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Soils Report

For

Delaware River Solar, LLC
Solar Energy Facility

466 Yellow Mills Road
Town of Farmington, New York

Prepared by Schultz Associates, Engineers & Land Surveyors, P.C.

Dated: December 17, 2018

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December 17, 2018

RE: Delaware River Solar, LLC
Solar Energy Facility
466 Yellow Mills Road
Prime Soils Report

Background:

Delaware River Solar (DRS) is proposing to develop a 7 Mega Watt AC ground mounted Solar Photovoltaic (PV) System located at 466 Yellow Mills Road in the Town of Farmington. The Solar System will be three (3) 2.338 MW AC systems constructed within approximately 29.9 acres of a 135.4 acre agricultural parcel. The parcel is located in Ontario County Agricultural District 1, in the north east section of the Town, approximately 5 miles south of the Macedon town line, and Wayne County line. The parcel is owned by the Smith Family, who raise approximately 160 head of cattle and grow feedstock (typically hay) on the parcel.

According to the Soils Group Worksheet prepared by the Ontario County Soil and Water Conservation District, 84.5 acres of the parcel is comprised of soils classified as Class 1 through 4. The Smith family also owns an adjacent parcel to the west of the project site, which 6.7 of the 21.1 acres is comprised of soils classified as Class 1 through 4.

It is a requirement of the Town of Farmington Town Code that in order for a large-scale ground mounted solar PV system to be constructed on soils classified as Class 1 through 4 it must be shown that there is no feasible alternative area at the project location which will not impact these soils.

Town Requirements:

Section 8 of the Town of Farmington's Local Law No. 7 of the year 2017, Solar Photovoltaic (PV) Systems Regulations, states the Standards for facilities requiring a Special Use Permit. Part of Chapter 165-65.3.6(1)[b](3) reads:

"Large-scale ground mounted solar PV systems located upon Farmland located within the delineated Town of Farmington Farmland Active Farmland Map, Number 8, page 92 of the adopted Town of Farmington Farmland Protection Plan, shall be allowed on soils classified as Class 1 through Class 4 as documented upon the Soil Group Worksheets prepared by the Ontario County Soil and Water Conservation District and used by the Town Assessor in calculation of the Agricultural Use Exemption Values, a part of the New York State Department of Agriculture and Markets Agricultural Districts Law, once it can be determined by the Planning Board, that there is no feasible alternative."

At the December 5, 2018 meeting of the Town of Farmington Planning Board, the Board passed a Resolution, which in part, included the following:

"…that the Planning Board determines that the applicant is to prepare a Soils Group Worksheet Map for the entire holdings of the Smith Property and to have this map prepared in cooperation with the Ontario County Soil and Water Conservation District Office staff, so as to enable the Planning Board to determine that there is no feasible alternative area on this site that will not affect soils classified as Class 1 through 4, or that there are alternative soils of lower classifications on the site where there would be a lessened impact upon the loss of the more important farmland soils."

Appendix A of this report includes the Soils Group Worksheet Maps prepared by the Ontario County Soil and Water Conservation District Office staff for both parcels.

Parcel Analysis – Tax Map No. 10.00-01-37.110:

The Prime Soils color coded maps provided in Appendix B highlight the soil classification and restrictions or hardships found at the project location. Table 1.1 in Appendix C quantifies the areas depicted in the color coded maps.

The Soils Group Worksheet Map show the various soils types located on the project parcel. Soils classified as Class 1 through 4 include:

Class 2a:	Pb – Palmyra Cobbly Loam	62.1 acres
	Pd – Palmyra Gravelly Loam	00.7 acres
Class 2b:	Pk – Phelps Gravelly Silt Loam	20.4 acres
Class 3a:	Ok – Ontario Silt Loam	01.3 acres

The Class 1 though 4 soils make up 84.5 of the project parcels 135.4 total acres. Lower classification soils are 50.9 acres (135.4 – 84.5 = 50.9 acres). Map PS-1 shows the soil class division line which separates the Class 1 through 4 (yellow hatch) soils from the soils of lower classification (light blue hatch) on the site. As shown on this map the lower classification soils are located mainly in the southwest portion of the parcel.

The first restriction looked at when selecting the location for the proposed system were the site setbacks for a large-scale ground mounted solar PV system in the A-80 Agricultural Zoning District. As per Town Code Section 165-65.3.3(1)[b](1), the front setbacks shall be 180 feet and the side and rear setbacks shall be 160 feet. Map PS-2 shows the required setbacks along the exterior of the property (orange hatch). From Table 1.1, the site setbacks encumber a total of 35.4 acres. Of which, 15.3 acres are lower classification soils.

The second restriction shown on PS-2 is the wetland (red hatch) areas. The wetland area as shown on this map include the wetlands delineated by North Country Ecological Services, wetlands as mapped on the federal and state maps, the 100 foot buffer area associated with the state wetland boundary and the 100-year flood zone as shown on the FEMA Flood Insurance Rate Map (Panel No. 3612990010B). The wetland areas shown are a total of 27.2 acres with 17.6 acres located on lower classification soils. This

leaves 18.0 acres (50.9 – 15.3 – 17.6 = 18.0 acres) of lower classification soils that could be used to develop the solar facility.

Map PS-3 looks at the feasibility of locating the solar facility with respect to various limiting factors at the project site. The first factor is the existing mature woodlands (green hatch) on the parcel. A significant amount of the woodland areas are located within the wetlands mentioned above. Of the woodlands located on lower classification soils, approximately 0.2 acres are located to the north of the wetlands, 1.0 acres are adjacent the wetlands on the drumlin to the southeast and 0.4 acres is a separate finger of trees to the east of this.

In conjunction with the woodlands, is the location of the proposed solar system must take into account the shadow cast by the trees (dark purple hatch). The Shadow Cast by Trees Detail (Appendix D) on Sheet S-2 of the plan set, indicates the length of a shadow cast by a 50 foot tall tree at various times of the day on the most unfavorable day of the year. The shadow cast area shown on Map PS-3 only shows the area of the shadows cast by trees located within the wetland. The assumption is that the developer could feasibly clear cut any trees and/or vegetation outside the wetland and the associated buffer area. The area of the shadow cast by wetland trees is a total of 1.6 acres with 0.7 acres located on lower classification soils.

Map PS-3 also includes areas with steep slopes (teal hatch). Along Fox Road is a man made excavation that appears to have been a quarry or borrow pit location. This area has steep, nearly shear in some places, side slopes and is adjacent to the delineated wetland. The southern portion of the parcel is dominated by a large drumlin. The drumlin raises more than 75 feet through the parcel and a majority of the slopes are between 5% and 20%. The western portion of the drumlin is covered by the 1.0 acres of woodlands mentioned above. The justification for not placing the solar system on the north facing steep slopes of the drumlin is shown in Table 1.2 (Appendix E).

Appendix E shows the calculation used to determine the optimal width between rows based on the slope of the land to prevent a row of solar panel modules from casting a shadow on the adjacent row. The Table indicates that the optimal row width, assuming an average slope of -1.5%, is 18.8 feet. The proposed design uses a row width of 19 feet. For this calculation a negative slope is described to be the north face, meaning a slope that increases in elevation from north to south. Map PS-3 includes steep slopes over 5% as not being desirable for the solar system. At 5% slope a solar module will be 54% shaded by the module to the south of it at the peak time on the most unfavorable day. At 6% slope this increase to 76% shaded and at 7% slope it is 100% shaded. Being more than 50% shaded at the peak time of day during the unfavorable times of the year is not feasible for the solar system.

An option could be to increase the distance between the rows of modules on the steep slopes. This will not be feasible as a large portion of the drumlin not currently proposed for development has slopes of 10% - 20% which would require row spacing of 47 feet to over 500 feet. Of the 14.3 acres of steep slopes located on the site, 12.7 acres are located on soils with the lower classification.

Map PS-4 highlights the unbuildable areas (red hatch) of the setbacks and the wetlands, the undesirable areas (orange, green and purple hatch), the soils of class 1 through 4 (yellow hatch), the soils of lower classification (light blue hatch) and the location of the proposed system (white hatch). There is a total of 50.9 acres of lower classified soils on this site, 32.9 acres are unbuildable and 15.0 acres are undesirable / not feasible as described in this report. (50.9 – 32.9 – 15.0 = 3.0 acres)

This leaves 3.0 acres of lower classified soils that the proposed solar system could be developed on. These areas are shown in the light blue hatch on PS-4. The area to the south is 1.0 acres located on the high area of the drumlin. This location would be isolated from the rest of the system and at 25 to 40 feet above the elevation of Yellow Mills Road and 50 to 65 feet above the elevation of Fox Road it would be impossible to visually shield from the neighbors. The isolated location would require unnecessary disturbance of additional steep slope, erodible farmland during construction and decommissioning. The area near the center of the base of the drumlin is 1.5 acres. Of this area 1.3 acres are proposed to be utilized by the system. The area to the southwest of proposed Lot 4 is 0.3 acres. Approximately 0.2 acres is proposed to be utilized by the system as well as 0.1 acres of shaded area. There is also 0.1 acres at the southern portion of Wetland #3, approximately half of this area is to be utilized by the system.

Of the 3.0 acres which could potentially be developed for the proposed solar system 1.6 acres (1.3 + 0.2 + 0.1 = 1.6 acres) are currently proposed to be utilized.

Parcel Analysis – Tax Map No. 10.00-01-37.131:

The Smith Family also owns a parcel of land west and adjacent to the proposed project site. This site has frontage along Fox Road, southeast of the intersection with Ellsworth Road.

This site was investigated using the same methods as 466 Yellow Mills Road.

The Soils Group Worksheet Map show the various soils types located on this parcel. Soils classified as Class 1 through 4 include:

Class 2a: Pb – Palmyra Cobbly Loam 6.7 acres

The Class 1 though 4 soils make up 6.7 of the parcels 21.1 total acres. Lower classification soils are 14.4 acres (21.1 – 6.7 = 14.4 acres). Map PS-1 shows the soil class division line which separates the Class 1 through 4 (yellow hatch) soils from the soils of lower classification (light blue hatch) on the site. As shown on this map the lower classification soils are located mainly in the southern portion of the parcel.

The restrictions on this parcel include setbacks (orange hatch) and the 100-year Flood zone (red hatch). The area of lower classification soils within the restricted areas are 7.6 acres and 1.1 acres respectively. The amount of lower classified soil developable land on this parcel is 5.8 acres (14.4 – 7.6 – 1.1 = 5.8 acres). Portions of this site are undesirable for a couple reasons. There is 0.9 acres of woodland (green hatch) within the developable area which could be removed. In order for any proposed solar modules to

not be shaded by the existing trees and additional 1.5 acres would need to be removed to make this area feasible.

A review of the elevations of this parcel with respect to the 100-year flood zone indicates that 2.33 acres of the lower classified soils (located in the southwest quadrant of the parcel) are at an elevation that is lower than the 100-year flood zone. This area is hydraulically linked to the floodway by the drainage swales located on the property. As this area will be prone to flooding it is not feasible for the solar system to be installed here.

Overall there is approximately 3.5 acres (5.8 – 2.3 = 3.5 acres) of potentially usable lower classified soils land on this parcel. This portion of the site is located downslope of the adjacent wetland between the wetland and the flood zone putting it at risk for seasonal flooding.

Conclusion:

An attempt was made to design the proposed Large-scale ground mounted solar PV system in a way that would maximize the amount of lower classified soils utilized and reduce the affect on soils classified as Class 1 through 4. Of the proposed project site and adjacent lands owned by the Smith family there is very little desirable developable lower classified land available due to the factors investigated within this report.

There are 50.9 acres of lower classified soils on the project parcel, of which 32.9 acres are unbuildable due to wetlands and required setbacks. Another 15.0 acres are undesirable to build on, not just for the proposed project but for any type of development. This leaves approximately 3.0 acres of lower classified soils which the proposed solar system could potentially be built on. The proposed layout was able to incorporate 1.6 acres of lower classified soils into the design. The remaining 1.4 acres are too isolated to feasibly include.

The adjacent parcel owned by the Smiths has 14.4 acres of lower classified soils, of which 8.7 acres are unbuildable due to wetlands and required setbacks. Another 2.3 acres are undesirable to build on due to being below the adjacent floodzone elevation. This leaves approximately 3.5 acres of lower classified soils which the proposed solar system could potentially be built on. 60 modules could be installed on the 3.5 acres. The panels on these modules would only produce around 0.56 Mega Watts. It would not be feasible to connect these panels to an additional 190 modules in the northwest portion of the project parcel. This would require an additional 1,035 feet of buried connection wire crossing a wetland and 380 feet of flood zone.

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Appendix A:

Ontario County Soil and Water Conservation District
Soil Group Worksheet

APD-1 (Rev. 12/05)

New York State
Department of Agriculture and Markets
Division of Agricultural Production and Development Services
10B Airline Drive
Albany, NY 12235

SECTION A: WORKSHEET INFORMATION
Page 1 of 1
New Worksheet
Revised Worksheet

SOIL GROUP WORKSHEET

SECTION B. LANDOWNER NAME AND PROPERTY IDENTIFICATION

Landowner Name	Last: Smith	First: Roger and Carol	Middle Initial:	
	Street/Road No. and Name: 4790 Fox Road	City, Town: Palmyra	State: NY	Zip Code: 14522
Property Location Same as Mailing Address: No	Street/Road No. and Name: 466 Yellow Mills Road			
County: Ontario	City, Town: Farmington	Village:		

Filing Status: Agricultural District #1

SECTION C: TAX MAP & ASSESSMENT ROLL INFORMATION

SWIS Code (Six Digit)	322800
Tax Map Identifier	10.00-1-37.110
Roll Identifier (if different)	
Total Parcel Acres	135.4

SECTION D: PARCEL ACREAGE SUMMARY*

	ACRES
(1) Agricultural Land	
(2) Farm Woodland (up to 50 acres)	
(3) Excess Farm Woodland	
(4) Non-Agricultural Land	
TOTAL ACREAGE	135.4

SECTION E: SOIL MAP BREAKDOWN OF AGRICULTURAL LAND

SOIL MAP SYMBOL	SOIL MAP UNIT NAME	SOIL GROUP	NUMBER OF ACRES
CC	Colwood silt loam, 0 to 1 percent s	7	2.1
Kb	Kendaia silt loam, 0 to 3 percent slop	5a	0.2
Od	Ontario fine sandy loam, 10 to 21	6a	1.7
Ok	Ontario loam, 3 to 10 percent slop	3a	1.3
Ol	Ontario loam, 10 to 20 percent slo	6a	6.5
Om	Ontario loam, eroded, 10 to 20 pe	6a	10.7
Pb	Palmyra cobbly loam, 0 to 5 percent slopes.	2a	62.1
Pd	Palmyra gravelly loam, 0 to 5 perc	2a	0.7
Pe	Palmyra gravelly loam, 5 to 15 per	5a	2.10
Pk	Phelps gravelly silt loam, 0 to 5 pe	2b	20.40
Wd	Westland silt loam, 0 to 1 percent	7	27.60

SECTION F:

AGRICULTURAL LAND SOIL GROUP SUMMARY

Mineral Soil Group		Acres
1	a	
	b	
2	a	62.8
	b	20.4
3	a	1.3
	b	
4	a	
	b	
5	a	2.3
	b	
6	a	18.9
	b	
7		29.7
8		
9		
10		
Organic (muck) Soil Group		
A		
B		
C		
D		
SOIL GROUP TOTAL ACRES		135.4

* SEE EXPLANATION OF TERMS ON BACK

SECTION G: DATE AND SIGNATURES

Jointly Reviewed and Concurred:

Date: 12/4/2018

Land Owner: Roger and Carol Smith (Dave Matt (Schultz Associates) 585-349-3750)

Signature: 

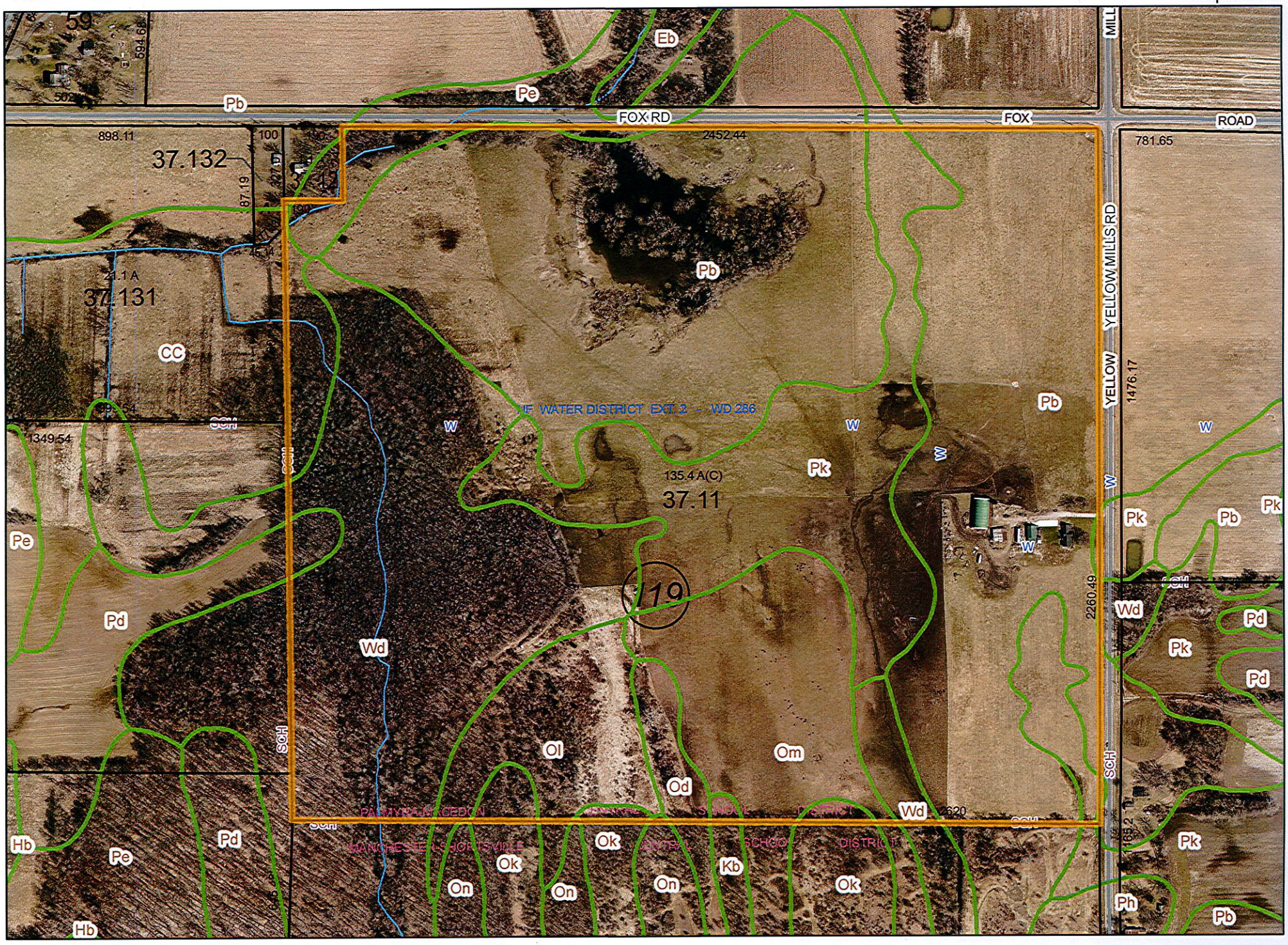
Completed By: K. Cappiello

Signature: 

Distribution: Submit Original Copy to the Assessor and Copies to SWCD and Landowner

Roger and Carol Smith 10.00-1-37.110

1 inch = 400 feet



APD-1 (Rev. 12/05)

New York State
Department of Agriculture and Markets
Division of Agricultural Production and Development Services
10B Airline Drive
Albany, NY 12235

SECTION A: WORKSHEET INFORMATION
Page 1 of 1
New Worksheet
Revised Worksheet

SOIL GROUP WORKSHEET

SECTION B. LANDOWNER NAME AND PROPERTY IDENTIFICATION

Landowner Name	Last: Smith	First: Roger and Carol	Middle Initial:	
	Street/Road No. and Name: 4790 Fox Road	City, Town: Palmyra	State: NY	Zip Code: 14522
Property Location Same as Mailing Address: No	Street/Road No. and Name: Fox Road			
County: Ontario	City, Town: Farmington	Village:		

Filing Status: Agricultural District # 1

SECTION C: TAX MAP & ASSESSMENT ROLL INFORMATION

SWIS Code (Six Digit)	322800
Tax Map Identifier	10.00-1-37.131
Roll Identifier (if different)	
Total Parcel Acres	21.1

SECTION D: PARCEL ACREAGE SUMMARY*

	ACRES
(1) Agricultural Land	
(2) Farm Woodland (up to 50 acres)	
(3) Excess Farm Woodland	
(4) Non-Agricultural Land	
TOTAL ACREAGE	21.1

SECTION E: SOIL MAP BREAKDOWN OF AGRICULTURAL LAND

SOIL MAP SYMBOL	SOIL MAP UNIT NAME	SOIL GROUP	NUMBER OF ACRES
CC	Colwood silt loam, 0 to 1 percent s	7	14.4
Pb	Palmyra cobbly loam, 0 to 5 percent s	2a	6.7

SECTION F: AGRICULTURAL LAND SOIL GROUP SUMMARY

Mineral Soil Group		Acres
1	a	
	b	
2	a	6.7
	b	
3	a	
	b	
4	a	
	b	
5	a	
	b	
6	a	
	b	
7		14.4
8		
9		
10		
Organic (muck) Soil Group		
A		
B		
C		
D		
SOIL GROUP TOTAL ACRES		21.1

* SEE EXPLANATION OF TERMS ON BACK

SECTION G: DATE AND SIGNATURES

Jointly Reviewed and Concurred:

Date: 12/4/2018

Land Owner: Roger and Carol Smith (Dave Matt (Schultz Associates) 585-349-3750)

Signature: Dave Matt

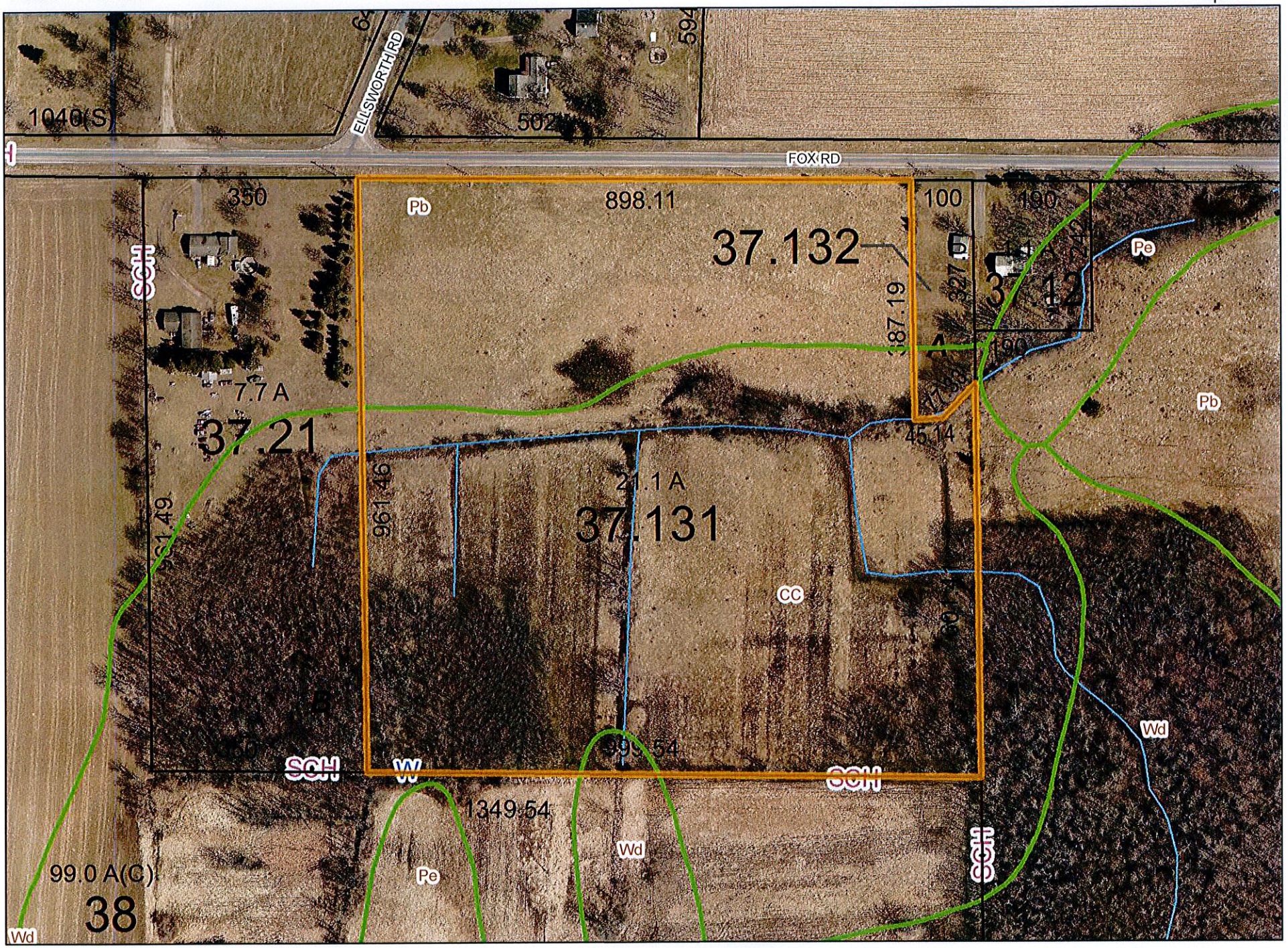
Completed By: K. Cappiello

Signature: K. Cappiello

Distribution: Submit Original Copy to the Assessor and Copies to SWCD and Landowner

Roger and Carol Smith 10.00-1-37.131

1 inch = 200 feet



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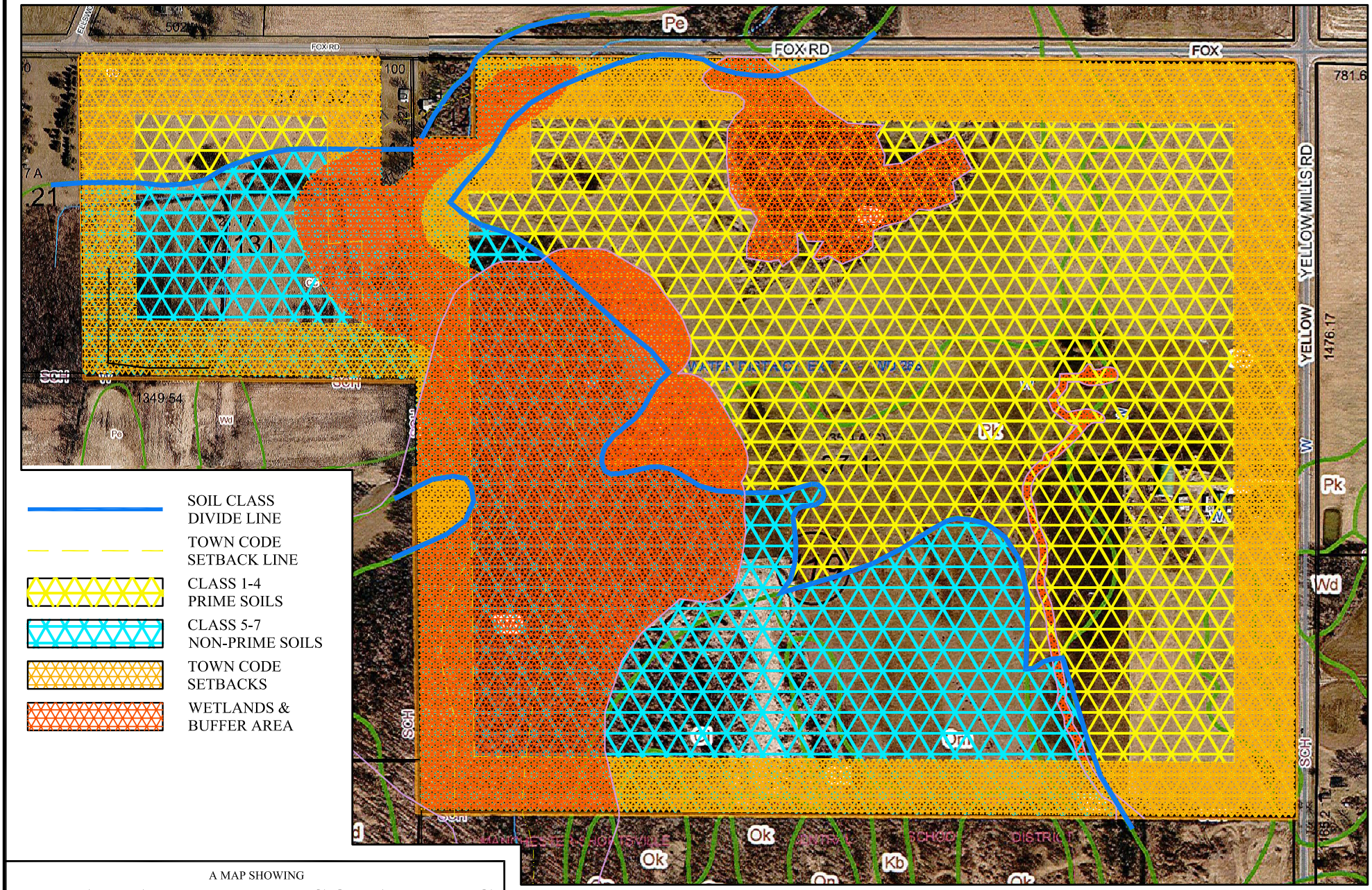
Appendix B:

Color Coded Prime Soils Maps



A MAP SHOWING

DELAWARE RIVER SOLAR, LLC
SOLAR ENERGY FACILITY
~ YELLOW MILLS ROAD ~

SITUATE IN :
PART OF TOWN LOTS 118 & 119, TOWN OF FARMINGTON,
COUNTY OF ONTARIO, STATE OF NEW YORK

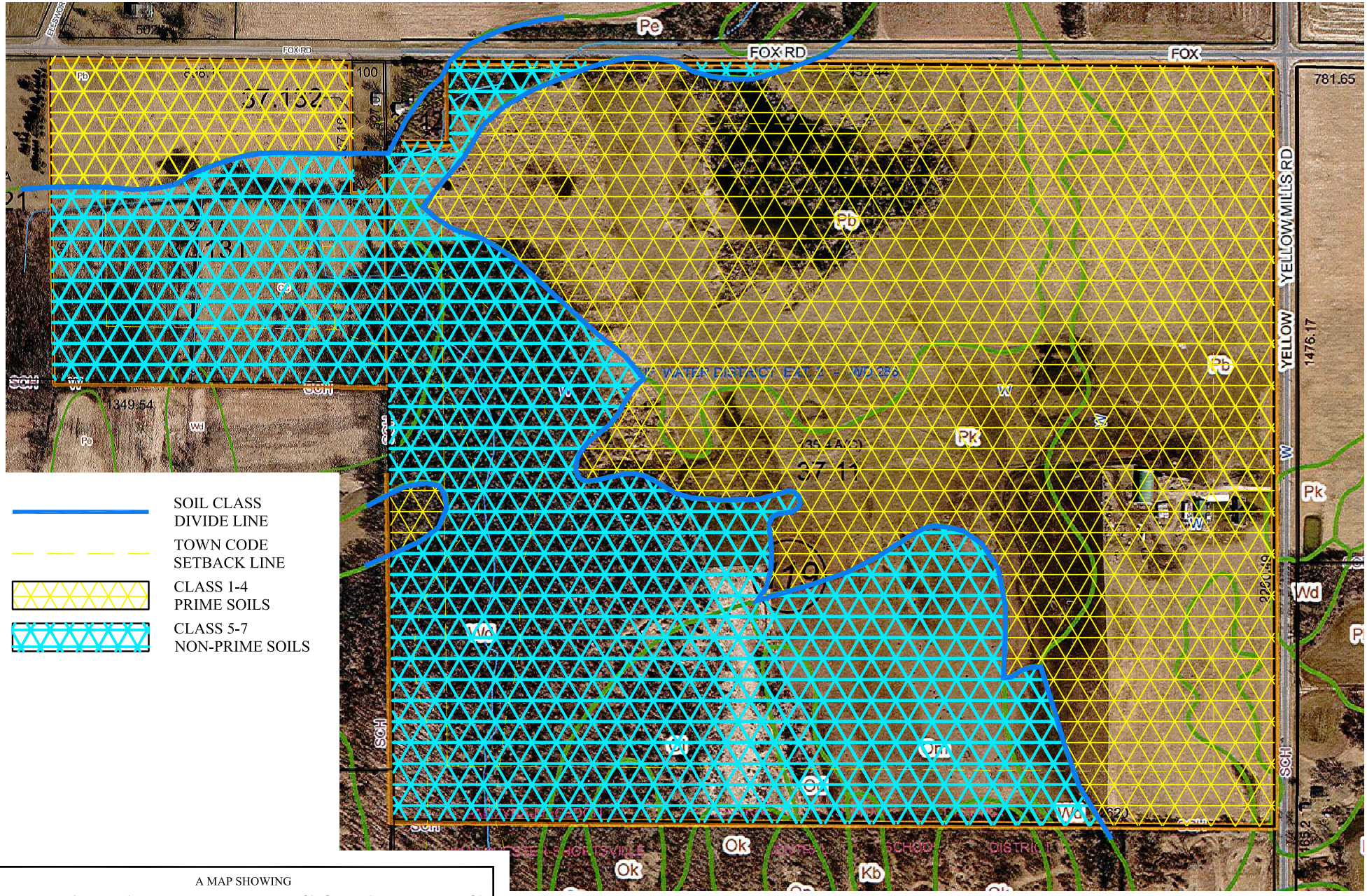
SCHULTZ ASSOCIATES
ENGINEERS & LAND SURVEYORS, P.C.
129 SOUTH UNION STREET, PO BOX 89
SPENCERPORT, NEW YORK 14559
585-349-3750
www.SchultzAssociatesPC.com

PRIME SOILS

DRAWN BY:	DSM	PROJECT NO.	18.023
CHECKED BY:	CJA	SHEET No.	2 OF 4
SCALE:	1" = 400'	DWG. NO.	PS-2
DATE:	DECEMBER 7, 2018		

0' 400' 800'

SCALE: 1"=400'



A MAP SHOWING

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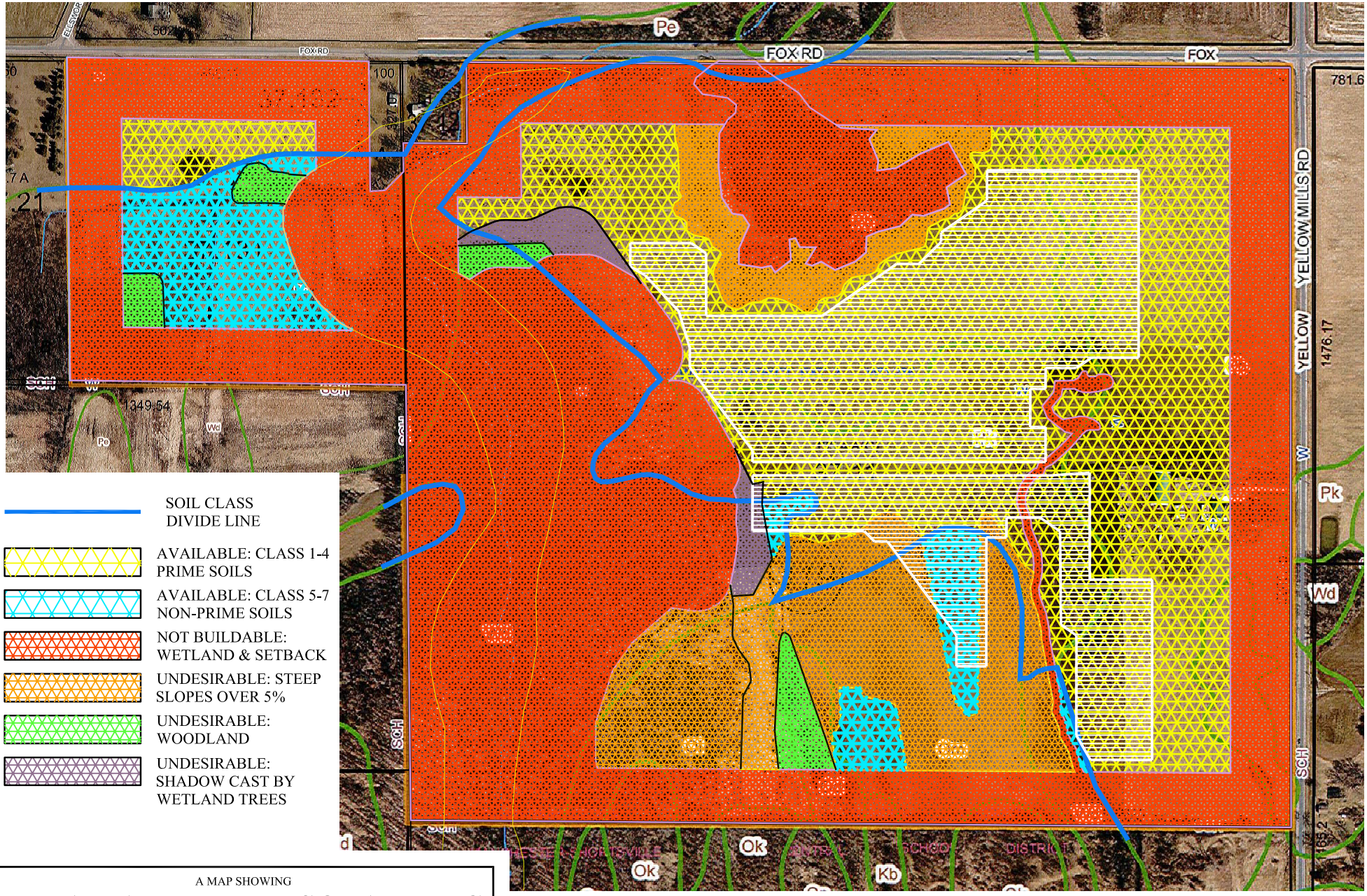
PRIME SOILS

DRAWN BY:	DSM	PROJECT NO.	18.023
CHECKED BY:	CJA	SHEET No.	1 OF 4
SCALE:	1" = 400'	DWG. NO.	PS-1
DATE:	DECEMBER 7, 2018		

0' 400' 800'

SCALE: 1"=400'



SOIL CLASS DIVIDE LINE

AVAILABLE: CLASS 1-4 PRIME SOILS

AVAILABLE: CLASS 5-7 NON-PRIME SOILS

NOT BUILDABLE: WETLAND & SETBACK

UNDESIRABLE: STEEP SLOPES OVER 5%

UNDESIRABLE: WOODLAND

UNDESIRABLE: SHADOW CAST BY WETLAND TREES

A MAP SHOWING

DELAWARE RIVER SOLAR, LLC
SOLAR ENERGY FACILITY
~ YELLOW MILLS ROAD ~

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PRIME SOILS

DRAWN BY:	DSM	PROJECT NO.	18.023
CHECKED BY:	CJA	SHEET No.	4 OF 4
SCALE:	1" = 400'	DWG. NO.	PS-4
DATE:	DECEMBER 7, 2018		

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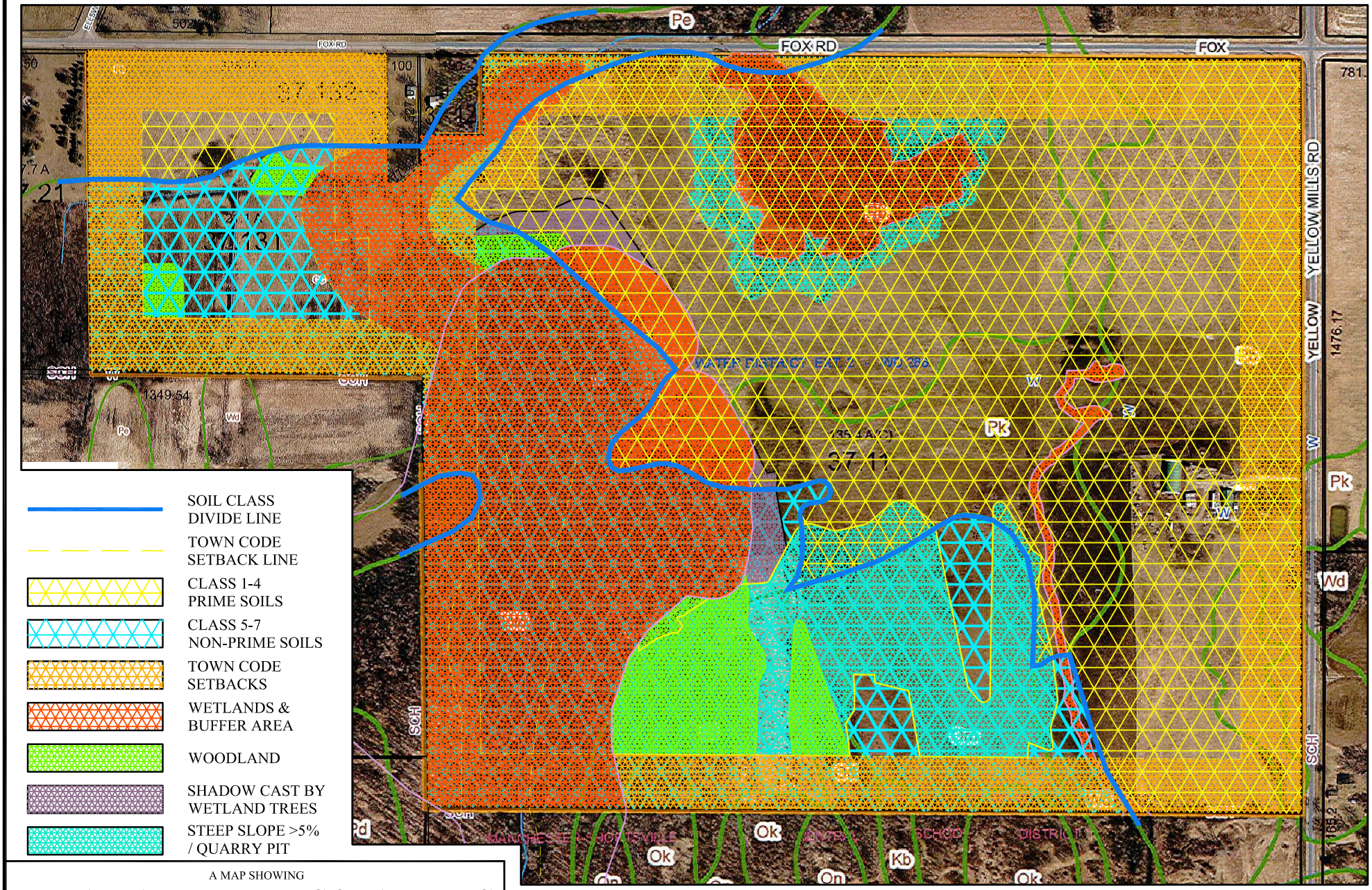
SCALE: 1"=400'



A MAP SHOWING

DELAWARE RIVER SOLAR, LLC
SOLAR ENERGY FACILITY

~ YELLOW MILLS ROAD ~

SITUATE IN :
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PRIME SOILS

DRAWN BY:	DSM	PROJECT NO.	18.023
CHECKED BY:	CJA	SHEET No.	3 OF 4
SCALE:	1" = 400'	DWG. NO.	PS-3
DATE:	DECEMBER 7, 2018		

0' 400' 800'

SCALE: 1"=400'

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Appendix C:

Table 1.1: Soil Classification Chart

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Table 1.1
Soil Classification Chart

466 Yellow Mills Property	**Soil Classification**			
	1 to 4	**5+**		**Sum**
Total Area	84.5	50.9		135.4
Setbacks	20.1	15.3		35.4
Wetlands/Floodzone out of Setback	9.6	17.6		27.2
Developable Land	**54.8**	**18.0**		**72.8**
Woodland (Slopes < 5%)	0.2	1.6		1.8
Shadow Cast by Wetland Woods	0.9	0.7		1.6
Quarry Edge (non Wetland)	3.7	0.0		3.7
North facing Slopes Over 5%	1.6	12.7		14.3
Available Land	**48.3**	**3.0**		**51.4**
Land Proposed for Solar	**28.3**	**1.6**		**29.9**

(Note - Land Proposed for solar is measured to the fenceline)

Fox Road Property	**Prime**	**Non-Prime**		
	Soils	**Soils**		**Sum**
Total Area	6.7	14.4		21.1
Setbacks	4.8	7.6		12.4
Wetlands/Floodzone out of Setback	0.0	1.1		1.1
Developable Land	**1.9**	**5.8**		**7.7**
Woodland (Slopes < 5%)	0.0	0.9		0.9
Shadow Cast by Wetland Woods	0.0	0.0		0.0
Elevation lower than the Floodzone	0.0	2.3		2.3
North facing Slopes Over 5%	0.0	0.0		0.0
Available Land	**1.9**	**3.5**		**5.4**
Land Proposed for Solar	**0.0**	**0.0**		**0.0**

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Appendix D:

Shadow Cast by Tree Detail

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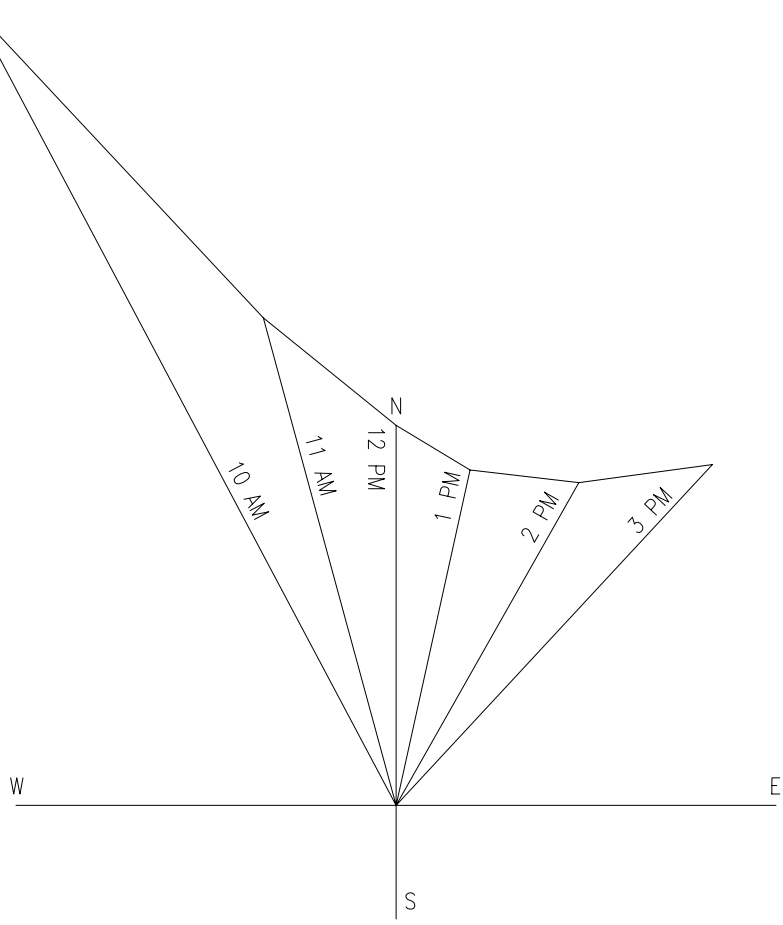
HEIGHT OF TREES: 50' APPROXIMATE SLOPING TERRAIN: (−2)° SOLAR ANGLE: 19° HOUR: 10AM ON DEC. 21 (MOST UNFAVORABLE DAY) REQUIRED DISTANCE FROM THE MODULE: 336'
HEIGHT OF TREES: 50' APPROXIMATE SLOPING TERRAIN: (−2)° SOLAR ANGLE: 19° HOUR: 11AM ON DEC. 21 (MOST UNFAVORABLE DAY) REQUIRED DISTANCE FROM THE MODULE: 188'
HEIGHT OF TREES: 50' APPROXIMATE SLOPING TERRAIN: (−2)° SOLAR ANGLE: 19° HOUR: 2PM ON DEC. 21 (MOST UNFAVORABLE DAY) REQUIRED DISTANCE FROM THE MODULE: 138'
HEIGHT OF TREES: 50' APPROXIMATE SLOPING TERRAIN: (−2)° SOLAR ANGLE: 19° HOUR: 3PM ON DEC. 21 (MOST UNFAVORABLE DAY) REQUIRED DISTANCE FROM THE MODULE: 173'



SHADOWS CAST BY TREES

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Appendix E:

Table 1.2: Row Width Calculations

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Table 1.2: Row Width Calculations

Calculating the Optimal Width between rows based on the slope of the land to avoid shading
- Shading is from the row of modules to the south of a particular module.
- Land slope is defined as North to South being a positive slope
  and South to North being a negative slope

Constants:

L:	13.32	feet	Diagonal Length of the module face
C:	12	feet	Horizontal projection of the module face
Sun Angle:	19	degrees	The suns angle on the most unfavorable day of the year
Tilt:	25	degrees	The angle of the lower part of the module w/ respect to the land

Calculated:

B = Sun Angle - Slope of Land:

a = Tilt + Slope of Land:

$$D = \frac{(\sin(a) \times L)}{\tan(B)} .+ (\cos(a) \times L)$$

Row Width = D-C

Land Slope	B	a	(sin(a) x L)	tan(B)	(cos(a) x L)	D	Row Width	%
percent	degrees	degrees				feet	feet	**Shaded**
5	24	30	6.66	0.45	11.54	26.5	14.5	-
4	23	29	6.46	0.42	11.65	26.9	14.9	-
3	22	28	6.25	0.40	11.76	27.2	15.2	-
2	21	27	6.05	0.38	11.87	27.6	15.6	-
1	20	26	5.84	0.36	11.97	28.0	16.0	-
0	19	25	5.63	0.34	12.07	28.4	16.4	-
-1	18	26	5.84	0.32	11.97	29.9	17.9	-
-1.5	17.5	26.5	5.94	0.32	11.92	30.8	18.8	-
-2	17	27	6.05	0.31	11.87	31.6	19.6	100%
-3	16	28	6.25	0.29	11.76	33.6	21.6	100%
-4	15	29	6.46	0.27	11.65	35.8	23.8	100%
-5	14	30	6.66	0.25	11.54	38.2	26.2	100%
-6	13	31	6.86	0.23	11.42	41.1	29.1	100%
-7	12	32	7.06	0.21	11.30	44.5	32.5	100%
-8	11	33	7.25	0.19	11.17	48.5	36.5	-
-9	10	34	7.45	0.18	11.04	53.3	41.3	-
-10	9	35	7.64	0.16	10.91	59.1	47.1	-
-11	8	36	7.83	0.14	10.78	66.5	54.5	-
-12	7	37	8.02	0.12	10.64	75.9	63.9	-
-13	6	38	8.20	0.11	10.50	88.5	76.5	-
-14	5	39	8.38	0.09	10.35	106.2	94.2	-
-15	4	40	8.56	0.07	10.20	132.6	120.6	-

Note: An average of -1.5% slope was assumed in the initial layout of the system

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