Mohawk Solar

Case No. 17-F0182

1001.21 Exhibit 21

Geology, Seismology, and Soils

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EXHIBIT 21 GEOLOGY, SEISMOLOGY, AND SOILS

This exhibit includes a study of the geologic, seismologic, and soil impacts of the Facility[1]. It includes mapped or otherwise identified existing conditions, an impact analysis, and proposed impact avoidance and mitigation measures.

(a) Existing Slopes Map

A map delineating existing slopes (0-3%; 3-8%; 8-15%; 15-25%; 25-35%; and 35% and over) on and within the drainage area potentially influenced by the Facility Site and interconnections was prepared using the USGS National Elevation Dataset and is included in the Exhibit E of the Report of Expected Geotechnical Conditions (Appendix 21-A) prepared by Terracon Consultants-NY, Inc. (Terracon). Existing slopes are also depicted on Figure 21-1. Digital Elevation Model (DEM) data were processed using ESRI ArcGIS® Software to delineate a drainage area and develop slope mapping. The map includes and labels surface water features in and around the Facility Site. The Preliminary Stormwater Pollution Prevention Plan (SWPPP) (Appendix 21-B) describes how and where stormwater from the site discharges and references the associated tributaries and other water bodies that appear on the mapping.

(b) Proposed Site Plan

See the Preliminary Design Drawings included with Exhibit 11, which include existing and proposed contours at 2-foot intervals for the Facility Site and interconnections.

(c) Cut and Fill

Cut and fill calculations discussed in this Section are preliminary and based on the above-described contour data. Topsoil, sub-soil, and bedrock were approximated based on publicly available data from the Montgomery County Soil Survey and the results of preliminary geotechnical investigations.

In the initial design process, the Applicant developed design parameters for Facility components, as shown in the Preliminary Design Drawings in Exhibit 11. These design parameters minimize areas of cut and fill wherever possible, however, there remain various scenarios where cut and fill are unavoidable. For example, cut and fill will be necessary for site access roads, perimeter access drives, and the construction of the collection substation and point of interconnection (POI) switchyard.

[1] As defined throughout this Application, the Facility refers to all components of the proposed project, including PV panels and support structures, inverters, access roads, buried and above ground collection lines, a generation tie line (or "gen-tie"), a substation, a switching station, fences, and staging areas.

It is estimated that 65,000 cubic yards of material will be excavated for the construction of the proposed Facility, based on 2-foot contours interpolated from publicly available Montgomery County LiDAR data. Of this amount, approximately 22,000 cubic yards will be topsoil, and 43,500 cubic yards will be subsoil. At this time, rock excavation is not anticipated for the construction of the Facility. Approximately 64,500 cubic yards of fill will be used in constructing the Facility. Of this amount, 21,500 cubic yards of fill will be topsoil, and 43,000 cubic yards will be subsoil fill. Cut soils will be stockpiled along the construction corridors to be used in site restoration and all such materials will be re-graded to approximate pre-construction contours.

(d) Fill, Gravel, Asphalt, and Surface Treatment Material

As previously noted, approximately 64,500 cubic yards of fill will be used in the construction of the Facility. Suitable fill will be used to create appropriate grades for site access roads, perimeter access drives, collection substation, POI switchyard, the O&M building, and laydown areas. Besides gravel, fill will be derived from excavated material. Gravel will be brought into the Facility Site and used as surface material for access roads, and other Facility components. Approximately 19,300 cubic yards of gravel will be needed to surface access roads and the collection substation and POI switchyard. The approximate length of all Facility access roads is approximately 30 miles, 6.5 miles of which will be constructed with gravel. These roads will be a minimum of 20-feet wide, with a gravel foundation 8 inches deep. The collection substation and POI switchyard will be 260 feet by 273 feet and 217 feet by 350 feet, both underlain by gravel set approximately 6 inches deep. Final thickness of the access roads, collection substation, POI switchyard, and other Facility components will be determined during final design.

(e) Type and Amount of Materials to be Removed from the Facility

It is anticipated that approximately 650 cubic yards of cut or spoil may be removed from the Facility Site during construction if the material is not suitable for use on other parts of the site. During excavations, topsoil and subsoil will be segregated and stockpiled separately. Stockpiled soils will be stored in dry, upland areas, surrounded by silt fencing along the construction corridors, and will be used to revegetate landscaped areas or exposed slopes after the completion of grading operations or placed in non-structural areas and in fill sections not exceeding 5 feet in height.

(f) Excavation Techniques to be Employed

Excavation activities will be primarily associated with the construction of the collection substation and POI switchyard. The substation and switchyard sites will be cleared and graded, and topsoil and subsoil will be separated and stockpiled for use in restoration. The exposed subgrade will be proof-compacted with a heavy vibratory roller in static mode. Unstable subgrades will be removed and replaced with compacted structural fill, as necessary. Structural fill will then be placed to attain the required grade.

Although the exposed soil subgrade is anticipated to be relatively stable upon initial exposure, unstable subgrade conditions could develop during general construction operations, particularly if the soils are wetted and/or subjected to repetitive construction traffic. Should unstable subgrade conditions develop, stabilization measures, such as the addition of replacement fill, will need to be employed. Erosion control stabilization measures such as armored riprap, haybales, and silt fences, may also be utilized.

Foundation excavations will be completed using industry standard equipment (e.g., bulldozers, and track hoes). Temporary excavations will be shored, sloped or braced, as required by Occupational Safety and Health Administration (OSHA) regulations, to provide stability and safe working conditions. All excavations will comply with applicable local, State, and federal safety regulations, including the current OSHA Excavation and Trench Safety Standards. Concrete foundations for major equipment and structural supports will be placed, followed by the installation of various conduits, cable trenches, and grounding grid conductors.

The electrical collections system will be installed using direct burial methods. Industry standard equipment (e.g., cable plows) will be used. Direct burial will involve the installation of bundled cable directly into a narrow cut or "rip" in the ground. The rip would disturb an area approximately 24 inches wide. Bundled cable would be installed to a minimum depth of 36 inches in most areas, and 48 inches in agricultural areas.

Where direct burial is not possible, an open trench will be excavated. Topsoil and subsoil will be segregated and stockpiled adjacent to the trench for use in site restoration. As utility trenches can provide a conduit for groundwater flow, trenches will be backfilled with material that approximately matches the permeability characteristics of the surrounding soil. If higher permeability fill is used in trenches, consideration will be given to installing seepage collars and/or check dams to reduce the likelihood of migration of water through the trenches.

At locations where an electrical collection line crosses streams or wetlands, either a jack and bore crossing method or an open trench will be used. Jack and bore installation will involve digging a bore pit and a receiving pit, one on either side of the obstacle (e.g. stream or wetland). The crossing will be installed using a drilling or auger machine in the bore pit, which will create a path for the underground cable to be laid. Jack and bore methodology for cable installation avoids significant impacts to environmental resources by routing the cable beneath said resources. Typically, a cleared ROW is required during the installation of above ground or underground lines. By contrast, the jack and bore drilling method does not require surface disturbance or clearing activities between the bore pits. As a result, segments of underground line may be installed without disturbing surface resources, allowing trees and vegetation along the edge of roads and bank of streams to remain, and avoiding impacts to streams and wetlands. Minimal environmental impacts in the vicinity of the bore and receiving pits are likely. However, mitigation measures such as seeding may be used to manage environmental impacts.

(g) Temporary Cut and Fill Storage Areas

The construction of the access roads and other site features will require final grades of several areas of the Facility that necessitate cutting and/or filling. In the initial design process, the Applicant developed a basis of design for these features. Within these design parameters, the Applicant has aimed to minimize significant areas of cut or fill. However, various scenarios would create areas of cut and fill. Preliminary cut and fill locations are identified in the Preliminary Design Drawings (Appendix 11-A).

Proper methods for segregating stockpiled and spoil material will be implemented. Excavated soil will be reused to the maximum extent possible in the location from which it was excavated to limit opportunities for proliferation of non-native flora and other invasive species. Specific locations where cut and fill materials will be temporarily stockpiled have not been developed. Topsoil and subsoil spoils will be separated and placed in upland locations best suited to their storage, adjacent to the sites where they are excavated (e.g., access roads and trenches). Final cut and fill storage areas will be available following Certification and will be included in the final construction drawings.

(h) Suitability for Construction

Terracon conducted a preliminary geotechnical investigation to evaluate the surface and subsurface soils, bedrock, and groundwater conditions within the Facility Site. The results of the investigation are summarized in Terracon's Report of Expected Geotechnical Conditions (see Appendix 21-A). Based on Terracon's findings, the Facility Site is generally suitable for the proposed development. As part of this evaluation, Terracon:

- Investigated subsurface soil and bedrock conditions through sampling and limited geotechnical laboratory testing at 25 boring sites. Boring locations were sited to be proximal to where the PV mounts and the collection substation and POI switchyard will be located.
- Conducted a literature review and obtained publicly available data regarding surface and subsurface soil, bedrock, and groundwater conditions, including: *Surficial Geologic Map of New York, Geologic (Bedrock) Map of New York, Soil Survey of Montgomery and Schenectady Counties, 2014 New York State Hazard Map, USGS Earthquake Hazards Program, and DMA 2000 Hazard Mitigation Plan Update for Montgomery County.*

- Analyzed the available data to determine the suitability of the site for construction.
- Developed a full Preliminary Geotechnical Investigation, included as Appendix 21-A, that discusses:
  - Surface Soils
  - Subsurface Soils
  - Bedrock Conditions
  - Groundwater Conditions
  - Chemical and Engineering Properties
  - Laboratory Testing
  - Seismic Considerations
  - Construction Suitability Analysis and Recommendations

Before construction commences, a site survey will be performed to stake out the exact location of proposed Facility components. Once site surveys are complete, a detailed geotechnical investigation will be performed to verify subsurface conditions and facilitate the development of final designs for the Facility.

(i) Preliminary Blasting Plan

No blasting will be required in the construction of the Facility. As detailed in the Report of Expected Geotechnical Conditions, the depth of bedrock and its observed poor rock quality conditions indicate blasting would likely not be necessary. Shallow bedrock at several locations may prevent the installation of driven steel piers or ground screws to a sufficient depth. At these locations, pre-drilling would be performed to set and install PV steel piers. Based on the preliminary geotechnical investigation, the Applicant assumes that any bedrock or boulders encountered during construction of associated structures or collection lines will be rippable with an excavator or able to be broken with a pneumatic hammer.

(j) Potential Blasting Impacts

As detailed in Section (i), blasting will not be used in the construction of the Facility.

(k) Mitigation Measures for Blasting Impacts

As detailed in Section (i), blasting will not be used in the construction of the Facility.

(l) Regional Geology, Tectonic Setting, and Seismology

The Facility is located within southern to middle portions of Montgomery County, and is part of the Hudson-Mohawk physiographic province. Surficial geologic deposits distributed throughout the Hudson Valley consist of several types of glacial deposits that are associated with continental glaciation. Based upon the Surficial Geologic Map of New York, Hudson-Mohawk Sheet, the surficial deposits at the Facility Site may be classified as “glacial till”. The Geologic

Map of New York, Hudson-Mohawk Sheet, classifies the underlying bedrock as Utica Shale of the Middle Ordovician geologic period (NYSM/NYSGS, 1999). No known or suspected areas of karst geology are located within the Facility area, given karst geology forms in limestone bedrock and the dominant bedrock in the Facility area is black shale and shale formations.

New York state generally has low tectonic activity. Although portions of the State have moderate tectonic activity, these moderately active locations are not found proximal to the Facility Site. Within New York, areas with higher probability of earthquake occurrences are located along the northern (St. Lawrence River Valley), western (Buffalo-Attica regions), and southern (New York City region) portion of the State. The Facility Site is located within the area of lowest probability occurrence. The New York State (NYS) Seismic Hazard Map shows levels of horizontal shaking, in terms of percent of the gravitational acceleration constant (%g), that is associated with a 2% probability of occurring during a 50-year period. The Facility Site is located in an area with the lowest seismic hazard class rating in New York (2% probability of exceeding 0.04 to 0.08g in a 50-year period). The USGS Earthquake Hazards Program does not list any young faults, or faults that have had displacement in the Holocene epoch within the vicinity of the Facility Area. Therefore, no seismic activity-related impacts are anticipated within or immediately adjacent to the Facility Site.

(m) Facility Impacts on Regional Geology

The glacial till deposits and/or bedrock encountered at the Facility Site are structurally suitable for support of PV panel foundations and associated structures, as detailed in the Report of Expected Geotechnical Conditions (Appendix 21-A). Prior to construction, the Applicant will carry out additional subsurface investigation activities. Depth to bedrock in the Facility Site is expected to be variable and it is possible some PV panel foundations may require drilling into bedrock. However, the proposed PV development is not anticipated to result in significant impacts to the regional geology.

Based on the Applicant's experience constructing other solar power facilities (including in NYS), only temporary, minor impacts to geology are expected as a result of construction activities. For example, cut and fill will be required where PV panels, associated structures, and access road sites are not located on completely level terrain; however, the impact to overall topography will be minor. Once operational, impacts to geology will be minimal.

To the extent practical, Facility components will be designed, sited, and constructed in a manner that avoids or minimizes temporary and permanent impacts to physiography, geology, and soils. Accordingly, the Facility is not anticipated to result in any significant impacts to the regional geology.

(n) Impacts of Seismic Activity on Facility Operation

See Section (l) for a discussion of the anticipated impacts of seismic activity on the Facility.

(o) Soil Types Map

See Figure 21-2 for a map delineating soil types within the Facility Site in relation to the proposed Facility layout. The Prime Farmland, Prime Farmland if Drained, and Farmland of Statewide Importance geospatial data contained in this map were obtained from the Soil Survey Geographic Database (SSURGO). According to the Natural Resources Conservation Service (NRCS), these three farmland classes are the only farmland classes recognized in New York. As a result, Unique Farmland and Farmland of Local Importance were not mapped. See Exhibit 4 for a full discussion of the agricultural use and productivity of farmlands within the Facility Site.

(p) Characteristics of Each Soil Type and Suitability for Construction

Information regarding on-site soils was obtained from investigations conducted by Terracon detailed in Section 21(h), including, a literature review, a site visit to observe surficial features and assess general constructability of the proposed Facility, and a preliminary subsurface investigation.

The Soil Survey Montgomery and Schenectady Counties, New York (USDA, 1978) indicates the Facility Site consists of 45 individual soil map units (soil map units comprised of greater than 1% of the Facility area). Thirteen soil series (Angola, Appleton, Burdett, Churchville, Darien, Fluvaquents, Fonda, Hornell, Ilion, Lansing, Madalin, Palatine, and Rhinebeck) comprise approximately 90% of the Facility Site soils. General descriptions of the 13 series are provided in Table 21-1 below, see Appendix 21-A for additional detail.

Table 21-1. Soil series and their characteristics within the Facility Site.

Soil Series	Main Characteristics
Angola Series **(3 to 8% slopes, prime farmland if drained)**	• Medium-textured soils, somewhat poorly drained • Depth to bedrock approximately 2 to 3 feet • Seasonal minimum water table depth approximately 9 inches • Nearly level and gently sloping • Organic material is approximately 4.5%
Appleton Series **(3 to 8% slopes, prime farmland if drained)**	• Silt loam; somewhat poorly drained, medium textured • Deep, bedrock not identified in preliminary geotechnical investigations • Seasonal minimum water table depth approximately 11 inches • Organic material is approximately 5.1%

Soil Series	Main Characteristics
Burdett Series **(3 to 15% slopes, prime farmland if drained/farmland of statewide importance)**	• Loamy till; somewhat poorly drained, medium textured • Nearly level to sloping • Deep, bedrock not identified in preliminary geotechnical investigations • Seasonal minimum water table depth approximately 9 inches • Organic material is approximately 4.5%
Churchville Series **(3 to 8% slopes, prime farmland if drained)**	• Silty clay loam; somewhat poorly drained, moderately fine textured • Deep, bedrock not identified in preliminary geotechnical investigations • Seasonal minimum water table depth approximately 7 inches • Nearly level and gently sloping • Organic material is approximately 4%
Darien Series **(3 to 8% slopes, prime farmland if drained/farmland of statewide importance)**	• Loamy till; somewhat poorly drained, medium textured • Deep, bedrock not identified in preliminary geotechnical investigations • Seasonal minimum water table depth approximately 7 inches • Nearly level to sloping • Organic matter approximately 5.5%
Fluvaquents (**Not prime farmland)**	• Loamy; poorly drained, medium to coarse • No bedrock identified in preliminary geotechnical investigations • Seasonal minimum water table depth approximately 6 inches • Frequently flooded • Organic material is approximately 2.5%
Fonda Series **(No prime farmland)**	• Silty clay loam; very poorly drained, moderately fine textured • Deep, no bedrock identified in preliminary geotechnical investigations • Water table near surface • Nearly level • Organic material is approximately 75%
Hornell Series **(3 to 8% slopes, farmland of statewide importance)**	• Silt loam; somewhat poorly drained or moderately well drained, medium textured • Moderately deep; depth to bedrock from 2 to 3 feet • Seasonal minimum water table depth approximately 8 inches • Nearly level to sloping • Organic material is approximately 4%
Ilion Series **(0 to 8% slopes, farmland of statewide importance)**	• Silt loam; poorly drained, medium textured • Deep, no bedrock identified in preliminary geotechnical investigations • Water table near surface • Nearly level and gently sloping • Organic material is approximately 5.5%

Soil Series	Main Characteristics
Lansing Series **(3 to 25% slopes, not prime farmland/all areas prime farmland/farmland of statewide importance)**	• Silt loam; well drained, medium-textured • Deep, no bedrock identified in preliminary geotechnical investigations • Water table near surface • Gently sloping to very steep • Organic material is approximately 3.1%
Madalin Series **(Farmland of statewide importance)**	• Silty clay loam; poorly drained and very poorly drained, moderately fine textured • Deep, no bedrock identified in preliminary geotechnical investigations • Water table near surface • Nearly level • Organic material is approximately 8.1%
Palatine Series **(8 to 15% slopes, farmland of statewide importance/all areas prime farmland/not prime farmland)**	• Silt loam; poorly drained and very poorly drained, moderately fine textured • Deep, depth to bedrock approximately 2 to 3 feet • Water table near surface • Nearly level • Organic material is approximately 6%
Rhinebeck Series **(0 to 8% slopes, prime farmland if drained)**	• Silty clay loam; somewhat poorly drained, moderately fine-textured • Deep, no bedrock identified in preliminary geotechnical investigations • Seasonal minimum water table depth approximately 7 inches • Nearly level and gently sloping • Organic material is approximately 5%

Source: Soil Survey of Montgomery and Schenectady Counties, New York (USDA, 1978)

Most soils in the Facility Site are silt loams and channery silt loams, but textures such as silty clay loam and gravelly silty loam are present in small areas. The Report of Expected Geotechnical Conditions addresses the suitability and limitations of these and other soils listed in Table 21-1 for the proposed site development, including excavation stability, erosion hazard, corrosion potential, and structural integrity. The Report of Expected Geotechnical Conditions and the Preliminary Design Drawings discuss best management practices (BMPs) that will be employed to stabilize the Facility Site, ultimately minimizing risks and hazards to the Facility and construction personnel. As mentioned in Section (f), excavations will comply with OSHA, local, state, and federal safety regulations.

Based on information from the Montgomery and Schenectady County Soil Survey, construction excavations may encounter areas of perched groundwater if construction occurs during a time when a seasonally high-water table may be present (spring and fall). In addition, hydraulic conductivity within the Facility Site is low; therefore, construction during rainy periods may see an increase in perched groundwater. Construction dewatering may be required for surface water control and for excavations that encounter perched groundwater conditions, groundwater, or seepage. Open sump pumping method is a common and economical method of dewatering and is anticipated to be sufficient based on relatively low permeability soils found within the Facility Site. See Exhibit 23, Section (a)(3) for a discussion of how pumped water will be managed. The final geotechnical investigations will determine whether long-term dewatering will be necessary.

Prior to construction, the Applicant will carry out an additional geotechnical investigation within the footprint of the proposed PV array fields and associated structures. Soil samples will be collected and tested for typical corrosivity parameters (e.g., sulfates, chlorides) for verification. Test results will be used by the foundation designers for consideration of concrete and steel design requirements.

(q) Bedrock Analyses and Maps

Maps, figures, and analyses on depth to bedrock, underlying bedrock types, vertical profiles of soils, bedrock, water table, and seasonal high groundwater are provided in the Report of Expected Geotechnical Conditions (Appendix 21-A). These maps and analyses were created using U.S. Fish and Wildlife Service Online Spatial Geology Data, the U.S. Department of Agriculture NRCS Web Soil Survey, and the preliminary geotechnical analysis. In addition, Figure 21-3 shows depth to bedrock, bedrock formation, and depth to the high water table across the Facility Site relative to Facility components. Typical panel support structure and inverter foundation depths are provided in Appendix 21-A, while typical panel support structure details are provided in Appendix 11-F. The foundation bases will be placed below the frost depth, which is anticipated to be 48 inches (4 feet) at the Facility Site. The maps included in the Report of Expected Geotechnical Conditions show all boring locations advanced during the preliminary geotechnical investigations and Facility components, including access roads and interconnections. Areas designated for stockpiling of spoils and fill materials are identified. Layout for spoil materials temporarily stockpiled adjacent to access roads and trenches are also provided. A boring location map and complete boring logs are included in the Report of Expected Geotechnical Conditions.

Competent bedrock, confirmed by bedrock coring, was encountered in in several boring locations at depths of approximately 9 to 10 feet below existing ground surface. Decomposed bedrock was encountered in most of the borings across the Facility Site at shallower depths. The bedrock encountered is anticipated to be structurally suitable for support of the collection substation and POI switchyard foundations, support buildings, and access road construction. Driven piers may encounter refusal above the required embedment depth. Where this occurs, oversized holes will be drilled to allow for the installation of the piers to the required embedment depth. Ground screws may also be used to support the racking system that supports the panels. If ground screws cannot penetrate the bedrock sufficiently, an oversized hole will be drilled to facilitate screw installation. Photovoltaic mount locations will undergo additional subsurface investigation prior to construction.

(r) Foundation Suitability Evaluation

(1) Preliminary Engineering Assessment

Foundation construction will be primarily associated with the PV mounts, collection substation and POI switchyard, O&M building, and equipment pads. As detailed in Section (h), the Facility Site has been analyzed and found to be suitable to the foundation types proposed.

PV panels will be supported on driven piers installed to a depth of at least 4 feet due to the depth of frost action. Ground screws may also be used to support the driven piers of the racking system. Based on geological conditions of the Facility Site, installation of piers and ground screws may be hindered by ground refusal at required embedment depths. If this occurs, it may be necessary to pre-drill oversized holes to allow the driven piers to be installed. Additional foundations for the collection substation and POI switchyard, O&M building, and equipment pads may include the following: cast-in-place concrete spread; continuous foundations; drilled concrete shafts; or reinforced concrete mats. These foundations will vary depending on the Facility component. The width of the foundations will vary as well, ranging from 1.5 to 4 feet for continuous and spread footing foundations, and up to 40 feet for reinforced concrete mats.

Based on Terracon's geotechnical investigations, soils within the Facility Site are susceptible to frost. Frozen soils may exert a heaving force on the supports. If the anchorage of the foundations and the deadweight of the structures are not enough to resist these forces, they can cause uplift. Driven piers will be designed to be long enough to counteract potential heave forces in the seasonal frost zone. Thawing soils typically have significantly less strength than frozen or fully thawed soils. Therefore, the seasonal frost zone will be ignored for use in resisting axial tension or compression loads and the foundations for Facility components will be constructed at a suitable depth below the frost line, assumed to be 4 feet below ground surface. For design purposes, weathered bedrock will be treated as soil.

The soil observed in the test borings generally consists of non-plastic silt with varying amounts of sand and gravel. Accordingly, soils found on-site should have minimal shrink/swell potential. As a result, specific construction procedures associated with potential expansive clays will not be required for the Facility.

Typical pier foundation depths range from 6.5 to 8 feet (Appendix 21-A). However, the final design length of driven supports is not known at this time and will primarily be dependent on the embedment/lateral capacity required to resist live loading (e.g., the combination of wind and ice loads). During the detailed engineering phase, technical specifications will be prepared. This phase will require material and installation detail submittals, as well as proof of experience in driven support installation. See the Report of Expected Geotechnical Conditions for a full discussion of pier foundation construction considerations.

Switchgear, transformers, and other electronic equipment are expected to be supported on mat foundations. Further, it is anticipated that there will be pole mounted equipment inside of the substation, and large diameter drilled shafts for dead-end transmission line structures. These foundations will be constructed in several stages, and will include: ground excavation, rebar and bolt cage assembly, outer form setting, casting and finishing of the concrete, removal of the forms, backfilling, compacting, and site restoration.

Excavation and foundation construction will be conducted in a manner which will minimize the size of the excavation area and duration of time required to install foundations. These foundations will be constructed and inspected in accordance with relevant portions of the NYS Building Code and in conformance with the Report of Expected Geotechnical Conditions, and preconstruction site-specific studies.

(2) Pier Driving Assessment

The driven foundations used to support the PV panels will be similar to foundations for highway signs or guide rails. These driven piers are insignificant compared to those used in typical sheet pile foundations and the negative effects of installation will be commensurately smaller.

The pier driving process will be performed under the direction of a Geotechnical Engineer. The load carrying capacity of the piers will vary when installed by different methods (e.g., driving vs pre-drilled, grout filled holes). Production pier testing will be performed on piers installed using each installation method to confirm their capability to carry the foundation loads. Actual pier lengths will be determined by full-scale pier load testing at the time of construction. The Geotechnical Engineer will document the pier installation process, including soil, rock, and groundwater conditions encountered; consistency with expected conditions; and details of the installed pier.

The contractor will submit a pier driving plan and a pier hammer-cushion combination to the engineer for evaluation prior to pier installation. Each pier will be observed and checked for buckling, crimping and alignment and penetration resistance, depth of embedment, and general pier driving operations will be recorded by the Geotechnical Engineer.

(3) Mitigation Measures for Pier Driving Impacts

As outlined in Exhibit 21(r)(2), pier foundations used to support PV panels are light capacity as compared to piles typically used in the construction of bridges and buildings. High-speed impact hammers are the most widely used application for driving light capacity piers. Vibrations generated by high-speed hammers are typically low and transfer at short distance. Vibratory driver extractors, DTH hammers, and auger drills (for pre-drilling or installing ground screws) may also be used for this project as supplemental tools to the impact hammer.

Although vibrations from pier driving in solar applications may be significantly below the levels associated with typical pile driving applications, vibration monitoring will be performed for all pier driving that occurs within 200 feet of existing structures or utilities sensitive to vibrations. Vibration monitoring will continue until monitoring results indicate that peak particle velocity (PPV) is less than or equal to 0.5 inch per second.

(s) Vulnerability to Earthquake and Tsunami Events

As previously indicated, the Facility appears to have minimal vulnerability associated with seismic events based on review of publicly available data. However, components of this Facility will be evaluated, designed, and constructed to resist the effects of earthquake motions in accordance with the American Society of Civil Engineers (ASCE) 7. The seismic design category for Project structures will be determined in accordance with Section 1613 of the NYS Building Code or ASCE 7.

The Facility is located approximately 100 miles from the nearest large water body (Lake Ontario). Therefore, vulnerability associated with tsunami events will not be discussed in this Application.

REFERENCES

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