H.W. Lochner (Lochner) in collaboration with Stahl Sheaffer Engineering (Stahl Sheaffer) has developed this work plan based upon information provided in a request for proposal (RFP) dated July 19, 2018 from Cassadaga Wind. Based upon the proposed site plan included in the RFP, there are approximately 31.7 miles of public roadways planned to be used for the wind farm development.

Task 1 – Road Condition Report Preparation

This task includes the scope of work to prepare a road condition report for the Cassadaga Project in Chautauqua County, NY. The following roads and limits will be included in the study:

Agency	Road Name	From	To	Length (mi)	Number of Cores	Core Locations
Town of Arkwright	Hall Road	Charlotte Hall Rd	County Route 70	1.187		
Town of Charlotte	Cook Road	County Route 77	T4 Access/ Lewis Road	0.683		
Town of Charlotte	Cassadaga Road	Hall Road	County Route 77	2.496		
Town of Charlotte	North Hill Road	T 20 Access	T3 Access	0.536		
Town of Charlotte	Hall Road	T43 Access	Arkwright Hall Road	3.616		
Town of Charlotte	East Road	Substation Access	East Creek Road	1.868		
Chautauqua County	Farrington Hollow / Erwin Road	T2 Access	Villenova Twp - Plank Road	3.218	NA	NA
Chautauqua County	Rood Road	T 35 Access	Charlotte - Cassadaga Rd	0.993	NA	NA
Chautauqua County	Bard/ Cassadaga Road	NY 60	South Hill Road	9.927	NA	NA
Town of Cherry Creek	Plank Road	County Route 85	Villenova Twp - South Hill Rd	2.173		
Town of Cherry Creek	Weaver Hill Road	Villenova Plank Road	T23 Access	0.536		
Town of Cherry Creek	Boutwell Hill Road	Mill Creek Road	County Rote 85	2.858		
Town of Cherry Creek	Mill Creek Road	Charlotte - East Creek Rd	Boutwell Hill Rd	0.113		
Town of Villenova	South Hill Road	VIllenova Twp Plank Road	County Route 72	1.512		

There will be no geotechnical analysis, upgrade recommendations, or betterment strategy developed for the county roads.

Task 1A – Existing Road Assessment

A roadway surface condition report will be completed for roads that will be utilized for the Cassadaga Wind Project.

- Roadway surface condition survey in accordance with *ASTM Standard Practice for Road and Parking Lots Pavement Condition Index Surveys (D6433-09)* or for gravel roads the *TM 5-626 Unsurfaced Road Maintenance Management from Dept. of the Army (Jan 1995)*.
- Documentation of existing roadway damage by location, type, size, and severity with field data collected with a mobile LiDAR scan with georeferenced imagery.
- Photographs of existing damage or items of concern along the roadway.
- A high-definition video log of the roadway condition at the time of inspection
- Development of an initial Pavement Condition Index (PCI) to rate the overall condition of the roadway surface.

Task 1B – Roadway Geotechnical Investigation

Pavement coring, dynamic cone penetrometer (DCP), and falling weight deflectometer (FWD) for verification of existing strength of roadway. DCP testing in accordance with ASTM D6951 and manufacturers specifications. FWD testing in accordance with ASTM D4694 and ASTM 4695. Locations of cores, DCP's, and FWD's are depicted on the attached map. Traffic control in accordance with state-specific *Manual of Uniform Traffic Control Devices*. Includes:

- place state-specific One-Call Notifications
- Coordinate with road owner to acquire any coring permits, as necessary.
- Prepare pavement core, DCP, and FWD analysis summary reports.

Task 1C – Roadway and Structure Analysis and Report Preparation

- Perform pavement analysis on the selected public access routes.
    - Perform analysis to forecast design life based on excess traffic and operations schedule.
- Perform flexible pavement analysis in accordance with *AASHTO Guide for the Design of Pavement Structures, 1993* and in accordance with SSE *ME-1 Mechanistic-Empirical Pavement Analysis and Design Procedures*.
- Perform gravel road analysis in accordance with *Earth and Aggregate Surfacing Design Guide for Low Volume Roads, USDA EM-7170-16* and in accordance with SSE *ME-1 Mechanistic-Empirical Pavement Analysis and Design Procedures*.
- Prepare recommendations for roadway use.
    - Prepare roadway betterment project scope of work and cost estimate for roadways that are found to be not structurally sufficient.
- Evaluate safety issues and propose mitigations, if necessary

- All existing roadway bridge structures along the route will be documented by location, type, size, and weight restrictions, as applicable. Lochner identified thirteen (13) County/Town owned bridges and culvert structures that will be traversed for erection of the wind turbine generators.

    1) Review and assessment of existing bridges to determine disposition during delivery.

        Throughout the system there are five bridges of the thirteen structures identified along the project routes as follows:

        - County Road 85 (Erwin Rd)
            - 3 sided box founded on pedestals (signs of settlement) #6
        - County Road 72 (Bard/Cassadaga Rd)
            - 43'-6" Single Span Adjacent Plank Beam Bridge on Sheet Pile Abutment/Wings (Fabricated Steel Railing – 29'-6" Rail to Rail)
            - 23'-0" Two Span Concrete Slab Bridge founded on Conventional Abutments (Concrete Parapets – 24'-0" Curb to Curb)
            - 42'-0" Single Span Adjacent Plank Beam Bridge on Sheet Pile Abutment/Wings (Fabricated Steel Railing – 29' – 6" Rail to Rail)
            - 22'-0" Single Span Adjacent Plank Beam Bridge on Conventional Concrete

        Additionally there are eight culvert structures of the thirteen identified along the project routes as follows:

        - County Road 85 (Erwin Rd)
            - 3'x3' R/C Box Culvert with concrete wingwalls
            - 5'x5' R/C Box Culvert with concrete wingwalls (does not cross road – diverts channel around rock outcrop under portion of road)
            - 5'x8' Precast R/C Box Culvert with gabion wingwalls/headwalls
            - 5'x5' R/C Box Culvert with concrete wingwalls (does not cross road – diverts channel around rock outcrop under portion of road)
            - 5'x8' Precast R/C Box Culvert with gabion wingwalls and concrete headwalls
        - County Road 72 (Bard/Cassadaga Rd)
            - 6'x8' R/C Box Culvert with concrete wingwalls (runs diagonally through intersection of County Road 72 and County Road 85 near TriVal Farm)
            - 6'x9' R/C Box Culvert with concrete wingwalls (2' or less of fill)
            - 5'x12' R/C Box Culvert with concrete wingwalls/abutment (Fabricated Steel Railing – 29'-0" Rail to Rail)

    2) Review and assessment of all existing bridge and culvert structures to determine disposition during delivery. Within the project limits, over 20 culverts of various materials and cover depths are present.

    3) Based on the New York legal load and the truck configurations provided to Lochner by innogy, Lochner anticipates calculating the "worst-case" loading that can occur at any of these thirteen structures based on the provided truck configuration. Although, no lateral clearance issues at the structures were noted during the site visit and online research, Lochner will also confirm sufficient lateral clearance for each anticipated load configuration. Lastly, Lochner will also evaluate the need for steel plating for minor pipe culverts and underground utilities, if required

- Prepare final report documenting the roadway management plan (RMP).
- Provide one hard copy of each report and one DVD containing an electronic copy of the report and video to the owner and the RUA agency (if required).

Schedule of Work to be Completed

Task	Anticipated Completion Date
LiDAR Scan of Existing Roadway Condition	9/28/2018
High-Definition Video Log of Existing Roadway Condition	9/28/2018
Development of PCI to rate initial condition of the roadway	10/12/2018
Pavement Coring	9/15/2018
Falling Weight Deflectometer (FWD)	9/15/2018
Dynamic Cone Penetrometer (DCP)	9/15/2018
Pavement Analysis	10/12/2018
Existing Culvert/Structure Plan Research	10/5/2018
Existing Culvert/Structure Inspection and Evaluation	10/5/2018
Existing Culvert/Structure Analysis	10/19/2018
Recommendations for Structure Reinforcement/Repair	10/26/2018
Recommendations for Roadway Use	10/26/2018
Final Report Documenting the Roadway Management Plan (RMP)	10/26/2018