



# Solar Project Feasibility Summary Report

## Front Range - Midway Solar Project El Paso County, CO



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# Solar Project Feasibility Summary Report

Front Range - Midway Solar Project, LLC

## 1. Executive Summary

### A. Market Compliance

Front Range - Midway is the primary solar site being pursued in the Colorado, which is a state that TWE management and EGP have both deemed desirable. The market segment targeted here is the very large, utility-scale market. To date, the 60+ MW Front Range - Midway Project is the first project to be secured by TWE in Colorado.

It targets a key node in Colorado's electric system where 5 major utility entities converge: Black Hills, Colorado Springs Utilities, Tri-State G&T, Xcel, and WAPA. All of the utilities present at the Midway substation (except WAPA) have recently been active in procuring utility-scale solar power. Xcel recently announced acquisitions of 170 MW of solar capacity (there has also been a large amount of distributed solar added to the Xcel system in the past 3-4 years). CSU is gearing up to procure renewable power to take advantage of the solar ITC which expires in 2016 via an RFP in 2014, Black Hills is seeking 60 MW of renewables via a RFP in 1Q 2014, and Tri-State has been a recent buyer of solar power in Colorado and New Mexico. The belief is that Colorado will remain a relatively strong market for utility-scale solar through 2016 (prior to expiration of the Federal ITC). Targeting the Midway substation provides TWE with flexibility to target one or more of these utilities with a single site.

### B. Site Assessment /SWOT Analysis

Front Range - Midway is a large solar project site that is anticipated to accommodate ~60-75 MW of capacity, dependent upon detailed terrain analysis and off taker appetite.

The site is located just west of I-25 about 20 miles south of downtown Colorado Springs in El Paso County. It is very wide open and mostly flat, with some acreage with moderate roll. There is very good access from the highway as the site is adjacent to an I-25 exit/entrance. Although located along the Front Range, there is a "gap" in the Rocky Mountains to the west southwest and west providing significant fetch.

Adjacent to the site are other developments, including:

- the Midway landfill to the south;
- the Midway substations (WAPA and Xcel);



- Fountain Valley Power Facility, a gas-fired power plant adjacent to the substations;
- the Pikes Peak International Raceway;
- the El Dorado Village development and other multi-acre single family homesites 1-2 miles west of the proposed site.

Strengths	Weaknesses
<p>The site has a high solar resource compared to other major electrical nodes in the Front Range;</p> <p>Generally flat, open ground;</p> <p>Good access from major interstate highway (I-25);</p> <p>Provides interconnection access to four primary utility offtakers from one-site;</p> <p>The Midway node is a desired delivery/transaction point for the offtakers;</p> <p>The area is quasi-industrial, which should make permitting manageable.</p>	<p>The lowest interconnection voltage is 115 kV, so the cost to interconnect is relatively high (thus the requirement for a larger project).</p> <p>While mostly regarded as an industrial-like setting, the site parcels are zoned Residential Rural-2.5 acre, which will require a conditional use permit from El Paso County.</p> <p>Other weaknesses include (per EFR report):</p> <ul style="list-style-type: none"> <li>- Water availability may be limited.</li> <li>- Existence of an active landfill nearby could increase cleaning frequency.</li> <li>- Some unsuitable slopes in the northern part of the project.</li> <li>- Two easements consisting of underground utilities and a county road ROW will require encroachment and/or crossing agreements.</li> </ul>
Opportunities	Threats
<p>The location permits one project to be developed that can be marketed to 1-4 utility off takers.</p> <p>There is an opportunity to parse out MW to deliver to/transact with more than one offtaker (i.e. via the WAPA interconnection).</p>	<p>The primary threat is potential resistance to the project from homeowners to the west of the Project and/or lack of support from El Paso County.</p> <p>A lack of ATC on one or more utility systems would reduce off-take flexibility. Competitive threats may come from other large utility scale projects or a number of smaller distributed projects.</p>

### C. Scoring Recap

Scoring criteria were not applied to this site relative to other sites in Colorado. The Midway substation is a unique in Colorado in that it serves four potential utility



offtakers at one location and possesses other attributes that support development of a large solar project.

#### D. Actions Items

Action Items	Now	Near Term
Key Management Actions	Approval of Purchase Options	Negotiations w/ multiple offtakers
Key Development Tasks	1. Given the project's size and location, TWE will immediately pursue installation of a solar MET. 2. TWE will immediately file for interconnection with WAPA (for CSU and BH)	
Cost of Key Development Tasks	1. ~ \$20,000 2. TBD	

## 2. Site Suitability

### A. Market

- i. Target Market/Customer: Multiple utilities (Black Hills, CSU, Tri-State, Xcel)
- ii. Market Opportunities: 60+ MW PPA
- iii. RPS or Other Energy/Market Related Incentives: See market discussion above.
- iv. Load Growth or Other Market Drivers: Load growth in the Front Range is nominal, but customer preference for renewables is high; CSU may be retiring a coal unit and would be in the market for solar and natural gas generation.
- v. Competition Highlights: Competition is strong at both the utility-scale level as well as from smaller, distributor solar systems.
- vi. LMP: NA

### B. Transmission

The Midway complex is made up of the "WAPA" substation/system (where WAPA, Black Hills, CSU, and Tri-State transmission lines converge) and the "Xcel" substation/system that is directly adjacent and connected to the WAPA substation, but operates largely independent of WAPA. For TWE, an analysis was conducted by Black & Veatch to determine the available transfer capability (ATC) of both substation/systems to accommodate a large solar project. The highlights of the analysis indicated that the WAPA substation/system can accommodate approximately 146 MW and 158 MW of solar capacity for Black Hills and CSU, respectively, as there are no significant prior queued projects in either system. For Tri-State, due to a large number of prior queued projects, ATC is limited if most or all projects come to fruition (note: there is the opportunity to jump prior queued projects but the ATC analysis conservatively assumed all prior projects would move forward). For the separate Xcel system, results were similar to Tri-State, with a large number of prior queued projects clouding the ATC picture at Midway (note: same opportunity to jump prior queued projects exists).



The B&V analysis gives TWE confidence that two of the four possible off takers, Black Hills and CSU, have sufficient ATC at Midway to deliver power from a large, 60+ MW solar project. It is also plausible that Tri-State and Xcel will also have ATC by 2016 due to a thinning of the interconnection queue and completion of transmission system upgrades that were not fully factored into the B&V analysis.

### **C. Interconnection**

The initial interconnection strategy at Midway will include an umbrella project filing on the WAPA system, which will cover Black Hills, CSU, and Tri-State. A project filing on the Xcel system will be determined based on further assessment of Xcel's solar appetite and more clarity of ATC on their system.

- i. Existing Infrastructure: On-site 115 kV/230 substations
- ii. Proposed Gen-tie Scheme: short tie-line to 115 kV breaker position(s)
- iii. Summary of Interconnection Queue: See discussion above.
- iv. Summary of Other System Impact Studies Having Impact at POI: See above.
- v. Cost and Loss Impacts in Regards to Location: Step-up costs will be relatively high but the tie-line will be short with nominal losses.

### **D. Permitting and Environmental**

This site has had a Phase I Environmental Site Assessment (ESA) performed by Terra-Con, with no environmental issues found that would preclude development.

The project site lies just west of I-25 within El Paso County. The site is currently zoned "Residential Rural-2.5 Acre" so the project will require a variance of use (VOU) permit (note: given the site is immediately off of I-25 with minimal housing nearby, and several adjacent industrial and waste facilities, a VOU is regarded as cumbersome but achievable).

Environmental (and cultural)-related information is covered in the Critical Issues Assessment report associated with this project (see Attachment A). The highlights of the CIA are:

*This desktop study of the Midway Solar project in El Paso County, Colorado was conducted to ensure compliance with state and federal regulations including, but not limited to, the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), Cultural and Historic Regulations, and various local zoning regulations.*

*Based on data obtained in this analysis for the proposed Solar PV Project site in El Paso County, Colorado, no critical flaws that would prevent construction of a solar energy facility were identified. However, potential concerns were identified that need*



*consideration when siting project facilities and infrastructure. The following issues may warrant further study:*

- *A habitat assessment to determine the presence/absence of required habitat that could support any of the T&E species identified in this report is recommended. The absence of species specific habitat would be sufficient to determine that there is low likelihood of those T&E species.*

*Additionally, an ASTM Phase I Environmental Site Assessment should be conducted for the Project.*

#### **E. Meteorology**

While it is widely known that the best solar resource in Colorado is found in the San Luis Valley area of south central Colorado, electrical connection from this area to the populated Front Range is limited (recent solar project build-outs in the Valley have all but consumed ATC to the east). In the Front Range of Colorado, solar resource increases to south, making the Midway substation area one of the more attractive electrical nodes with a relatively high solar resource. In fact, it is the best solar resource available to CSU and its resource compares favorably with other potential locations in Pueblo County to the south.

Meteorology has acquired virtual MET data from 3Tier for the Midway site to enable energy simulations to be run for the site. This site will require a solar MET to be installed, and may require more frequent maintenance cleanings due to airborne dust from the adjacent land fill operation and a network of rock/dirt roads in the area. It is anticipated that a single-axis tracking configuration will be used at the site, and the broad horizons and the comparative economics with fixed arrays for this location support that approach. As the site is not dead flat with some moderate roll in certain areas, an articulating tracking system will likely be required.

#### **F. Engineering/Construction**

Engineering/construction-related information is covered in the Engineering Feasibility Report associated with this project (see Attachment B). The highlights of the EFR are:

*TradeWind's in-house engineering staff conducted a desktop review of this potential utility scale solar energy generation site utilizing information culled from public resources including the USDA's Soil Web Server, the Soil Survey of El Paso County, the El Paso County website, as well as other sources.*

*The purpose of this feasibility report is to review the site's suitability for use as a solar energy project and seek out any potential risks not immediately identifiable from other desktop efforts and/or site visits. No site visit has been undertaken by TradeWind's Engineering staff to date, nor has there been any consultation with any other reputable*



*parties to validate any assumptions or statements herein. However, in reviewing the site, some items have surfaced that may impact suitability and/or contribute to additional costs:*

- Water availability may be very limited. The water rights are owned by the land owner of the project parcels. Fountain Valley Power Plant may be expanding and will be competing for available water.*
- Existence of an active landfill nearby could increase cleaning frequency and water availability is limited and may be relatively expensive.*
- Some unsuitable slopes in the northern part of the project.*
- Two easements consisting of underground utilities will require encroachment and crossing agreement. Additionally a county road ROW will need crossing agreements.*
- Potential for rezoning through the County of El Paso for use as a solar project within rural residential districts.*

#### **G. Operations**

- Access: Road access is very good from I-25.
- Operational Impacts to Neighborhood: Care will need to be taken during construction to minimize impacts to the residential neighborhood 1-2 miles to the west, but operational impacts will be nominal.
- Available Utility Services: On-site

#### **H. Real Estate**

Initial site acquisition activities involve pursuing agreements with two key landowners:

##### Midway Development Company

Midway Development Company owns 490 acres to the east of the Midway substations that represent the primary acreage for the Project. Acquisition will be pursued via a purchase option agreement that will involve 2 semi-annual payments per year totaling \$60,000/yr (\$120/acre) during the option term. The purchase price for the acreage is \$1,470,000, or \$3,000/acre. [Note: on a 20 year project life basis, the total purchase amount is equivalent to an annual lease payment of \$210/acre; either way (purchase or lease) the site acquisition costs are regarded as relatively low relative to typical land costs in Colorado and other TWE solar site costs in other markets.]

Since this is a site purchase scenario, extended term rent is not applicable.



### Cando + Eldorado Village Lot

Cando owns 212 acres to the east of the Midway substations that represent useful acreage for the Project as well as access to the WAPA and Xcel substations. Acquisition will be pursued via a purchase option agreement that will involve 2 semi-annual payments per year totaling \$40,000/yr (\$188/acre) during the development term. The purchase price for the acreage is \$848,000, or \$4,000/acre. [Note: on a 20 year project life basis, the total purchase amount is equivalent to an annual lease payment of \$280/acre.] An easement will likely be pursued on the Eldorado Village Lot (11 acres); the lot is for currently for sale at \$50,000 if a purchase option is pursued.

Since this is a site purchase scenario, extended term rent is not applicable.

### Additional Acreage

Should the Project need to add additional land to increase project size, there are other interested landowners adjacent to these properties, including El Paso County and a private landowner group affiliated with the nearby racetrack that could be pursued.

- i. Ownership: Verified via recorded deed with title commitments to be ordered upon execution of the options.
- ii. Land Values: See above.
- iii. Mineral/Water Rights: Mineral rights are not expected to be an issue as the land is currently zoned residential; water rights will be purchased from Wigwam Water company (~\$20k/year for water assuming an aggressive 900,000 gal/yr assumption, but would be more likely be ~\$5k/yr).

### **I. Government Affairs**

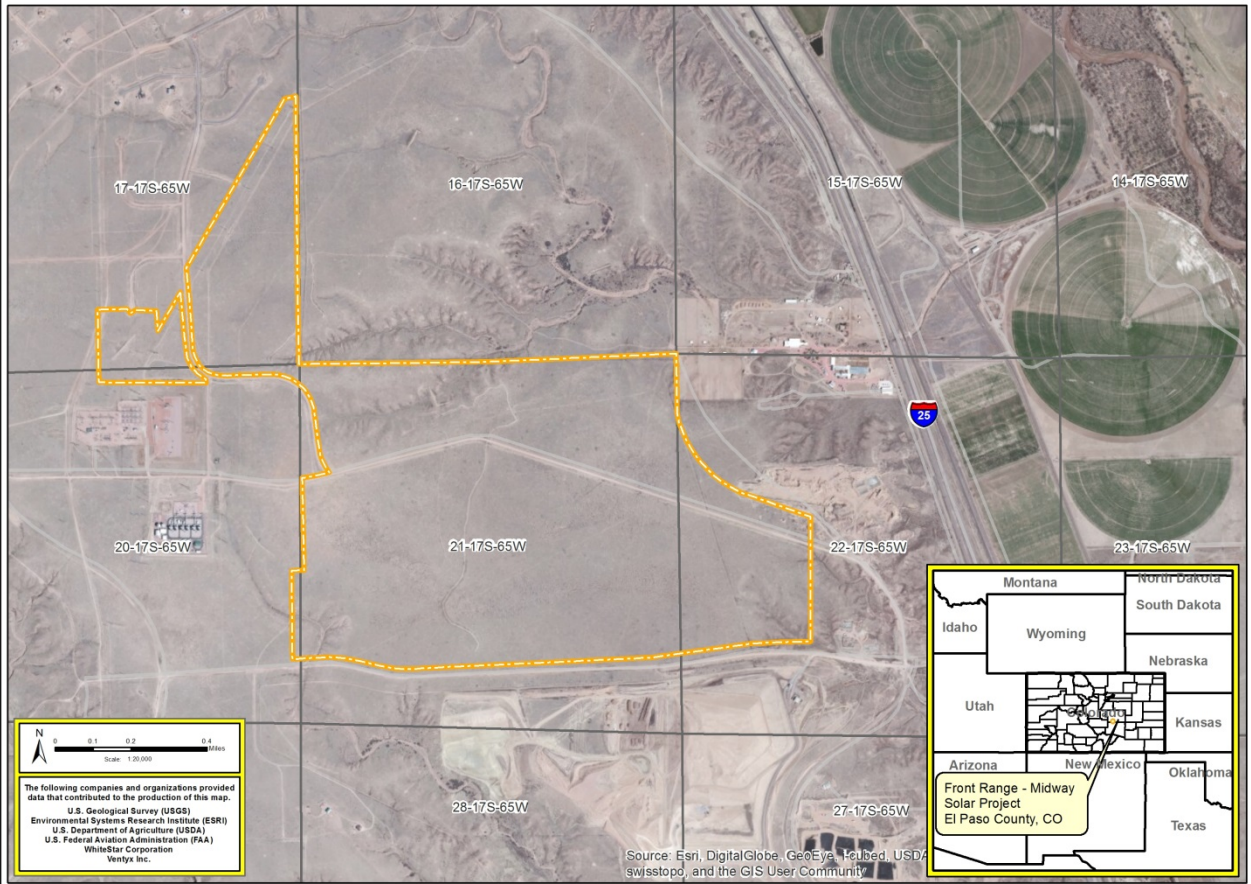
TWE is broadly aware of regulatory issues and procedures in Colorado due to its prior experience with wind development. TWE also retains the services of Mark Detsky, and experienced energy regulatory attorney in Colorado who is intimately familiar with the four utility offtakers, the PUC, and renewable energy and the power industry.

### **J. Maps**

The map below indicates the location of the project within Colorado and an aerial view of the leased parcel. Attachments A, B, and C also include maps of different aspects of the project.



# Front Range - Midway Solar Project







## Critical Issues Analysis (CIA) Attachment A

### Front Range - Midway Solar Project El Paso County, CO



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# El Paso County, Colorado Midway Solar Project

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### **1. Environmental Setting**

A desktop review for the Midway Solar photovoltaic (PV) energy Project (Project) located in El Paso County, Colorado was completed on November 14, 2013. The Project area analyzed in this review includes over 30 adjacent parcels of land proposed for solar panel installations. The state and federally protected species known or likely to occur in the vicinity of the project area were reviewed, as well as the environmental setting of the Project and surrounding area.

The Project area encompasses approximately 1,100 acres (1.7 square miles) of land located 10 miles south of the city of Fountain, Colorado and two miles northwest of the populated place of Wigwam, Colorado. The Project is located three miles north of the El Paso-Pueblo county line and lies half a mile west of Interstate 25, which connects the two counties. According to the latest national census data, El Paso County has a population 622,263, Pueblo County has a population 159,063, and the city of Fountain has a population of 25,846 (USCB 2010). No municipalities are located within the Project area.

The Project lies in the U.S. Environmental Protection Agency Level III Ecoregion entitled the Southwestern Tablelands. Specifically, the Project lies within the Piedmont Plains and Tablelands Level IV subsection, located east of the foothills of the Rocky Mountain Range in eastern Colorado. The Level IV Ecoregion is defined by its irregular and dissected plains. Natural vegetation is shortgrass prairie (Chapman et al 2006). The Level IV subsection extends south to New Mexico and east to Kansas. This Ecoregion contains mostly shortgrass prairie rangeland with scattered areas of dry and irrigated cropland (Chapman et al 2006).

Land cover data for the Project area was obtained from the United States Geological Survey (USGS), National Land Cover Database (NLCD) (Fry et al. 2011). Results from these queries indicate a cover type primarily of grassland/herbaceous within and surrounding the Project area. This correlates to shortgrass



prairie as identified in the U.S. EPA Level IV Ecoregion associated with the Project site location. Other cover types represented within the Project area were identified as low, medium, and high density developed areas, developed open space (roads), and a small area of scrub/shrub land cover. The resolution of the dataset (one pixel = 30 meters X 30 meters) indicates that the scrub/shrub area is approximately 1 acre (it is represented by 5 pixels). The shrub/scrub land cover category is defined as dominated by shrubs less than 5 meters tall with shrub canopy typically greater than 20% of total vegetation. This class includes true shrubs, young trees in an early successional stage or trees stunted from environmental conditions (Fry et al. 2011).

There is potential for habitat suitable for endangered species within the Project. This statement is based primarily on NLCD Land Cover data that indicates the dominant land cover type within the Project area as grassland/herbaceous (shortgrass prairie). The Project should be surveyed to identify the presence/absence of the required habitat that could support threatened or endangered species. The species most likely to be affected by Project development include terrestrial flora and fauna, and grassland birds. The absence of species specific habitat would be sufficient to determine that there is low likelihood of these T&E species.

Should this Project proceed, an on-site habitat assessment is recommended in order to ground-truth land uses and habitats at the Project.

## 2. Threatened and Endangered (T&E) Species Assessment

A review of federal and state Threatened and Endangered (T&E) Species was conducted for the Project. The U.S. Fish and Wildlife Service (USFWS) maintains a county list of documented occurrences/locations of federal trust resources, which includes species protected under the Endangered Species Act (ESA). This list was obtained for El Paso County, Colorado. State T&E species in Colorado are not available by a county level query. In-lieu of a county level query, the entire state T&E list was downloaded and researched for species probable occurrence within the Project vicinity. The determination of probable occurrence was based on reading the life history requirements of state listed species and comparing it to potential habitats in the vicinity of the Project. The determination also noted the current range of the species within the state and compared it to the Project location. In summary, federal species having the potential to occur in the county, and state species having the potential to occur within the vicinity of the Project area are listed in the table below. Inclusion of these species on the following table does not confirm that the species is present within the Project area.

Common Name	Scientific Name	State Status	Federal Status
Mexican Spotted Owl	<i>Strix occidentalis lucida</i>	Endangered	Threatened
Arkansas Darter	<i>Etheostoma cragini</i>	Threatened	Candidate Threatened
Greenback Cutthroat Trout	<i>Oncorhynchus clarki stomias</i>	Threatened	Threatened



Common Name	Scientific Name	State Status	Federal Status
Ute Ladies'-Tresses	<i>Spiranthes diluvialis</i>	None	Threatened
Pawnee Montane Skipper	<i>Hesperia leonardus montana</i>	None	Threatened
Black-Footed Ferret	<i>Mustela nigripes</i>	Endangered	EXP*
North American Wolverine	<i>Gulo gulo luscus</i>	Endangered	Proposed Threatened
Preble's Meadow Jumping Mouse	<i>Zapus hudsonius preblei</i>	Threatened	Threatened
Least Tern	<i>Sterna antillarum</i>	Endangered	Endangered
Piping Plover	<i>Charadrius melodus</i>	Threatened	Threatened
Whooping Crane	<i>Grus americana</i>	Endangered	Endangered
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	None	Endangered
Plains Sharp-Tailed Grouse	<i>Tympanuchus phasianellus jamesii</i>	Endangered	None
Burrowing Owl	<i>Athene cunicularia</i>	Threatened	None
Lesser Prairie-Chicken	<i>Tympanuchus pallidicinctus</i>	Threatened	Proposed Threatened
River Otter	<i>Lontra canadensis</i>	Threatened	None

Sources: UFWS 2013 and CPW 2013

\*EXP - experimental population. A taxon listed as experimental (either essential or nonessential). Experimental, nonessential populations of endangered species (e.g., red wolf) are treated as threatened species on public land, for consultation purposes, and as species proposed for listing on private land.

The Project area may provide habitat for some of the species that are included on the state and federal lists. The lack of significant permanent surface water habitats in the Project area makes it unlikely that obligate aquatic species would occur within the Project area. Sand Creek is a noted blue-line stream immediately south of the Project area. This may be an ephemeral streambed as aerial photography shows little to no riparian vegetation associated with this feature. Fountain Creek occurs several miles east of the Project area. Aerial photography shows a well-developed riparian vegetation zone along this feature. Species listed above that may utilize Fountain Creek and its associated riparian habitat may include Preble's Meadow Jumping Mouse, Least Tern, Piping Plover, Whooping Crane, Pawnee Montane Skipper, River Otter, and Ute-ladies'-tresses. Species listed above that may utilize shortgrass prairie



within the Project area or vicinity include Plains Sharp-tailed Grouse, Burrowing Owl, and Lesser Prairie-Chicken.

The plant species included in the table above have a potential to occur in the project area based on a desktop analysis alone. However, federally-listed plant species are not protected by the Endangered Species Act (ESA) except if they occur on federal lands, or if the proposed Project is considered a federal action or has a federal nexus under NEPA.

Based on the T&E portion of the desktop review for the Project area, critical flaws that would prevent construction of a solar facility were not identified. If the Project moves forward, consultation with the U.S. Fish and Wildlife Service and Colorado Parks and Wildlife is advisable to determine with greater certainty whether appropriate habitat exists within the Project area for any of the above-mentioned species, or others that were not identified for inclusion on the list. Depending on the outcome of consultation, biological surveys may need to be conducted to ensure that T&E species will not be impacted by the Project. If surveys indicate federally protected T&E species are present at the Project, the Project developer may choose to either avoid impacts or seek an incidental take permit from the USFWS to authorize "take" of the protected species under the ESA.

### **3. State Areas of Conservation Concern or Significance**

A search of publicly available maps and GIS data layers was performed in order to identify federal, state, and local lands (wildlife preserves or other protected lands) in the area. No such designated lands are located within the Project area; however, portions of one assumed federal owned land parcel (United States), and one unknown ownership parcel (Public Service) are enveloped by the Project boundary and appear excluded from participating land parcels.

Pikes Peak International Raceway (USA Landmark) occurs approximately 1.5 miles north of the Project boundary. A cemetery labeled as the Wilson Cemetery occurs approximately 1.5 miles northeast of the Project boundary. Wigwam School occurs approximately 1.5 miles southeast of the Project boundary. Fort Carson Military Reservation occurs approximately 1 mile west of the Project boundary.

A database search was performed to identify designated National Register of Historic Places (NRHP) resources within 5 miles of the Project area in El Paso and Pueblo counties. A total of 87 designated NRHP properties in El Paso County and 64 NRHP properties in Pueblo County were identified by the database query (NRHP 2013). Of these properties, none were located within the proposed Project installation area, or within 5 miles of the Project. The nearest property to the Project is located 10 miles to the north within the city of Fountain, Colorado. The Project is not expected to impact any historical properties during construction or operation.

### **4. State Environmental and Wildlife Laws**

Colorado Revised Statutes (C.R.S.) Article 2 - *Nongame and Endangered Species Conservation* (C.R.S. 33-2-105, revised 2013) comprises the state's endangered species provisions. The term "threatened species" means any species or subspecies of wildlife which, as determined by the commission, is not in



immediate jeopardy of extinction but is vulnerable because it exists in such small numbers or is so extremely restricted throughout all or a significant portion of its range that it may become endangered (C.R.S. 33-1-102). The term "endangered species" means any species or subspecies of native wildlife whose prospects for survival or recruitment within this state are in jeopardy as determined by the commission (C.R.S. 33-1-102).

This statute empowers the State of Colorado to list species and also outlines the criteria for listing. Under this statute it is unlawful for any person to take, possess, transport, export, process, sell or offer for sale, or ship and for any common or contract carrier to knowingly transport or receive for shipment any species or subspecies of wildlife appearing on the list of wildlife indigenous to this state determined to be threatened or endangered within the state (C.R.S. 33-2-105). It should be noted that the State of Colorado has not "adopted" federal ESA listed species, but for the most part the commission lists most of the species that occur on the USFWS list. Based on a preliminary review of C.R.S. 33-2-105, it appears that plants and insects do not receive state statutory protection in Colorado. Additionally, the prohibitions on state T&E species are fundamentally different from prohibitions on federal ESA listed species. According to C.R.S. 33-1-102, the term "take" means to acquire possession of wildlife; but such term shall not include the accidental wounding or killing of wildlife by a motor vehicle, vessel, or train.

## **5. Conclusions and Next Steps**

This desktop study of the Midway Solar project in El Paso County, Colorado was conducted to ensure compliance with state and federal regulations including, but not limited to, the Endangered Species Act (ESA), Migratory Bird Treaty Act (MBTA), Bald and Golden Eagle Protection Act (BGEPA), Cultural and Historic Regulations, and various local zoning regulations.

Based on data obtained in this analysis for the proposed Solar PV Project site in El Paso County, Colorado, no critical flaws that would prevent construction of a solar energy facility were identified. However, potential concerns were identified that need consideration when siting project facilities and infrastructure. The following issues may warrant further study:

- A habitat assessment to determine the presence/absence of required habitat that could support any of the T&E species identified in this report is recommended. The absence of species specific habitat would be sufficient to determine that there is low likelihood of those T&E species.

Additionally, an ASTM Phase I Environmental Site Assessment should be conducted for the Project.

## **6. References**

Colorado Parks and Wildlife (CPW). 2011. Threatened and Endangered List (last updated 12/21/2011).

Available on-line at:

<http://wildlife.state.co.us/WildlifeSpecies/SpeciesOfConcern/ThreatenedEndangeredList/Pages/ListOfThreatenedAndEndangeredSpecies.aspx>. Accessed November 2013.



Fry, J., G. Xian, S. Jin, J. Dewitz, C. Homer, L. Yang, C. Barnes, N. Herold, and J. Wickham. 2011. [Completion of the 2006 National Land Cover Database for the Conterminous United States](#), *PE&RS*, Vol. 77(9):858-864.

National Park Service. 2012. List of National Historic Landmarks. Available on line at: <http://www.nps.gov/nhl/designations/listsofnhls.htm>. Accessed October 2013.

National Register of Historic Places (NRHP), National Park Service. 2013. National Register of Historic Places Download Center. Available on line at: <http://nrhp.focus.nps.gov/natreg/docs/Download.html>. Accessed October 2013.

United States Census Bureau (USCB). 2010. 2010 Census Data. Available on line at: <http://quickfacts.census.gov/qfd/states/08000.html>. Accessed November 2013.

U.S. Fish and Wildlife Service. 2013. County query for federal threatened and endangered species that may be affected by project. Available on-line at: <http://www.fws.gov/mountain-prairie/co.HTML>. Accessed November 2013.





# Engineering Feasibility Report (EFR) Attachment B

## Front Range - Midway Solar Project El Paso County, CO



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## Summary

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The purpose of this feasibility report is to review the site's suitability for use as a solar energy project and seek out any potential risks not immediately identifiable from other desktop efforts and/or site visits. No site visit has been undertaken by Tradewind's Engineering staff to date, nor has there been any consultation with any other reputable parties to validate any assumptions or statements herein. However in reviewing the site, some items worth consideration have surfaced that may impact suitability and/or contribute to additional costs:

- Water availability may be very limited. The water rights are owned by the land owner of the project parcels. Fountain Valley Power Plant may be expanding and will be competing for available water.
- Existence of an active landfill nearby could increase cleaning frequency and water availability is limited and may be relatively expensive.
- Some unsuitable slopes in the northern part of the project.
- Two easements consisting of underground utilities will require encroachment and crossing agreement. Additionally a county road ROW will need crossing agreements.
- Potential for rezoning through the County of El Paso for use as a solar project within rural residential districts.

The following captures the detailed review of the site from an engineering perspective.

### A. Available Transmission Capacity (ATC)

According to the final interconnection facility study GI-2007-12 rev 1, the PSCO 230kV system that connects to the Midway substation had 250MW of injection capacity available. However, a Clipper wind project will be taking up 200MW of that capacity. The total remaining capacity is unknown at this point in time.

Black & Veatch will be supplying a study of the available transmission capacity at the Midway substation in the near future.

### B. Presumed Point of Interconnection

A substation of substantial size with voltages of 69, 115, and 230kV is conveniently located adjacent to the southwestern portion of the project site. There appears to be expansion underway to the east for accommodation of 345kV as part of the Midway-Waterton 345kV Transmission Project. Burns & McDonnell appears to be Xcel's EPC contractor for some portion of this work.

Fountain Valley Power, LLC (Southwest Generation) runs a power plant adjacent to the Midway Substation. The Fountain Valley Facility is a 240 MW simple cycle, natural gas-fired, peaking facility with





a PPA with PSCo. Adjacent to the Fountain Valley Facility is 145 vacant acres of land for future development.

## C. Existing Conditions - Terrain/Slope

The dominant use is idle land with a total acreage is 490 of which 319 acres are located on the south side of Peacepipe Heights Rd. An adjacent facility appears to have dry storm-water ponds for runoff and/or rate control which may be a requirement of the state. If this is true, plans for similar such facilities should be anticipated for use over the life of the project. The entire project is void of trees and/or significant vegetative cover. Looking at the landowner provided ALTA product, there appear to be two easements through the project area. One easement owned by Arkansas Valley G&T Inc. is 100 feet wide and presumably contains a gas line to the Fountain Valley Power Plant. This easement runs east-west through the center of the project area. The other easement is owned by AT&T and is approximately 17 feet wide and contains an underground utility. This AT&T easement run diagonally through the southern part of the parcel. TWE will need encroachment and crossing agreements with Arkansas Valley G&T and AT&T. Additionally the existing county road ROW splits the project area and TWE will need ROW crossing agreements with the county.

This parcel is comprised mostly of slopes under 3%, however the project area located north of the county road has some unsuitable areas with slopes greater than 12% facing north. The majority of the project's slope faces east which is not optimal but due to the minimal slope it will only have a small impact on the design. A landfill (Midway Landfill) abuts the southerly edge which may be problematic from an O&M perspective as cleaning the panels may have to be performed on a more frequent basis given the fine grained nature of soils in the area. It appears the El Paso County has two (if not more) landfills and disposal ponds for Coal Ash which has environmental risks, but unlikely to affect the suitability of the site for a solar project. In addition to the northern boundary being encumbered by steep slopes, the site appears to have unfavorable back slope towards the north which will require more spacing between rows and unfavorable tilt for single axis tracking.

## D. Available Utilities

No calls have been placed to any utility company operating in the area nor has any research been performed in regards to the available capacity on their infrastructure.

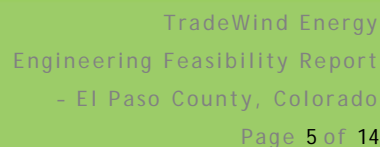
### 1. Water

The land owner of the project parcel owns the all the remaining water rights in the area. TWE will have to secure a very limited water supply to wash panels before they are sold. Fountain Valley Power, LLC is proposing an expansion of their facility which will require additional water and they may be acquiring much of the remaining water available.

### 2. Power

The City of Fountain is serviced by **MEAN (Municipal Energy Agency of Nebraska)**. MEAN is the wholesale electricity supply organization of the Nebraska Municipal Power Pool (NMPP). A commercial Load Data Form may need to be completed and submitted to the City to determine serviceability to a project. An application for Electric Line extensions may also be necessary.





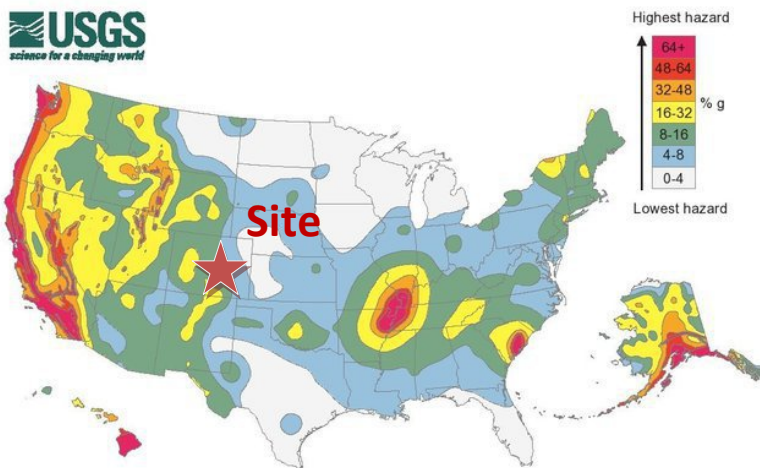
Electric (Rural El Paso County):	<a href="#">Mountain View Electric</a>	(719) 495-2283
Natural Gas (Fountain/Widefield):	<a href="#">Black Hills Energy</a>	(800) 303-0752
Natural Gas (Security):	<a href="#">Colorado Springs Utilities</a>	(719) 448-4800
Telephone:	<a href="#">Qwest</a>	(800) 244-1111
Wastewater (Fountain):	<a href="#">Fountain Sanitation District</a>	(719) 382-5303
Water/Wastewater (Security):	<a href="#">Security Water and Sanitation District</a>	(719) 392-3475
Water/Wastewater (Widefield):	<a href="#">Widefield Water and Sanitation District</a>	(719) 390-7111





## F. Seismic Risk

The project is located in Seismic Zone 1 which is an area of very low risk for seismic activity. US Geology Survey National Seismic Hazard Map —These maps are based on current information about the rate at which earthquakes occur in different areas and on how far strong shaking extends from earthquake sources. Colors on this particular map show the levels of horizontal shaking that have a 2 % chance of being exceeded in a 50 year period. Shaking is express as a percentage of g (g is the acceleration of a falling object due to gravity). Areas in red have a much higher likelihood than areas of white to be exceeded, for example.



## G. Snow Loads

Snow Loads are determined by the Pikes Peak Regional Building Department. They can be contacted at 327-2880 or at their offices at 2880 International Circle. It is unclear if this type of project would have to be reviewed by the Building Department. El Paso County's average annual snowfall is ranked 18<sup>th</sup> highest among 64 climate monitoring stations located in Colorado. Assuming new snowfall has an average density of 10%, (i.e., 1 inch of snow water or rainfall = 10 inches of new snowfall), a cubic foot of snow would weigh  $62.418\text{lbs} \times 10\% = 6.24$  pounds per foot in a square foot column. Therefore, the maximum ground snow loading (without factoring for wind, shape, ice, etc...) should be ~48lbs per square foot for this site.

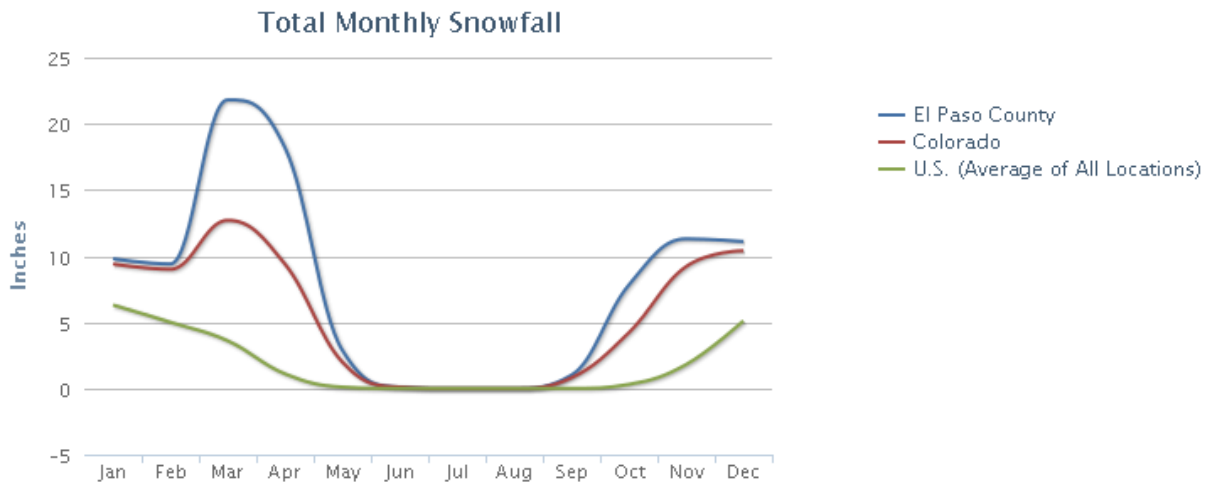
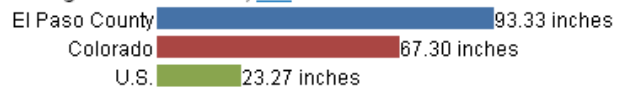
The following is taken from <http://www.usa.com/el-paso-county-co-weather.htm>:





## Snow

### Average Annual Snowfall, #18



## H. Wind loading

Normal meteorological events appear to not impact the site's infrastructure significantly. The following is taken from <http://www.usa.com/el-paso-county-co-weather.htm>:



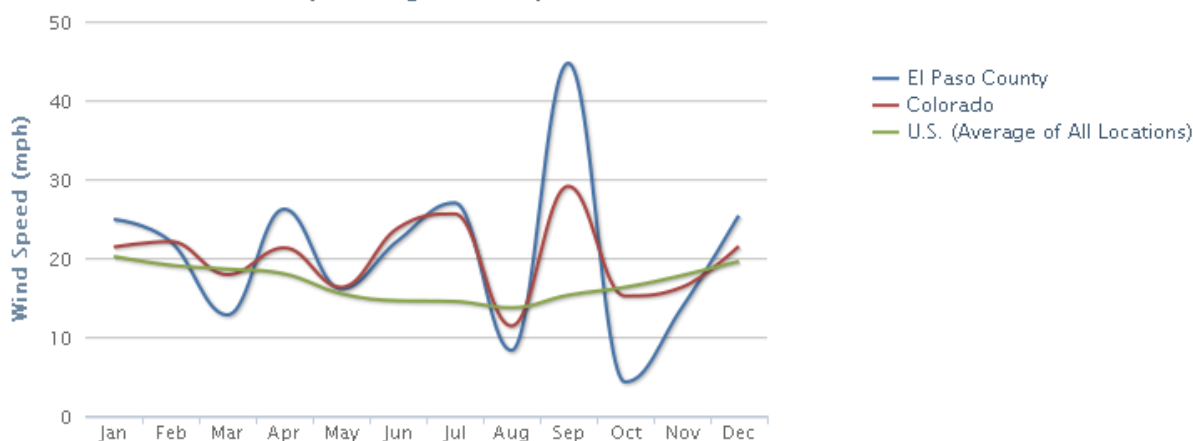


## Wind Speed

### Annual Average Wind Speed, #31



### Monthly Average Wind Speed



\* The temperature, snow fall, and precipitation information on this page were calculated from the historical data of 18,000+ U.S. weather stations for the period of time from 1980 to 2010. The humidity and wind speed information were calculated from data from 15,000 worldwide stations for the period of time from 1980 to 2010.

## I. Flood Hazard

There does not appear to be any flood risk to this site.

## J. Subsurface Soil Characteristics

The predominant soil types are given as Kim Loam, Schamber-Razor Complex, Wilid Silt Loam, and Wiley Silt Loam. Loam is soil composed of sand, silt, and clay in relatively even concentration (about 40-40-20% concentration respectively). Loam soils generally contain more nutrients and moisture and humus than sandy soils, have better drainage and infiltration of water and air than silty soils, and are easier to till than clay soils. The different types of loam soils each have slightly different characteristics, with some draining liquids more efficiently than others.

Loam is considered ideal for gardening and agricultural uses because it retains nutrients well and retains water while still allowing excess water to drain away. A soil dominated by one or two of the three particle size groups can behave like loam if it has a strong granular structure, promoted by a high content of organic matter. However, a soil that meets the textural definition of loam can lose its characteristic desirable qualities when it is compacted, depleted of organic matter, or has clay dispersed throughout its fine-earth fraction.





The following are additional soil considerations given as it relates to the site's potential use as a solar facility:

### 1. Shallow Excavations

The Project's suitability for development in so far as shallow excavations are concerned indicates that it is somewhat limited due to unstable excavation walls in all the upland areas. Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

### 2. Gravel Sources

The Project's suitability to self-generate gravel material is rated mostly "Poor." Gravel consists of natural aggregates (2 to 75 millimeters in diameter) suitable for commercial use with a minimum of processing. It is used in many kinds of construction. Specifications for each use vary widely. Only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains gravel, the soil is considered a likely source regardless of thickness. The assumption is that the gravel layer below the depth of observation exceeds the minimum thickness. The ratings are for the whole soil, from the surface to a depth of about 6 feet. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be gravel.

### 3. Road-fill Sources

The Project's suitability to self-generate structural fill material for use in road or pad material is mostly "poor" or "fair" with approximately 20% actually rated as "good." Roadfill is soil material that is excavated in one place and used in road embankments in another place. The soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments. The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The soils are rated "good," "fair," or "poor" as potential sources of roadfill. The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential). Normal compaction, minor processing, and other standard construction practices are assumed.





#### 4. Vegetative Cover

The Project's suitability for establishing and maintaining vegetative cover appears to range between "fair" and "good" due to the topsoil on site. Areas deemed "fair" possess too much clay, carbonate, and sodium content. Topsoil is used to cover an area so that vegetation can be established and maintained. The surface layer of most soils is generally preferred for topsoil because of its content of organic matter. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. Normal compaction, minor processing, and other standard construction practices are assumed.

#### 5. Septic Tank Absorption Fields

The Project's suitability for use of an on-site septic system to accommodate an operations facility appears to be somewhat- to very limited due to slow water movement and filtering capacity of the soils. Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Saturated hydraulic conductivity (Ksat), depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

#### 6. Susceptibility to Corrosion

The USDA Soil Survey indicates that most of the flat upland areas may exhibit high corrosive properties that affect steel. Concrete corrosivity does not appear to be a risk for this project.

#### 7. Depth to bedrock

The site doesn't appear to have any significant bedrock concerns in the upper 2m of soil depth. Areas where indurated soils or rock exist appear to be in eroded drainage ways that won't be contenders for development.

### K. Geology

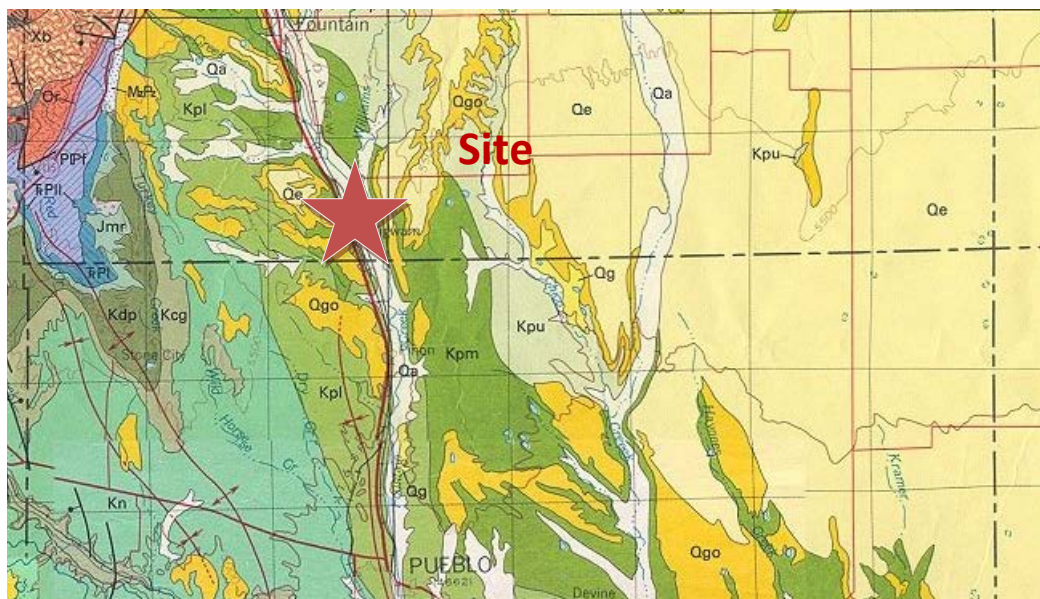
Although seven physiographic provinces are defined in Colorado, there are basically three topographic/geologic zones in the state. Topographically, the state is divided into Eastern Plains, Rocky Mountains, and Colorado Plateau. Geologically, the eastern plains and western plateau are composed of sedimentary rock whereas, the Rocky Mountain province is a complex assortment of igneous, metamorphic, and sedimentary rocks in approximate equal proportions (<http://www.geospectra.net/fieldgeology/coloradorocks.htm>).





The geology symbols around the site are as follows:

- Kpl - Lower shale member of Pierre Shale (Upper Cretaceous)
- Qe - Eolium (windblown clay, silt (loess), sand, and granules) (upper Holocene to Bull Lake Glaciation)
- Qgo - Quaternary alluviums and gravels.



Geology image taken from <http://www.geospectra.net/fieldgeology/coloradorocks.htm>:







## L. Accessibility

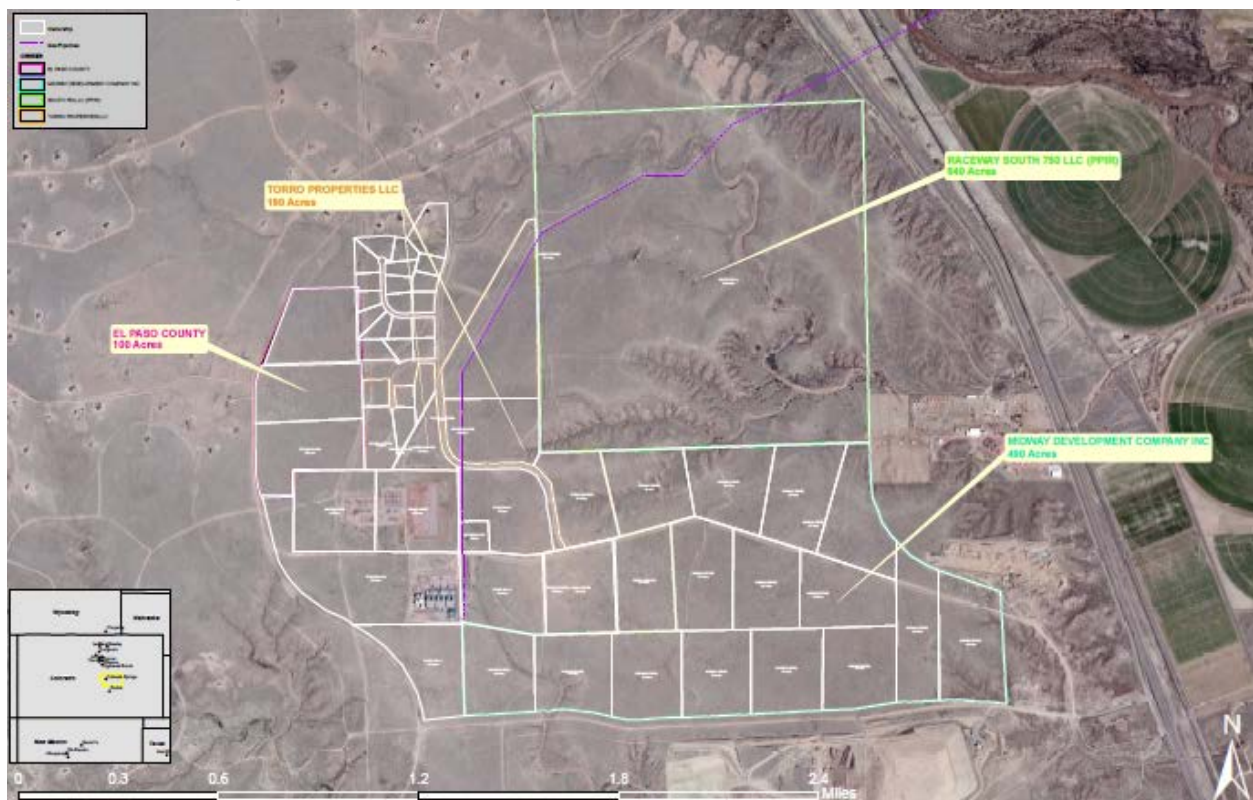
Accessibility appears to be very good with a few roads in or near the project that access off of HWY 25 on the eastern limits of the project area. Although it appears that most of the internal roads are gravel or sand, no information on road conditions or material has been collected to date.

## M. Cultural and Environmental Resources

No information relative to cultural and environmental resources has surfaced during basic desktop research for this project.

## N. Maps/Exhibits

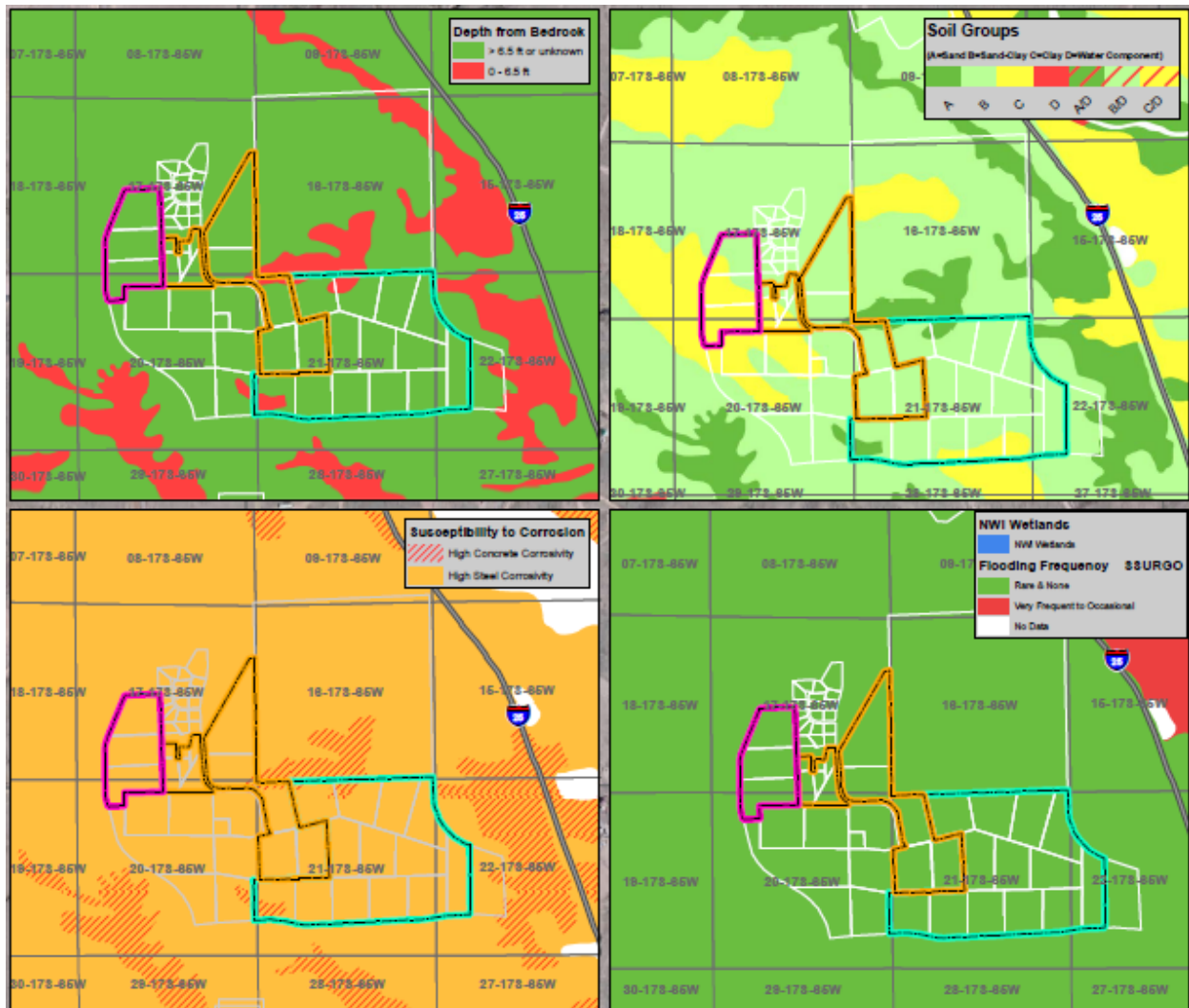
### 1. Site Map







## 2. Soil 4-panel Map











## Maps Attachment C

# Front Range - Midway Solar Project El Paso County, CO

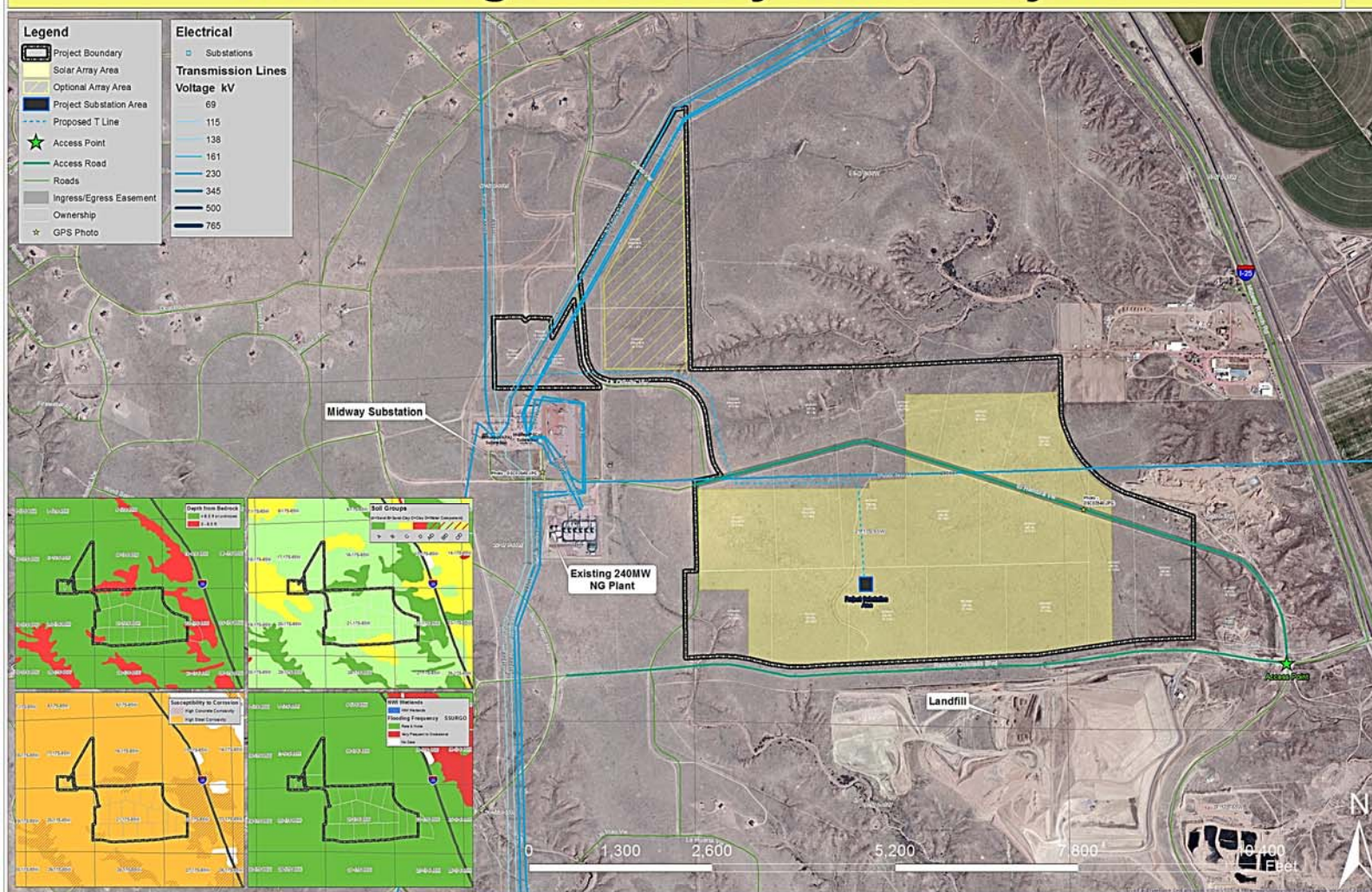


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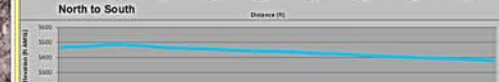
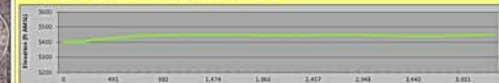


# Front Range - Midway Solar Project

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## Northern Elevation Profiles



## Southern Elevation Profiles

