinity.

7.0 PUBLIC INVOLVEMENT

A notice of availability (NOA) was published in the Charleston Gazette Mail between October 8 and October 15, 2015, with a public comment period of 30 days (October 15 to November 16, 2015). Physical copies of the draft EA were made available at the Airport and at the Kanawha County Public Library in Charleston, WV. Additionally, an internet link was provided in the NOA for the public to view the document online. The NOA advised the public to provide written comments to Terry Sayre (Authority staff member located at the Airport) by November 16, 2015. No written comments were received.

8.0 LIST OF PREPARERS

LeighFisher—Consultant

Darcy Zarubiak, P.E.—Director. M.S.E., Mechanical and Aerospace Engineering, 19 years of experience. Responsible for overall EA project management and document review.

Neal Wolfe, J.D.—Principal Consultant. M.S., Molecular Biology & Biochemistry, 10 years of experience. Responsible for coordination with FAA and EA preparation.

Laura Parry—Senior Consultant. M.S., Environmental Engineering, 4 years of experience. Responsible for assistance with EA preparation and production of EA graphics.

Appendix A

SOLAR PV SITING STUDY

Leigh | Fisher

Date	May 6, 2014	File Ref	37CRW003 Solar
To	Rick Atkinson	cc	Blair Stocker
From	Neal Wolfe		
Subject	Yeager Airport		

The purpose of this technical memorandum is to provide a refined project description of the Green Energy Initiative proposed by the Central West Virginia Regional Airport Authority (the Authority) for Yeager Airport (the Airport). This technical memorandum will provide a thorough description of each component of the proposed Initiative, including key design and cost considerations, and energy savings. This memorandum is intended to describe the project to external stakeholders and to provide key project parameters for the engineering, cost estimating, and glare hazard analysis.

Project Understanding

The Authority intends to undertake a Green Energy initiative, which will install solar photovoltaic (PV) arrays to improve regional air quality, reduce dependence on the local power grid, and generate significant cost savings. The objective is to make the Airport the first carbon neutral airport in the United States.

It is important to note that the Green Energy Initiative is just one of the Authority's environmentally friendly and sustainable projects that are being pursued at the Airport. The Authority is currently seeking funding assistance from the Federal Aviation Administration's (FAA's) Voluntary Airport Low Emission (VALE) Program for the (1) purchase of gate power equipment that will allow aircraft to turn off their auxiliary power units while parked at the gates, significantly reduce regional air pollution and jet fuel consumption and (2) conversion of gasoline- and diesel-powered Airport vehicles to operate on compressed natural gas, which would reduce regional air pollution and vehicle operating costs. Additionally, the Authority was recently awarded a grant by the FAA through its Sustainability Pilot Program to develop a sustainability management plan, with Phase 1 of the planning process already complete. Accordingly, implementation of the Green Energy Initiative is a key aspect of the Authority's broader environmental and sustainability efforts.

Solar PV

A solar PV array is comprised of number of smaller solar PV panels that use light energy from the sun to generate electricity through the photovoltaic effect. Solar PV panels have a flat top surface area, are typically silicon-based, and are designed to maximize the absorption of incoming sunlight. The direct current electricity generated by each solar PV panel is transmitted to inverters which convert the electricity to alternating current, a more useable form of electricity. The electricity can then be routed either directly to a power consumption center or to the local utility grid. A typical solar PV array is shown in Figure 1.

Sizing Considerations

The Authority's goal is to generate sufficient electricity on-site to meet all of the Airport's electricity needs, enhancing the Airport's financial stability and helping reduce greenhouse gas emissions. Since solar PV arrays do not produce electricity during the nighttime, the Authority seeks to "net-meter"

electricity to the grid – essentially releasing surplus electricity generated during the day onto the grid and then drawing a commensurate amount of electricity when there is insufficient solar energy production. Although this keeps the Authority tied to the electrical grid, this is a much more affordable approach than using battery storage of electricity.

Figure 1
TYPICAL SOLAR PV ARRAY
Yeager Airport

Source: LeighFisher, March 2014.

The Authority is seeking to size the solar PV arrays to meet the Airport's total annual electrical demand, anticipating that periods of surplus production will be routed to the grid via a net metering agreement with the local utility provider (Appalachian Power). An analysis of the Airport's 2012 utility bills indicates an annual electrical consumption of 5,200 megawatt-hours (MWh). Using the National Renewable Energy Laboratory's PVWatts solar calculator, it is estimated that a 1 MW array located in Charleston with optimal orientation and no shading would produce 1,329 MWh/yr. Thus, a 4-MW solar PV array would meet the Airport's current annual electrical consumption.

Siting Considerations

The primary mission of the Airport is to provide for safe and efficient aircraft operations and other functions must support and/or not hinder its primary mission. When considering potential locations of solar PV arrays, the Authority must consider guidance on airport planning and design standards, airspace obstruction clearance and operational compatibility, and on-airport solar technology, including the following:

- FAA Advisory Circular (AC) 150/5300-13A, Airport Design

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

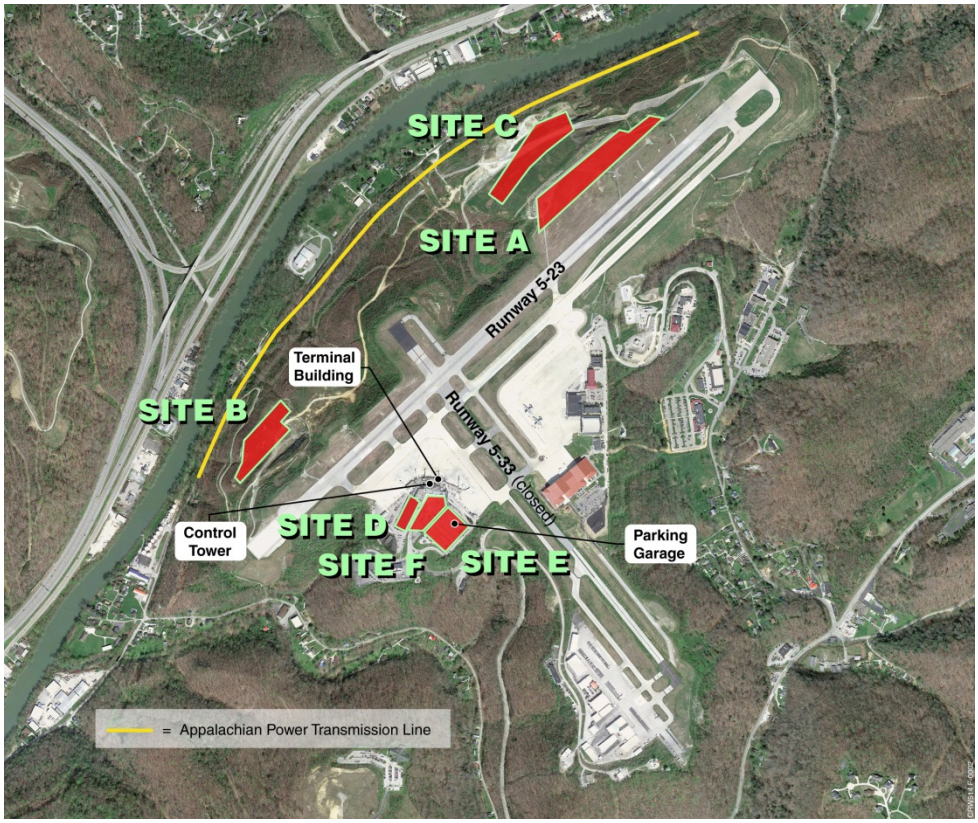
- FAR Part 77, Safe, Efficient Use, and Preservation of the Navigable Airspace
- Technical Guidance for Evaluating Selected Solar Technologies on Airports
- 78 FR 63276, Interim Policy, FAA Review of Solar Energy System Projects on Federally Obligated Airports

A 1 MW solar array that has optimal orientation for Charleston requires roughly 2.75 acres when constructed with high efficiency panels, and 3.25 acres when constructed with standard efficiency panels. Thus, a minimum of 11 to 13 acres is required for a 4 MW array, and this space requirement could increase if mitigation of glare hazards requires a sub-optimal orientation, or if there is shading from nearby obstructions.

Preliminary Site Evaluation

In evaluating the siting considerations listed above, several in-person site surveys were performed to identify and evaluate potential sites on Airport property. A total of six potential sites were evaluated for suitability to support the proposed solar PV arrays. The six potential locations, Sites A through F, are shown in Figure 2.

Figure 2
POTENTIAL LOCATIONS OF SOLAR PV ARRAYS
Yeager Airport



Source: LeighFisher, March 2014.

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

Each site was measured and the following characteristics were evaluated qualitatively. Subsequent quantitative analysis of each parameter will be required prior to final design, but qualitative analysis is sufficient to meet the objective of this memorandum.

Proximity to Electrical Load or Transmission Lines

The Authority has 17 separate electrical meters (accounts) with Appalachian Power and any movement of electricity upstream of those meters requires involvement of Appalachian Power and potentially requires conversion to three phase power to higher voltages. Thus, it is an important design consideration to know if a potential site can be tied-in downstream of one of the Authority's meters, or if a site is better suited to being directly connected into a transmission line. Longer cables needed to carry the electricity to distant load centers or transmission lines can also result in added costs.

Glare

Sites that are visible to the east or west of the control tower may require solar panels to be aligned in a manner that is sub-optimal for energy production in order to avoid glare hazards. Sites that are south of the control tower can be generally configured to meet glare hazard requirements with no or minor deviations from optimal array alignment.

Solar Efficiency

The mountainous terrain of the Charleston area raises the importance of solar shading and the associated reduction in energy production. It is important that each site consider the impact of nearby hills and structures.

Appearance

The Authority intends to showcase this innovative energy source, and to that end, locations that are visible by the public are preferentially considered. Additionally, the Authority would consider designs of supporting infrastructure (e.g., canopies) that are aesthetically pleasing. As with any capital expenditure, appropriate fencing and other security measures would also be considered.

Site A

Shown in Figure 3, proposed Site A is situated northwest of and parallel to Runway 5/23. Site A is level with the Runway and occupies approximately 8.6 acres of land, which would be capable of supporting a nearly 3-MW solar PV array. There are no obstructions that would shade the array and the parcel is well north of the air traffic control tower, meaning there is very little likelihood of encountering a glare hazard at the control tower. The site is situated outside of safety and navigational runway critical areas, but is located a considerable distance from on-Airport electrical load centers near the Terminal building. However, power lines are located just to the northwest of the site, therefore, it is expected that it could be directly tied into the local utility grid. Aside from the western perimeter of the site, there is little visibility to the public and an array would only be visible to passengers on aircraft. The site is relatively flat and thus standard solar ground mounts could be used.

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

Figure 3
POTENTIAL SOLAR PV SITE A
Yeager Airport

Source: LeighFisher, March 2014.

Site B

Shown in Figure 4, proposed Site B is situated to the west of, and parallel to Runway 5/23. Site B is lies at least 100 feet below the elevation of the Runway and is approximately 4.4 acres in size. This site would be capable of supporting at least a 1.3-MW solar PV array, although production at the site would be impacted by shading – the adjacent hill blocks sunlight from reaching this site during morning hours. During winter site visits, sunlight did not reach the site until after 11 am. The site is located on the other side of the runway from all Airport electrical load centers (meters), however, power lines are located just to the west of the site, therefore, it is expected that it could be directly tied into the local utility grid with minimal interconnection costs. This site is relatively flat and thus standard solar ground mounts could be used. The site can be partially seen from the nearby interstate highway so it would have some visibility to the community.

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

Figure 4
POTENTIAL SOLAR PV SITE B
Yeager Airport

Source: LeighFisher, March 2014.

Site C

Shown in Figure 5, proposed Site C is situated northwest of Site A. Site C is lies at least 100 feet below the elevation of the Runway and is approximately 4.4 acres in size. This site would be capable of supporting at least a 1.3-MW solar PV array, although production at the site would be impacted by shading – the adjacent hills to the east and south block sunlight from reaching this site during morning hours. During winter site visits, sunlight did not reach the site until after 11 am. The site is located on the other side of the runway from all Airport electrical load centers (meters), however, power lines are located just to the west of the site, therefore, it is expected that it could be directly tied into the local utility grid with minimal interconnection costs. This site is relatively flat and thus standard solar ground mounts could be used. The site can be partially seen from the nearby interstate highway so it would have some visibility to the community.

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

Figure 5
POTENTIAL SOLAR PV SITE C
Yeager Airport

Source: LeighFisher, March 2014.

Site D

Shown in Figure 6, proposed Site D currently serves as the rental car garage and is situated directly south and southwest of the Terminal building. There is approximately 1 acre of land at Site D, which would be capable of supporting at least a 300-kilowatt (kW) solar PV array. Because of its close proximity to the Terminal building, it is expected that power from this site would be routed directly to Airport load centers (downstream of the meters), reducing the costs for inverters and reducing the necessary voltage increase. The site is south of the control tower and may require minor deviations from optimal panel orientation in order to mitigate glare hazards. Such modifications are unlikely to reduce panel output by more than 5%. Site D may experience some shading during morning and evening hours from the parking garage – elevating the array can reduce some of the shading. In order to preserve the roofing over the rental car area, an elevated racking system (i.e., parking canopies) may need to be constructed. This site would provide an excellent opportunity for public visibility and aesthetic design.

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

Figure 6
POTENTIAL SOLAR PV SITE D
Yeager Airport

Source: LeighFisher, March 2014.

Site E

Shown in Figure 7, proposed Site E is on the top of the parking garage and is situated directly south of the Terminal building. There is approximately 2.4 acre of land at Site D, which would be capable of supporting at a 750-kilowatt (kW) solar PV array. Because of its close proximity to the Terminal building, it is expected that power from this site could be routed directly to Airport load centers (downstream of the meters), reducing the costs for inverters and reducing the necessary voltage increase. The site is south of the control tower and may require minor deviations from optimal panel orientation in order to mitigate glare hazards. Such modifications are unlikely to reduce panel output by more than 5%. In order to preserve the current vehicle parking on the site, an elevated racking system (i.e., parking canopies) would need to be constructed, such modifications would need coordination with structural engineers to ensure the garage structure can support the solar array. This site would provide an excellent opportunity for public visibility and aesthetic design.

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

Figure 7
POTENTIAL SOLAR PV SITE E
Yeager Airport

Source: LeighFisher, March 2014.

Site F

Shown in Figure 8, proposed Site E is the site of the uncovered short term parking lot located between the rental car garage and the parking garage and is situated directly south of the Terminal building. There is well over one acre of land at Site D, which would be capable of supporting at a 500-kilowatt (kW) solar PV array. Because of its close proximity to the Terminal building, it is expected that power from this site could be routed directly to Airport load centers (downstream of the meters), reducing the costs for inverters and reducing the necessary voltage increase. The site is south of the control tower and may require minor deviations from optimal panel orientation in order to mitigate glare hazards. Such modifications are unlikely to reduce panel output by more than 5%. The southern portion of Site F may experience some shading in winter time from the adjacent parking garage. In order to preserve the current vehicle parking on the site, an elevated racking system (i.e., parking canopies) would need to be constructed. This site would provide an excellent opportunity for public visibility and aesthetic design.

To: Rick Atkinson (May 6, 2014)
From: Neal Wolfe
Subject: Yeager Airport

Figure 8
POTENTIAL SOLAR PV SITE F
Yeager Airport

Source: LeighFisher, March 2014.

Conclusion

This siting analysis has evaluated key feasibility parameters for six potential sites at the Airport. These parameters are summarized in the following table.

Site	Size (acres)	Standard Panel Array (MW)	Shading	Glare Hazard at Tower	Connection to Grid	Racking
A	8.6	2.7	No	No	Transmission	Ground Mount
B	4.4	1.3	Morning	No	Transmission	Ground Mount
C	4.4	1.3	Morning	No	Transmission	Ground Mount
D	1.0	0.3	Morning and Evening	Minor if any	Airport Load	Roof Mount/Elevated
E	2.4	0.7	No	Minor if any	Airport Load	Elevated
F	1.5	0.5	Winter	Minor if any	Airport Load	Elevated

Sites B and C have shading that could substantially reduce the output of solar PV arrays at these sites. Thus, it is recommended that detailed engineering focus on placing the 4 MW of solar production at Sites A, D, E, and F, prioritizing array placement on Site A and E. Inclusion of sites D and E is necessary to meet the 4MW goal using standard panels, but the complete use of D and E is not required. Thus, panel placement within Sites D and E should attempt to maximize solar generation (sites with minimal

shading). The design engineers should consider the cost effectiveness of using of high efficiency panels, since such panels may allow the entire 4 MW array to be accomplished by sites A and E. The design engineers should design a system that delivers 5,200 MWh/yr of energy generation for the minimal installation cost. Focusing on energy generation (rather than the system capacity) requires the quantitative consideration of shading and sub-optimal panel alignment.

Recent costs for solar PV arrays installed at airports have been around $2.60 / W for ground mounted arrays and $3.50 / W for arrays constructed on elevated racking systems. Assuming 2.7 MW is ground mounted and 1.3 MW is on elevated racks, the installed array costs are expected to be $11.6 million, allowing 10% for design, engineering, and project formulation, and 15% for contingency, total project cost is likely to be around $14.5 million.

Appendix B

SOIL SURVEY DATA

Map Scale: 1:1,400 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kanawha County, West Virginia
Survey Area Data: Version 7, Dec 19, 2013

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 5, 2011—Feb 28, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Kanawha County, West Virginia (WV039)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CDF	Clymer-Dekalb complex, very steep	2.5	100.0%
Totals for Area of Interest		**2.5**	**100.0%**

Soil Map—Kanawha County, West Virginia

Map Scale: 1:2,430 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
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- Miscellaneous Water
- Perennial Water
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- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Kanawha County, West Virginia
Survey Area Data: Version 8, Sep 25, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Oct 5, 2011—Feb 28, 2012

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Kanawha County, West Virginia (WV039)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
GID	Gilpin silt loam, 20 to 30 percent slopes	1.8	16.3%
UC	Udorthents, smoothed-Urban land complex	9.2	83.7%
Totals for Area of Interest		**10.9**	**100.0%**

Appendix C

AGENCY CORRESPONDENCE

Leigh | Fisher

June 11, 2015

Ms. Susan Pierce
Deputy State Historic Preservation Officer
West Virginia Division of Culture and History
1900 Kanawha Boulevard, E.
Charleston, WV 25305

Re: Proposed Installation of Solar Photovoltaic Arrays at Yeager Airport

Dear Ms. Pierce:

The Central West Virginia Regional Airport Authority (the Authority) is pursuing a Green Energy Initiative at Yeager Airport (the Airport), located at 100 Airport Road, Charleston, West Virginia, 25311, which seeks to: (1) maximize the economic contribution from non-aviation uses of Airport property; (2) maximize Airport energy efficiency and self-sufficiency; (3) minimize the carbon footprint of the Airport; and (4) support economic and sustainable development at the Airport. The Authority can best achieve these goals through the installation of a solar photovoltaic (PV) system that generates as much power as the Airport consumes each year (the Project). A detailed siting study has been conducted and given the existing space constraints at the Airport, which is located on the top of a mountain, solar PV arrays at three locations are proposed. It is expected that the combined output of the three arrays would nearly match the Airport's annual electricity requirements in the first year of operation.

The proposed Project involves the installation of (1) a 2.3-Megawatt (MW) solar PV array near the end of closed Runway 15 (Site A1), which would cover approximately 9.6 acres of land, (2) a 1.2-MW solar PV array at the bottom and west of the Runway 5-23 embankment (Site C), which would cover approximately 6.5 acres, and (3) a 579-kilowatt (kW) solar PV array on the parking garage (Site E), which would cover approximately 1.5 acres. Direct current electricity generated by each solar PV array would be converted into alternating current (AC) electricity by inverters adjacent to the arrays. The AC electricity would then be transmitted via underground feeder lines to an above-ground substation and transformer near Appalachian Power Company (APCO) transmission lines. The transformer would "step-up" the AC electricity to a higher voltage more suitable for long distance transmission. The stepped up AC electricity would then be distributed directly to the nearby APCO power transmission line. Both Sites A1 and C have been previously disturbed; Site A1 occupies the same footprint as the paved threshold of closed Runway 15, Site C serves as a fill/borrow site for various development projects at the Airport and as a site for natural gas extraction. Only gravel, grasses, and shrub brush are located in both areas. Site E is located on the existing parking garage.

Because the proposed Project would occur on Airport property, the Authority is required to perform an environmental assessment (EA), in accordance with the National Environmental Policy Act of 1969 and Federal Aviation Administration (FAA) Orders 5050.4B and 1050.1E, to determine the possible environmental impacts that would result from Project implementation, specifically relating to Section 106 of the National Historic Preservation Act. The proposed Project would involve the disturbance of land caused by grading and earth levelling, excess fill material transport, utility trenching, and panel support foundation work. Given the lack of existing structures on the site and the nature of the surrounding land use, it is unlikely that the work would affect any archaeological resources or historic buildings, structures, or landscape features. Additionally, a previous finding of no potential impact was issued on March 17, 2003 (FR#03-362-KA) for the 2003 Runway Safety Area Project at the Airport.

Accordingly, we are seeking a determination from the West Virginia Division of Culture and History (WVDCH) that the proposed Project is unlikely to adversely impact any archaeological, historic, or cultural resources. WVDCH's findings would be included in the EA to be submitted to FAA.

I would respectfully request an expedited impact determination, as the Authority has recently submitted a financial assistance request to FAA, with grant approval pending the outcome of the EA review process. I have included all necessary documentation in support of the proposed Project. Should you have any questions, please call me at (513) 287-7167.

Regards,

Neal Wolfe
Principal Consultant
LeighFisher
650 Van Meter Street, Suite 500
Cincinnati, OH 45202

cc: Mr. Andrew Brooks, Federal Aviation Administration, Eastern Region
Mr. Rick Atkinson, Central West Virginia Regional Airport Authority

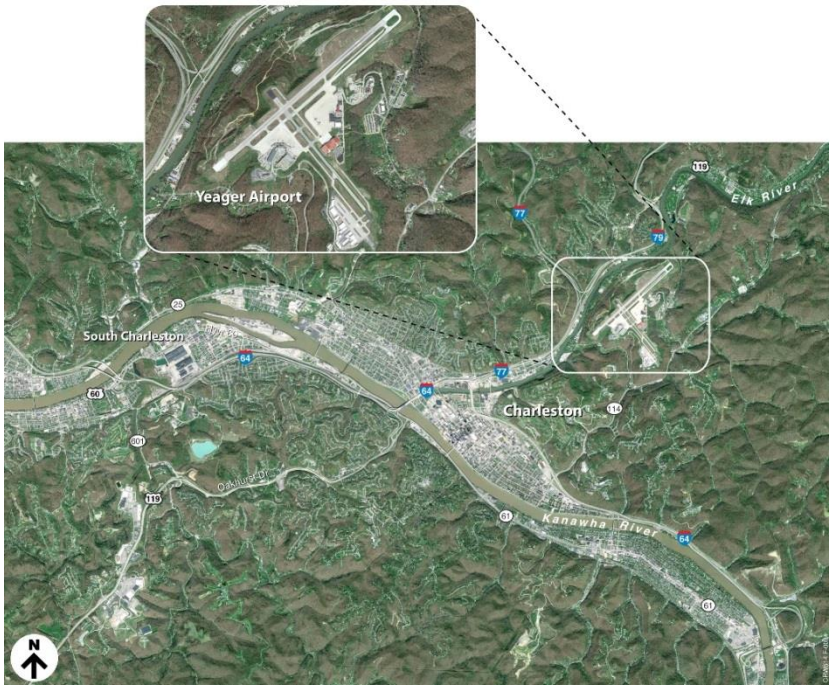
Leigh|Fisher

INSTALLATION OF A PHOTOVOLTAIC ARRAY AT YEAGER AIRPORT

PROJECT WORK DESCRIPTION

The Central West Virginia Regional Airport Authority (the Authority) is pursuing a Green Energy Initiative at Yeager Airport (the Airport), located at 100 Airport Road, Charleston, West Virginia, 25311 in Kanawha County, which seeks to: (1) maximize the economic contribution from non-aviation uses of Airport property; (2) maximize Airport energy efficiency and self-sufficiency; (3) minimize the carbon footprint of the Airport; and (4) support economic and sustainable development at the Airport. The location of the Airport is shown in Figure 1. The Authority can best achieve these goals through the installation of a solar photovoltaic (PV) system that generates as much power as the Airport consumes each year (the Project). A detailed siting study has been conducted and given the existing space constraints at the Airport, which is located on the top of a mountain, solar PV arrays at three locations are proposed. It is expected that the combined output of the three arrays would nearly match the Airport's annual electricity requirements in the first year of operation.

Figure 1
LOCATION OF YEAGER AIRPORT

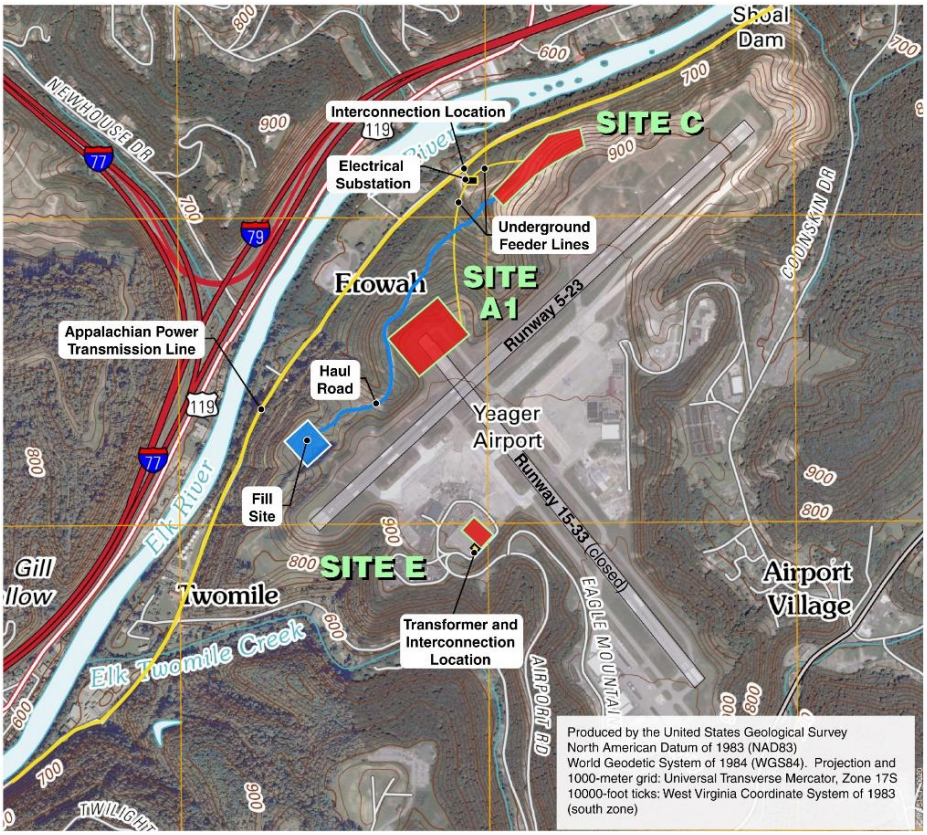


Source: LeighFisher, June 2015.

As shown in Figure 2, the proposed Project involves the installation of (1) a 2.3-Megawatt (MW) solar PV array near the end of closed Runway 15 (Site A1), which would cover approximately 9.6 acres of land, (2) a 1.2-MW solar PV array at the bottom and west of the Runway 5-23 embankment (Site C), which would cover approximately 6.5 acres, and (3) a 579-kilowatt (kW) solar PV array on the parking garage (Site E), which would cover approximately 1.5 acres. Direct current electricity generated by

each solar PV array would be converted into alternating current (AC) electricity by inverters adjacent to the arrays. The AC electricity would then be transmitted via underground feeder lines to an above-ground substation and transformer near Appalachian Power Company (APCO) transmission lines. The transformer would "step-up" the AC electricity into a higher voltage more suitable for long distance transmission. The stepped up AC electricity would then be distributed directly to the nearby APCO power transmission line. Both Sites A1 and C have been previously disturbed; Site A1 occupies the same footprint as the paved threshold of closed Runway 15, Site C serves as a fill/borrow site for various development projects at the Airport and as a site for natural gas extraction Only gravel, grasses, and shrub brush are located in both areas. Site E is located on the existing parking garage. The total area of the proposed Project is approximately 22 acres.

Figure 2
LOCATIONS OF THE PROPOSED PROJECT
Yeager Airport



Source: LeighFisher, June 2015.

Site A1 would cover approximately 9.6 acres adjacent to the western edge of Runway 5-23 and would include a 2.3-MW solar PV array. The Site A1 solar PV array would be comprised of a ground-mounted racking system with 6,996 modules and four inverters. The arrays would generate approximately 3,050 MWh of electricity per year. Power generated at Site A1 would be routed to a nearby transmission line for distribution into the local power grid, both of which are managed by

APCO. Modules would be oriented 180 degrees and horizontally tilted 25 degrees to maximize energy production.

Site C would cover approximately 6.5 acres located down the Runway 5-23 northwestern embankment and would include a 1.2 MW solar PV array. The Site C solar PV array would be comprised of a ground-mounted racking system with 3,608 modules and two inverters. The arrays would generate approximately 1,532 MWh of electricity per year. Power generated at Site C would be routed to the APCO transmission line for distribution into the local grid. Modules would be oriented 180 degrees and horizontally tilted 25 degrees to maximize energy production. Although Site C is situated at the bottom of the Runway embankment, its location is far enough west to avoid most of the shading in the early morning hours caused by the embankment.

The arrays at Sites A1 and C would utilize a standard ground-mounting system where the modules are attached to a support structure with piers secured to a depth of 10 to 15 feet below ground. A recent geotechnical investigation of Sites A1 and C indicates that the ground is capable of adequately supporting the vertical mounting components. Both sites are located outside of the Object Free Area of Runway 5-23.

Site A1 includes developing part of the threshold and RSA of closed Runway 15. Site C previously served as a fill/borrow site for various Airport development projects and is mostly vacant and provides no revenue for the Authority, with the exception of a small natural gas extraction that is located at the southwestern portion of the site. Development of Site A1 would require modest pavement removal and earthmoving activities. Site C is relatively flat and only minor scrub brush removal and site grading would be necessary for installation of the solar PV panels.

Site E would cover approximately 1.5 acres located on the roof of the Parking Garage A and would include a 579-kilowatt array. The Site E solar PV array would be comprised of an overhead racking system, 1,782 modules and a single inverter. The arrays would generate approximately 713 MWh of electricity per year. Modules would be oriented 235 degrees (to align with the existing garage footprint) and horizontally tilted 5 degrees. Aligning the solar PV array with the footprint of the parking garage would reduce physical stresses to the structure caused by wind. While maintaining this alignment, a “saw tooth” design was found to better maximize power production as compared to the standard smaller, multi-row design typically used for most solar PV arrays. Power generated at this site would be routed to a transformer located adjacent to the southwest corner of the parking garage. The “saw tooth” pattern would consist of three large sheets of modules that would span the entire width of the Parking Garage.

Site E is a multi-story parking garage for passenger automobiles. The proposed Project would allow the Authority to maximize the economic value of the three sites and would be compatible with existing aeronautical uses of the land.

For Sites A1 and C, direct current (DC) electricity generated by each solar PV panel would be converted into alternating current (AC) electricity by inverters adjacent to the arrays. The AC electricity would then be transmitted via underground feeder lines to an above-ground substation and transformer (an approximately 1,000-foot run to the west of both sites) located near an existing 12-kilovolt Appalachian Power Company (APCO) transmission line that runs parallel to Barlow Drive and the Elk River. The transformer would “step-up” the AC electricity into a higher voltage more suitable for long distance transmission. The stepped up AC electricity would then be distributed directly to the nearby APCO power transmission line. A short (approximately 50 feet) above-ground electrical line would run from the substation and transformer to the APCO transmission line.

At Site E, the DC electricity would be converted to AC by inverters located in the basement of the parking garage. The AC electricity would then be routed, via an underground feeder line, to an existing transformer approximately 100 feet to the east of the parking garage, where the power would be stepped-up and distributed to the local grid. The locations of the panels, the feeder lines, and interconnection locations are show in Figure 2.

Site A1 would involve the (1) removal of pavement associated with the threshold of closed Runway 15, and (2) grading and removal of the underlying earth to a depth of approximately 15 to 20 feet. A portion of the disturbed earth would be graded laterally to provide a uniform, level bed on which to install the solar PV panels. It is estimated that approximately 220,000 cubic yards of excess earth would need to be relocated to an existing fill site, via an existing haul road, approximately a thousand feet to the southwest, as shown in Figure 2. It is expected that the grading of Site C would generate approximately 45,000 cubic yards of excess earth, which would also be relocated to the same fill site.

Identification of Historic Properties

There are no structures or buildings located at the site of the proposed Project. The National Historic Register does not indicate that any historic buildings, structures, or landscape features are located within the APE.

Consulting Parties/Public Notification

It is not anticipated that the proposed Project would affect any historic buildings, structures, or landscape features and it is unlikely that it would generate public controversy or opposition. Accordingly, no additional public outreach or agency coordination has been performed.

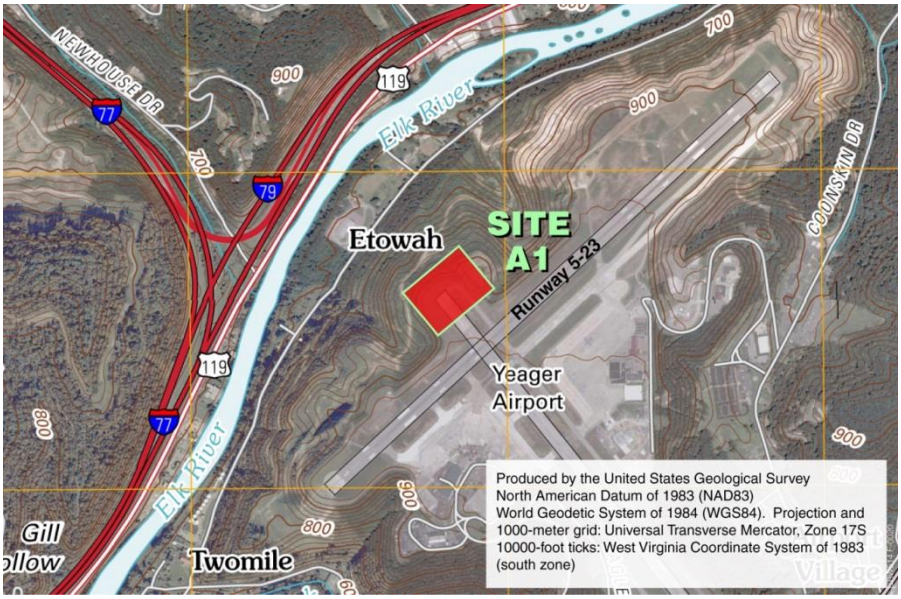
Area of Potential Effects

Because the locations affected by the proposed Project—Sites A1, C, and E, the fill site, and the electrical substation—are separated by hundreds to thousands of feet, an area of potential effects (APE) is defined for each site separately.

Site A1

The Site A1 APE is generally defined as a 9.6-acre square shape (centered at 38.37499^{o}, -81.59758^{o}) that is located at the end of closed Runway 15. The APE is bounded to the west by the Elk River and Barlow Drive, to the east by Runway 5-23, and to the north and south by undeveloped Airport property, as shown in Figure 3. The site resides on a solid bedrock shelf adjacent to the Runway 5-23 embankment. It has been significantly disturbed in the past as it was paved to serve as the runway safety area and landing threshold for Runway 15. The site is generally flat and barren of vegetation, except for small patches of grass and scrub brush, as shown in Figure 4. Perspective views in the four cardinal directions—north, east, south, and west—from Site A1 are shown in Figures 5, 6, 7, and 8, respectively.

Figure 3
SITE A1 AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 4
SITE A1 ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 5
NORTHERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

Figure 6
EASTERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

Figure 7
SOUTHERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

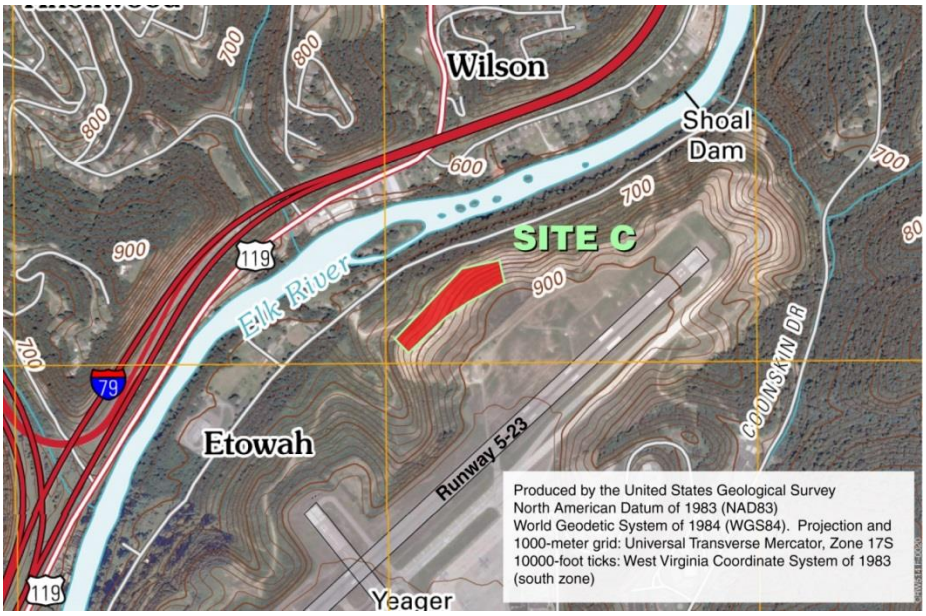
Figure 8
WESTERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

Site C

The Site C APE is generally defined as a 6.5-acre rectangular shape (centered at 38.38074°, -81.59307°) that runs southwest to northeast. The APE is bounded to the west and north by the Elk River and Barlow Drive, to the east by Runway 5-23, and to the south by undeveloped Airport property, as shown in Figure 9. The site resides on a solid bedrock shelf adjacent to the Runway 5-23 embankment. It has been significantly disturbed in the past as it served as a fill/borrow site for the 2003 Runway Safety Area Project. The site is generally flat and barren of vegetation, except for small patches of grass and scrub brush, as shown in Figure 10. Perspective views in the four cardinal directions—north, east, south, and west—from Site C are shown in Figures 11, 12, 13, and 14, respectively.

Figure 9
SITE C AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 10
SITE C ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 11
NORTHERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Figure 12
EASTERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Figure 13
SOUTHERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Figure 14
WESTERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Site E

The Site E APE is generally defined as a 1.5-acre square shape (centered at 38.36953°, -81.59559°) that is located on the top of the existing parking garage. The APE is bounded to the north and west by the terminal building and airfield, to the east by the airfield, and to the south by Airport Road, as shown in Figure 15. The site contains a concrete parking garage and paved roadways, as shown in Figure 16. Perspective views in the four cardinal directions—north, east, south, and west—from Site E are shown in Figures 17, 18, 19, and 20, respectively. It is important to note that the solar PV array would be located on the top of the garage and would not involve the disturbance of the surrounding environment.

Figure 15
SITE E AREA OF POTENTIAL EFFECTS
Yeager Airport

Source: LeighFisher, June 2015.

Figure 16
SITE E ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 17
NORTHERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

Figure 18
EASTERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

Figure 19
SOUTHERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

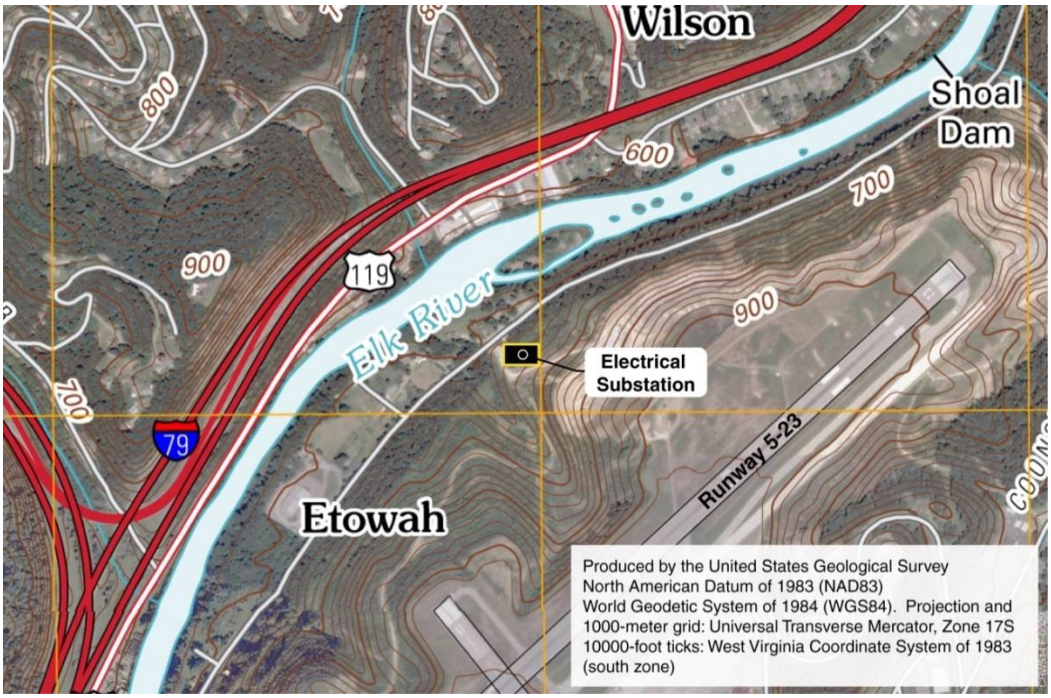
Figure 20
WESTERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

Electrical Substation

The electrical substation APE is generally defined as a 0.25-acre square shape (centered at 38.37988°, -81.59630°) that is located near the existing APCO transmission line and Barlow Road. The APE is bounded to the north and west by Barlow Road and the Elk River and to the east and south by undeveloped Airport property, as shown in Figure 21. The site contains short grasses, scrub brush, and several deciduous trees approximately 10 to 20 feet in height, as shown in Figure 22. Perspective views in the four cardinal directions—north, east, south, and west—from the electrical substation are shown in Figures 23, 24, 25, and 26, respectively. Installation of the electrical substation would involve installing electrical equipment on a concrete pad and interconnecting with the APCO transmission line approximately 50 feet away.

Figure 21
ELECTRICAL SUBSTATION AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 22
ELECTRICAL SUBSTATION ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 23
NORTHERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

Figure 24
EASTERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

Figure 25
SOUTHERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

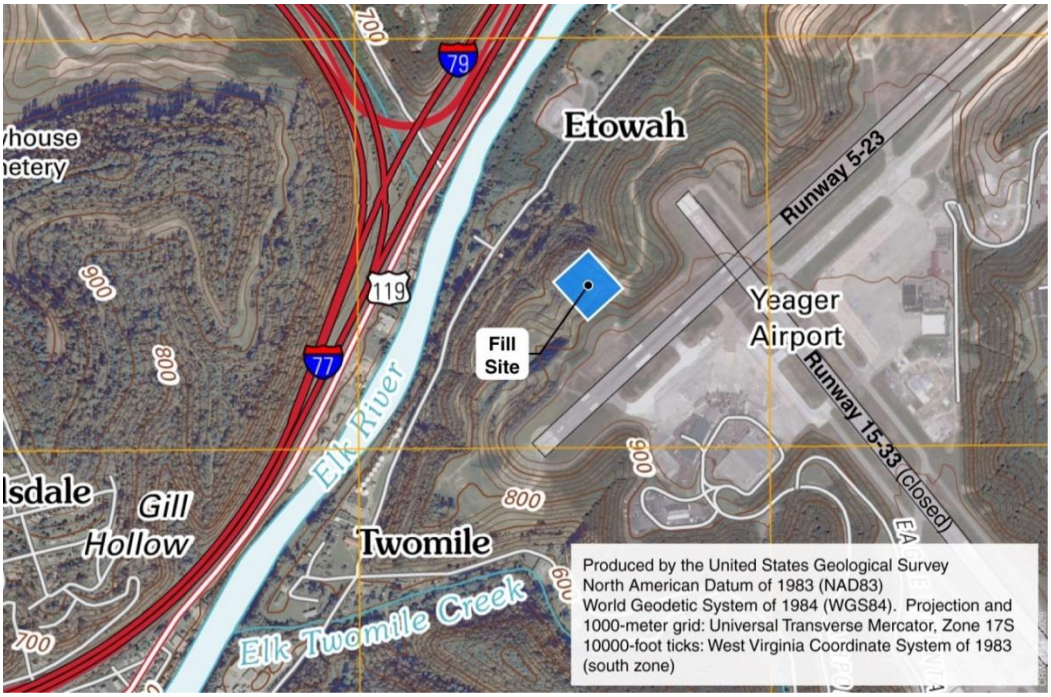
Figure 26
WESTERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

Fill Site

The Fill Site APE is generally defined as a four-acre square shape (centered at 38.37206°, -81.60222°) that is located at the end of an existing Airport access road (called the Haul Road for the proposed Project), which follows the contour of the Runway 5-23 embankment, as shown in Figure 27. The Fill Site is located approximately 80 feet below the grade of the Runway 5-23, near the threshold of Runway 5. The site has been heavily disturbed and currently serves as an active fill/borrow site for Airport development projects. The site contains exposed soils, short grasses, and scrub brush, as shown in Figure 28. Perspective views in the four cardinal directions—north, east, south, and west—from the Fill Site are shown in Figures 29, 30, 31, and 32, respectively. The deposition of soil and rock removed from Sites A1 and C would not increase the footprint of the existing fill/borrow site.

Figure 27
FILL SITE AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 28
FILL SITE ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 29
NORTHERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

Figure 30
EASTERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

Figure 31
SOUTHERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

Figure 32
WESTERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

DETERMINATION OF ELIGIBILITY

The National Historic Register does not indicate that any historic buildings, structures, or landscape features are located within the APEs for each of the described locations. Additionally, it is unlikely that any of the existing buildings, structures, or landscape features are eligible under criteria provided by 36 CFR Part 60, as they:

1. have not been associated with events that have made a significant contribution to the broad patterns of history
2. have not been associated with the lives of significant persons of the past
3. do not represent a distinctive period or possess high artistic value
4. have not and are unlikely to yield important historical information

DETERMINATION OF EFFECT

Because the proposed sites are devoid of any buildings, structures, or landscape features and the proposed Project is consistent with adjacent land uses, it is unlikely that development would change the design, setting, or feeling of the sites either physically, visually, audibly, or economically. Because the APEs are highly unlikely to contain any historic buildings, structures, or landscape features, the proposed Project would not affect any historic properties.

WEST VIRGINIA DIVISION OF
CULTURE AND HISTORY

March 17, 2003

Ms. Laura J. Bee
Kimball & Associates
180 Regent Court
State College, PA 16801

RE: Yeager Airport
Runway Safety Area Construction
FR#: 03-362-KA

Dear Ms. Bee:

We have reviewed the above mentioned project to determine its effects to cultural resources. As required by Section 106 of the National Historic Preservation Act, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties," we submit our comments.

Architectural Resources:
We have determined that the proposed project will have no effect on any property eligible for or listed in the National Register of Historic Places. Therefore, no further consultation is necessary with this office regarding architectural resources.

Archaeological Resources:
A search of office site files and maps located one known site within the 1 mile Area of Potential Effect (APE) of the proposed project area. As well, your information indicates that the project area has been previously disturbed. Therefore, we are of the opinion that there is little possibility of intact archaeological deposits within the project area. We have also determined that no known archaeological sites listed on or eligible for inclusion in the National Register will be affected by this project. If, however, cultural materials are encountered during construction, all such activities shall cease and our office shall be contacted immediately.

We appreciate the opportunity to be of service. *If you have questions regarding our comments or the Section 106 process, please call Robin Fisher, Historian or Rachel Black, Staff Archaeologist at (304) 558-0240.*

Sincerely,

Joanna Wilson

Joanna Wilson
Senior Archaeologist

JLW:reb/rlf

WEST VIRGINIA
Division of Culture and History

The Culture Center
1900 Kanawha Blvd., E.
Charleston, WV 25305-0300
Randall Reid-Smith, Commissioner
Phone 304.558.0220 • www.wvculture.org
Fax 304.558.2779 • TDD 304.558.3562
EEO/AA Employer

July 13, 2015

Mr. Neal Wolfe, Principal Consultant
Leigh | Fisher
555 Airport Boulevard, Suite 300
Burlington, California 94010

RE: Proposed Installation of Solar Photovoltaic Arrays at Yaeger Airport
FR# 15-726-KA

Dear Mr. Wolfe:

We have reviewed the above mentioned project to determine its effects to cultural resources. As required by Section 106 of the National Historic Preservation Act of 1966, as amended, and its implementing regulations, 36 CFR 800: "Protection of Historic Properties," we submit our comments.

According to submitted information, the Central West Virginia Regional Airport Authority (the Authority) proposes to install a solar photovoltaic (PV) system in pursuit of a Green Energy Initiative at Yeager Airport (the Airport), located at 100 Airport Road, Charleston, West Virginia. It is expected that the combined output of the three proposed solar PV array systems would nearly match the Airport's annual electricity requirements in the first year of operation. The proposed Project involves the installation of a 2.3-Megawatt (MW) solar PV array near the end of closed Runway 15, a 1.2-MW solar PV array at the bottom and west of the Runway 5-23 embankment, and a 579-kilowatt (kW) solar PV array on the parking garage site.

Architectural Resources:
We have reviewed the submitted information, and determined that no architectural properties which are eligible for or listed in the National Register of Historic Places are within the direct or indirect Area of Potential Effects (APE). No further consultation is necessary regarding architectural resources; however, we ask that you contact our office if your project should change.

Archaeological Resources:
We remain in concurrence with comments provided in our March 17, 2003 letter. In our opinion no known historic archaeological properties will be affected by the proposed project.

We appreciate the opportunity to be of service. *If you have questions regarding our comments or the Section 106 process, please contact Jeffrey S Smith, Structural Historian, or Lora A Lamarre-DeMott, Senior Archaeologist, at (304) 558-0240.*

Sincerely,

Susan M. Pierce
Deputy State Historic Preservation Officer

SMP/JSS/LLD

Leigh | Fisher

June 11, 2015

Ms. Barbara Douglas
United States Department of the Interior
Fish and Wildlife Service
West Virginia Field Office
694 Beverly Pike
Elkins, WV 26241

Re: Proposed Installation of Solar Photovoltaic Arrays at Yeager Airport

Dear Ms. Douglas:

The Central West Virginia Regional Airport Authority (the Authority) is pursuing a Green Energy Initiative at Yeager Airport (the Airport), located at 100 Airport Road, Charleston, West Virginia, 25311, which seeks to: (1) maximize the economic contribution from non-aviation uses of Airport property; (2) maximize Airport energy efficiency and self-sufficiency; (3) minimize the carbon footprint of the Airport; and (4) support economic and sustainable development at the Airport. The Authority can best achieve these goals through the installation of a solar photovoltaic (PV) system that generates as much power as the Airport consumes each year (the Project). A detailed siting study has been conducted and given the existing space constraints at the Airport, which is located on the top of a mountain, solar PV arrays at three locations are proposed. It is expected that the combined output of the three arrays would nearly match the Airport's annual electricity requirements in the first year of operation.

The proposed Project involves the installation of (1) a 2.3-Megawatt (MW) solar PV array near the end of closed Runway 15 (Site A1), which would cover approximately 9.6 acres of land, (2) a 1.2-MW solar PV array at the bottom and west of the Runway 5-23 embankment (Site C), which would cover approximately 6.5 acres, and (3) a 579-kilowatt (kW) solar PV array on the parking garage (Site E), which would cover approximately 1.5 acres. Direct current electricity generated by each solar PV array would be converted into alternating current (AC) electricity by inverters adjacent to the arrays. The AC electricity would then be transmitted via underground feeder lines to an above-ground substation and transformer near Appalachian Power Company (APCO) transmission lines. The transformer would "step-up" the AC electricity into a form more suitable for long distance transmission. The stepped up AC electricity would then be distributed directly to the nearby APCO power transmission line. Both Sites A1 and C have been previously disturbed; Site A1 occupies the same footprint as the paved threshold of closed Runway 15, Site C serves as a fill/borrow site for various development projects at the Airport and as a site for natural gas extraction. Only gravel, grasses, and shrub brush are located in both areas. Site E is located on the existing parking garage.

Because the proposed Project would occur on Airport property, the Authority is required to perform an environmental assessment (EA), in accordance with the National Environmental Policy Act of 1969 and Federal Aviation Administration (FAA) Orders 5050.4B and 1050.1E, to determine the possible environmental impacts that would result from Project implementation, specifically relating to the Endangered Species Act. The proposed Project would involve the disturbance of 39 acres of previously disturbed land (but no forested land) caused by grading and level earth, excess fill material transport, utility trenching, and panel support foundation work. It is important to note that the IPAC Trust Resource Report mapping tool does not allow for delineating multiple sites, therefore a polygon that incorporated all proposed sites into a single report was utilized.

Given the lack of suitable habitat at the proposed sites of development to support threatened or endangered species common to the area, it is unlikely that the work would affect any federally-threatened or endangered species. Additionally, a "no effect" determination was previously issued on March 25, 2003 (copy enclosed) for the 2003 Runway Safety Area Project at the Airport. Accordingly, we are seeking a determination from the United States Fish and Wildlife Service (F&WS) that the proposed Project is unlikely to adversely impact any known threatened or endangered species. USF&WS's findings would be included in the EA to be submitted to FAA.

I would respectfully request an expedited "no effect" determination, as the Authority has recently submitted a financial assistance request to FAA, with grant approval pending the outcome of the EA review process. I have included all necessary documentation in support of the proposed Project. Should you have any questions, please call me at (513) 287-7167.

Regards,

Neal Wolfe
Principal Consultant
LeighFisher
650 Van Meter Street, Suite 500
Cincinnati, OH 45202

cc: Mr. Andrew Brooks, Federal Aviation Administration, Eastern Region
Mr. Rick Atkinson, Central West Virginia Regional Airport Authority

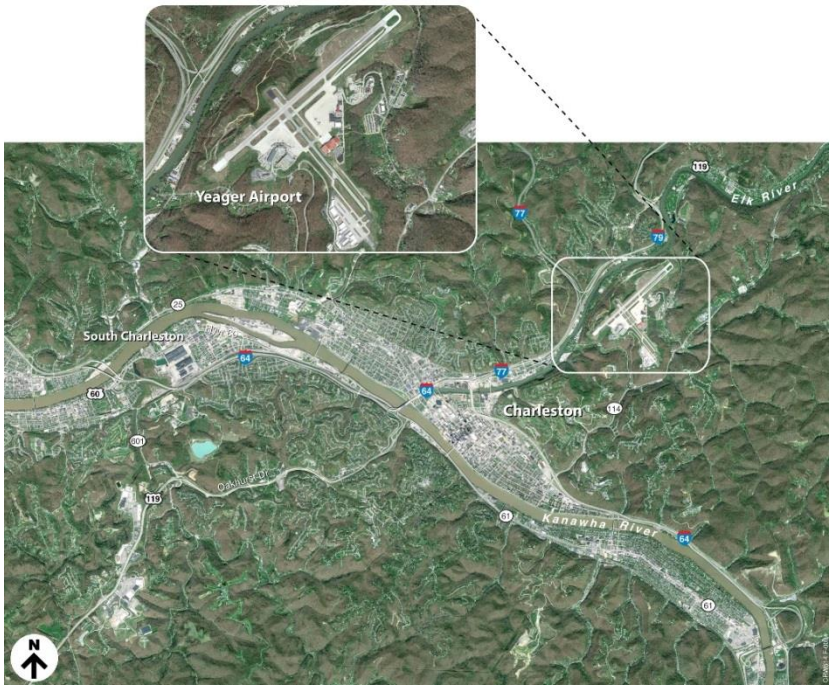
Leigh|Fisher

INSTALLATION OF A PHOTOVOLTAIC ARRAY AT YEAGER AIRPORT

PROJECT WORK DESCRIPTION

The Central West Virginia Regional Airport Authority (the Authority) is pursuing a Green Energy Initiative at Yeager Airport (the Airport), located at 100 Airport Road, Charleston, West Virginia, 25311 in Kanawha County, which seeks to: (1) maximize the economic contribution from non-aviation uses of Airport property; (2) maximize Airport energy efficiency and self-sufficiency; (3) minimize the carbon footprint of the Airport; and (4) support economic and sustainable development at the Airport. The location of the Airport is shown in Figure 1. The Authority can best achieve these goals through the installation of a solar photovoltaic (PV) system that generates as much power as the Airport consumes each year (the Project). A detailed siting study has been conducted and given the existing space constraints at the Airport, which is located on the top of a mountain, solar PV arrays at three locations are proposed. It is expected that the combined output of the three arrays would nearly match the Airport's annual electricity requirements in the first year of operation.

Figure 1
LOCATION OF YEAGER AIRPORT

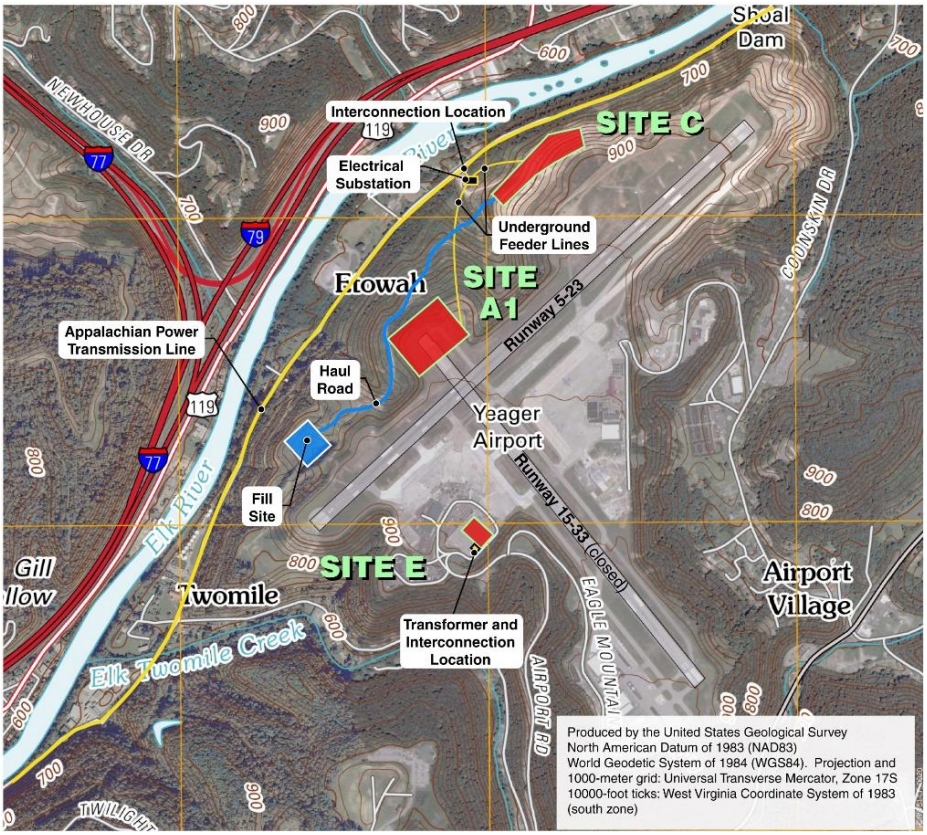


Source: LeighFisher, June 2015.

As shown in Figure 2, the proposed Project involves the installation of (1) a 2.3-Megawatt (MW) solar PV array near the end of closed Runway 15 (Site A1), which would cover approximately 9.6 acres of land, (2) a 1.2-MW solar PV array at the bottom and west of the Runway 5-23 embankment (Site C), which would cover approximately 6.5 acres, and (3) a 579-kilowatt (kW) solar PV array on the parking garage (Site E), which would cover approximately 1.5 acres. Direct current electricity generated by

each solar PV array would be converted into alternating current (AC) electricity by inverters adjacent to the arrays. The AC electricity would then be transmitted via underground feeder lines to an above-ground substation and transformer near Appalachian Power Company (APCO) transmission lines. The transformer would "step-up" the AC electricity into a higher voltage more suitable for long distance transmission. The stepped up AC electricity would then be distributed directly to the nearby APCO power transmission line. Both Sites A1 and C have been previously disturbed; Site A1 occupies the same footprint as the paved threshold of closed Runway 15, Site C serves as a fill/borrow site for various development projects at the Airport and as a site for natural gas extraction Only gravel, grasses, and shrub brush are located in both areas. Site E is located on the existing parking garage. The total area of the proposed Project is approximately 22 acres.

Figure 2
LOCATIONS OF THE PROPOSED PROJECT
Yeager Airport



Source: LeighFisher, June 2015.

Site A1 would cover approximately 9.6 acres adjacent to the western edge of Runway 5-23 and would include a 2.3-MW solar PV array. The Site A1 solar PV array would be comprised of a ground-mounted racking system with 6,996 modules and four inverters. The arrays would generate approximately 3,050 MWh of electricity per year. Power generated at Site A1 would be routed to a nearby transmission line for distribution into the local power grid, both of which are managed by

APCO. Modules would be oriented 180 degrees and horizontally tilted 25 degrees to maximize energy production.

Site C would cover approximately 6.5 acres located down the Runway 5-23 northwestern embankment and would include a 1.2 MW solar PV array. The Site C solar PV array would be comprised of a ground-mounted racking system with 3,608 modules and two inverters. The arrays would generate approximately 1,532 MWh of electricity per year. Power generated at Site C would be routed to the APCO transmission line for distribution into the local grid. Modules would be oriented 180 degrees and horizontally tilted 25 degrees to maximize energy production. Although Site C is situated at the bottom of the Runway embankment, its location is far enough west to avoid most of the shading in the early morning hours caused by the embankment.

The arrays at Sites A1 and C would utilize a standard ground-mounting system where the modules are attached to a support structure with piers secured to a depth of 10 to 15 feet below ground. A recent geotechnical investigation of Sites A1 and C indicates that the ground is capable of adequately supporting the vertical mounting components. Both sites are located outside of the Object Free Area of Runway 5-23.

Site A1 includes developing part of the threshold and RSA of closed Runway 15. Site C previously served as a fill/borrow site for various Airport development projects and is mostly vacant and provides no revenue for the Authority, with the exception of a small natural gas extraction that is located at the southwestern portion of the site. Development of Site A1 would require modest pavement removal and earthmoving activities. Site C is relatively flat and only minor scrub brush removal and site grading would be necessary for installation of the solar PV panels.

Site E would cover approximately 1.5 acres located on the roof of the Parking Garage A and would include a 579-kilowatt array. The Site E solar PV array would be comprised of an overhead racking system, 1,782 modules and a single inverter. The arrays would generate approximately 713 MWh of electricity per year. Modules would be oriented 235 degrees (to align with the existing garage footprint) and horizontally tilted 5 degrees. Aligning the solar PV array with the footprint of the parking garage would reduce physical stresses to the structure caused by wind. While maintaining this alignment, a “saw tooth” design was found to better maximize power production as compared to the standard smaller, multi-row design typically used for most solar PV arrays. Power generated at this site would be routed to a transformer located adjacent to the southwest corner of the parking garage. The “saw tooth” pattern would consist of three large sheets of modules that would span the entire width of the Parking Garage.

Site E is a multi-story parking garage for passenger automobiles. The proposed Project would allow the Authority to maximize the economic value of the three sites and would be compatible with existing aeronautical uses of the land.

For Sites A1 and C, direct current (DC) electricity generated by each solar PV panel would be converted into alternating current (AC) electricity by inverters adjacent to the arrays. The AC electricity would then be transmitted via underground feeder lines to an above-ground substation and transformer (an approximately 1,000-foot run to the west of both sites) located near an existing 12-kilovolt Appalachian Power Company (APCO) transmission line that runs parallel to Barlow Drive and the Elk River. The transformer would “step-up” the AC electricity into a higher voltage more suitable for long distance transmission. The stepped up AC electricity would then be distributed directly to the nearby APCO power transmission line. A short (approximately 50 feet) above-ground electrical line would run from the substation and transformer to the APCO transmission line.

At Site E, the DC electricity would be converted to AC by inverters located in the basement of the parking garage. The AC electricity would then be routed, via an underground feeder line, to an existing transformer approximately 100 feet to the east of the parking garage, where the power would be stepped-up and distributed to the local grid. The locations of the panels, the feeder lines, and interconnection locations are show in Figure 2.

Site A1 would involve the (1) removal of pavement associated with the threshold of closed Runway 15, and (2) grading and removal of the underlying earth to a depth of approximately 15 to 20 feet. A portion of the disturbed earth would be graded laterally to provide a uniform, level bed on which to install the solar PV panels. It is estimated that approximately 220,000 cubic yards of excess earth would need to be relocated to an existing fill site, via an existing haul road, approximately a thousand feet to the southwest, as shown in Figure 2. It is expected that the grading of Site C would generate approximately 45,000 cubic yards of excess earth, which would also be relocated to the same fill site.

Identification of Historic Properties

There are no structures or buildings located at the site of the proposed Project. The National Historic Register does not indicate that any historic buildings, structures, or landscape features are located within the APE.

Consulting Parties/Public Notification

It is not anticipated that the proposed Project would affect any historic buildings, structures, or landscape features and it is unlikely that it would generate public controversy or opposition. Accordingly, no additional public outreach or agency coordination has been performed.

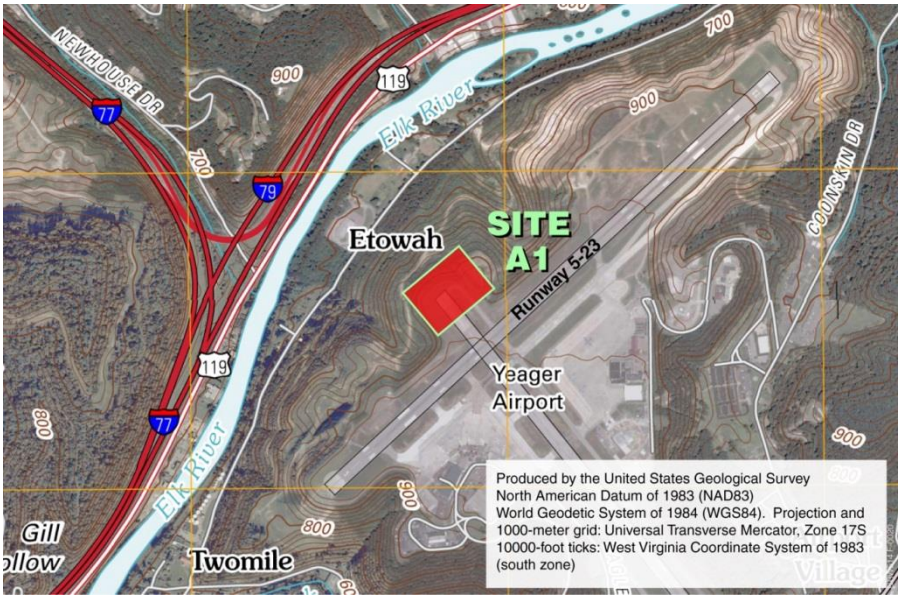
Area of Potential Effects

Because the locations affected by the proposed Project—Sites A1, C, and E, the fill site, and the electrical substation—are separated by hundreds to thousands of feet, an area of potential effects (APE) is defined for each site separately.

Site A1

The Site A1 APE is generally defined as a 9.6-acre square shape (centered at 38.37499^{o}, -81.59758^{o}) that is located at the end of closed Runway 15. The APE is bounded to the west by the Elk River and Barlow Drive, to the east by Runway 5-23, and to the north and south by undeveloped Airport property, as shown in Figure 3. The site resides on a solid bedrock shelf adjacent to the Runway 5-23 embankment. It has been significantly disturbed in the past as it was paved to serve as the runway safety area and landing threshold for Runway 15. The site is generally flat and barren of vegetation, except for small patches of grass and scrub brush, as shown in Figure 4. Perspective views in the four cardinal directions—north, east, south, and west—from Site A1 are shown in Figures 5, 6, 7, and 8, respectively.

Figure 3
SITE A1 AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 4
SITE A1 ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 5
NORTHERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

Figure 6
EASTERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

Figure 7
SOUTHERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

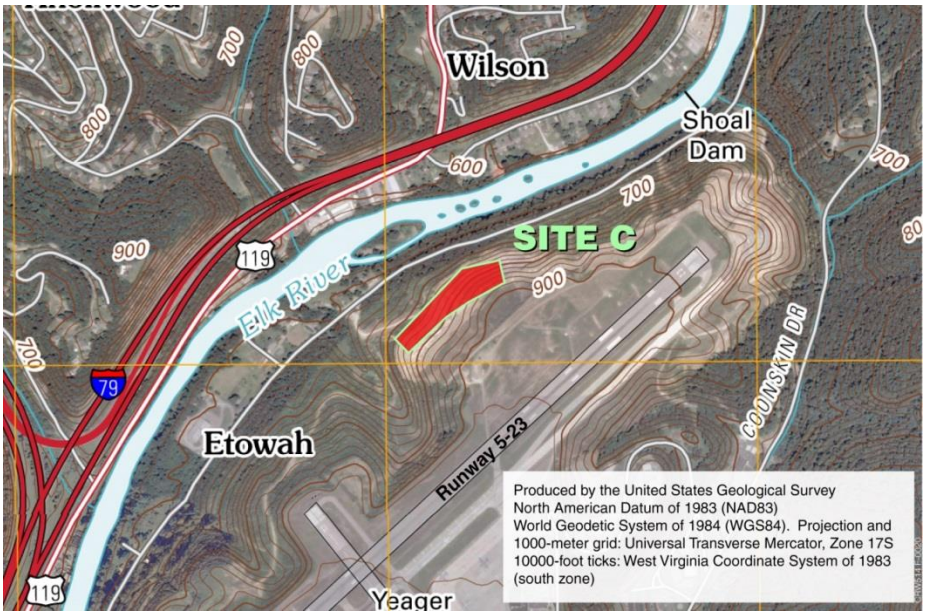
Figure 8
WESTERN PERSPECTIVE VIEW FROM SITE A1
Yeager Airport

Source: LeighFisher, June 2015.

Site C

The Site C APE is generally defined as a 6.5-acre rectangular shape (centered at 38.38074°, -81.59307°) that runs southwest to northeast. The APE is bounded to the west and north by the Elk River and Barlow Drive, to the east by Runway 5-23, and to the south by undeveloped Airport property, as shown in Figure 9. The site resides on a solid bedrock shelf adjacent to the Runway 5-23 embankment. It has been significantly disturbed in the past as it served as a fill/borrow site for the 2003 Runway Safety Area Project. The site is generally flat and barren of vegetation, except for small patches of grass and scrub brush, as shown in Figure 10. Perspective views in the four cardinal directions—north, east, south, and west—from Site C are shown in Figures 11, 12, 13, and 14, respectively.

Figure 9
SITE C AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 10
SITE C ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 11
NORTHERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Figure 12
EASTERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Figure 13
SOUTHERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Figure 14
WESTERN PERSPECTIVE VIEW FROM SITE C
Yeager Airport

Source: LeighFisher, June 2015.

Site E

The Site E APE is generally defined as a 1.5-acre square shape (centered at 38.36953°, -81.59559°) that is located on the top of the existing parking garage. The APE is bounded to the north and west by the terminal building and airfield, to the east by the airfield, and to the south by Airport Road, as shown in Figure 15. The site contains a concrete parking garage and paved roadways, as shown in Figure 16. Perspective views in the four cardinal directions—north, east, south, and west—from Site E are shown in Figures 17, 18, 19, and 20, respectively. It is important to note that the solar PV array would be located on the top of the garage and would not involve the disturbance of the surrounding environment.

Figure 15
SITE E AREA OF POTENTIAL EFFECTS
Yeager Airport

Source: LeighFisher, June 2015.

Figure 16
SITE E ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 17
NORTHERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

Figure 18
EASTERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

Figure 19
SOUTHERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

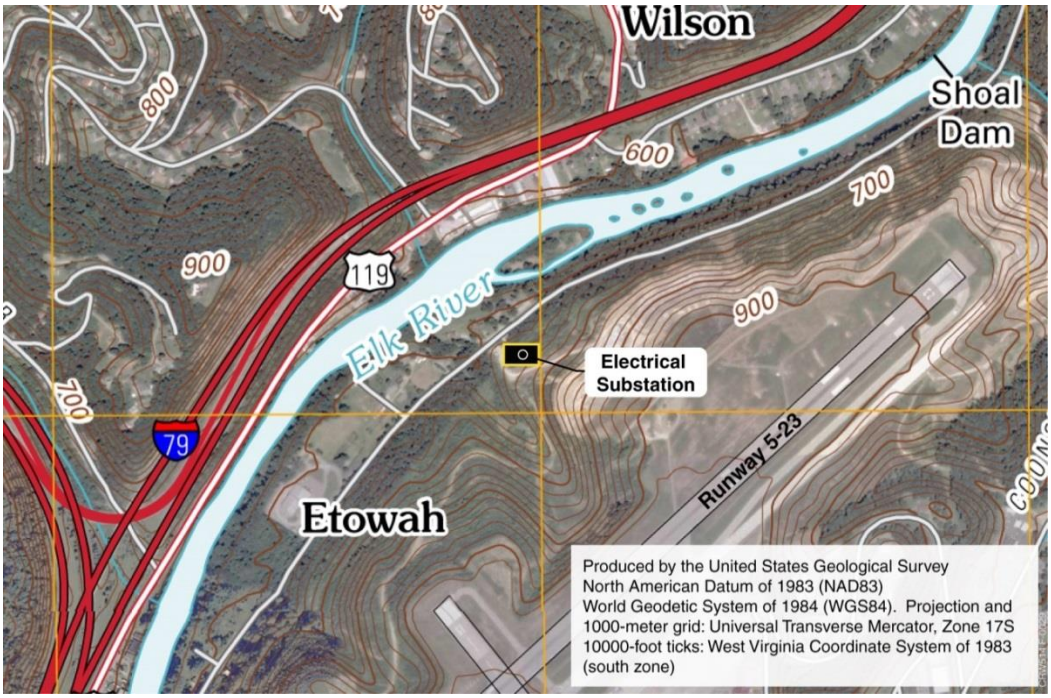
Figure 20
WESTERN PERSPECTIVE VIEW FROM SITE E
Yeager Airport

Source: LeighFisher, June 2015.

Electrical Substation

The electrical substation APE is generally defined as a 0.25-acre square shape (centered at 38.37988°, -81.59630°) that is located near the existing APCO transmission line and Barlow Road. The APE is bounded to the north and west by Barlow Road and the Elk River and to the east and south by undeveloped Airport property, as shown in Figure 21. The site contains short grasses, scrub brush, and several deciduous trees approximately 10 to 20 feet in height, as shown in Figure 22. Perspective views in the four cardinal directions—north, east, south, and west—from the electrical substation are shown in Figures 23, 24, 25, and 26, respectively. Installation of the electrical substation would involve installing electrical equipment on a concrete pad and interconnecting with the APCO transmission line approximately 50 feet away.

Figure 21
ELECTRICAL SUBSTATION AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 22
ELECTRICAL SUBSTATION ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 23
NORTHERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

Figure 24
EASTERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

Figure 25
SOUTHERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

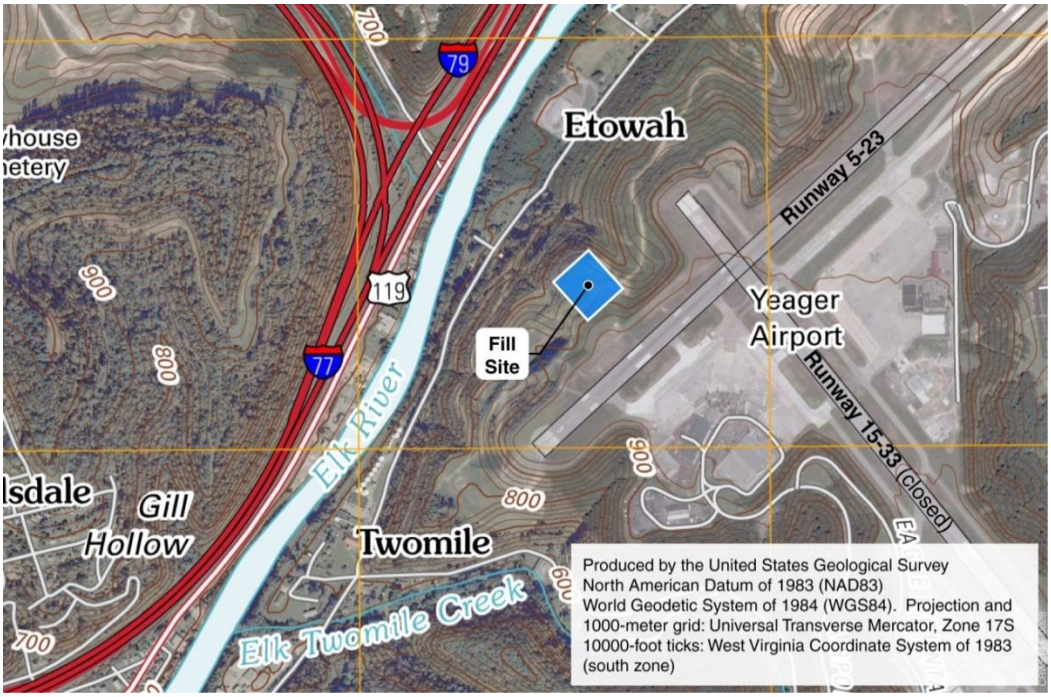
Figure 26
WESTERN PERSPECTIVE VIEW FROM ELECTRICAL SUBSTATION
Yeager Airport

Source: LeighFisher, June 2015.

Fill Site

The Fill Site APE is generally defined as a four-acre square shape (centered at 38.37206°, -81.60222°) that is located at the end of an existing Airport access road (called the Haul Road for the proposed Project), which follows the contour of the Runway 5-23 embankment, as shown in Figure 27. The Fill Site is located approximately 80 feet below the grade of the Runway 5-23, near the threshold of Runway 5. The site has been heavily disturbed and currently serves as an active fill/borrow site for Airport development projects. The site contains exposed soils, short grasses, and scrub brush, as shown in Figure 28. Perspective views in the four cardinal directions—north, east, south, and west—from the Fill Site are shown in Figures 29, 30, 31, and 32, respectively. The deposition of soil and rock removed from Sites A1 and C would not increase the footprint of the existing fill/borrow site.

Figure 27
FILL SITE AREA OF POTENTIAL EFFECTS
Yeager Airport



Source: LeighFisher, June 2015.

Figure 28
FILL SITE ENVIRONMENT
Yeager Airport

Source: LeighFisher, June 2015.

Figure 29
NORTHERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

Figure 30
EASTERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

Figure 31
SOUTHERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

Figure 32
WESTERN PERSPECTIVE VIEW FROM FILL SITE
Yeager Airport

Source: LeighFisher, June 2015.

DETERMINATION OF EFFECT

Installation of solar PV arrays and the supporting electrical infrastructure at the proposed sites are unlikely to:

- Result in or have the potential to result in harm, harassment, or take of any fish and/or wildlife species.
- Result in or have the potential to result in direct or indirect destruction, ground disturbance, or other modification of any habitat that may support fish and/or wildlife species.
- Result in or have the potential to result in the removal of vegetation with potential to support wildlife.
- Result in or have the potential to result in noise, vibration, dust, light, pollution, or an alteration in water quality that may affect fish and/or wildlife directly or from a distance.
- Result in or have the potential to result in any interference with the movement of any fish and/or wildlife species.

U.S. Fish & Wildlife Service

My project

IPaC Trust Resource Report

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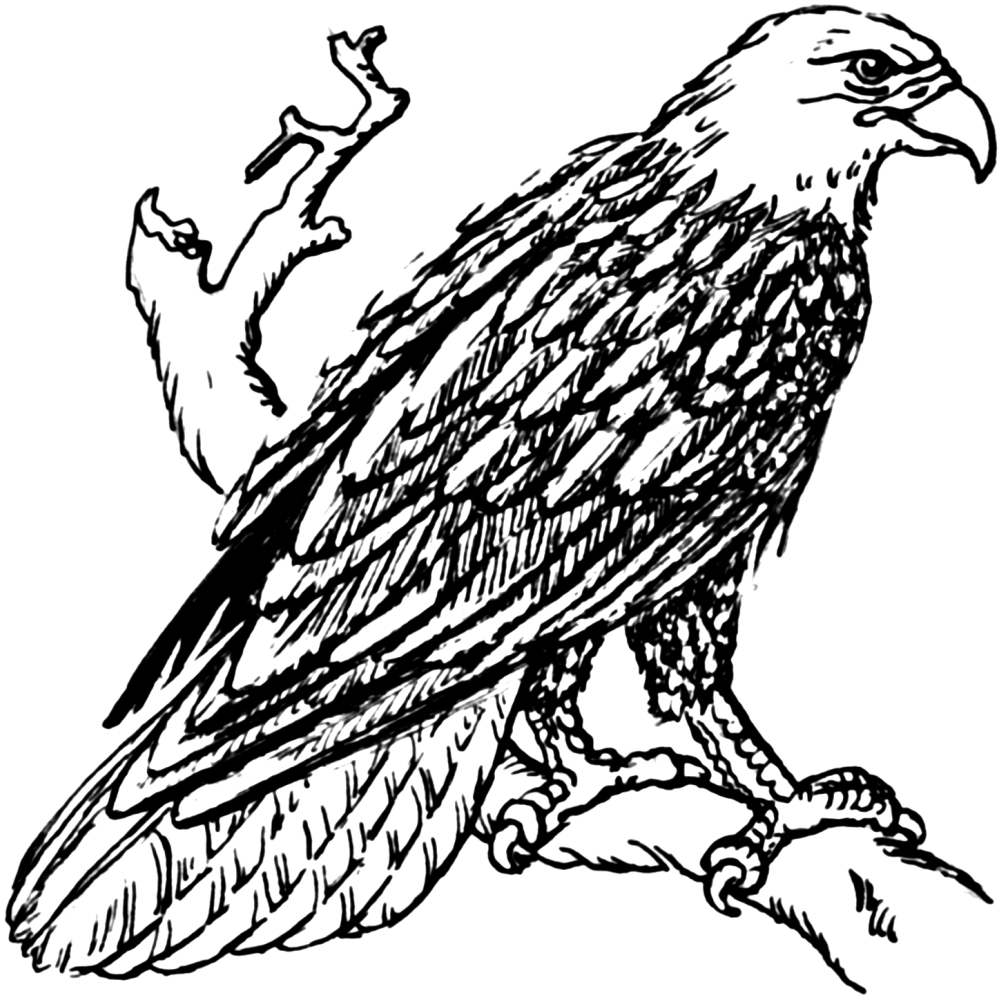


US Fish & Wildlife Service

IPaC Trust Resource Report

Project Description

NAME

My project

PROJECT CODE

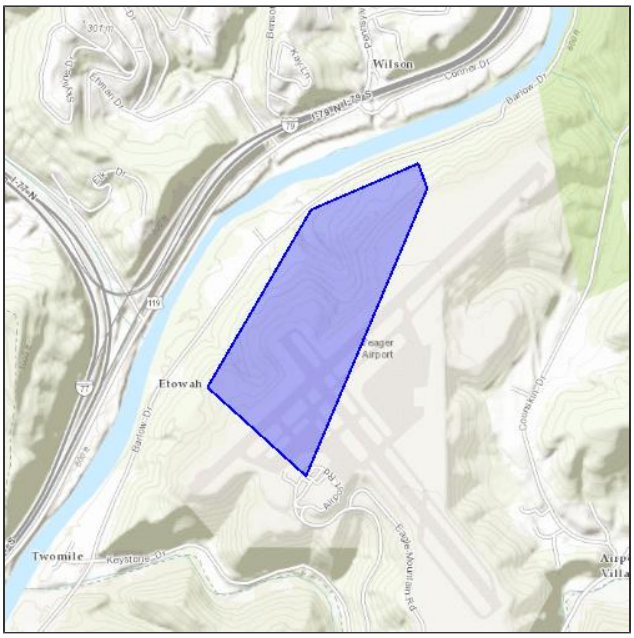
IM4RG-SCL5J-E2TFR-WH7TE-6YRJUI

LOCATION

Kanawha County, West Virginia

DESCRIPTION

No description provided



U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

West Virginia Ecological Services Field Office
694 Beverly Pike
Elkins, WV 26241-9475
(304) 636-6586

Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

Clams

Clubshell Pleurobema clava **Endangered**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=F01D

Northern Riffleshell Epioblasma torulosa rangiana **Endangered**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=F02Z

Pink Mucket (pearlymussel) Lampsilis abrupta **Endangered**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=F00G

Rayed Bean Villosa fabalis **Endangered**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=F01A

Snuffbox Mussel Epioblasma triquetra **Endangered**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=F03J

Fishes

Diamond Darter Crystallaria cincotta **Endangered**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E014

Mammals

Indiana Bat Myotis sodalis **Endangered**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A000

Northern Long-eared Bat Myotis septentrionalis **Threatened**

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

Virginia Big-eared Bat Corynorhinus (=Plecotus) townsendii virginianus **Endangered**

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A080

Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

Bald Eagle Haliaeetus leucocephalus **Bird of conservation concern**
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

Black-billed Cuckoo Coccyzus erythropthalmus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HI

Blue-winged Warbler Vermivora pinus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JY

Cerulean Warbler Dendroica cerulea **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B09I

Fox Sparrow Passerella iliaca **Bird of conservation concern**
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0NE

Kentucky Warbler Oporornis formosus **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0IN

Least Bittern Ixobrychus exilis **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JW

Louisiana Waterthrush Parkesia motacilla **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0ND

Pied-billed Grebe Podilymbus podiceps **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JQ

Prairie Warbler Dendroica discolor **Bird of conservation concern**
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0K4

Rusty Blackbird Euphagus carolinus **Bird of conservation concern**

Season: Wintering

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0JI

Swainson's Warbler Limnothlypis swainsonii **Bird of conservation concern**

Season: Breeding

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0IK

Wood Thrush Hylocichla mustelina **Bird of conservation concern**

Season: Breeding

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0IB

Worm Eating Warbler Helmitheros vermivorum **Bird of conservation concern**

Season: Breeding

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0II

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

There are no refuges within this project area

Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

There are no wetlands identified in this project area

United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

MAR 2 5 2003

Ms. Laura Bee
Kimball & Associates
180 Regent Court
State College, Pennsylvania 16801

Dear Ms. Bee:

This responds to your information request of February 18, 2003 regarding the potential impacts of a proposed project on wetlands and federally listed endangered and threatened species. The Central West Virginia Regional Airport Authority is proposing to improve the Runway Safety Areas (RSA) for Runways 5 and 32 to enhance safety and meet Federal Aviation Authority (FAA) regulations at the Yeager Airport in Kanawha County, West Virginia. The Authority proposes to place fill material at runway ends and to grade the area to provide for the RSA's. Borrow areas are two forested sites between the airport runways and the Elk River. A total of 62.73 forested acres will be removed with this project.

A federally listed species that is likely to occur within the proposed project area is the endangered Indiana bat, Myotis sodalis. This species may use the project area for foraging and roosting between April 1 and November 14. Indiana bat summer foraging habitats are generally defined as riparian, bottomland, or upland forest, and old fields or pastures with scattered trees. Roosting/maternity habitat consists primarily of live or dead hardwood tree species such as shagbark hickory, which have exfoliating bark that provides space for bats to roost between the bark and the bole of the tree. Tree cavities, crevices, splits, or hollow portions of tree boles and limbs also provide roost sites.

There are numerous hibernacula for the Indiana bat in the limestone region of eastern West Virginia in Preston, Tucker, Randolph, Pendleton, Pocahontas, Greenbrier, Monroe, and Mercer Counties. The population of the hibernacula in West Virginia range in size from one to 9,000 Indiana bats. Recent data indicate that the area within an approximate 5.0 mile radius of a hibernaculum is important foraging and roosting habitat for the Indiana bat in the fall swarming period, August 15 through November 14. The project area is outside a five mile radius of a known hibernaculum. Therefore, fall-swarming behavior is not expected in the proposed project area.

The Service has determined the number of acres of suitable foraging and roosting habitat on the West Virginia landscape available to each Indiana bat known to occur there. On that basis, we have determined that small projects, generally affecting 17 acres or less of suitable foraging and roosting habitat, will have little chance (at the 98% confidence level) of resulting in direct or indirect take of the species and is therefore considered discountable. If less than 17 acres will be removed, tree removal can occur at any season of the year. If 17 acres or more will be disturbed, the Service recommends one of two options. Mist net surveys can be conducted to determine if the summer foraging and roosting habitat within the area affected by the proposed project is occupied. A survey plan should be submitted to the Service and the West Virginia Division of Natural Resources (WVDNR) for concurrence prior to conducting the work. The survey should follow the standard Indiana bat mist net protocol from the Draft Indiana Bat Recovery Plan, and be conducted between May 15 and August 15 by a qualified mammalogist with experience in identifying Indiana bats.

If Indiana bats are collected, the data should be incorporated into a Biological Assessment (BA) pursuant to Section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.)(ESA). BA's are designed to assist Federal agencies in determining if formal consultation is required. The Service recommends that the following steps be taken in preparation of the BA.

1. Conduct recent interviews of recognized experts on the species at issue, including those within the Service, WVDNR, U.S. Forest Service, universities and others who may have data not yet found in scientific literature.

2. Review up to date literature and other scientific data to determine the species distribution, habitat needs, and other biological requirements.

3. Analyze the effects of the action on individuals and populations of the species and its habitat, including <u>indirect and cumulative effects of the action</u>.

4. Analyze alternative actions that may provide conservation measures.

5. Conduct any studies necessary to fulfill the requirements of (1) through (4) above.

6. Review any other relevant information.

If you determine that the proposed action "may affect" a federally listed species you must request, in writing, formal consultation with this office, pursuant to Section 7(a) of the ESA. If the determination is "no effect", no further consultation is necessary, unless requested by the Service. Regardless of your findings, you should provide this office a copy of the survey results and any other relevant information that assisted you in reaching your conclusion.

Another option the Federal agency may use to address Indiana bat concerns is to assume Indiana bats are present and schedule timber removal operations during the hibernation period, between November 15 and March 31. If that option is chosen, the federal agency must then submit a calculation of the percentage of area of suitable habitat that would remain within a two-mile

radius of the center point of the proposed disturbance. If the Service determines that the extent of disturbance is significant and may affect the Indiana bat, the federal agency must request formal Section 7 consultation with the Service or conduct mist net surveys to determine if Indiana bats are, in fact, present. If Indiana bats are collected during mist netting, the federal agency must prepare a BA, as described above.

Definitive determinations of the presence of waters of the United States, including wetlands, in the project area and the need for permits, if any, are made by the U.S. Army Corps of Engineers. They may be contacted at: Huntington District, Regulatory Branch, 502 Eighth Street, Huntington, West Virginia 25701, telephone (304)529-5710.

If you have any questions regarding this letter, please contact Linda Smith, of my staff, or contact me directly at (304) 636-6586, or at the letterhead address.

Sincerely,

William A. Tolin

William A. Tolin
Acting Field Supervisor

Enclosure (Bat surveyors)

United States Department of the Interior

FISH AND WILDLIFE SERVICE

West Virginia Field Office
694 Beverly Pike
Elkins, West Virginia 26241

Huntington District - No Effect/Not Likely to Adversely Affect Concurrence Form

Contact Name: Neal Wolfe, Leigh/Fisher

Email Address or Fax Number: 1-650-579-7722

Project Name & Location: Proposed Installation of Solar Photovoltaic Arrays at Yeager Airport, Kanawha County

Date of Letter Request: June 11, 2015

This is in response to your letter requesting threatened and endangered species information in regard to the proposed project listed above. These comments are provided pursuant to the Endangered Species Act (ESA, 87 Stat. 884, as amended; 16 U. S. C. 1531 *et seq.*).

We have made a determination that the project _____will have no effect/**XXXX** is not likely to adversely affect federally listed endangered or threatened species. Therefore no biological assessment or further section 7 consultation under the ESA is required with the Fish and Wildlife Service. Should project plans change or amendments be proposed that we have not considered in your proposed action, or if additional information on listed and proposed species becomes available, or if new species become listed or critical habitat is designated, this determination may be reconsidered

Definitive determinations of the presences of waters of the United States, including wetlands, in the project area and the need for permits, if any, are made by the U.S. Army Corps of Engineers. They may be contacted at Huntington District, Regulatory Branch, 502 Eighth Street, Huntington, West Virginia, 25701, telephone (304) 399-5710.

Reviewer's signature and date Jul 8, 2015

Field Supervisor's signature and date 7/8/15

Appendix D

WETLANDS AND WATERBODY DELINEATION REPORT

Hatch Mott MacDonald

Central West Virginia Regional Airport Authority
Yeager Airport Solar Project
Wetland and Waterbody Delineation Report
Kanawha County, WV

Date: December 10, 2014

Prepared by:
Hatch Mott MacDonald
2601 Cranberry Square
Morgantown, WV 26508
T 304.212.4390 F 304.594.2814

Table of Contents

1.0 Introduction

This report identifies "Waters of the United States", as defined by the United States Army Corps of Engineers (USACE) (33 CFR 328.3), within the area of potential disturbance area of the proposed Yeager Airport Solar Project located in Kanawha County, WV. Investigations resulted in finding no wetlands or streams within the environmental survey limits.

The findings included in this report are based on review of publicly available mapping and field investigations. Publicly available mapping included 7.5-minute USGS topographic quadrangles, Soil Survey Maps and National Wetland Inventory (NWI) maps. Field investigations were conducted June 10, July 3, and October 7, 2014.

2.0 Project Description

The Yeager Airport Solar Project involves the installation of solar photovoltaic arrays on the Yeager Airport property in Charleston, WV. The project will be located on one of eight proposed solar array Sites (A, A1, B, B1, C, D, E, F). Five potential sites are located on portions of the Airport property grounds surrounding the runway (Sites A, A1, B, B1, C), one potential site is located on an Airport parking garage roof-top (Site D), one potential site is located on the upper level of the Airport parking garage (Site E) and one potential site is located at the Airport short term-parking area (Site F).

3.0 Field Investigation Methods

The wetland and stream surveys were performed on June 10, July 3, and October 7, 2014. The wetland delineation was conducted following the methodology set forth in the USACE Wetland Delineation Manual (1987) and the Regional Supplemental to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region Version 2.0 (April, 2012). The limits of disturbance were surveyed around the eight proposed solar array sites located at Yeager Airport. Hydrology, soils, and vegetation were examined throughout the proposed sites.

4.0 Site Description

The Yeager Airport Solar Project is located north of Interstate 77/64, off Highway 114 along Airport Road in Charleston, WV. Solar Sites A and C are positioned at the northeast portions of the Airport grounds. Site A is located on a ridge northwest of the Airport runway. Site C is located on a hillside terrace northwest of the Airport runway and down-slope from Site A. Solar Site A1 is located at the northwestern edge of the Airport property where a small portion of the Airport taxi-way extends to the

northwest away from the main runway. Site A1 is a mostly level surface that is the same elevation as the Airport runway and consists of mowed grass, pavement, and overgrown, heavily vegetated hillside.
Solar Sites B and B1 are positioned at the southwest portion of the Airport grounds. Site B is located on a hillside terrace northwest of the Airport runway. Site B1 is located on a hillside terrace west of the Airport runway. Plant species found at solar Sites A, A1, B, B1, and C includes red and white clover, bird's-foot trefoil, crownvetch, goldenrod, oxeye daisy, and various grass species.

Solar Sites D and E are positioned on Airport building rooftops located south of the Airport terminal Site D is located on the metal roof of a parking garage structure that adjoins the southwest end of the Airport terminal. Site E is located on the upper level roof-top parking of a parking garage structure that is connected to the southeast end of the Airport terminal. The northern half of Site E is five (5) levels in height compared to the southern half of Site E which is four (4) levels in height and about ten (10) feet shorter than the northern half.

Solar Site F is positioned in the short-term, ground level parking lot located directly south of the Airport terminal. Site F covers the entire portion of the short-term parking lot and is the same elevation as the Airport's main entry way.

5.0 Results of Wetland Investigation

No streams or wetlands were identified within the survey limits of Sites A, B, B1, C, D, E, and F. Located within Site C were two small, low-lying areas with surface water and common wetland plant species including cattail (*Typha*) wool grass (*Scirpus cyperinus*), and lamp rush (*Juncus effusus*). Soil auger samples in these two locations determined that the soil specifications do not meet the definition of a wetland soil. Soil layers show indicators of being disturbed and overlay impermeable rock substrate that has been placed as fill.

Located within Site A1 were three areas that exhibited wetland characteristics. The first area is a small groundwater seep that's positioned in the mowed area of the Airport grounds next to paved surface. The seep area was saturated at the time of investigation. The area is regularly mown but sedge (*Carex*) and rush (*Scirpus*) were present. Soil auger samples determined that the soil specifications do not meet the definition of a wetland soil. Soil layers were disturbed and poorly drained, causing the area to hold water and stay saturated. The second area is a small puddled area that's positioned along the Airport boundary fence in an area that's infrequently maintained and overgrown. The puddled area is a depression that

holds water after storm events. Wetland plant species including cattail (*Typha*), sedge (*Carex*), and rush (*Scirpus*) were present but appeared stressed. Soil auger samples found that soil specifications do not meet the definition of wetland soil. Soil layers appeared disturbed and were heavily compacted causing the area to retain water. The third area is a storm water retention pond that's positioned to the east of Site A1 on a terrace of a moderate slope. The storm water pond has points for water to enter and exit the pond but doesn't appear to be regularly saturated and no water or saturation was present at the time of investigation. Wetland plant species were present, aster (*Aster spp.*) and goldenrod (*Solidago*), but were not dominant enough to consider the area a wetland.

6.0 Results of Waterbody Investigation

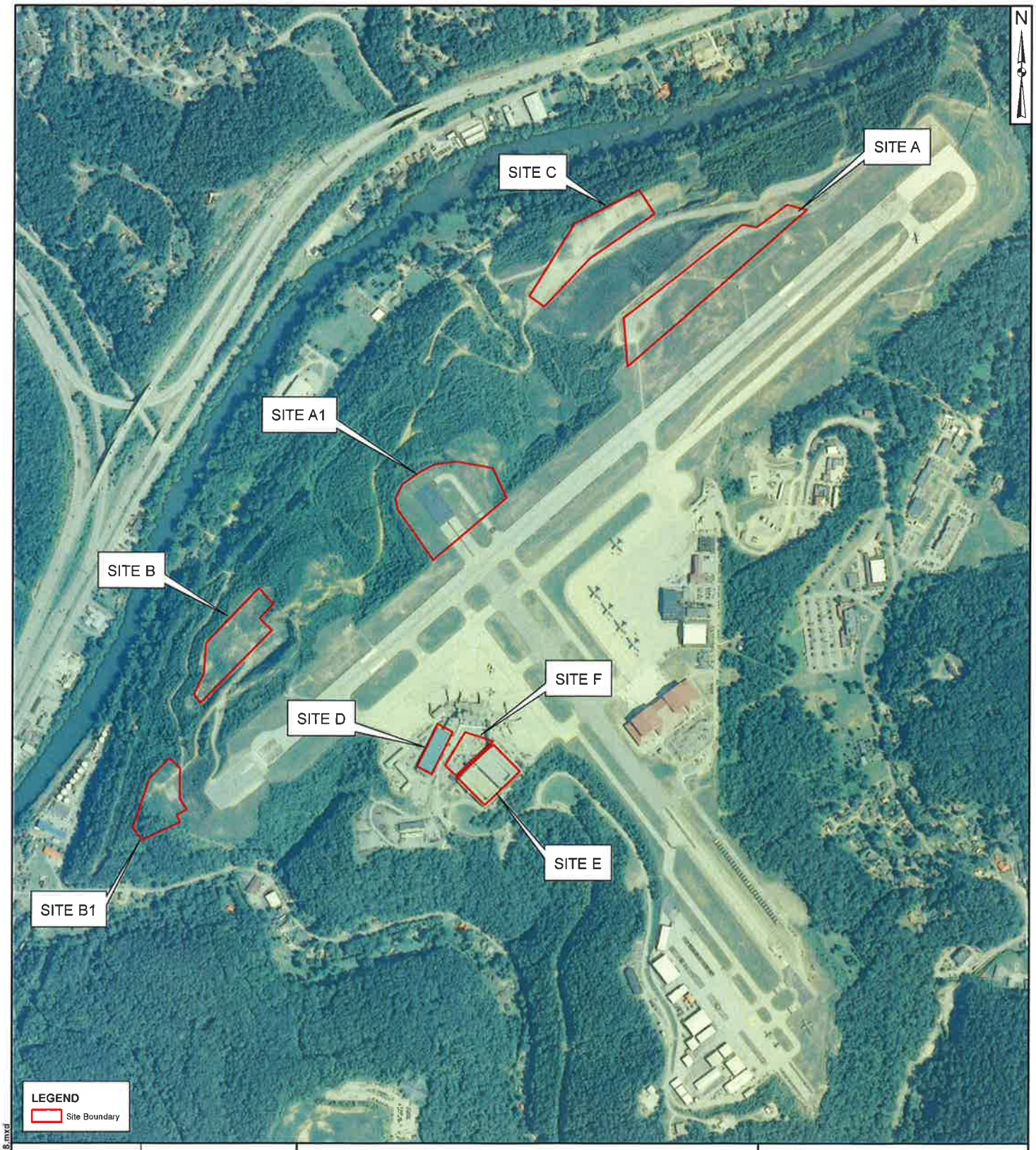
There were no streams identified within the survey limits.

7.0 Summary

No streams or wetlands were found within the environmental survey limits of the proposed Yeager Airport Solar Project.

Appendix A

Site Location Maps



CENTRAL WEST VIRGINIA REGIONAL AIRPORT AUTHORITY
YEAGER AIRPORT SOLAR PROJECT SITE LOCATIONS

LOCATION MAP - AERIAL

KANAWHA COUNTY, WEST VIRGINIA

1,000 500 0 1,000 FEET

YEAGER AIRPORT

Hatch Mott MacDonald
2601 Cranberry Square
Morgantown, WV 26508
Ph: (304) 212-4390 Fax: (304) 594-2814

ABSOLUTE SCALE: 1 inch = 1,000 feet
REFERENCE SCALE: 1:12,000

DATE: 12/16/2014

PAGE: 1 of 1

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REFERENCE: NAIP IMAGERY, 2011, KANAWHA COUNTY, WEST VIRGINIA.

Appendix B

Site Photographs

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

Easterly view of Site A

Northeasterly view of Site A

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

Southeasterly view of Site A1

Northerly view of Site A1

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

Northeasterly view of Site B

Southerly view of Site B

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

Northerly view of Site B1

Westerly view of Site B1

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

Easterly view of Site C

Westerly view of Site C

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

Westerly view of Site D roof-top viewing from Site E

Southwesterly view of Site D roof-top viewing from Site E

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

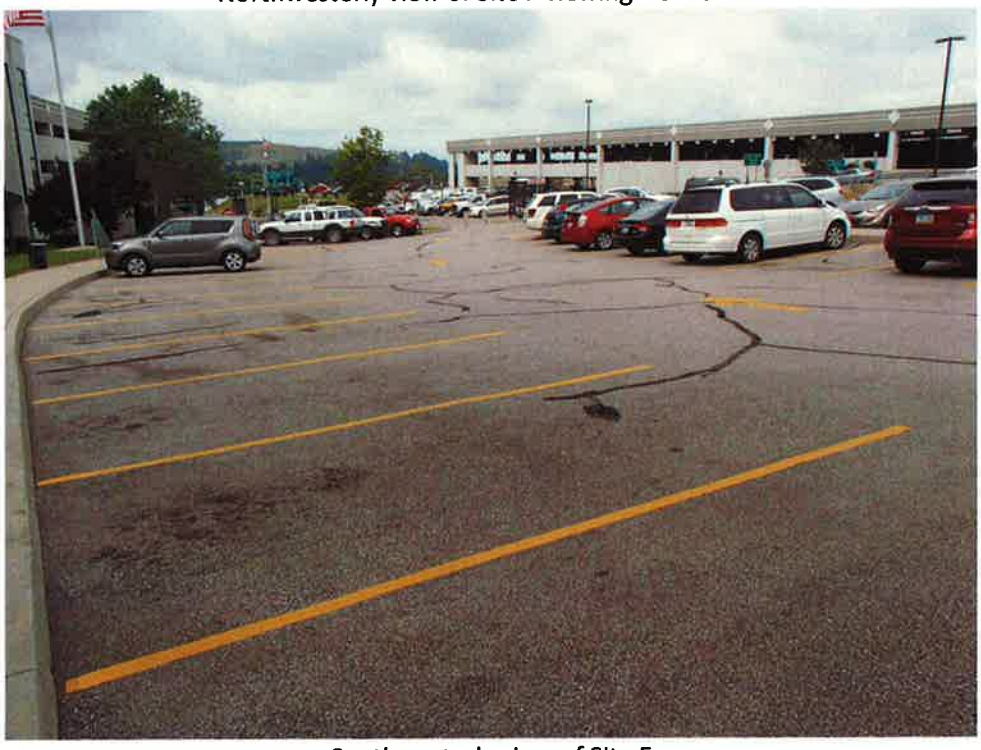
Southeasterly view of northern half of Site E from southwestern corner

Southeasterly view of southern half of Site E from northwestern corner

Hatch Mott MacDonald

Yeager Airport Solar Sites
Central West Virginia Regional Airport Authority
Site Photographs
June 10, July 3, and October 7, 2014

Northwesterly view of Site F viewing from Site E



Southwesterly view of Site F

Appendix E

AIR QUALITY ANALYSIS

Site A1

	Number of Vehicles	Total Operating Hours	Avg Rated HP	Load Factor	Vehicle Emission Factors (g/hp-hr) NOx	VOC Exhaust	CO	SO2	PM10	PM2.5	VOC Evaporative (g/equip-day)	Emissions (tons) NOx	VOC	CO	SO2	PM10	PM2.5
Forklift	2	160	100	0.59	2.241684	0.187797	2.173682	0.008864	0.296095	0.2724074	0.652871319	0.02328	0.00204	0.02257	0.00009	0.00307	0.00283
Pick up Trucks	10	640	175	0.43	3.177353	0.25712	0.782502	0.008504	0.194301	0.1787573	0.714698348	0.16832	0.01409	0.04145	0.00045	0.01029	0.00947
Crane	0	160	300	0.43	2.70284	0.216906	0.566198	0.008222	0.120734	0.1110753	1.082547681	0.06137	0.00492	0.01285	0.00019	0.00274	0.00252
Flatbed Semi	4	80	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	0.06317	0.00567	0.02508	0.00025	0.00410	0.00377
Tool Truck	4	80	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	0.06317	0.00567	0.02508	0.00025	0.00410	0.00377
Generator	1	640	40	0.43	4.950357	0.585221	2.19999	0.009756	0.412572	0.3795659	0.125659718	0.05994	0.00709	0.02664	0.00012	0.00500	0.00460
Grader	1	160	220	0.51	2.33509	0.211363	0.700132	0.008267	0.140056	0.1303767	2.32499844	0.04611	0.00433	0.01383	0.00016	0.00277	0.00257
Dozer	2	320	300	0.65	2.55899	0.233971	0.710234	0.008267	0.141223	0.1334712	2.39943221	0.17565	0.01638	0.04875	0.00057	0.00969	0.00916
Dumptruck	4	2500	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	1.97397	0.15799	0.78385	0.00779	0.12814	0.11789
Drill Rig	1	480	150	0.51	2.70284	0.216906	0.566198	0.008222	0.120734	0.1110753	1.082547681	0.10917	0.00883	0.02287	0.00033	0.00488	0.00449
Cement Truck	1	480	600	0.59	2.241684	0.187797	2.173682	0.008864	0.296095	0.2724074	0.652871319	0.41900	0.03514	0.40629	0.00166	0.05534	0.05092
											Site A1 Total	3.16315	0.26217	1.42926	0.01186	0.23012	0.21199

Site C

	Number of Vehicles	Total Operating Hours	Avg Rated HP	Load Factor	NOx	VOC Exhaust	CO	SO2	PM10	PM2.5	VOC Evaporative (g/equip-day)	NOx	VOC	CO	SO2	PM10	PM2.5
Forklift	2	160	100	0.59	2.241684	0.187797	2.173682	0.008864	0.296095	0.2724074	0.652871319	0.02328	0.00204	0.02257	0.00009	0.00307	0.00283
Pick up Trucks	10	480	175	0.43	3.177353	0.25712	0.782502	0.008504	0.194301	0.1787573	0.714698348	0.12624	0.01069	0.03109	0.00034	0.00772	0.00710
Crane	0	160	300	0.43	2.70284	0.216906	0.566198	0.008222	0.120734	0.1110753	1.082547681	0.06137	0.00492	0.01285	0.00019	0.00274	0.00252
Flatbed Semi	4	80	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	0.06317	0.00567	0.02508	0.00025	0.00410	0.00377
Tool Truck	4	80	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	0.06317	0.00567	0.02508	0.00025	0.00410	0.00377
Generator	1	480	40	0.43	4.950357	0.585221	2.19999	0.009756	0.412572	0.3795659	0.125659718	0.04496	0.00532	0.01998	0.00009	0.00375	0.00345
Grader	1	320	220	0.51	2.33509	0.211363	0.700132	0.008267	0.140056	0.1303767	2.32499844	0.09222	0.00850	0.02765	0.00033	0.00553	0.00515
Dozer	2	320	300	0.65	2.55899	0.233971	0.710234	0.008267	0.141223	0.1334712	2.39943221	0.17565	0.01638	0.04875	0.00057	0.00969	0.00916
Dumptruck	2	500	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	0.39479	0.03179	0.15677	0.00156	0.02563	0.02358
Drill Rig	1	320	150	0.51	2.70284	0.216906	0.566198	0.008222	0.120734	0.1110753	1.082547681	0.07278	0.00591	0.01525	0.00022	0.00325	0.00299
Cement Truck	1	320	600	0.59	2.241684	0.187797	2.173682	0.008864	0.296095	0.2724074	0.652871319	0.27933	0.02344	0.27086	0.00110	0.03690	0.03394
											Site C Total	1.39696	0.12034	0.65594	0.00498	0.10648	0.09827

Site E

	Number of Vehicles/Day	Operating Hours	Avg Rated HP	Load Factor	Vehicle Emission Factors (g/hp-hr) NOx (g/hp-hr)	VOC Exhaust (g/hp-hr)	CO (g/hp-hr)	SO2 (g/hp-hr)	PM10 (g/hp-hr)	PM2.5 (g/hp-hr)	VOC Evaporative (g/equipment-day)	Emissions (tons) NOx	VOC	CO	SO2	PM10	PM2.5
Forklift	2	160	100	0.59	2.241684	0.187797	2.173682	0.008864	0.296095	0.2724074	0.652871319	0.02328	0.00201	0.02257	0.00009	0.00307	0.00283
Pick up Trucks	10	160	175	0.43	3.177353	0.25712	0.782502	0.008504	0.194301	0.1787573	0.714698348	0.04208	0.00372	0.01036	0.00011	0.00257	0.00237
Crane	1	160	300	0.43	2.70284	0.216906	0.566198	0.008222	0.120734	0.1110753	1.082547681	0.06137	0.00497	0.01285	0.00019	0.00274	0.00252
Flatbed Semi	4	80	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	0.06317	0.00546	0.02508	0.00025	0.00410	0.00377
Tool Truck	4	80	600	0.59	2.027706	0.161637	0.805183	0.008002	0.131625	0.1210946	2.41879006	0.06317	0.00546	0.02508	0.00025	0.00410	0.00377
Generator	1	320	40	0.43	4.950357	0.585221	2.19999	0.009756	0.412572	0.3795659	0.125659718	0.02997	0.00355	0.01332	0.00006	0.00250	0.00230
											Site E Total	0.28303	0.02517	0.10928	0.00095	0.01909	0.01756
											Grand Total	4.8431	0.4077	2.1945	0.0178	0.3557	0.3278

Assumptions:

Emission factors provided by EPA's NONROAD2008a model

Equipment population and activity data provided by Suniva

Equipment HP and load factor data provided by NONROAD2008a

Site C equipment usage based on Site A1 operational assumptions, which would involve developing approximately 9 acres. Area to be developed at Site C is approximately 3 acres (the western half of Site C).

Appendix F

SOLAR GLARE HAZARD ANALYSIS RESULTS

YEAGER AIRPORT

Leigh|Fisher

Date	February 2, 2015	File Ref	
To	Matt DiGiulian	Enc	
From	Rick Atkinson	cc	Blair Stocker Darcy Zarubiak Neal Wolfe

Subject: Update to the Geometric Glint and Glare Study at Yeager Airport

The Central West Virginia Regional Airport Authority (the Authority) prepared a geometric glint and glare study (Glare Study), dated November 18, 2014, for the proposed three solar photovoltaic (PV) arrays at Yeager Airport (the Airport). The Glare Study was submitted to the Federal Aviation Administration (FAA) Beckley Airports District Office shortly thereafter. After an initial review, FAA responded to the Authority with comments regarding the Glare Study on January 20, 2015. This memorandum addresses comments provided by FAA and serves as an update to the November 18, 2014 Glare Study.

Geographical Coordinates of Air Traffic Control Tower

In the January 15, 2015 email, FAA indicated that incorrect coordinates for the air traffic control tower (ATCT) were used in the Glare Study. FAA provided the following coordinates: 38° 22’ 14.38” North and 81° 35’ 47.00” W. The Solar Glare Hazard Analysis Tool (SGHAT) requires coordinates in decimal form, thus these coordinates convert to 38.370661 North and 81.596389 West.

Elevation of the Air Traffic Control Tower

In the January 15, 2015 email, FAA also indicated that an incorrect elevation for the ATCT was used in the Glare Study. FAA confirmed that the appropriate elevation for the ATCT is 1,026 feet mean sea level (MSL). It is important to note that while the solar PV array vertices are displayed in the SGHAT results as “total elevation”, the ATCT location is displayed as “height above ground”. The elevation of the base of the ATCT, as provided by the SGHAT, is 952.55 feet MSL. Accordingly, the height above ground value for the ATCT was entered as 73.45 feet to achieve a total elevation of 1,026 feet MSL.

Model Results

The coordinates and elevation of the ATCT provided by FAA were entered into the SGHAT to determine the potential for glare impacts to the ATCT from the three solar PV arrays. As provided in the attachment, no potential glare impacts were identified from any of the three solar PV sites. The same geographical coordinates and elevations for the three solar PV arrays were used in both the November 18, 2014 Glare Study and in this update.

ATTACHMENT

SGHAT RESULTS

Solar Glare Hazard Analysis Report

Generated Feb. 1, 2015, 7:28 p.m.

No glare found

Print

Inputs

Analysis name	CRW
PV array axis tracking	none
Orientation of array (deg)	180.0
Tilt of solar panels (deg)	25.0
Rated power (kW)	0.0
Vary reflectivity	True

PV surface material	Smooth glass without ARC

Timezone offset	-5.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.3737435125	-81.5975672007	920.21	-8.21	912.0
2	38.3751229315	-81.5988975763	869.47	42.53	912.0
3	38.3757873983	-81.5978783369	890.61	23.39	914.0
4	38.3764013939	-81.5962582827	892.72	27.28	920.0
5	38.3754173163	-81.5951102972	912.0	8.0	920.0

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
ATCT	38.370661	-81.596389	952.55	73.45

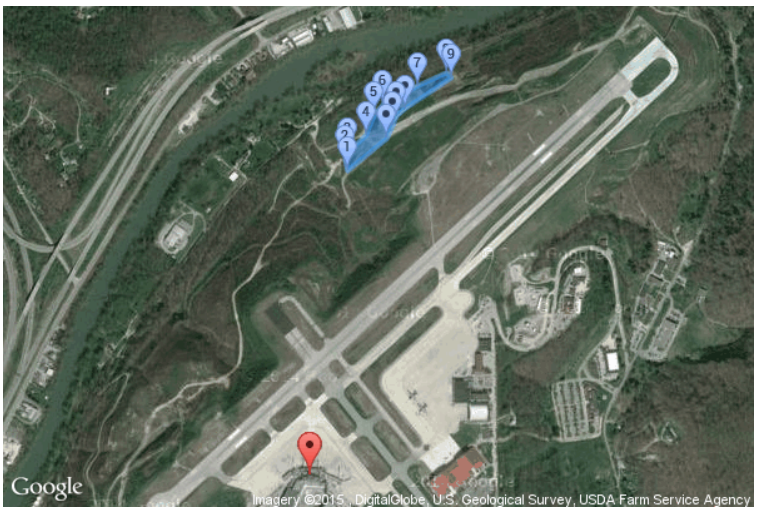
No glare found.

Solar Glare Hazard Analysis Report

Generated Feb. 1, 2015, 7:28 p.m.

No glare found

Print



Inputs

Analysis name	CRW
PV array axis tracking	none
Orientation of array (deg)	180.0
Tilt of solar panels (deg)	25.0
Rated power (kW)	0.0
Vary reflectivity	True

PV surface material	Smooth glass without ARC

Timezone offset	-5.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.378840503	-81.595121026	715.23	-11.23	704.0
2	38.3791348727	-81.5951961279	709.33	-5.33	704.0
3	38.3793367255	-81.5951102972	710.32	-6.32	704.0
4	38.3797908922	-81.5944880247	712.14	6.86	719.0
5	38.3803123394	-81.5942198038	706.96	12.04	719.0
6	38.3806067031	-81.5939086676	714.4	4.6	719.0
7	38.3811113237	-81.5927284956	740.23	-6.23	734.0
8	38.3814729664	-81.591719985	731.0	3.0	734.0
9	38.3813299916	-81.5915697813	760.09	-26.09	734.0
10	38.3805057785	-81.5931469202	781.73	-62.73	719.0

11	38.3803207498	-81.5934365988	770.69	-51.69	719.0
12	38.3800684371	-81.5935653448	773.64	-54.64	719.0
13	38.379698377	-81.5937799215	778.72	-59.72	719.0

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
ATCT	38.370661	-81.596389	952.55	73.45

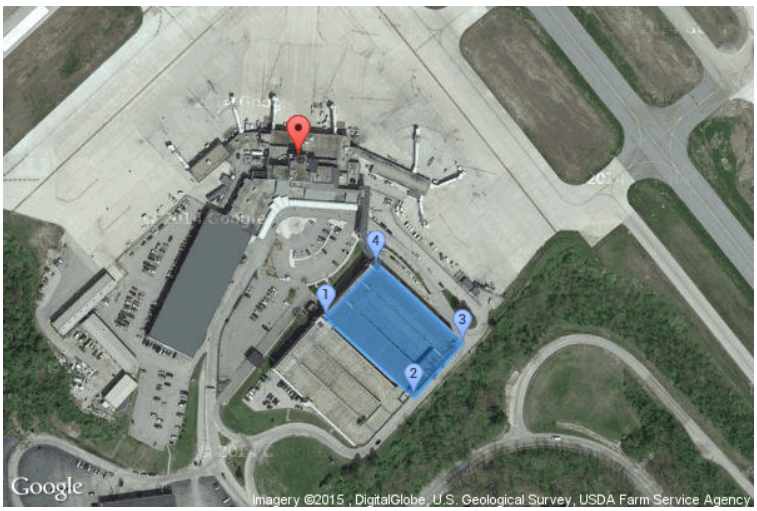
No glare found.

Solar Glare Hazard Analysis Report

Generated Feb. 1, 2015, 7:26 p.m.

No glare found

Print



Inputs

Analysis name	CRW
PV array axis tracking	none
Orientation of array (deg)	235.0
Tilt of solar panels (deg)	5.0
Rated power (kW)	0.0
Vary reflectivity	True

PV surface material	Smooth glass without ARC

Timezone offset	-5.0
Subtended angle of sun (mrad)	9.3
Peak DNI (W/m^2)	1000.0
Ocular transmission coefficient	0.5
Pupil diameter (m)	0.002
Eye focal length (m)	0.017
Time interval (min)	1
Slope error (mrad)	10.0

PV array vertices

id	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Height of panels above ground (ft)	Total elevation (ft)
1	38.3695882744	-81.5961617231	945.19	51.0	996.19
2	38.3690583382	-81.5953999758	946.17	51.0	997.17
3	38.3694200411	-81.59499228	947.14	51.0	998.14
4	38.3699499746	-81.5957218409	946.26	51.0	997.26

Observation Points

	Latitude (deg)	Longitude (deg)	Ground Elevation (ft)	Eye-level height above ground (ft)
ATCT	38.370661	-81.596389	952.55	73.45

No glare found.

U.S. Department
of Transportation

**Federal Aviation
Administration**

Kurt Blankenship
176 Airport Circle
Suite101
Beaver, WV 25813

May 14, 2015

TO:
Hatch Mott MacDonald
Attn: Blair Stocker
1600 West Carson Street
Gateway View Plaza
Pittsburgh, PA 15219
blair.stocker@hatchmott.com

CC:
Rick Atkinson
CENTRAL WVA REG ARPT AUTH
100 AIRPORT ROAD SUITE 175
CHARLESTON, WV 25311
rick@yeagerairport.com

RE: *(See attached Table 1 for referenced case(s))*
FINAL DETERMINATION

Table 1 - Letter Referenced Case(s)

ASN	Prior ASN	Location	Latitude (NAD83)	Longitude (NAD83)	AGL (Feet)	AMSL (Feet)
2014-AEA-1362-NRA		CHARLESTON, WV	38-22-30.15N	81-35-45.50W	9	930
2014-AEA-1363-NRA		CHARLESTON, WV	38-22-26.27N	81-35-50.42W	9	925

We do not object to the construction described in this proposal provided:

You comply with the requirements set forth in FAA Advisory Circular 150/5370-2, "Operational Safety on Airports During Construction."

All parts of the solar panels are below the elevation of the the Runway 5-23 Safety Area edge. As per 14 CFR Part 139.341, all existing underground utilities must be protected to prevent for interruption of services. The Airport Sponsor is required to coordinate with owner of any underground utilty (including FAA owned power/ communication cabling) that may be affected, in the area of excavation, by the solar power installation project. Necesary aggrement with owner of underground utility must be made for protection of these utilities and continuation of service they provide

For current Advisory Circulars go to http://www.faa.gov/regulations_policies/advisory_circulars/

A separate notice to the FAA is required for any construction equipment, such as temporary cranes, whose working limits would exceed the height and lateral dimensions of your proposal.

This determination does not constitute FAA approval or disapproval of the physical development involved in the proposal. It is a determination with respect to the safe and efficient use of navigable airspace by aircraft and with respect to the safety of persons and property on the ground.

In making this determination, the FAA has considered matters such as the effects the proposal would have on existing or planned traffic patterns of neighboring airports, the effects it would have on the existing airspace structure and projected programs of the FAA, the effects it would have on the safety of persons and property on the ground, and the effects that existing or proposed manmade objects (on file with the FAA), and known natural objects within the affected area would have on the airport proposal.

If you have any questions concerning this determination contact the Beckley AFO at (304) 252-6216.

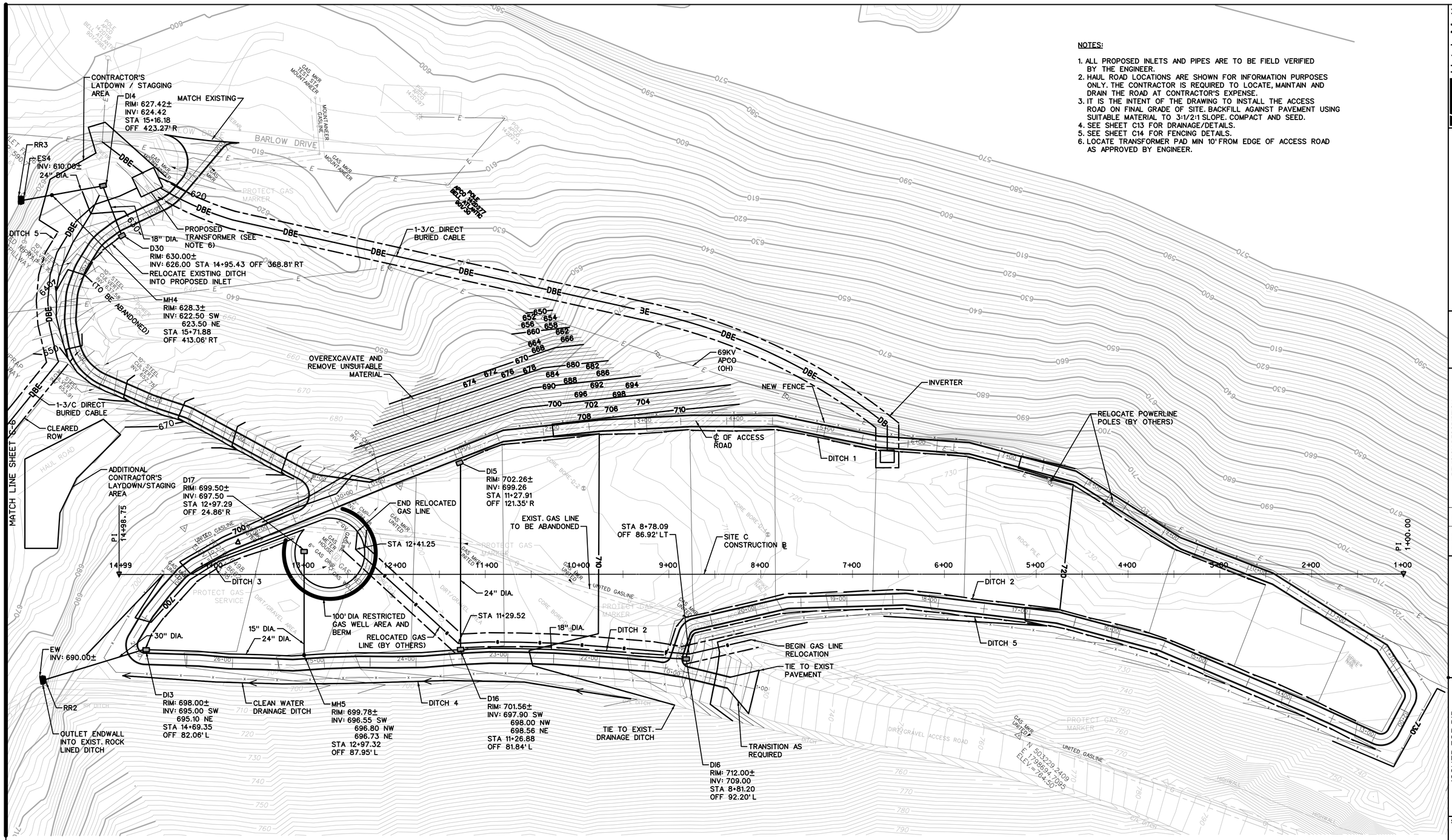
Kurt Blankenship
ADO

Appendix G

SITE AND DRAINAGE PLANS

NOTES:

1. ALL PROPOSED INLETS AND PIPES ARE TO BE FIELD VERIFIED BY THE ENGINEER.
2. HAUL ROAD LOCATIONS ARE SHOWN FOR INFORMATION PURPOSES ONLY. THE CONTRACTOR IS REQUIRED TO LOCATE, MAINTAIN AND DRAIN THE ROAD AT CONTRACTOR'S EXPENSE.
3. IT IS THE INTENT OF THE DRAWING TO INSTALL THE ACCESS ROAD ON FINAL GRADE OF SITE. BACKFILL AGAINST PAVEMENT USING SUITABLE MATERIAL TO 3:1/2:1 SLOPE. COMPACT AND SEED.
4. SEE SHEET C13 FOR DRAINAGE/DETAILS.
5. SEE SHEET C14 FOR FENCING DETAILS.
6. LOCATE TRANSFORMER PAD MIN 10' FROM EDGE OF ACCESS ROAD AS APPROVED BY ENGINEER.



SITE C CONTOUR, GRADING AND DRAINAGE PLAN

SCALE : 1"= 50'

LEGEND

- 780 — EXISTING CONTOUR
- 780 — CONTOUR
- PIPE
- INLET
- END WALL
- OUTLET APRON
- MANHOLE
- DITCH

GRAPHIC SCALE

50 0 50 100

SCALE : 1" = 50'

Hatch Mott MacDonald

Hatch Mott MacDonald, LLC
Engineers, Surveyors
CO23540
2012 Kanawha Blvd East, Suite 100, Charleston, WV 25302
Telephone: (304) 343-5197 Fax: (304) 343-5222

YEAGER AIRPORT
SOLAR ENERGY FACILITY INSTALLATION
100 AIRPORT ROAD - SUITE 175
CHARLESTON, WV 25311

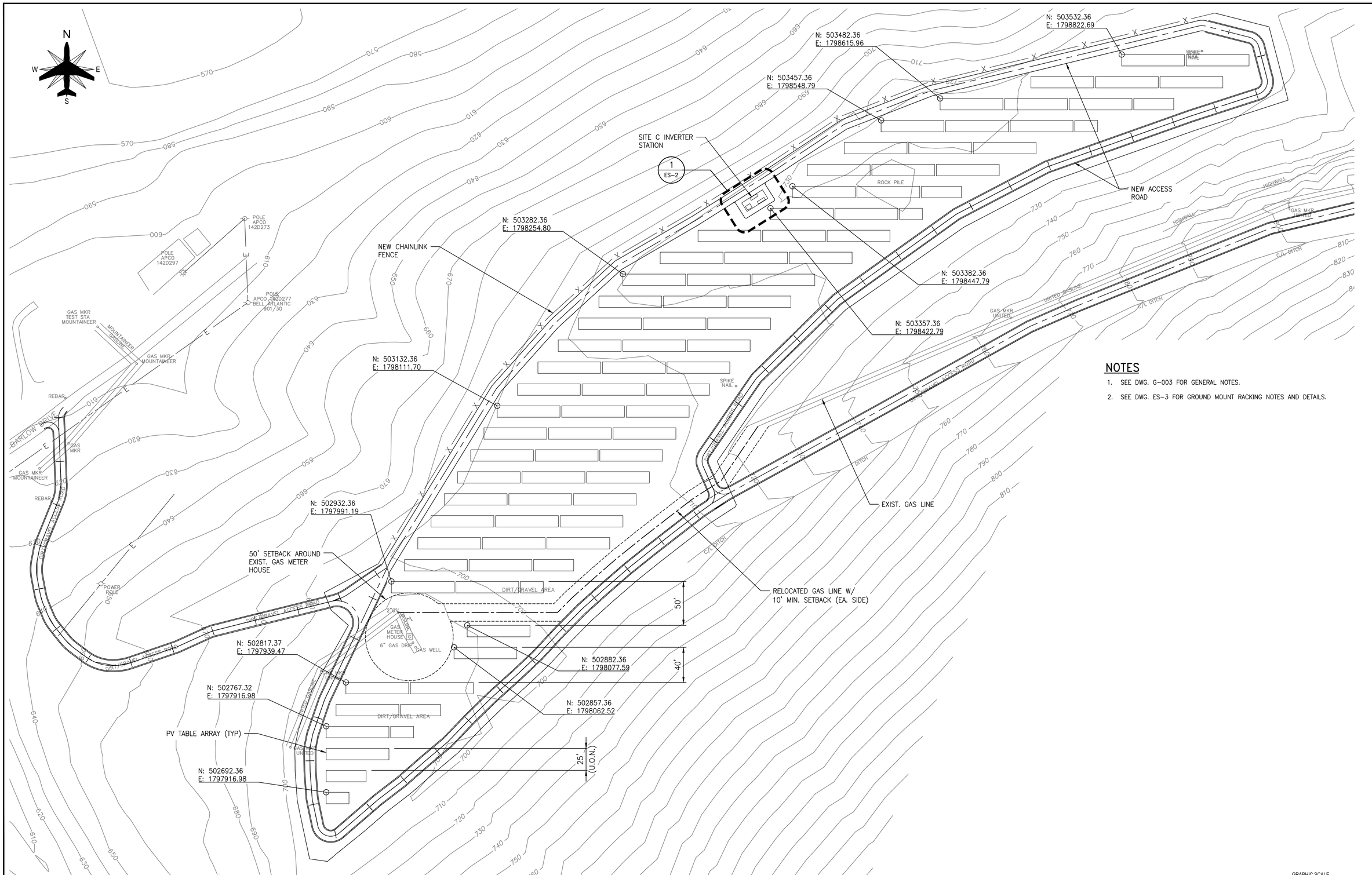
REV.	DATE	REVISION DESCRIPTION
1	9/5/14	ADDENDUM NO. 1
2	9/12/14	ADDENDUM NO. 2
5	11/14/14	ADDENDUM NO. 5
6	11/18/14	ADDENDUM NO. 6
7	11/25/14	ADDENDUM NO. 7

DATE: AUGUST 2014
DESIGNED BY: BJG
DRAWN BY: BJG
PROJECT MANAGER: BLAIR STOCKER
H.M.M. PROJECT NUMBER: 320873

ISSUED FOR BID
NOT FOR CONSTRUCTION

SHEET TITLE:
SITE C CONTOUR, GRADING AND DRAINAGE PLAN

SHEET NUMBER:
C-5



NOTES

1. SEE DWG. G-003 FOR GENERAL NOTES.
2. SEE DWG. ES-3 FOR GROUND MOUNT RACKING NOTES AND DETAILS.

GRAPHIC SCALE
50 25 0 50'
SCALE 1" = 50'

1 ES-1 SITE C – SITE PLAN
SCALE : 1"=50'

Hatch Mott MacDonald
Hatch Mott MacDonald, LLC
Engineers, Architects, Planners
CO236-00
201 Brooks Street, Charleston, WV 25301
Telephone 304-345-5410 Fax: (304) 316-6222

YEAGER AIRPORT
SOLAR ENERGY FACILITY INSTALLATION
100 AIRPORT ROAD - SUITE 175
CHARLESTON, WV 25311

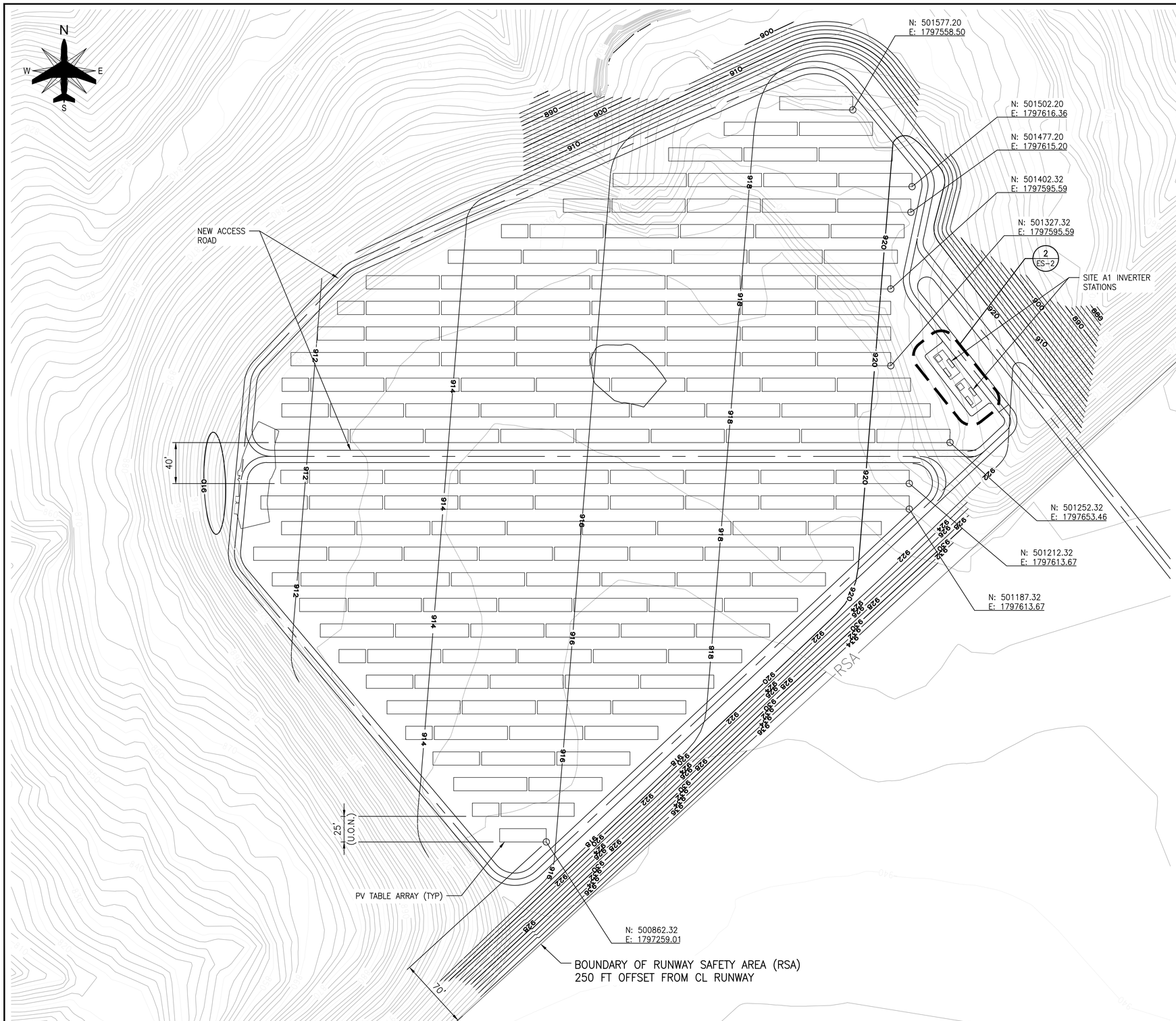
DATE	REV.	REVISION DESCRIPTION
9/5/14	1	ADDENDUM NO. 1
9/12/14	2	ADDENDUM NO. 2
11/14/14	3	ADDENDUM NO. 5

DATE: AUGUST 2014
DESIGNED BY: K. DARBY
DRAWN BY: KPD
PROJECT MANAGER: BLAIR STOCKER
H.M.M. PROJECT NUMBER: 320873

ISSUED FOR BID
NOT FOR CONSTRUCTION

SHEET TITLE:
SITE C
SITE PLAN

SHEET NUMBER:
ES-1



1 ES-7 SITE A1 – SITE PLAN

SCALE : 1"=50'

NOTES

1. SEE DWG. G-003 FOR GENERAL NOTES.
2. SEE DWG. ES-3 FOR GROUND MOUNT RACKING NOTES AND DETAILS.

GRAPHIC SCALE
50 25 0 50'
SCALE 1" = 50'

Hatch Mott MacDonald
Hatch Mott MacDonald, LLC
Engineers, Architects, Planners
CO2836-00
201 Donnally Street, Suite 100 Charleston, WV 25302
Telephone 304-342-1011 Fax: (304) 342-6222

YEAGER AIRPORT
SOLAR ENERGY FACILITY INSTALLATION
100 AIRPORT ROAD - SUITE 175
CHARLESTON, WV 25311

DATE	REV.	REVISION DESCRIPTION
9/5/14	1	ADDENDUM NO. 1
9/12/14	2	ADDENDUM NO. 2
11/14/14	3	ADDENDUM NO. 5

DATE: AUGUST 2014
DESIGNED BY: K. DARBY
DRAWN BY: KPD
PROJECT MANAGER: BLAIR STOCKER
H.M.M. PROJECT NUMBER: 320873

ISSUED FOR BID
NOT FOR CONSTRUCTION

SHEET TITLE:
SITES A1
SITE PLAN

SHEET NUMBER:
ES-7

CONSTRUCTION SAFETY AND PHASING PLAN

THE INTENT OF THIS PLAN IS TO ESTABLISH CERTAIN SAFETY REQUIREMENTS THAT MUST BE ADHERED TO BY THE CONTRACTOR DURING CONSTRUCTION OF THE PROJECT. A SAFETY PLAN COMPLIANCE DOCUMENT (SPCD) MAY BE REQUIRED BY THE AIRPORT AUTHORITY OR THEIR ENGINEER

THE AIRPORT WILL REMAIN OPEN AT ALL TIMES UNLESS THE AVIATION DIRECTOR APPROVES OTHERWISE. WORK WILL BE LIMITED TO DAYLIGHT HOURS UNLESS OTHERWISE APPROVED BY THE AIRPORT DIRECTOR

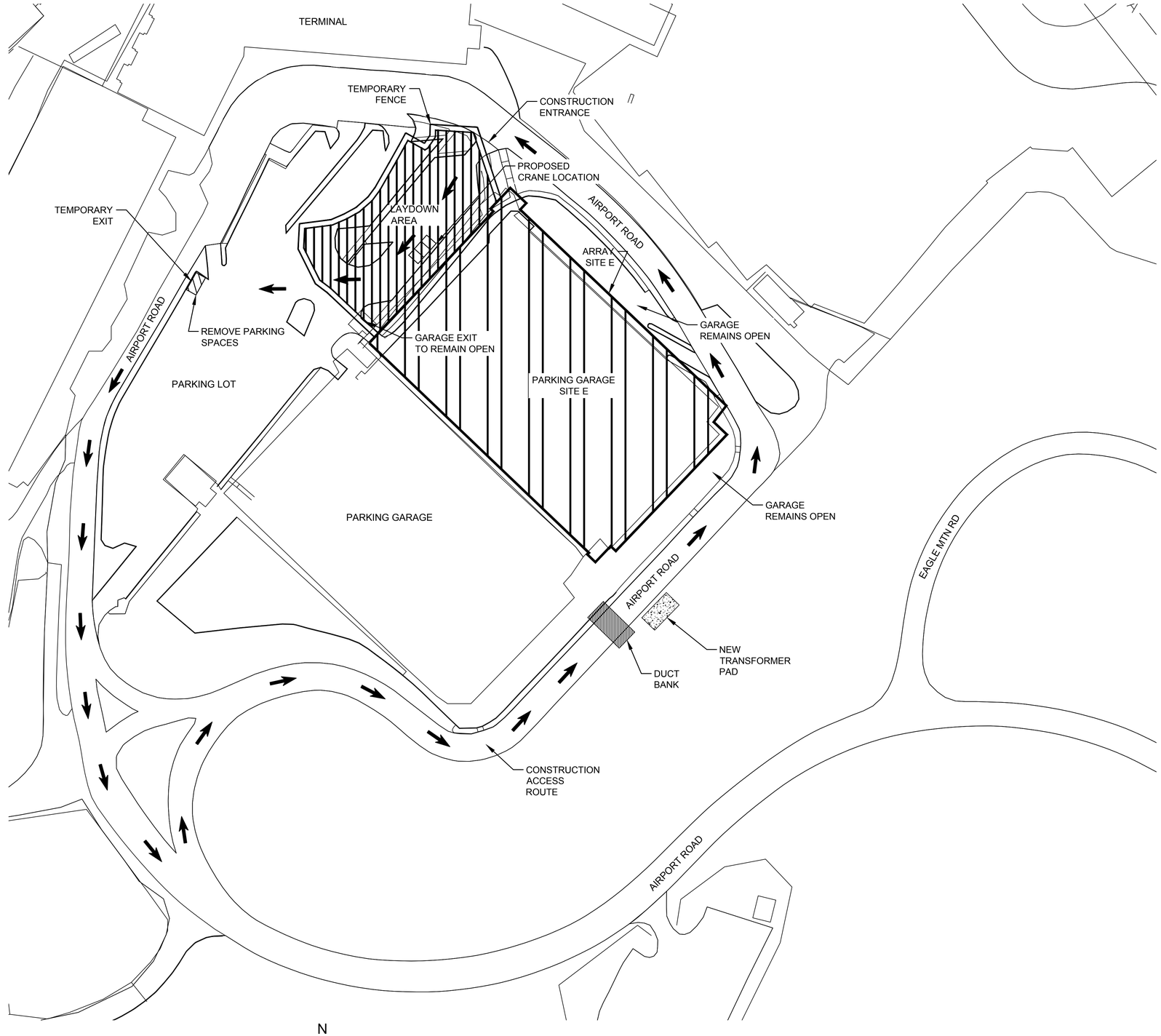
1. THE CONTRACTOR SHALL NOT BEGIN WORK WITHIN ANY AIRPORT OPERATIONS AREAS UNLESS AND UNTIL 48 HOURS PRIOR NOTICE HAS BEEN GIVEN TO THE ENGINEER AND THE AIRPORT MANAGEMENT.
2. NO AIRPORT OPERATIONS AREAS SHALL BE CLOSED UNLESS SO AUTHORIZED BY THE AIRPORT MANAGEMENT.
3. THE CONTRACTOR SHALL COORDINATE INRESS–EGRESS REQUIREMENTS WITH THE AIRPORT MANAGEMENT. ALL OPEN GATES TO SECURED AIRPORT AREAS SHALL BE MONITORED CONTINUOUSLY BY THE CONTRACTOR'S PERSONNEL TO CONTROL ACCESS TO SECURED AREA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL GATES AT THE END OF EACH DAYS OPERATION.
4. PRIOR TO MOVING ACROSS OR IN CLOSE PROXIMITY TO AN ACTIVE RUNWAY, TAXIWAY, OR APRON AREA, THE CONTRACTOR MUST CLEAR SUCH ACTION THROUGH THE AIRPORT ENGINEER WHO WILL CONTACT THE AIR TRAFFIC CONTROL TOWER, WHO WILL THEN ISSUE THE APPROPRIATE ADVISORIES TO AIRCRAFT. THE CONTRACTOR SHOULD NOTIFY AIRPORT OPERATIONS IMMEDIATELY IN AN EMERGENCY SITUATION. CONTRACTOR IS TO HAVE A CELLULAR PHONE FOR COMMUNICATION PURPOSES.
5. ALL CONSTRUCTION VEHICLES, INCLUDING PERSONAL CARS, MUST BE CLEARED FOR ACCESS BY THE AIRPORT MANAGEMENT. PERSONAL CARS SHALL BE PARKED OUTSIDE OF SECURED AIRPORT OPERATIONS AREAS. ALL VEHICLES OPERATING IN ACTIVE AIR OPERATIONS AREAS SHALL BE LIGHTED OR FLAGGED IN ACCORDANCE WITH ADVISORY CIRCULAR 150/5370–2F. COPIES OF THE ADVISORY CIRCULAR WILL BE MADE UPON REQUEST.
6. THE CONTRACTOR AND ALL SUBCONTRACTORS SHALL DESIGNATE A REPRESENTATIVE AS AN ALTERNATE TO CONTACT ON A 24 HOUR BASIS SHOULD PROBLEMS ARISE.
7. THE CONTRACTOR SHALL COORDINATE WITH THE FAA FACILITIES, THE AIRPORT MANAGEMENT, AND UTILITY COMPANIES WHEN WORKING IN AREAS CONTAINING FAA OR AIRFIELD LIGHTING CABLE OR UNDERGROUND CABLE.
8. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL REGULATIONS IN REGARD TO CONSTRUCTION NOISE AND EROSION CONTROL DURING CONSTRUCTION.
9. CONTRACTOR SHALL CLEAN ALL CONSTRUCTION AREAS OF LITTER, LOOSE PAPERS, DEBRIS, ETC., ON A DAILY BASIS, OR AS DIRECTED BY AIRPORT ENGINEER. ALL SPILLAGE IN ACTIVE AIR OPERATION AREAS SHALL BE CLEANED UP IMMEDIATELY.
10. PEDESTRIAN OR VEHICULAR TRAFFIC ON AIRPLANE MOVEMENT AREAS (RUNWAYS, TAXIWAYS, APRONS, ETC.) IS STRICTLY PROHIBITED.
11. MEN, EQUIPMENT OR OTHER CONSTRUCTION–RELATED MATERIAL WILL NOT BE PERMITTED CLOSER THAN 100 FEET FROM THE CENTERLINE OF ANY ACTIVE TAXIWAYS OR WITHIN 50 FEET OF EDGE OF ACTIVE APRONS WITHOUT PRIOR PERMISSION FROM THE AIRPORT MANAGEMENT.
12. A DAILY START–UP AND SHUT–DOWN CHECKLIST WILL BE JOINTLY PREPARED BY THE CONTRACTOR AND AIRPORT MANAGEMENT, WHICH WILL BE FOLLOWED THROUGHOUT THE PROJECT. THE CHECKLIST SHALL INCLUDE, BUT NOT BE LIMITED TO, BARRICADES, FLAGS, HAUL ROUTES, SECURING ALL ACCESS GATES, CLEAN UP, ETC.
13. INSPECTION – FREQUENT INSPECTIONS MAY BE MADE BY THE AIRPORT PUBLIC SAFETY OFFICE DURING CRITICAL PHASES OF THE WORK TO INSURE THAT THE CONTRACTOR IS FOLLOWING THE RECOMMENDED SAFETY PROCEDURES.
14. THE CONTRACTOR MUST COMPLETE NIGHTLY WORK AND BEGIN CLEANUP NO LATER THAN 6:00 AM. ALL CLEANUP MUST BE COMPLETED BY 6:30 AM AND AREA SAFETY INSPECTED BY OWNER PRIOR TO REOPENING AFFECTED GATE STANDS AT 7:00 AM. CONTRACTOR SHALL MAINTAIN ADEQUATE WORKFORCE ON SITE UNTIL GATE STANDS REOPEN SHOULD OWNER DETERMINE ADDITIONAL CLEANUP IS NECESSARY.
15. CONTRACTOR SHALL PREPARE, SUBMIT AND OBTAIN APPROVAL FROM FAA FOR ALL CONSTRUCTION STAGING/LAYDOWN ACTIVITIES. FAA FORM 7460–1 (LATEST EDITION) SHALL BE USED.
16. HAUL ROUTES (AS INDICATED) SHALL NOT BE ALTERED WITHOUT WRITTEN APPROVAL OF THE AIRPORT AUTHORITY OR THEIR ENGINEER.

CONTRACTOR SHALL PROVIDE:

– (1)ESCORT VEHICLE

– (2)MULTI CHANNEL HANDHELD RADIOS

– (3)NEXTEL PHONE FOR USE DURING CONSTRUCTION OPERATIONS.



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W E
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SITE E PROJECT SAFETY, LAYDOWN

SCALE : 1" = 50'–0"

TSA – TAXIWAY SAFETY AREA

ROFA – RUNWAY OBJECT FREE AREA

GRAPHIC SCALE
100 0 100 200
SCALE : 1" = 100'

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100 AIRPORT ROAD - SUITE 175
CHARLESTON, WV 25311

DATE	REV.	REVISION DESCRIPTION
9/5/14	1	ADDENDUM NO. 1
9/12/14	2	ADDENDUM NO. 2
11/14/14	5	ADDENDUM NO. 5
11/18/14	6	ADDENDUM NO. 6

DATE:
DESIGNED BY: PGE
DRAWN BY:
PROJECT MANAGER: BLAIR STOCKER
H.M.M. PROJECT NUMBER: 320873

ISSUED FOR BID
NOT FOR CONSTRUCTION

SHEET TITLE:
SITE E PROJECT SAFETY, LAYDOWN AND ACCESS PLAN

SHEET NUMBER:
G-005