Visibility Assessment

Gravel Pit Solar Project

Town of East Windsor
Hartford County, Connecticut

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Revised July 2020

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1.0 INTRODUCTION

1.1 Purpose of the Investigation

This Visual Assessment was developed in support of the Gravel Pit Solar Project (GPS or the Project) proposed by Gravel Pit Solar, LLC, Gravel Pit Solar II, LLC, Gravel Pit Solar III, LLC, and Gravel Pit Solar IV, LLC Project (collectively Gravel Pit Solar) in the Town of East Windsor, Connecticut. The Project includes the development of a 120-megawatt (MW) alternating current (AC) ground-mounted solar photovoltaic system. The Project will encompass 485-acres (the Project Area) and will be sited on eight parcels of land totaling approximately 737 acres (the Project Site) located near Apothecaries Hall Road, Plantation Road, Wapping Road, and Windsorville Road. This assessment was prepared by Environmental Design & Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) in support of an application for a Certificate of Environmental Compatibility and Public Need being submitted to the Connecticut Siting Council. The information and recommendations included in this report are intended to assist state agencies, interested stakeholders, and the general public in their review of the proposed Project. The purpose of this visibility assessment is to:

- Describe the visible components of the proposed Project.
- Evaluate the potential visibility of the Project within a defined visual study area (VSA).
- Identify key views for visual assessment.
- Assess the extent of potential Project visibility.
- Illustrate the appearance of the proposed Project.
- Identify potential mitigation measures.

1.2 Project Location and Description

1.2.1 Project Location

The proposed Project is located in the Town of East Windsor, Hartford County, Connecticut (see Figure 1.2-1).

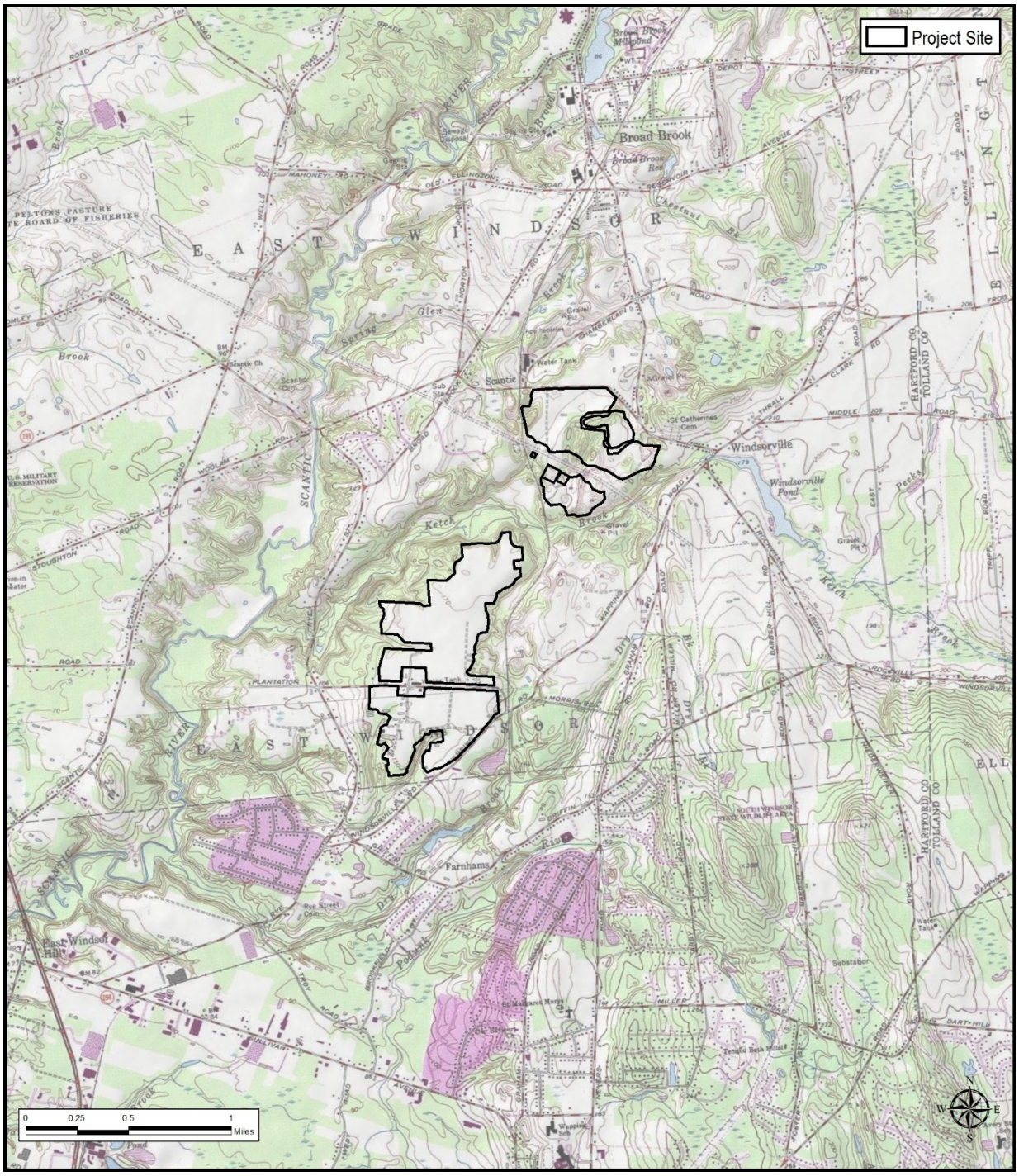


Figure 1.2-1 – Project Location

The Project Site (see Figure 1.2-4) includes forest land, actively cultivated agricultural fields, fallow fields, and an active gravel pit. Generally, the Project Site is bordered by dense forest vegetation and rural residential development. Additionally, a 115-kilovolt (kV) transmission line runs south of Apothecaries Hall Road and traverses the Project Site in an east-west direction. This development includes small residential subdivisions adjacent to agricultural fields, often

separated by small remnant woodlots or landscape vegetation.

1.2.2 Project Description

The proposed Project evaluated in this visibility assessment is a solar-powered electric generation plant with a generating capacity of 120 MW. It will include ground-mounted solar photovoltaic photovoltaic (PV) modules, commonly known as solar panels (panels), to generate renewable electricity. The panels will consist of two types; fixed-tilt and single axis trackers. As the name implies, fixed-tilt panels are mounted at a fixed angle on a metal racking system connected to driven steel piles. Fixed-tilt panel arrays are installed on an east-west axis and the panels are permanently tilted in a south-facing position (Figure 1.2-2). The single axis tracker panel arrays are oriented on a north-south axis and have a racking system that allows the panels to rotate about a central pivot from east to west in order to "track" the movement of the sun throughout the day and optimize energy collection (Figure 1.2-3). The panel arrays will be grouped in separate, contiguous clusters, each of which will be fenced with locked gates, for equipment security and public safety, in accordance with National Electric Safety Code (NESC) standards. Within the fence line, where steep slopes are present, grading will be required to achieve maximum slopes of 15 percent. Substantial grading will be required to accommodate the Project in the existing rock quarry south of Apothecaries Hall Road. Vegetation clearing will be necessary throughout the Project Site in order to expand the area available for development and to minimize shading of the panels.

Figure 1.2-2 – Fixed Tilt Panel

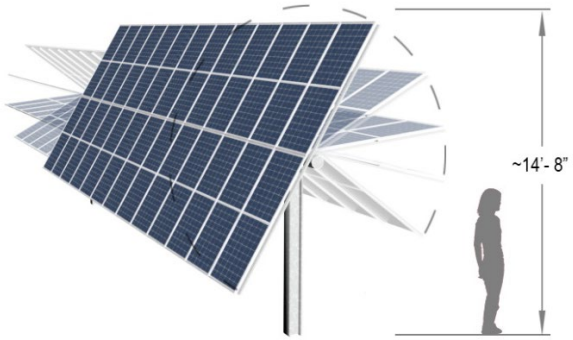


Figure 1.2-3 – Single Axis Tracker Panel

Along with the PV modules, the Project includes associated support facilities, consisting of access roads, buried electrical collection lines, inverters, a Project Collector Substation (Collector Substation), a Transmission Owner (Eversource) Switchyard (Switchyard), and a short 115-kV interconnection transmission line which will connect to the existing 115-kV transmission line traversing the Project Site. The configuration/layout of the Project is illustrated in Figure 1.2-4. The major components of the proposed Project are described below.

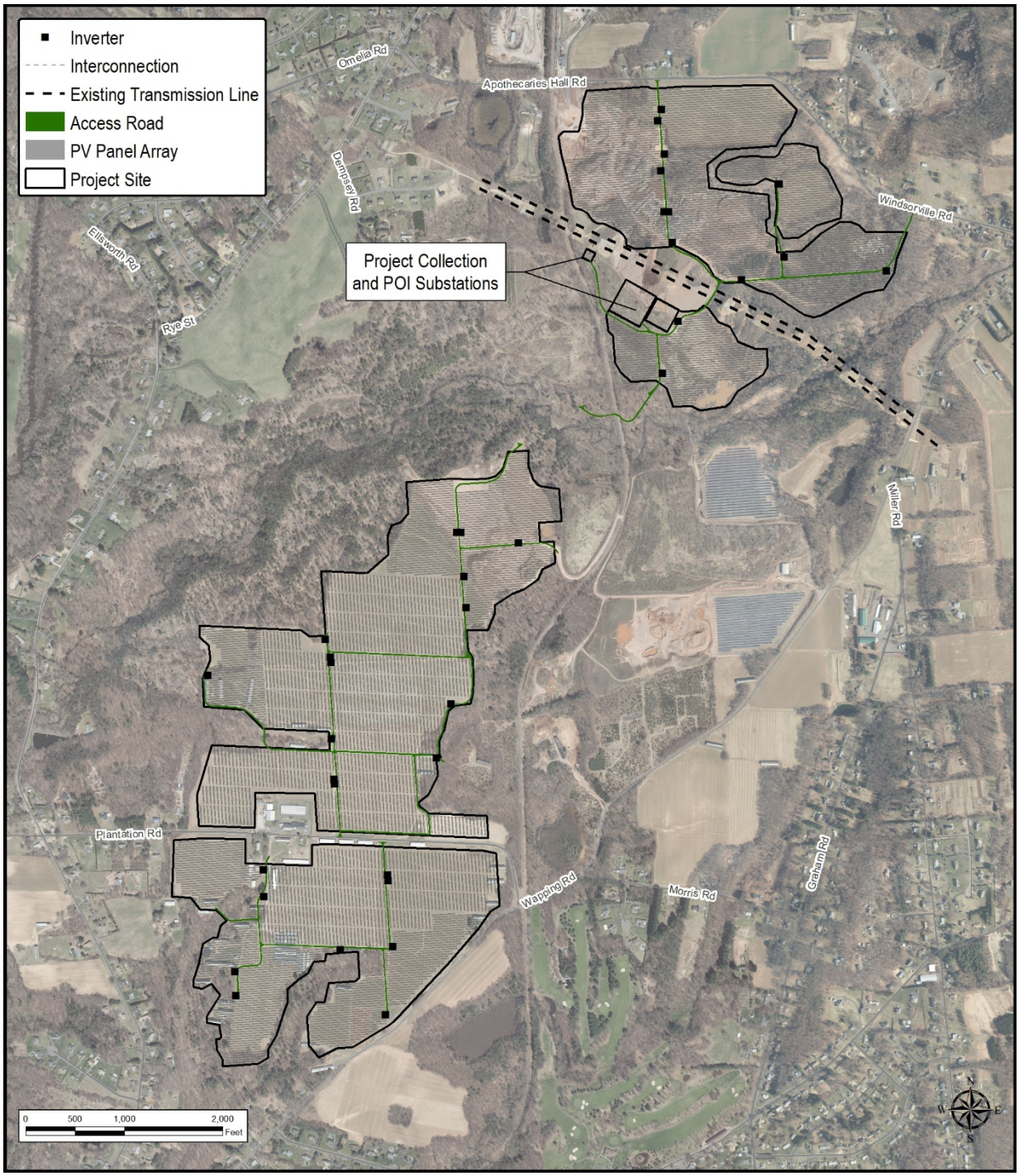


Figure 1.2-4 – Project Layout

1.2.2.1 Fencing

The above-ground components of the Project need to be fenced for safety and security purposes. As presently envisioned, the panel arrays will be surrounded by a 7-foot-tall chain link fence, with posts placed approximately every 8 feet. Both the posts and the chain link mesh will be made of galvanized steel.

1.2.2.2 Electrical System

The Project's solar panels will generate electricity when sunlight strikes the panels and excites electrons in their semiconducting material to generate direct electric current (DC). The DC current will be converted to alternating current (AC) and the voltage increased to 34.5-kV through a series of inverters and transformers located among the solar panels. The inverters and transformers will be installed on 15-foot square concrete foundations. The 34.5-kV AC energy will be transmitted via underground cables to the Collector Substation, which is located adjacent to the 115-kV transmission line at the northern end of the Project Site. The Collector Substation will be approximately 250 feet square and will be enclosed by a chain link fence similar to the fence enclosing the panel arrays. The Collector Substation will step up the 34.5-kV energy to 115-kV to allow a connection to the regional power grid. From the Collector Substation, the energy will enter the Switchyard (to be owned and operated by Eversource) which is directly adjacent to (and west of) the Collector Substation. The Switchyard is approximately 350 feet square and consists of a series of bus supports, circuit breakers, and two large A-frame structures which elevate the conductors to the grid interconnection. Both the Collector Substation and Switchyard include a series of self-supporting lightning masts which, at 50 feet tall, are the tallest substation components.

1.2.2.3 Access Roads

The Project will include a series of gravel roads to access the equipment for maintenance, repair, and replacement, and for emergency response (internal access roads). The internal access roads will be only as long and as wide as is necessary to accommodate these operational activities. Entrance roads to the Project will connect with public roads at two locations on Apothecaries Hall Road and two locations on Plantation Road.

2.0 BACKGROUND

2.1 Existing Visual Character

The existing visual character of the Project Site is defined by gently rolling topography and deciduous mature forest, interspersed with rural residential lots and winding local roads, which stem from the main feeder streets, such as Rye Street and Wapping Road. In the immediate vicinity of the Project Site, large isolated agricultural fields are enclosed by surrounding mature woodlots and forests. Residential development is generally most concentrated along Rye Street, Apothecaries Hall Road, and Windsorville Road. These homes tend to be clustered around small spur streets just off the main roads and consist of single-family modern homes with relatively large landscaped lots. To the northwest and south of the Project Site, development intensity is considerably higher, with suburban residential homes clustered around a network of spur streets. Within these developments, remnant mature vegetation stands weave between the clustered homes, creating a sense of separation and enclosure from within the individual lots. Generally, residential and agricultural uses dominate the area surrounding the Project Site. However, the Plantation Industrial Park on Plantation Road, along with a few other small commercial operations, also occur in the area. These commercial and industrial operations are relatively small and do not contribute substantially to the overall visual character of the area. The gravel pit which occurs within the Project Site is an extraction mining operation which covers an area of approximately 50 acres. The existence of the gravel pit from public vantage points is generally evidenced only by derelict, vegetated spoil piles surrounding the pit, and by a rail depot on Chamberlain Road which appears to be used for rail car loading of extracted materials from the gravel pit.

2.1.1 Visual Study Area

The visual study area (VSA) has been defined as the area contained within a 2-mile buffer around the Project property line (Figure 2.1-1). The resulting VSA encompasses approximately 25 square miles. However, based on a preliminary visibility analysis (described in Section 3.1), actual visibility within the VSA is likely to be limited to within 0.25 mile of the Project. Due to this limited visibility, the description of the VSA will generally be focused to this area of potential visibility, which primarily occurs on or adjacent to the Project Site (described in Section 2.1).

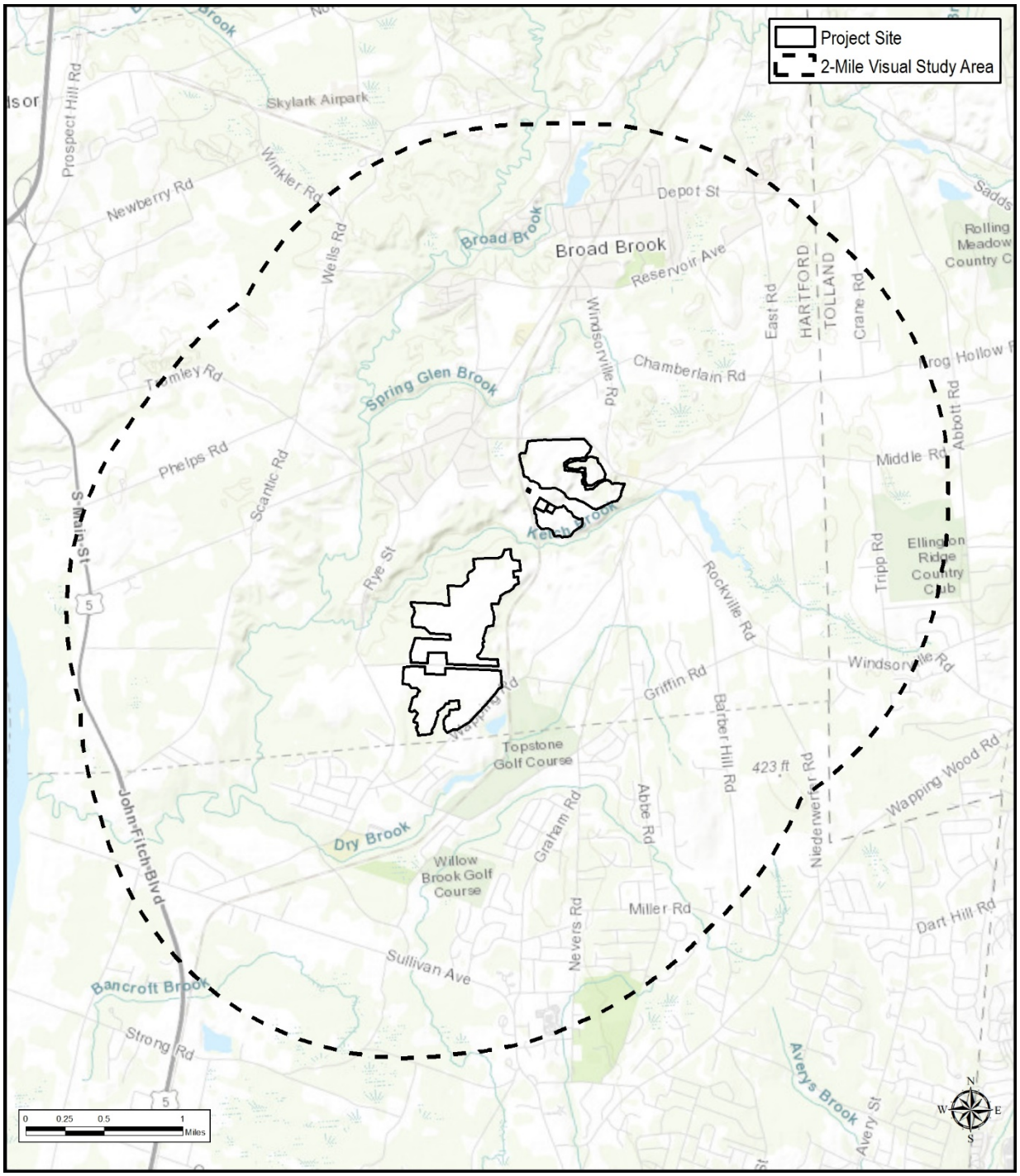


Figure 2.1-1 – Visual Study Area

3.0 VISIBILITY ANALYSIS

This Visibility Analysis utilizes three methods for determining potential Project visibility throughout the VSA: viewshed analysis, field verification, and visual simulations. The methodology employed for each of these assessment techniques, and the results of these analyses, are described below.

3.1 Viewshed Analysis Methodology

A viewshed map for the proposed Project was prepared using the following:

1. A bare earth digital elevation model (DEM) and a digital surface model (DSM) derived from the 2016 Capitol Region Council of Governments (CRCOG) Connecticut Statewide dataset via NOAA's Data Access Viewer lidar resource;
2. Sample points representing solar panel locations spaced 200 feet apart over the entire area proposed for panel installation;
3. An assumed maximum panel heights of 15.5 feet for the single axis trackers and 9 feet for the fixed-tilt panels;
4. An assumed viewer height of 6 feet; and
5. ESRI ArcGIS® software with the Spatial Analyst extension.

The previously mentioned publicly available lidar data did not accurately reflect the current conditions of the gravel pit due to an additional four years of extraction occurring since the time the lidar was collected. Therefore, EDR supplemented the lidar surface using survey data collected by the Project engineers (VHB). Additionally, due to the need for significant site grading, the proposed conditions surface was provided in site plans and was included in the DEM and DSM model surface to accurately reflect anticipated finished grades. These models were created by performing a comparison of a bare earth DEM, which includes a lidar-derived bare earth model (void of vegetation and structures) and a lidar derived DSM which includes structures and vegetation. Areas requiring clearing as a result of the Project were included in the analysis. The ArcGIS program defines the viewshed by reading every cell of the lidar data within the VSA on the modified DSM model to determine where ground-level views of the proposed Project could potentially be available. Once the viewshed analysis was completed, a conditional statement was used to set solar panel visibility to null in locations where the DSM elevation exceeded the DEM elevation by six feet or more (indicating the presence of vegetation or structures that exceed viewer height). This was done for two reasons; 1) because in locations where trees or structures are present in the DSM, the viewshed would reflect visibility from the vantage point of standing on the tree tops or building rooftops, which is not the intent of this analysis, and 2) to reflect the fact that ground-level vantage points within buildings or areas of vegetation exceeding six feet in height will generally be screened from views of the Project.

Because the lidar viewshed analysis accounts for the screening provided by structures and trees, the analysis is an accurate representation of potential Project visibility. However, it is worth noting that because certain characteristics of the solar panels that may influence visibility (color, distance from viewer, lower height of single axis trackers at certain times of the day, etc.) are not taken into consideration in the viewshed analyses, visibility indicated by this analysis does not necessarily equate to actual Project visibility. Conversely, possible views from beneath the tree canopy in forested areas are not considered in the viewshed analysis. Therefore, it is possible that residences and roads directly adjacent to the Project Site may have some Project visibility through the understory of existing forested areas where the viewshed analysis indicates a lack of Project visibility.

3.1.1 Viewshed Results

Results of the viewshed analysis (Figure 3.1-1 and 3.1-2) suggest that approximately 3.9 percent of the 2.0-mile radius VSA could have some level of Project visibility. The visible areas are largely contained within the Project Site itself, due to the relatively low-profile of the proposed panels and the presence of mature vegetation surrounding the Project Site. Local roads with potential visibility include Apothecaries Hall Road, Windsorville Road, Plantation Road, and Wapping Road. All of these roads occur directly adjacent to the Project Site. A small area of potential visibility extends beyond these roads and the Project Site into a small open field and a residential area north of Apothecaries Hall Road. As mentioned previously, possible views through the forest understory are not considered in this viewshed analysis and may be available in some locations where the understory is lacking in density or during winter months when the trees lack foliage. Similarly, in the southern portion of the Project Site, visibility extends to an open field south of Wapping Road. A narrow hedgerow separating this field from a residential development provides a vegetative buffer which could be effective in partially screening views of the Project. A very small area of visibility (approximately 57 feet wide) extends from the Project Site onto the Topstone Golf Course, located south of Wapping Road. To the west of the Project Site, views from Abraham George Lane and Rye Street would be substantially, if not entirely, screened from views toward the Project due to the presence of a thick vegetative buffer.

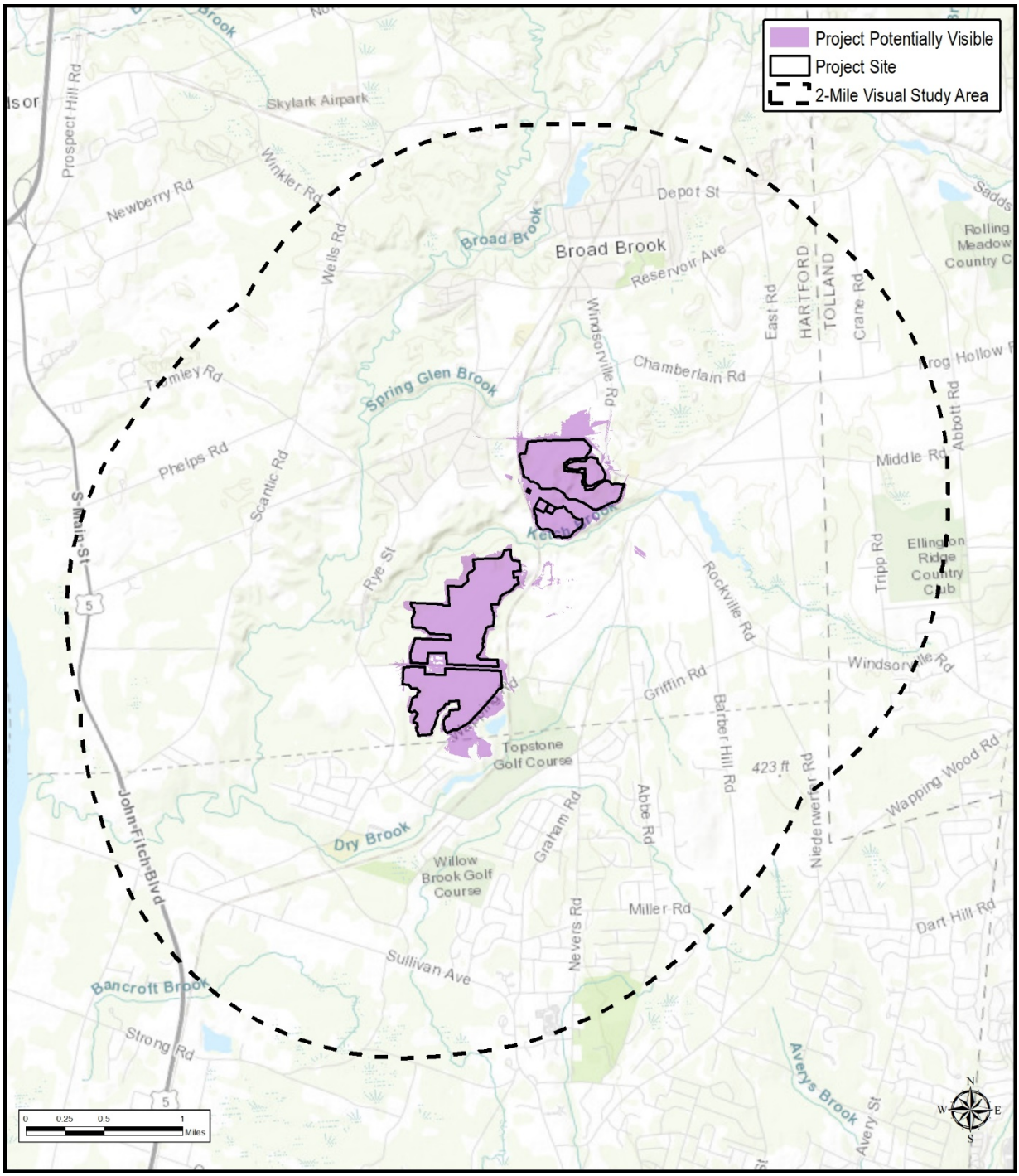


Figure 3.1-1 – Viewshed Analysis Results

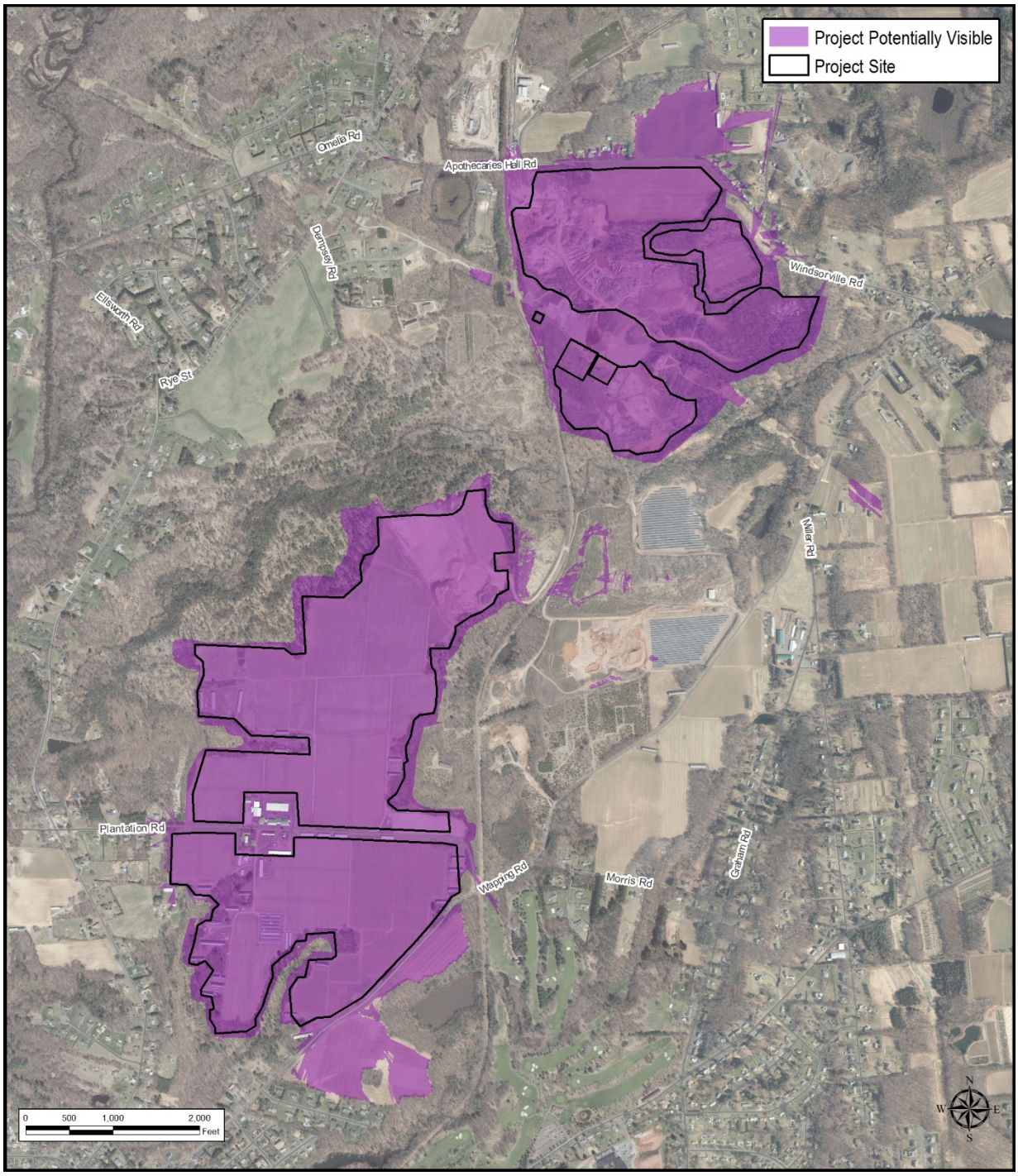


Figure 3.1-2 – Viewshed Analysis Results Detail

3.2 Field Verification Methodology

Potential visibility of the Project was evaluated in the field on February 14, 2020. The purpose of this field review was to identify available open views of the Project Site within the VSA, to obtain photographs for subsequent use in the development of visual simulations, and to document the visual character of the VSA. Consideration was also given to

viewer orientation and time of day by strategically capturing a variety of lighting conditions (front lit, side lit and backlit) as well as the angle of the solar array relative to the viewer.

During the field survey, an EDR staff member drove public roads and visited public vantage points within the VSA to document points from which the Project likely would be visible, partially screened, or fully screened. These vantage points were determined by looking for open views of the specific fields in which the Project is proposed. Photographs were taken from 23 representative viewpoints within the VSA. Photographs were taken with a Nikon D7100 camera with a focal length between 24 and 35 mm (equivalent to between 45 and 55 mm on a full frame 35mm camera). Viewpoint locations were determined using hand-held global positioning system (GPS) units, high resolution aerial photographs, and high-resolution lidar data (to determine elevation). The time and location of each photograph were documented on all electronic equipment (camera, GPS unit, etc.) and noted on electronic field data sheets. Where views toward the Project Site existed, viewpoints photographed during the field review generally represented the most open, unobstructed views available . The locations of viewpoints visited during field review are illustrated in Figure 3.2-1 and representative photographs are provided in Appendix A.

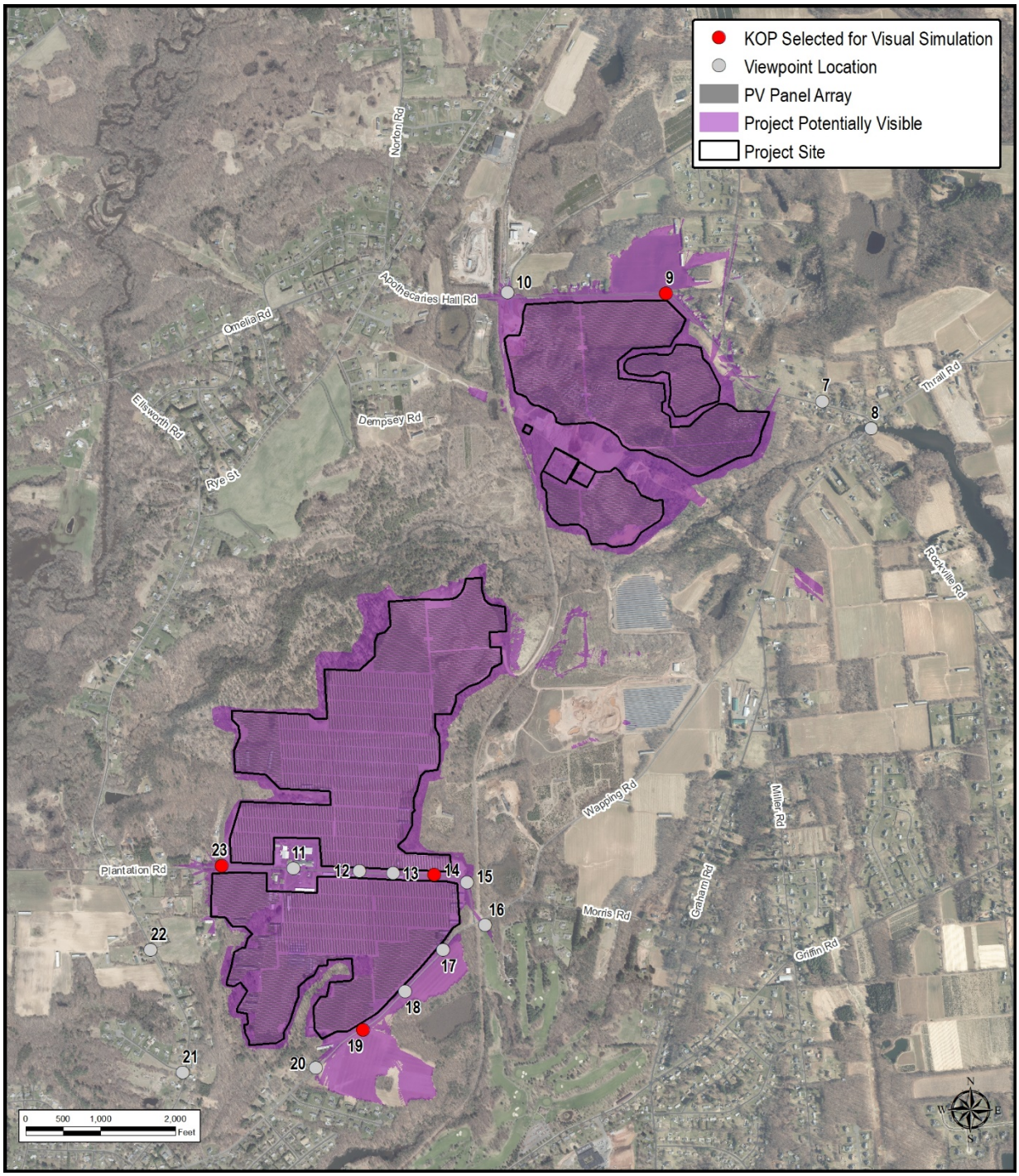


Figure 3.2-1 – Viewpoint Location Map

3.2.1 Field Verification Results

Confirming the results of the viewshed analysis, field review indicated that Project visibly would generally be restricted to locations void of vegetation and directly adjacent to the Project Site. Given the general lack of visibility beyond the

Project Site, viewpoint documentation was focused to areas along public roads adjacent to the Project Site. Views of the Project Site were available from Plantation Road, Apothecaries Hall Road, and Wapping Road. No potential views from Rye Street were available, and once beyond 500 feet from the Project, no public vantage points offered opportunities for open views toward the Project Site.

Field review also confirmed the viewshed analysis predictions that views of some portion of the Project would be available from the residences along Apothecaries Hall Road. In some instances, this visibility may be somewhat mitigated by the presence of landscape vegetation, but some portion of each of the adjacent residential properties or homes would likely see some of the proposed solar panels. On Plantation Road, a few adjacent residences to the west of the Project may have some level of Project visibility through an existing vegetated hedgerow during leaf-off conditions. These views would likely only include small portions of the Project through a relatively dense vegetated buffer. To the south of the Project, on Green Lane, several residences in a subdivision, may also have glimpses of the Project through an existing hedgerow. However, the Project is between 800 and 1,000 feet from these homes, so Project visibility would be significantly reduced as a result of distance and partial screening from the existing vegetation buffer.

Open views toward the Project Site were not available from the homes along Rye Street, to the west of the Project. However, some homes along the east side of Rye Street were set back from the road by up to 700 feet. For these residences, since they are situated much closer to the Project Site, views toward portions of the Project may be available through narrow hedgerows. Additionally, due to the location of the Project Collector Substation and the Switchyard within the Project Area, visibility of these facilities is expected to be very limited from public rights of way (ROWs).

It should be noted that fieldwork was completed during leaf-off conditions, thus representing the maximum potential visibility toward the Project Site in areas where existing vegetative buffers exist.

3.3 Visual Simulations

Beyond evaluating the potential visibility of the Project, this Visibility Assessment also examined the appearance of the solar arrays from various locations within the VSA. This assessment involved creating computer models of the solar panel arrays and above-ground Project components, selecting representative viewpoints within the study area, and preparing computer-assisted visual simulations of the proposed Project. These simulations then were used to characterize the type and extent of visibility and visual impact resulting from the construction of the Project. Details of the viewpoint selection and simulation procedures are described below.

From the photographic documentation conducted during the field survey, EDR selected four viewpoints for development of visual simulations. These viewpoints were selected based upon the following criteria:

1. They will provide views of the proposed Project (as determined through field verification).
2. They illustrate typical views from a variety of viewing distances and orientations.
3. They illustrate visibility/contrast of the solar arrays under different lighting conditions, to illustrate the range of visual change that will occur once the Project is in place.

Location of the selected viewpoints is indicated in Figure 3.2-1. Locational details and the criteria for selection of each simulation viewpoint are summarized in Table 3.3-1, below:

Table 1. Viewpoints Selected for Simulation

VP	Location	Town	Representative Land Use	Distance to Nearest Project Component	Direction of View	Time Taken
9	Apothecaries Hall Road	East Windsor	Rural Residential	129 Feet	Southwest	10:53 am
14	Plantation Road	East Windsor	Agricultural /Rural Residential	124 Feet	West-Southwest	11:56 am
19	Wapping Road	East Windsor	Agricultural /Rural Residential	114 Feet	North-Northeast	12:17 pm
23	Plantation Road	East Windsor	Agricultural /Rural Residential	233 Feet	Northeast	12:55 pm

3.3.1 Visual Simulation Methodology

To show visual changes that are expected to occur following construction of the Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the Project from each of the four selected viewpoints. These simulations were developed by constructing a three-dimensional (3D) computer model of the proposed solar panel arrays based on specifications and survey coordinates provided by VHB. .

Simulations were created by aligning each photographic viewpoint with the computer model of the Project and then superimposing the model on the photograph. This step involves the creation of a 3D virtual camera that exactly replicates the position, direction of view, and camera specifications used for field documentation. To verify the accuracy of the virtual camera alignment, aerial photographs, lidar data, and GPS data collected in the field were used to create an AutoCAD Civil 3D® drawing. The two-dimensional AutoCAD data were then imported into Autodesk 3ds MAX® and three-dimensional components (cameras, modeled array, etc.) added. These data were superimposed over photographs from each of the viewpoints, and minor changes in camera height, roll, and precise lens setting were

made to align all known reference points within the view. This process ensures that the elements of the Project are shown in proportion, perspective, and proper relation to the existing landscape elements in the view. Consequently, the alignment, elevations, dimensions, and locations of the proposed structures will be accurate and true in their relationship to other landscape features in the photograph.

At this point, a "wire frame" model of the Project and known reference points are shown on each of the photographs. The proposed exterior color/finish of the associated equipment were then added to the model and the appropriate sun angle simulated, based on the specific date, time, and location (latitude and longitude) at which each photograph was taken. This information allows the program to realistically illustrate highlights, shading and shadows for each individual array shown in the view.

3.3.2 Visual Simulation Results

The visual simulations illustrate the appearance of the proposed Project from four representative locations. The following results provide a summary of the visual character of the existing view (Figures 3.3.1, 3.3-3, 3.3-5, and 3.3-7), followed by a summary of the visual character of the view with the operational Project in place (Figures 3.3-2, 3.3-4, 3.3-6, and 3.3-8).

Figure 3.3-1– Existing view from Apothecaries Hall Road – Viewpoint 9

This existing view from Apothecaries Hall Road is adjacent to a small cluster of residential properties and therefore representative of the most open and unobstructed view available from these properties. The foreground of this view is dominated by the asphalt road and the roadside utility poles which enter the center of the frame and continue out of the frame on the right side. The small agricultural field adjacent to the road extends away from the viewer where it abruptly ends at a large horizontal berm in the middle ground. Beyond the berm, dense forest vegetation extends up to the blue sky forming a staggered horizon line across the entire view. The vertical forms presented by the utility poles juxtaposed with the horizonal form presented by the berm tend to distract the viewer and the sense of natural landform is interrupted. The overall scenic quality of this view is relatively low.

Figure 3.3-2 – Proposed view from Apothecaries Hall Road – Viewpoint 9

At its closest point, the proposed Project is approximately 129 feet from the viewer at this vantage point. With the Project in place, the solar panels and perimeter fence present another strong linear interruption of the landscape. However, the Project generally follows the road and the utility poles creating a visual reinforcement of the sinuous lines created by these existing landscape features. The backs of the panels are in full shade making the racking system and piles difficult to discern which strengthens the strong horizontal line created by the Project. The chain link fence does not appear out of character with what already appeared to be a heavily modified view. However, given the

presence of residences adjacent to this view, the solar panels and fencing represent a conflicting land use that changes the character of a once open view to the nearby woodlots. As a result, the Project is expected to result in appreciable visual impact to the residents living adjacent to this portion of the Project.

Figure 3.3-3 – Existing view from Plantation Road – Viewpoint 14

This existing view from Plantation Road illustrates an agricultural field with overhead netting and support structures for bird control. Several large tobacco barns line Plantation Road and a water tower is visible in the background. The foreground of this view is dominated by the asphalt road and the vertical posts associated with the netting system which extend down Plantation Road and away from the viewer. These posts add an element of visual clutter due to their irregular placement and lack of verticality. The middle ground is dominated on the right of the view by the large tobacco barns which are directly adjacent to the road. The barns are tall stately structures which, in combination with the water tower, add visual interest to the view. The background of the view consists of dense deciduous vegetation, occasionally interspersed with large evergreen trees. In the center of the view, there is a glimpse of distant hills through the tree line. The blue sky is wide open and interrupted only by the staggered tree line, the water tower, and roadside utility poles on the far right side of the view. This view exhibits a medium level of scenic quality.

Figure 3.3-4 – Proposed view from Plantation Road – Viewpoint 14

With the proposed Project in place, the solar panels are visible in the foreground (124 feet away) of the view and replaces the netting system with a regular and repeated pattern of horizontal and vertical forms across the view. This arrangement interrupts views of the background hedgerows in the center of the view and eliminates any view of the background hills. However, in the middle ground, the tobacco barns still represent a prominent focal point that draws the viewer's eye down the road. Although the berms help divert attention away from the Project, and serve to reduce its perceived scale, the panels substantially alter the agricultural character of the view, codominant with he barns and water tower as focal points in the view. Given the lack of residents or other visually sensitive resources in this location, it is anticipated that that Project will have limited visual impacts to the view.

Figure 3.3-5 – Existing view from Wapping Road – Viewpoint 19

This existing view from Wapping Road illustrates agricultural fields surrounded by several woodlots and hedgerows. The surface of Wapping Road is visible in the immediate foreground followed by what appears to be a successional field with tall grasses and a few shrubs scattered throughout. A system of overhead netting in the middle ground adds some visual clutter, but generally lacks color contrast and tends to blend in with the color of the dormant plant material in the field. A hedgerow in the foreground interrupts the blue sky on the left side of the view. Several tobacco barns are scattered throughout the middle ground of the view and appear somewhat discordant due to their seemingly random placement and variation in materials. The two barns in the center of the view tend to draw the viewer's eye due to the bright white color of their roofs resulting from reflection of direct sunlight. The background consists of a deciduous woodlot which runs across two thirds of the view. Generally, this view lacks visual interest and contains some visual clutter/discordant features which results in relatively low scenic quality.

Figure 3.3-6 – Proposed view from Wapping Road – Viewpoint 19

With the proposed Project in place, the solar panels appear to descend a small slope in the foreground, thus reducing the perceived height of the foreground panels (114 feet from the viewer). Additional rows of panels rise behind the initial row, but views of the background remains largely intact. Several barns are no longer visible due to their removal from the Project Site, and removal of a large hedgerow on the left reveals a broader expanse of open blue sky. The panels and chain link fence introduce an industrial element into the landscape, but this impact is limited by their relatively low profile and uniform character. The proposed Project alters the rural/agricultural character of the view, but lack of sensitive receptors and low baseline scenic quality limit adverse visual impact at this location.

Figure 3.3-7– Existing view from Plantation Road – Viewpoint 23

This existing view from Plantation Road is located approximately 0.5 mile west of Viewpoint 14 (previously described). This agricultural setting includes the previously mentioned netting and support system posts in the foreground as well as several large buildings (associated with the Plantation Industrial Park) partially visible beyond an evergreen screen in the middle ground. The road on the right side of the view extends away from the viewer, eventually disappearing from view. A short section of the road has patches vegetation on both sides and a small portion of a water tower can be seen beyond this vegetation. The built and natural elements in the foreground and middle ground of this view generally eliminate any long-distance views and the only evidence of the background is visible along the road and beyond the netting posts on the left side of the view. Due to the lack of topographic and vegetative variability, and the relative containment created by the built and natural features present in this view, the existing scenic quality is relatively low.

Figure 3.3-8 – Proposed view from Plantation Road – Viewpoint 23

At its closest point, the proposed Project is approximately 233 feet from the viewer at this location. The chain link fence enclosing the panels is clearly visible in the foreground, with the single axis tracker panels directly behind. Due to the time of the photograph, the solar panels are near their lowest profile position and they do not substantially block most of the background features in the view. From this location, the Project (particularly the fence) appear to be an extension of the Plantation Industrial Park. The solar panels eliminate the open character of the existing field, however, placement of the panels approximately 50 feet away from the road minimizes the feeling of enclosure commonly present with solar projects. While the fence and panels introduce an industrial feel, they do not appear out of place or contradictory to the existing land use. Based on this, along with the relatively low baseline scenic quality, minimal visual impacts are anticipated to result from the Project at this location.

3.3.3 Vegetative Screening

Gravel Pit Solar selected a single location on Apothecaries Hall Road to demonstrate potential vegetative screening measures which could be effective in minimizing the potential visual impacts to specific resources or discrete locations. The intent of this mitigation is to soften views toward the Project while providing a level of natural screening and additional ecological benefit to the Project. Figure 3.3-9 provides a plan view illustration of the potential mitigation concept along a short section of Apothecaries Hall Road adjacent to the residences with potential views of the Project.

Figure 3.3-9 – Plan View illustrating the conceptual mitigation on Apothecaries Hall Road

Where vegetative mitigation is proposed, Gravel Pit Solar will give preference to the use of plants native to the region. The concept illustrated in Figure 3.3-9 uses a mix of evergreen (Eastern Red Cedar and White Spruce) for year-round screening and deciduous species (Red Maple, Red Oak, and Shadblow Serviceberry) for additional seasonal screening and ecological benefits such as wildlife food sources or natural foraging habitat. As outlined in Appendix B – Landscape Mitigation Plan, this plant material can be substituted for smaller species in areas where proposed mitigation is south, west, or east of a proposed solar array to avoid shading of the Project. Additionally, the conceptual plant palette provides a mix of textures and colors for year-round visual interest. Figure 3.3-10 illustrates the simulation from Viewpoint 9 with the conceptual mitigation in place with a projected size representing five years of growth.

The simulation demonstrates that while the Project is still visible through the vegetative buffer, the strong linear form presented by the panels has been substantially softened, thus reducing the potential visual contrast previously presented by the Project. Additionally, the background vegetation is still somewhat visible through the vegetative buffer creating a sense of openness and continuation of the view. During the growing season, this mitigation is anticipated to provide additional screening of the Project, thus further reducing the potential visual contrast to the adjacent residences.

Figure 3.3-10 – Proposed view from Apothecaries Hall Road with mitigation – Viewpoint 9

3.3.4 Fence Alternatives

Gravel Pit Solar is also considering the use of an agricultural-style fence which utilizes a welded wire mesh and wood posts (see Figure 3.3-11). In this configuration the Project fence mimics the style of fencing commonly present in agricultural settings and it eliminates the "industrial" connotations commonly associated with chain link fence. Additional information on this and other potential mitigation options are outlined in Appendix B – Landscape Mitigation Plan.

Figure 3.3-11 – Proposed view from Apothecaries Hall Road with mitigation– Viewpoint 9

4.0 CONCLUSION

4.1 Visual Assessment Summary

The results of the Visibility Assessment can be summarized as follows:

- The viewshed analysis suggests that potential views of the Project will be contained within the Project Site, with the exception of some public roads and properties directly abutting the Project property. Approximately 3.9 percent of the VSA could have potential views of some portion of the Project (i.e., 96.1% of the VSA is fully screened from view). Most of the visible areas are actually contained within the boundaries of Project Site.
- Field review indicated that the viewshed results are generally accurate, and existing structures and vegetation will be effective in screening views of the Project in most locations. However, where forest vegetation is thin and/or understory vegetation is lacking, some visibility may be experienced from public roads and homes abutting the Project Site.

- Homes along Apothecaries Hall Road directly adjacent to the Project Site will experience some level of visual impact due to the introduction of the solar panels and boundary fencing. Vegetative mitigation (perimeter screen plantings) could be effective in reducing impacts to these residential areas.
- Homes located along Plantation Road may have some limited views into the Project Site through an existing hedgerow and may also benefit from some supplemental screening to minimize Project visibility.
- A few homes along Rye Street are situated relatively close to the Project Site and may experience some level of visual impact resulting from visibility of portions of the Project. Selective plantings may be effective in reducing or eliminating visibility from these locations.

4.2 Mitigation

Section 3.3.3 illustrates potential vegetative screening mitigation treatment for one of the aforementioned locations that may experience minor visual impacts associated with the Project. Appendix B also outlines the potential vegetative mitigation plan for the Project. However, the following additional mitigation measures to minimize visual impacts may be considered for inclusion in the Project.

- Burial of interconnection cables amongst the solar arrays and substations will help minimize visual clutter.
- The use of non-specular materials can be effective in reducing potential visual impacts from adjacent areas. This is particularly true for the perimeter fencing which is typically constructed with galvanized steel. Black vinyl coating can minimize light reflection and thus visibility of the fence.
- Increased setbacks from residences can help minimize visibility of solar facilities and helps to minimize the sense of enclosure which can occur when solar panels are situated too close to public rights of way.
- Positioning inverters and transformers within the solar arrays and away from public vantage points can minimize their potential visibility and reduce visual clutter.
- Agricultural-style fencing which utilizes a welded wire mesh and wood posts. This fencing mimics the style of fencing commonly present in agricultural settings.

Some of these mitigation measures have already been included in the Project design; however, the feasibility and practicability of all measures has not been determined at this time. The need for specific mitigation measures will be evaluated in consultation with Project stakeholders during the permitting process.

Appendix A

Viewpoint Photo Log

Viewpoint: #1

Location:
41.8925 N, 72.5159° W

View from Middle Road, in the Town of Ellington

Viewpoint: #2

Location:
41.8924° N, 72.5211 W

View from Intersection of Middle Road and East Road, in the Town of East Windsor

Viewpoint: #3

Location:
41.8901° N, 72.5210° W

View from East Road, in the Town of East Windsor

Viewpoint: #4

Location:
41.8892° N, 72.5209° W

View from East Road, in the Town of East Windsor

Viewpoint: #5

Location:
41.8860° N, 72.5208° W

View from East Road, in the Town of East Windsor

Viewpoint: #6

Location:
41.8926° N, 72.5276° W

View from Middle Road, in the Town of East Windsor

Viewpoint: #7

Location:
41.8916° N, 72.5381° W

View from Windsorville Road, in the Town of East Windsor

Viewpoint: #8

Location:
41.8904° N, 72.5358° W

View from Wapping Road, in the Town of East Windsor

Viewpoint: #9

Location:
41.8959° N, 72.5454° W

View from Apothecaries Hall Road, in the Town of East Windsor

Viewpoint: #10

Location:
41.8963° N, 72.5531° W

View from Intersection of Apothecaries Hall Road and Chamberlain Road, in the Town of East Windsor

Viewpoint: #11

Location:
41.8753° N, 72.5657° W

View from Plantation Road, in the Town of East Windsor

Viewpoint: #12

Location:
41.8753° N, 72.5628° W

View from Plantation Road, in the Town of East Windsor

Viewpoint: #13

Location:
41.8754° N, 72.5611° W

View from Plantation Road, in the Town of East Windsor

Viewpoint: #14

Location:
41.8753° N, 72.5587° W

View from Plantation Road, in the Town of East Windsor

Viewpoint: #15

Location:
41.8749° N, 72.5571° W

View from Plantation Road, in the Town of East Windsor

Viewpoint: #16

Location:
41.8733° N, 72.5564° W

View from Topstone Golf Course At Wapping Road, in the Town of East Windsor

Viewpoint: #17

Location:
41.8725° N, 72.5585° W

View from Wapping Road, in the Town of East Windsor

Viewpoint: #18

Location:
41.8711° N, 72.5605° W

View from Wapping Road, in the Town of East Windsor

Viewpoint: #19

Location:
41.8698° N, 72.5627° W

View from Wapping Road, in the Town of East Windsor

Viewpoint: #20

Location:
41.8685° N, 72.5651° W

View from Wapping Road, in the Town of South Windsor

Viewpoint: #21

Location:
41.8687° N, 72.5716° W

View from Rye Street, in the Town of South Windsor

Viewpoint: #22

Location:
41.8732° N, 72.5728° W

View from Rye Street, in the Town of East Windsor

Viewpoint: #23

Location:
41.8761° N, 72.5690° W

View from Plantation Road, in the Town of East Windsor

Appendix B

Landscape Mitigation Plan

Appendix B.
Gravel Pit Solar Project | Town of East Windsor, Hartford County, Connecticut
Landscape Mitigation Plan

Table of Contents

Section 1 | Introduction

This mitigation plan is a supplement to the visibility assessment for the Gravel Pit Solar Project and describes the potential mitigation options available to reduce and minimize potential visual impacts associated with the 120MW solar powered electric generation plant proposed by Gravel Pit Solar.

Successful siting and design of solar facilities requires consideration of the relationship between the proposed Project and the surrounding landscape, focusing on the minimization and mitigation of potential visual impacts. This plan utilizes vegetation as a key component in the mitigation approach to provide ecological benefits while also improving the overall aesthetics of the Project. This approach is increasingly the preferred mitigation method for solar facilities throughout the United States (e.g., Scenic Hudson, 2018; Sullivan and Abplanalp, 2013; Walston, et al. 2018).

When developing mitigation strategies for solar facilities, the retention of existing plant material is also an important consideration. Retention of this plant material provides screening, allows for the Project to better fit into the surrounding context, and retains existing habitat. Removing this vegetation from a Project site can result in a stronger visual contrast between the Project and the surrounding environment (Sullivan and Abplanalp, 2013). Where feasible, the retention of existing plant material in key areas helps to preserve both the visual and natural character of the existing landscape.

This mitigation plan is designed to consider site conditions as well as the natural and vernacular character of the surrounding landscape. The use of native plant material helps to replicate and compliment the surrounding landscape in order to minimize potential visual impacts resulting from the Project. This plan provides solutions that fit the scale and context of the Project and the visual character of the surrounding landscape. While the use of native trees and shrubs will not necessarily result in the complete screening of the Project, it's implementation will serve to minimize the Project's visibility and reduce potential visual impacts, while providing ecological benefits to local fauna.

Section 2 | Design Methodology

The design methodology developed for the Gravel Pit Solar Project focuses on integrating the Project Site into the surrounding landscape context through the utilization of planting modules and material selections. These planting modules are broadly repeatable, while maintaining the flexibility to respond to different circumstances that occur throughout the Project Site. The use of native plants and shrubs, along with pollinator-friendly plant species, will help to soften potential visibility and visual impacts resulting from the installation of the Gravel Pit Solar Project. This planting module strategy was developed utilizing the following approach:

- Documentation of landscape character and vegetation within the Project Site
- Build on inspiration from the surrounding landscape in development of the mitigation plan
- Maintain existing viewsheds where possible
- Maintain existing vegetation where feasible
- Integrate the Project into the surrounding context by softening Project appearance and visual contrast
- Utilize native plant material to provide ecological benefits

Native Trees & Shrubs

Native trees and shrubs promote the diversification of existing wood lots and hedgerows present on the Project site while providing region-appropriate screening and buffering of the proposed solar Project. In addition, native species are in keeping with local and state initiatives to promote the planting of native plant material in order to minimize invasive and non-native plants while providing ecological benefits to local fauna (see section 5)

Pollinator Species

Agrarian landscapes, such as the area surrounding the Project, have a unique character, characterized by fields with little vertical impediment to open vistas. Use of grasses and wildflowers in the mitigation plan helps to provide habitat for local pollinators while maintaining views of the pastoral landscape. In addition to the ecological benefits, visual benefits such as color variety will be apparent, particularly in the late spring summer and fall.

Materials Selection

Gravel Pit Solar is considering the use of an agricultural style fence material for the perimeter of the solar arrays. This type of fencing maintains Project safety and security while utilizing a more vernacular type of material which incorporates a wood post and wire mesh system.

Section 3 | Plant Material Selection & Maintenance

When developing a conceptual planting plan, the context of the site is essential for the development of the plant palette. Existing plant species and visual character in the vicinity of the Project provide building blocks for planting plan development. To create the plant list shown on subsequent pages, several variables were considered – most notably plant origin. Native plantings are a crucial component of the conceptual planting plan. The use of native plant material can provide a higher likelihood of plant success as well as better visual integration into the existing landscape. To develop this list of native plant material a number of sources were used, including but not limited to: on-site observation, the U.S. Department of Agriculture (USDA) Plants Database, the USDA Forest Atlas, the University of Connecticut, College of Agriculture, Health and Natural Resources Plant Database, and Connecticut Invasive Plants Council: Connecticut Invasive Plant List (Oct 2018).

The existing vegetation observed near the proposed Project is largely agricultural, but hedgerows and wood lots are an integral part of the landscape character. This patchwork of agricultural fields, intermixed with hedgerows, play a key role in the species selection.

Plant Material Maintenance

While the plant material outlined in this report has been selected for their compatibility with the existing landscape and to reduce the need for prolonged maintenance, Gravel Pit Solar has developed a strategy to review the plant material after initial installation to ensure the intents of the mitigation plan remain a viable mitigation strategy once the Project is operational.

For woody plant material, Gravel Pit Solar will ensure that maintenance staff are familiar with the appearance of unhealthy or damaged vegetation associated with the Project mitigation. Staff will periodically monitor the planting modules to ensure adequate establishment. Gravel Pit Solar will remove and replace plantings that fail in materials, workmanship or growth within one-year following the completed installation of plantings. Periodic review of the planting will continue for up to three years to evaluate the health of wood plant material remains.

If die-back occurs after the three year period outlined above, Gravel Pit Solar will evaluate to determine if the mitigation planting is still accomplishing the goals outlined in this report. Typically limited die-back still provides the vegetative cover necessary to meet the module objectives once the plants begin to mature. If the remaining vegetation accomplishes these goals, no further action will be taken. If significant die-back occurs, Gravel Pit Solar will work with qualified individuals to identify additional mitigating requirements.

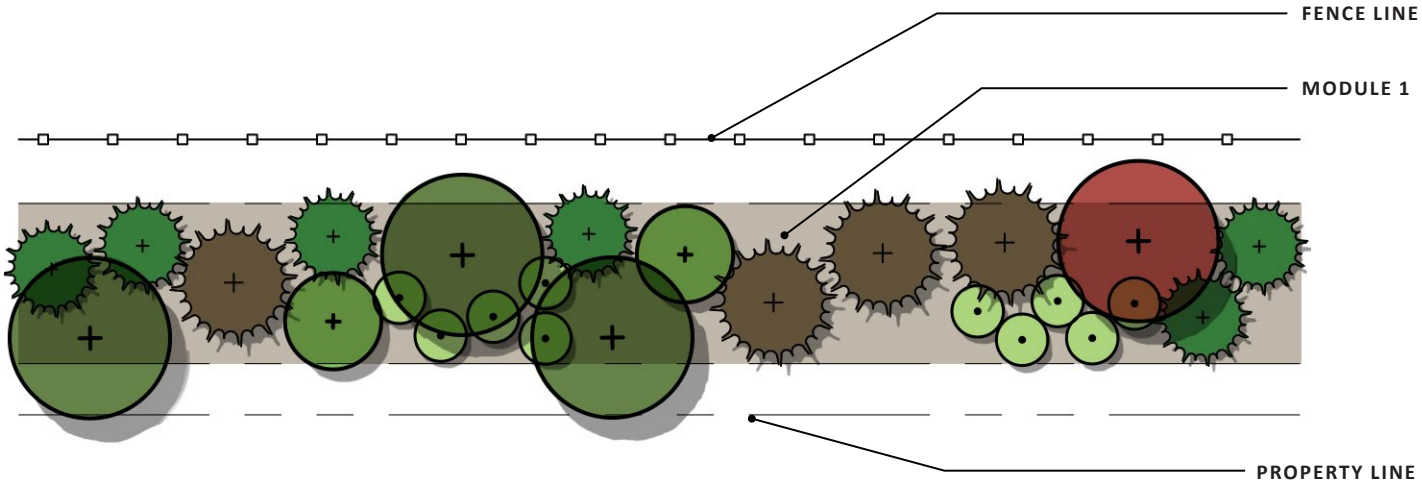
For herbaceous plant material, Gravel Pit Solar will conduct periodic mowing to assist in the establishment of this material and promote propagation. Areas of die-back will be reviewed by Gravel Pit Solar to evaluate if further action will be needed to meet the mitigation goals outlined in this report.

Section 4 | Planting Modules

Module 1 | Adjacent Residence

Module 1 is designed be used when the highest level of screening is desired, most notably where stationary adjacent uses could be impacted by the Project. The use of trees and shrubs, and the incorporation of more evergreen material will provide significant screening during the summer and winter seasons. Additionally, the module is intended be adaptable to conform to the unique site conditions. For example, in areas where the module is south, west or east of a proposed solar array, tree species that are taller in height can be replaced with smaller species already specified in other modules to avoid shading of the Project. It is important to note that the intent of this module is not to screen the Project entirely, rather to provide a vegetative buffer that feels appropriate in the existing contextual landscape (i.e. maintaining views across the Project to middleground and background features)

Sample Simulation | Module 1

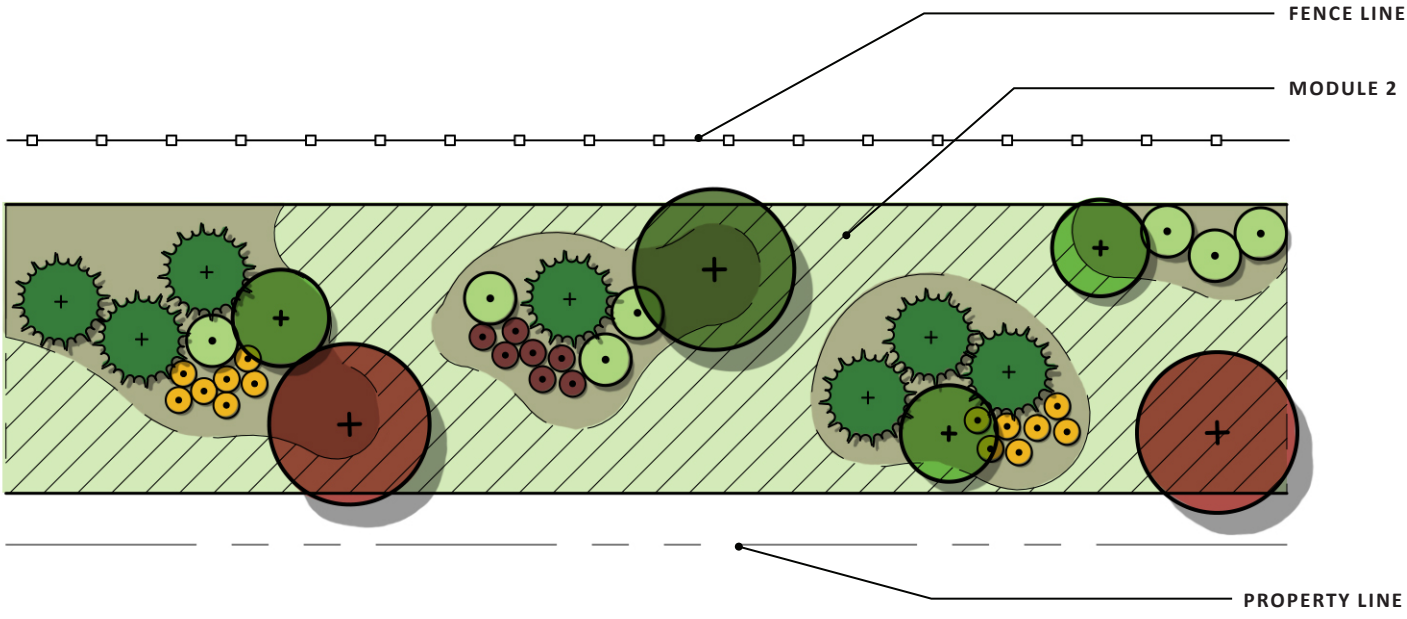


Sample Layout | Module 1

Module 2 | Vertical softening

Module 2 is designed for use in areas where there is potential for high viewership and visibility, but where stationary activity, such as residential or recreational activity, is low. This module is appropriate along more major roadways and select areas along the perimeter of proposed solar arrays. The primary goal of this module is to interrupt the horizontal lines of the Project components, allowing the proposed vegetation and components to blend into the vegetated background.

Sample Simulation | Module 2

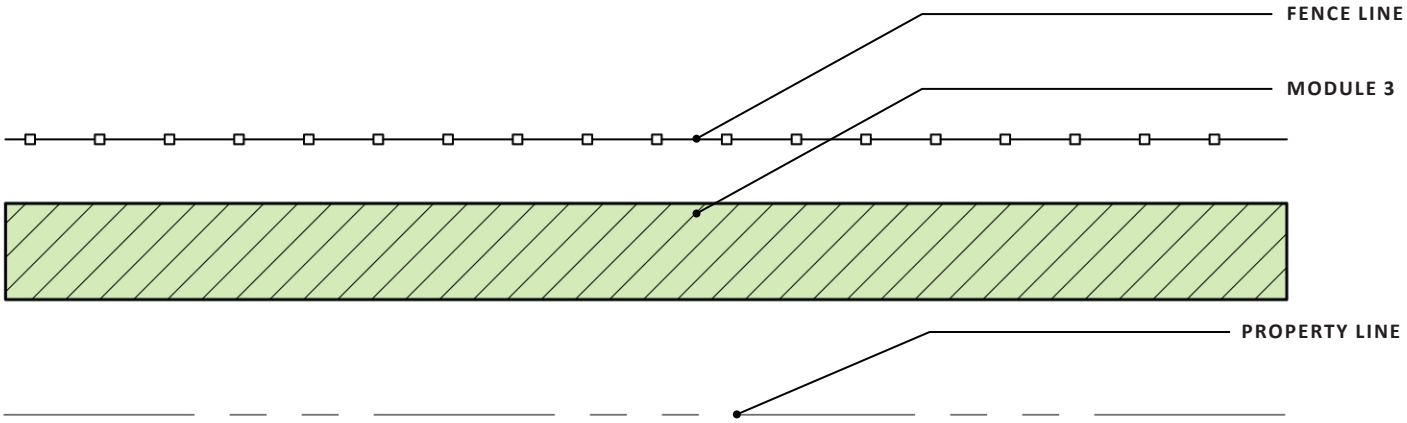


Sample Layout | Module 2

Module 3 | Pollinator Habitat

Module 3 is intended to help establish a visual and ecological buffer along the fence line in areas where viewer exposure is generally low or fleeting in nature. The mix of herbaceous plant material is intended to provide habitat for local pollinators as well as provide seasonal color and interest.

Sample Imagery | Module 3



Sample Layout | Module 3

Section 5 | Plant Palette

Red Oak *(Quercus rubra)*
Native to Connecticut: Yes
Fall color: Russet red to bright red
Maximum Growth Height: 50'-75'
Ecological Benefit: Northern Red Oak provides cover and nesting material for a wide variety of birds and mammals; acorns provide a food source for many birds and mammals. Adaptable to unproductive environments and therefore useful in rehabilitation projects.
Form & Texture: Rounded in youth, round topped and symmetrical with age; medium texture; fast growing.

Red Maple 'Red Sunset' *(Acer Rubrum 'Red Sunset')*
Native to Connecticut: Yes ('Red Sunset' is a cultivated variety of acer rubrum)
Fall color: Excellent orange to red
Maximum Growth Height: 40'-50'
Ecological Benefit: Maples provide food and cover for many species of wildlife. Red Maple is tolerant of many types of disturbed sites, and water-logged soils.
Form & Texture: Pyramidal to rounded outline; medium texture; medium to fast growing

White Spruce *(Picea glauca)*
Native to Connecticut: Yes
Fall color: Evergreen
Maximum Growth Height: 40'-60'
Ecological Benefit: Provides forage, cover, denning and nesting sites for mammals and birds. White spruce can be found growing in abandoned agricultural fields in New England.
Form & Texture: Narrow, conical, branches held horizontally. Dense when young, becoming looser and more open with age. Medium texture.

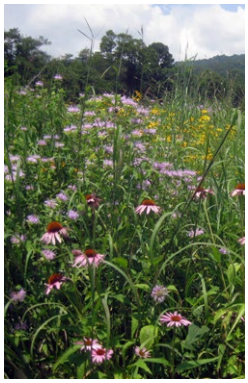
Shadblow Serviceberry *(Amelanchier canadensis)*
Native to Connecticut: Yes
Fall color: Gold
Maximum Growth Height: 25'-30'
Ecological Benefit: Fruit provides an important food source for many birds and other wildlife.
Form & Texture: Large shrub or multi-stemmed small understory tree. Medium in texture

Eastern Red Cedar *(Juniperus Virginiana)*
Native to Connecticut: Yes
Fall color: Evergreen. Needles may have a bronze cast in the coldest months.
Maximum Growth Height: 30'-65'
Ecological Benefit: Many birds and mammals eat the berry-like cones, especially in winter. The evergreen foliage provides good nesting and roosting cover. Eastern Red Cedar is tolerant of difficult sites and commonly found along interstate highway medians.
Form & Texture: Conical in youth, becoming open and irregular with age. Medium in texture; moderate growth rate.

Northern Bayberry *(Myrica Pensylvanica)*
Native to Connecticut: Yes
Fall color: Semi-evergreen, can turn bronze or tan through autumn and winter.
Maximum Growth Height: 5'-10'
Ecological Benefit: Fruit is a food source to birds. Provides shelter for game and other mammals. As a nitrogen-fixing plant bayberry improves soil fertility; it is adaptable to difficult growing conditions including roadsides; provides soil stabilization.
Form & Texture: Semi-evergreen to deciduous shrub with upright spreading branch habit. Multi-stemmed and suckering to form colonies. Medium in texture, interesting branch habit visible in winter.

Highbush Blueberry *(Vaccinium corymbosum)*
Native to Connecticut: Yes
Fall color: Excellent variety of red, orange, purple and yellow.
Maximum Growth Height: 6'-12'
Ecological Benefit: Blueberries provide important summer and early fall food for numerous species of birds. Some mammals and humans alike enjoy the highly palatable fruit. Bees are the primary pollinator.
Form & Texture: A deciduous twiggy multi-stem shrub with an irregular to rounded outline. Medium texture.

Winged Sumac *(Rhus copallina)*
Native to Connecticut: Yes
Fall color: Rich red, crimson, and scarlet.
Maximum Growth Height: 7'-15'
Ecological Benefit: Mature sumac berries are eaten by grouse, wild turkey and songbirds; the thickets of winged sumac provide environmental protection for a variety of birds and mammals. Soil adaptable.
Form & Texture: A small deciduous suckering tree with an open, irregular crown and crooked branches, becoming picturesque with age. Medium texture in summer, coarse in winter; growth rate fast from root suckers, slower on old wood.



Pollinator Mix

Native to Connecticut: Yes

Fall color: A pollinator meadow will offer a wide range of colors typical of fall foliage.

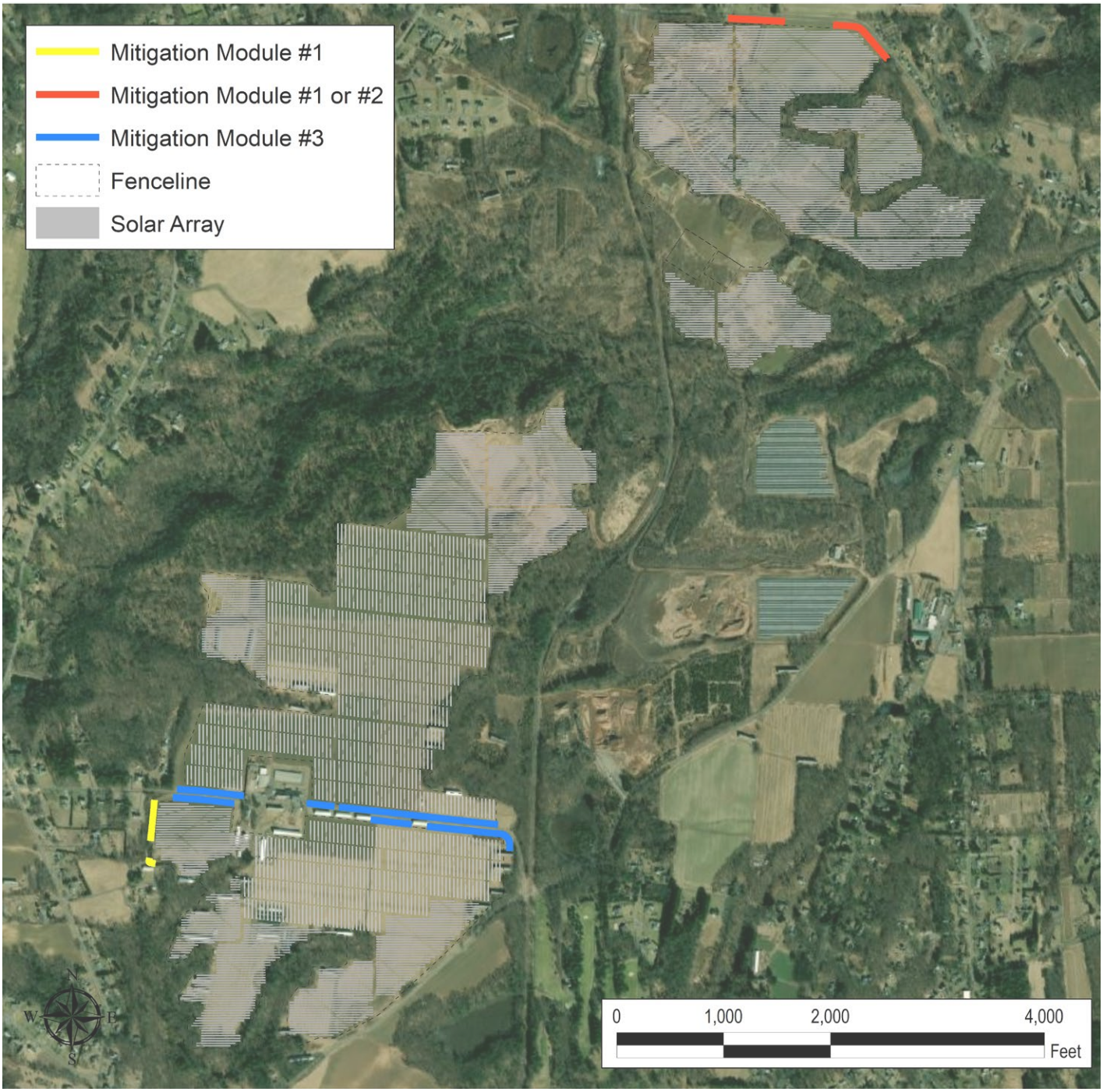
Maximum Growth Height: 3'-5'

Ecological Benefit: Individual plants are selected for their value as a pollinator species. A pollinator meadow will attract and provide habitat for a variety of pollinators and songbirds.

Form & Texture: Being a mix of native grasses and wildflowers pollinator meadows provide a beautiful variety of intertwined form and texture.

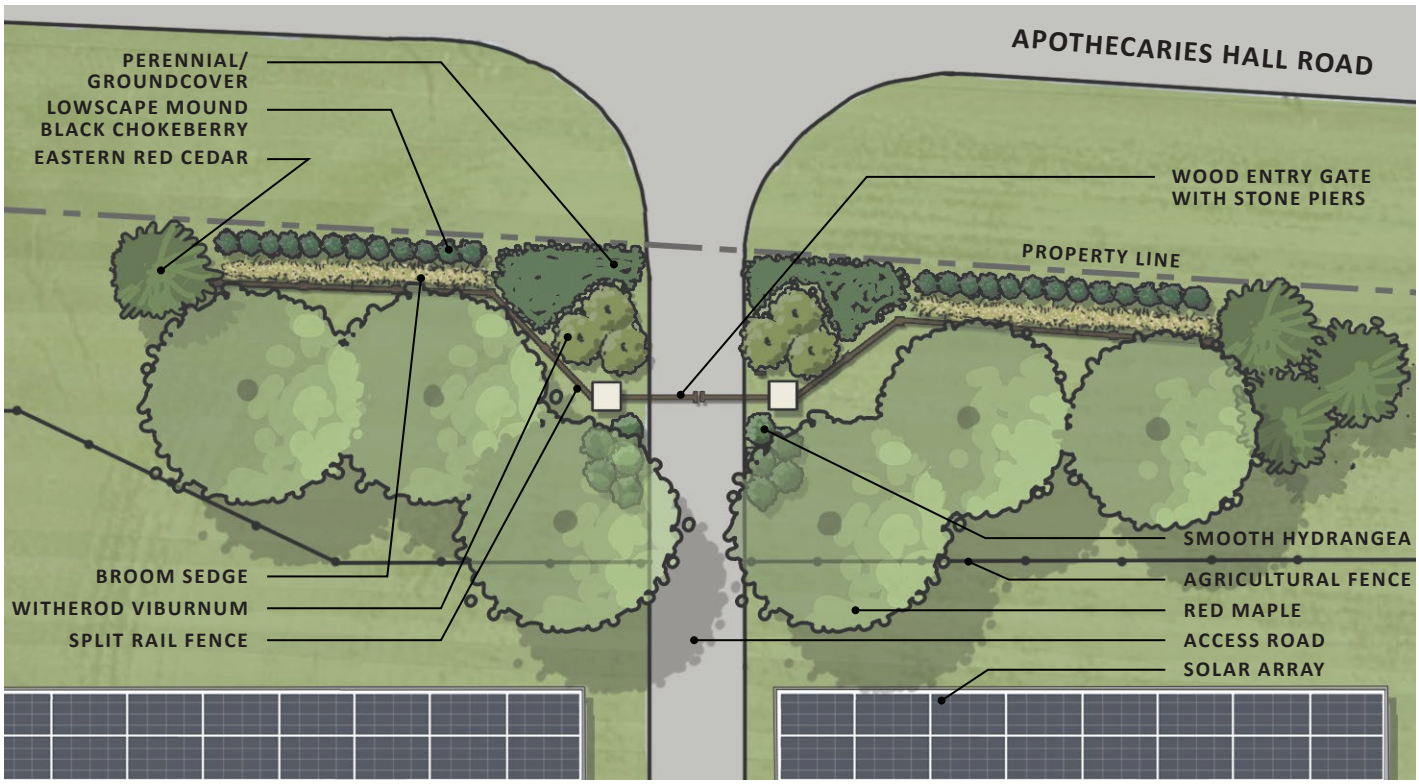
Section 6 | Location of Planting Modules

Landscape Architects at EDR used desktop analysis and information gathered on-site to propose potential appropriate locations for the proposed modules outlined in Section 4. These locations were selected to match the proposed module with the anticipated degree of Project visibility and viewer exposure/activity. This review determined which module type will be most fitting for specific portions of the Project, including seldom seen areas, areas adjacent to roadsides, and areas adjacent to residences that have little or no existing screening.



Section 7 | Enhancement of Access Road Entry Points

Access roads are an important component to assist in the long-term maintenance and functionality of the Project. The interface between the access roads and the public road network provides an opportunity to create a gateway to better integrate the access road into the surrounding context. For example, in residential areas, access road entries could be designed to resemble a residential driveway which would provide a visual buffer and a locally appropriate landscape treatment.



Plan Rendering | Access Road Entry Point

Agricultural Fence

Wood Entry Gate with Stone Piers

Split Rail Fence

Precedent Imagery | Access Road Entry Point

Section 8 | Conclusion

The recommended mitigation strategies provided in this plan would likely result in a regionally and locally appropriate visual buffer, which is also intended to enhance habitat and foraging opportunities for a local fauna. In agricultural landscapes, such as the Project Site, it is important to maintain the character of the visual setting while providing mitigation that responds to the potential visual effects resulting from the Project. As illustrated in this plan and in the Visibility Assessment, the proposed mitigation for the Gravel Pit Solar Project aims to achieve the following goals:

- Minimize the visibility of the Project along portions of Apothecaries Hall Road which will effectively reduce potential visual impacts to neighbouring residents.
- Provide ecological benefits by using native plant material which will provide foraging and habitat opportunities for fauna.
- Promote native species indigenous to the region while reducing the presence of invasive species on the Project Site.
- Provide annual and perennial plants that will be beneficial to native pollinators.
- Minimize the industrial connotation suggested by the use of chain link fencing, by using a wood post agricultural style fencing.
- Enhance the Project access roads where they meet public roads by introducing materials and plantings that soften the entrance, similar to a residential driveway.

It is anticipated the proposed plan will be effective in achieving the goals of the Project. However, appropriate planting medium, the presence of utilities, and input from the local municipality and Project stakeholders may result in alterations or substitutions of the proposed materials. It is anticipated the concepts included in this plan would result in the successful mitigation of the potential visual effects resulting from the Project.