

APPENDIX 1

Property Characteristic List/Table

APPENDIX 2

NRCS Soils Report and Prime Farmland Classifications

APPENDIX 2 – NRCS Soils Report

Soil Map—Caroline County, Maryland




Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey


8/4/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	3.2	4.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	8.6	12.3%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	12.3	17.6%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	17.8	25.3%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	20.4	29.0%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	1.1	1.6%
LgA	Lenni loam, 0 to 2 percent slopes	3.0	4.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.4	0.6%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	2.0	2.8%
Za	Zekiah sandy loam, frequently flooded	1.4	2.0%
Totals for Area of Interest		70.2	100.0%

Soil Map—Caroline County, Maryland (Soils Map)



Soil Map—Caroline County, Maryland
(Soils Map)


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.3	6.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0.4	0.4%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	20.1	21.2%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	7.0	7.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	0.3	0.3%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	52.3	55.2%
LgA	Lenni loam, 0 to 2 percent slopes	8.4	8.9%
Totals for Area of Interest		94.7	100.0%


Soil Map—Caroline County, Maryland (Soils Map)



Soil Map—Caroline County, Maryland
(Soils Map)


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

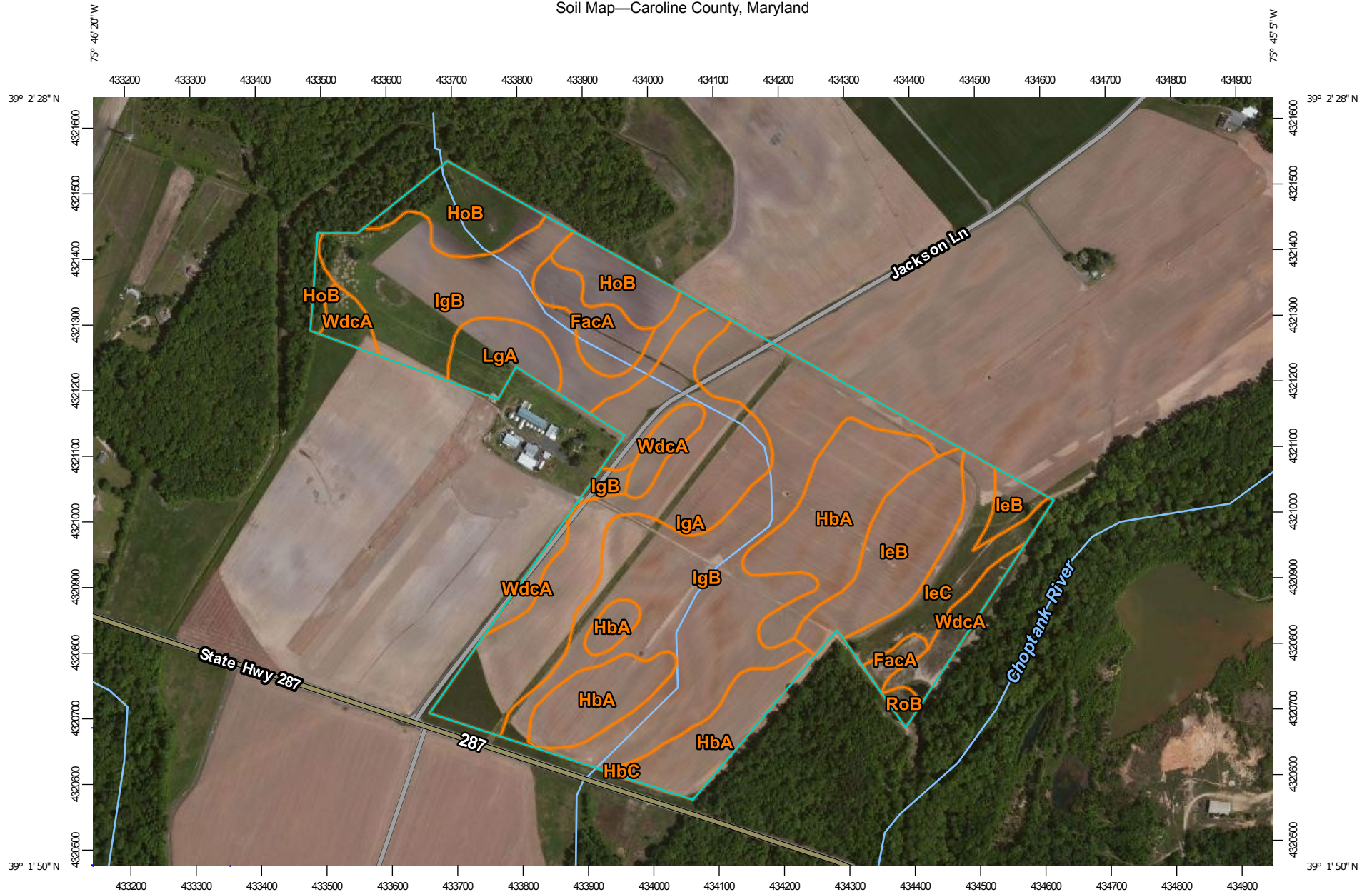
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

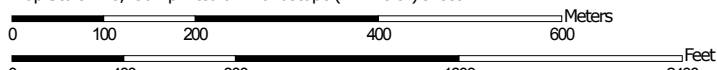
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EwB	Evesboro sand, 2 to 5 percent slopes	9.5	10.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0.5	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	16.1	17.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	4.9	5.4%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	5.9	6.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	13.6	15.1%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	19.5	21.6%
RoA	Rosedale loamy sand, 0 to 2 percent slopes	14.8	16.5%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	5.2	5.8%
Totals for Area of Interest		90.0	100.0%

Soil Map—Caroline County, Maryland



Map Scale: 1:8,250 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge ticks: UTM Zone 18N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

8/4/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.3	3.4%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	20.5	16.3%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	0.1	0.1%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	8.8	7.0%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	9.2	7.3%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	5.9	4.7%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	19.4	15.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	46.5	37.0%
LgA	Lenni loam, 0 to 2 percent slopes	3.7	3.0%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	0.5	0.4%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.7	5.3%
Totals for Area of Interest		125.7	100.0%

Soil Map—Caroline County, Maryland



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey

8/4/2017
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

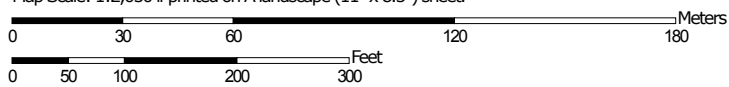
Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	0.4	0.6%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	17.1	29.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	12.2	21.1%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	0.1	0.1%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	5.1	8.7%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	3.9	6.8%
LgA	Lenni loam, 0 to 2 percent slopes	7.3	12.6%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.5	11.2%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	3.3	5.7%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	2.0	3.5%
Totals for Area of Interest		57.9	100.0%

Soil Map—Caroline County, Maryland



Soil Map may not be valid at this scale.

Map Scale: 1:2,050 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey


8/4/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	0.2	1.6%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.6	45.4%
HcA	Hambrook loam, 0 to 2 percent slopes	2.6	17.7%
leB	Ingleside loamy sand, 2 to 5 percent slopes	0.0	0.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	1.1	7.5%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.0	27.6%
Totals for Area of Interest		14.5	100.0%

Soil Map—Caroline County, Maryland



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

8/4/2017
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	0.0	0.0%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	2.9	2.9%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	24.4	24.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	2.9	2.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	11.7	11.8%
HcA	Hambrook loam, 0 to 2 percent slopes	14.6	14.7%
LgA	Lenni loam, 0 to 2 percent slopes	12.3	12.4%
LhA	Lenni silt loam, 0 to 2 percent slopes	3.1	3.1%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.4	4.5%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	1.7	1.7%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	21.2	21.3%
Totals for Area of Interest		99.3	100.0%

Soil Map—Caroline County, Maryland



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey


8/4/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

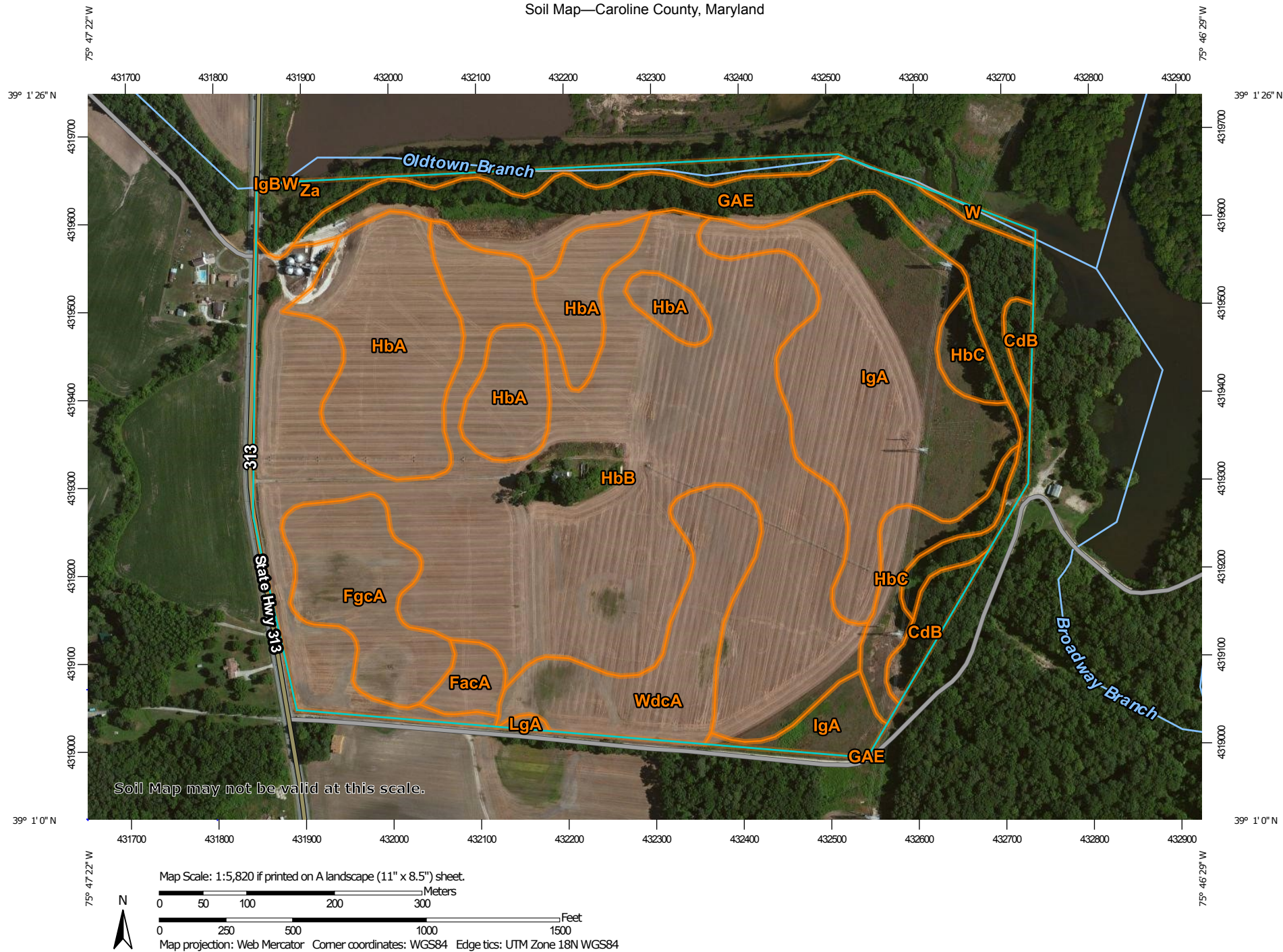
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	5.4	6.2%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	2.2	2.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.5	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	0.1	0.1%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	57.7	66.4%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	1.7	2.0%
LgA	Lenni loam, 0 to 2 percent slopes	2.4	2.8%
LhA	Lenni silt loam, 0 to 2 percent slopes	12.9	14.8%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	4.1	4.7%
Za	Zekiah sandy loam, frequently flooded	0.0	0.0%
Totals for Area of Interest		86.9	100.0%

Soil Map—Caroline County, Maryland




Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey


8/4/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

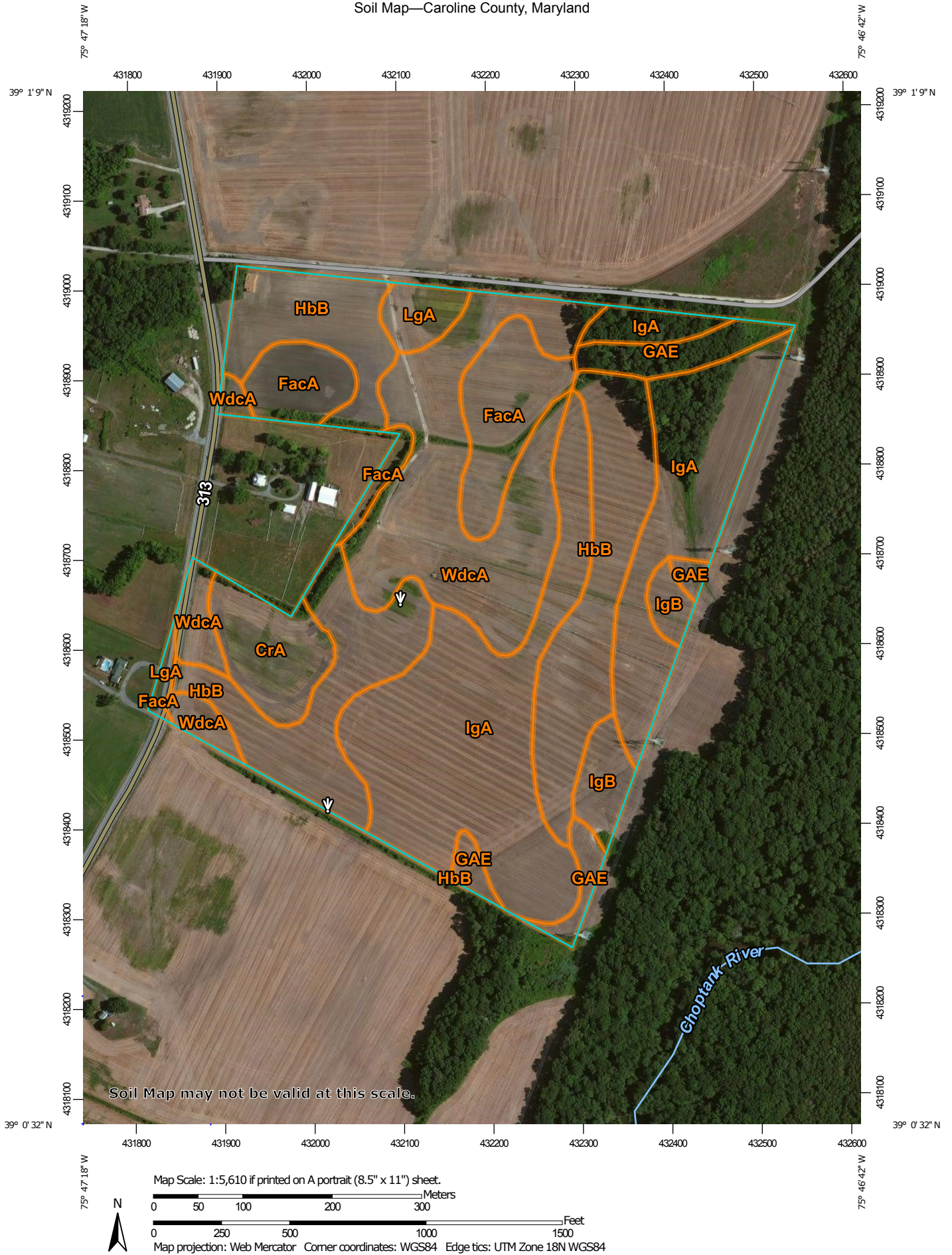
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CdB	Cedartown loamy sand, 2 to 5 percent slopes	2.1	1.6%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	1.4	1.0%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.6	5.0%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	13.3	10.0%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	16.7	12.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	54.7	41.4%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	4.5	3.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	20.6	15.6%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	0.0	0.0%
LgA	Lenni loam, 0 to 2 percent slopes	0.2	0.1%
W	Water	0.5	0.4%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	8.2	6.2%
Za	Zekiah sandy loam, frequently flooded	3.7	2.8%
Totals for Area of Interest		132.4	100.0%

Soil Map—Caroline County, Maryland



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

8/4/2017
Page 1 of 3

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

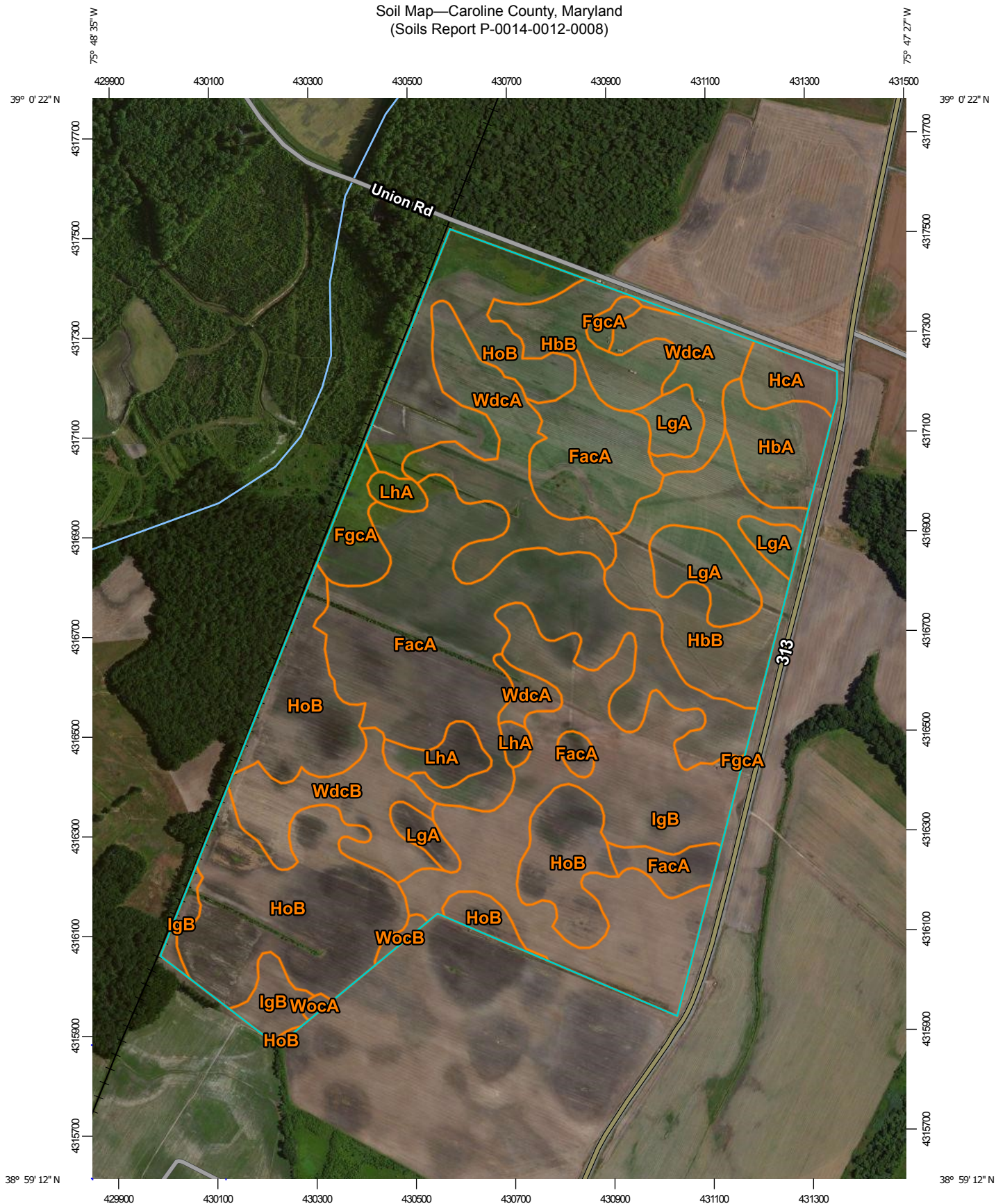
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

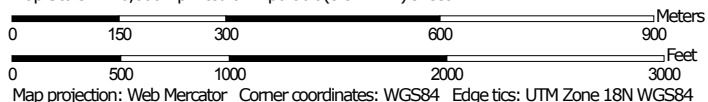
Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	3.6	4.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	7.2	9.1%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	3.6	4.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	20.0	25.3%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	25.5	32.3%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	2.3	3.0%
LgA	Lenni loam, 0 to 2 percent slopes	1.6	2.1%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	15.2	19.3%
Totals for Area of Interest		79.1	100.0%

Soil Map—Caroline County, Maryland
(Soils Report P-0014-0012-0008)



Map Scale: 1:10,600 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge ticks: UTM Zone 18N WGS84



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

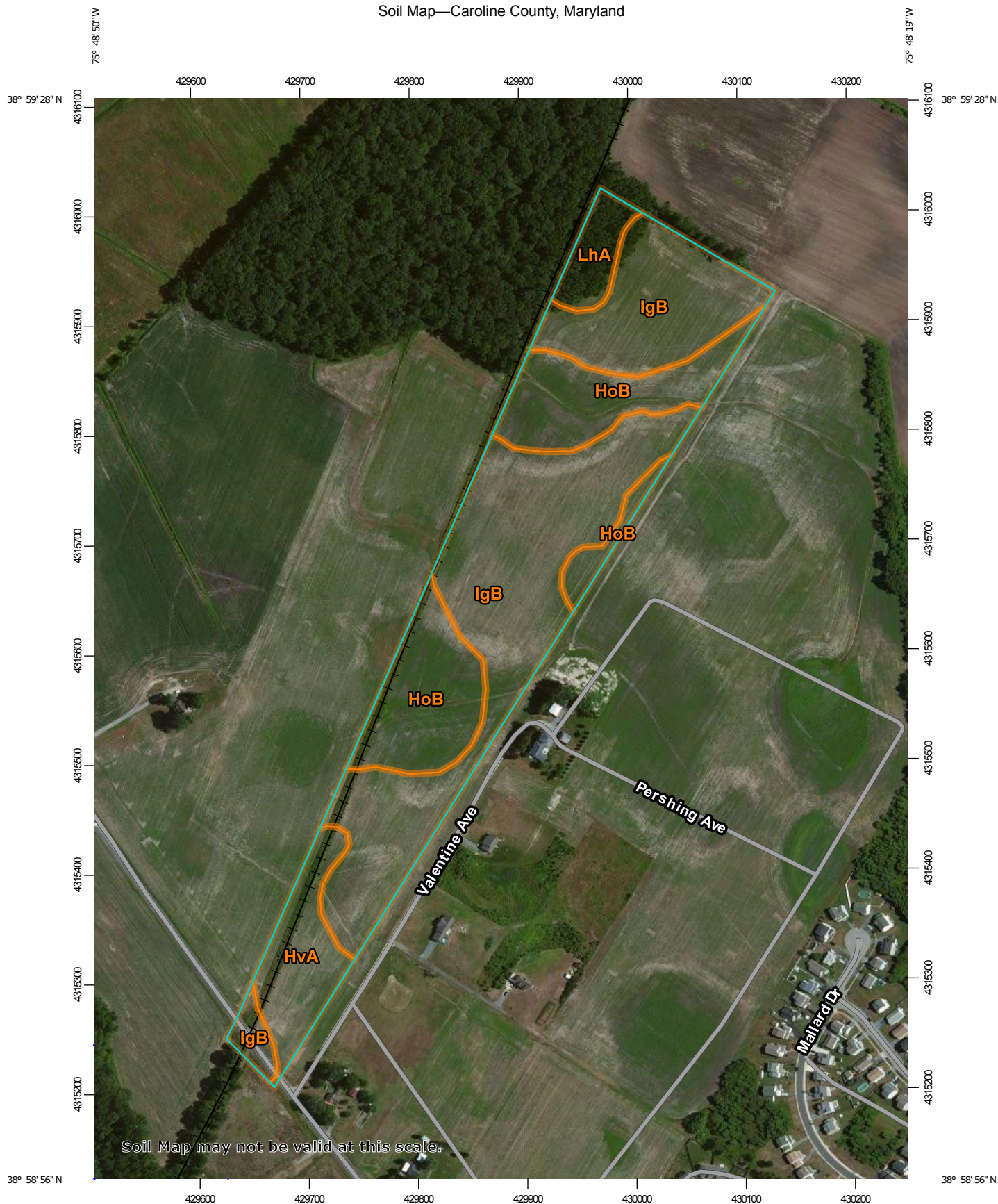
Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

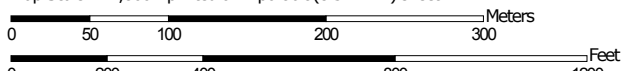
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	75.8	22.9%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	6.7	2.0%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	9.2	2.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	33.0	9.9%
HcA	Hambrook loam, 0 to 2 percent slopes	4.6	1.4%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	78.8	23.8%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	57.1	17.2%
LgA	Lenni loam, 0 to 2 percent slopes	14.4	4.4%
LhA	Lenni silt loam, 0 to 2 percent slopes	6.7	2.0%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	30.0	9.0%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	13.9	4.2%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.4	0.1%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	0.8	0.2%
Totals for Area of Interest		331.3	100.0%

Soil Map—Caroline County, Maryland



Map Scale: 1:4,800 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge ticks: UTM Zone 18N WGS84



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey


8/4/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	6.8	26.6%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	2.5	9.5%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	15.3	59.6%
LhA	Lenni silt loam, 0 to 2 percent slopes	1.1	4.2%
Totals for Area of Interest		25.7	100.0%

Soil Map—Caroline County, Maryland


Map Scale: 1:5,830 if printed on A landscape (11" x 8.5") sheet.

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84


Soil Map may not be valid at this scale.


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	0.3	0.4%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	30.0	35.4%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0.7	0.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	25.8	30.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	7.6	8.9%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	11.5	13.6%
LgA	Lenni loam, 0 to 2 percent slopes	4.9	5.8%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.0	4.7%
Totals for Area of Interest		84.8	100.0%

Soil Map—Caroline County, Maryland



**Natural Resources
Conservation Service**

Web Soil Survey
National Cooperative Soil Survey


8/4/2017
Page 1 of 3


MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 15, Sep 22, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

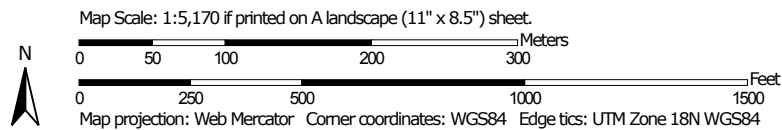
Map Unit Legend

Caroline County, Maryland (MD011)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	1.4	1.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	18.4	24.4%
HcA	Hambrook loam, 0 to 2 percent slopes	6.0	8.0%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	34.1	45.3%
LgA	Lenni loam, 0 to 2 percent slopes	8.3	11.0%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	7.0	9.3%
Totals for Area of Interest		75.2	100.0%

Soil Map—Caroline County, Maryland (Soils Map)



Soil Map may not be valid at this scale.



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 3

Soil Map—Caroline County, Maryland
(Soils Map)

MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)

Soils

 Soil Map Unit Polygons

 Soil Map Unit Lines

 Soil Map Unit Points

Special Point Features



Blowout



Borrow Pit



Clay Spot



Closed Depression



Gravel Pit



Gravelly Spot



Landfill



Lava Flow



Marsh or swamp



Mine or Quarry



Miscellaneous Water



Perennial Water



Rock Outcrop



Saline Spot



Sandy Spot



Severely Eroded Spot



Sinkhole



Slide or Slip



Sodic Spot



Spoil Area



Stony Spot



Very Stony Spot



Wet Spot



Other



Special Line Features

Water Features



Streams and Canals

Transportation



Rails



Interstate Highways



US Routes



Major Roads



Local Roads

Background



Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

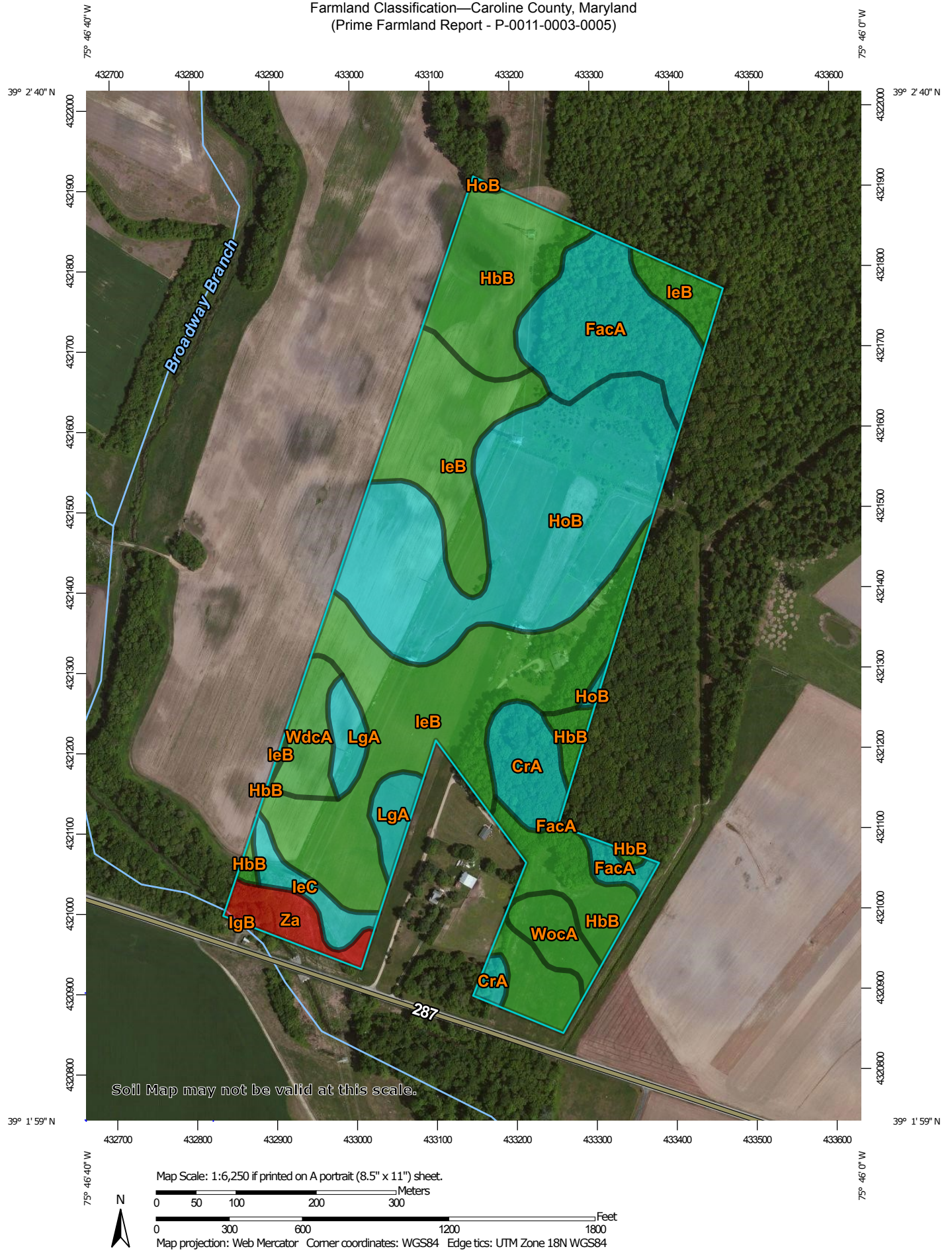
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
HnA	Hammonton sandy loam, 0 to 2 percent slopes	1.8	2.6%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	22.5	33.4%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	8.3	12.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	25.4	37.6%
LgA	Lenni loam, 0 to 2 percent slopes	2.7	4.0%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	4.2	6.2%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	2.6	3.8%
Totals for Area of Interest		67.4	100.0%

APPENDIX 2 – Prime Farmland Classification


Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0003-0005)



Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0003-0005)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	3.4	4.2%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	8.4	10.3%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	13.4	16.4%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	21.1	25.8%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	25.0	30.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	Farmland of statewide importance	1.7	2.0%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	0.0	0.0%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	2.5	3.1%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	2.3	2.8%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	1.8	2.3%
Za	Zekiah sandy loam, frequently flooded	Not prime farmland	2.0	2.5%
Totals for Area of Interest			81.6	100.0%

Description

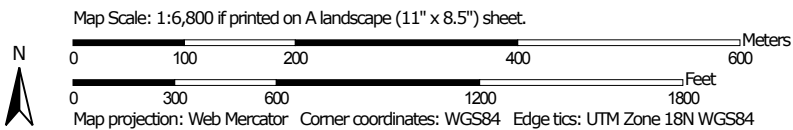
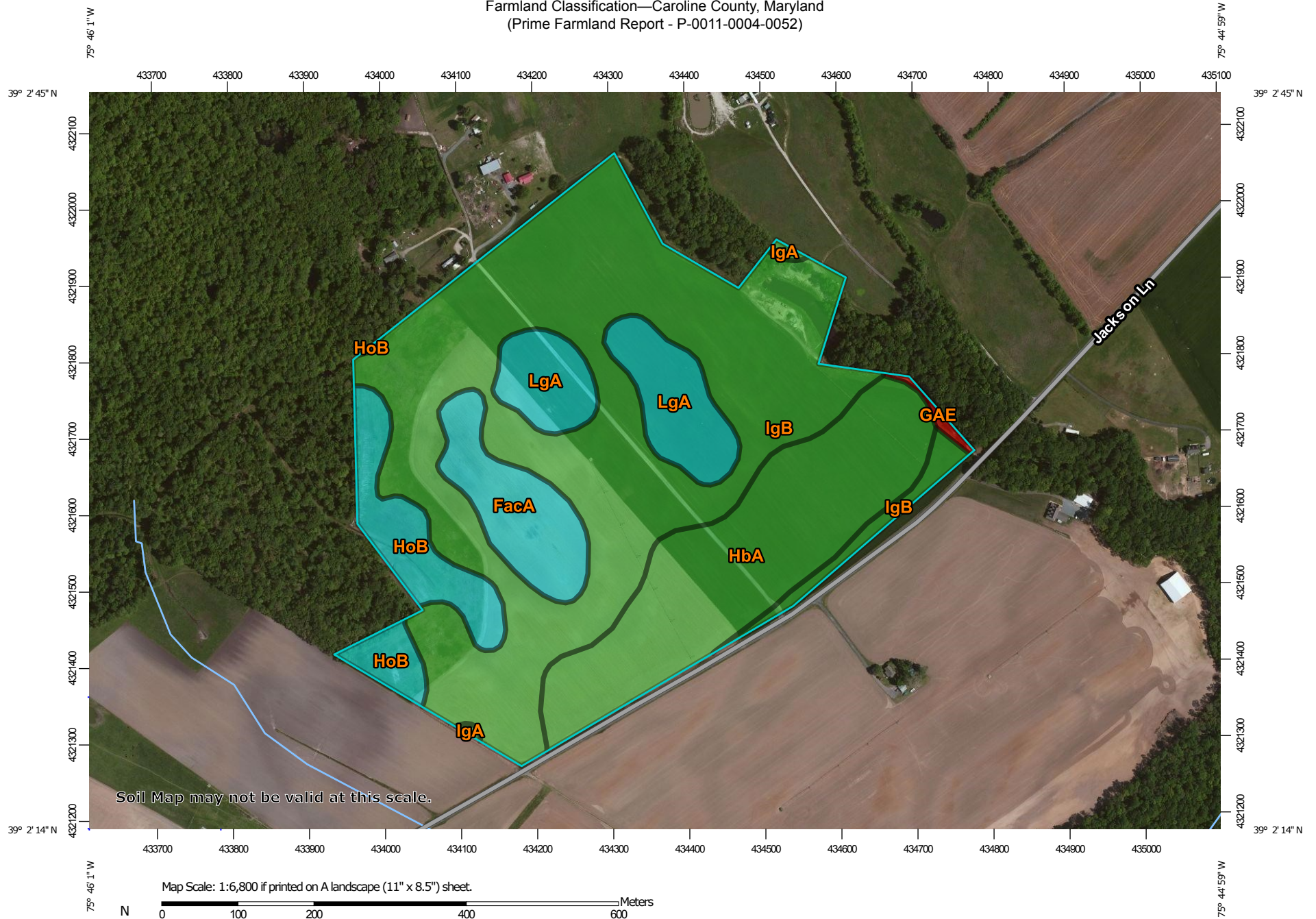
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0004-0052)



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 4

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0004-0052)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	6.3	6.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	0.4	0.4%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	20.1	21.2%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	7.0	7.4%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	0.3	0.3%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	52.3	55.2%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	8.4	8.9%
Totals for Area of Interest			94.7	100.0%

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0004-0053)



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 4

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0004-0053)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features


MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EwB	Evesboro sand, 2 to 5 percent slopes	Not prime farmland	9.5	10.6%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	0.5	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	16.1	17.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	4.9	5.4%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	5.9	6.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	Farmland of statewide importance	13.6	15.1%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	19.5	21.6%
RoA	Rosedale loamy sand, 0 to 2 percent slopes	Prime farmland if irrigated	14.8	16.5%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	5.2	5.8%
Totals for Area of Interest			90.0	100.0%

Description

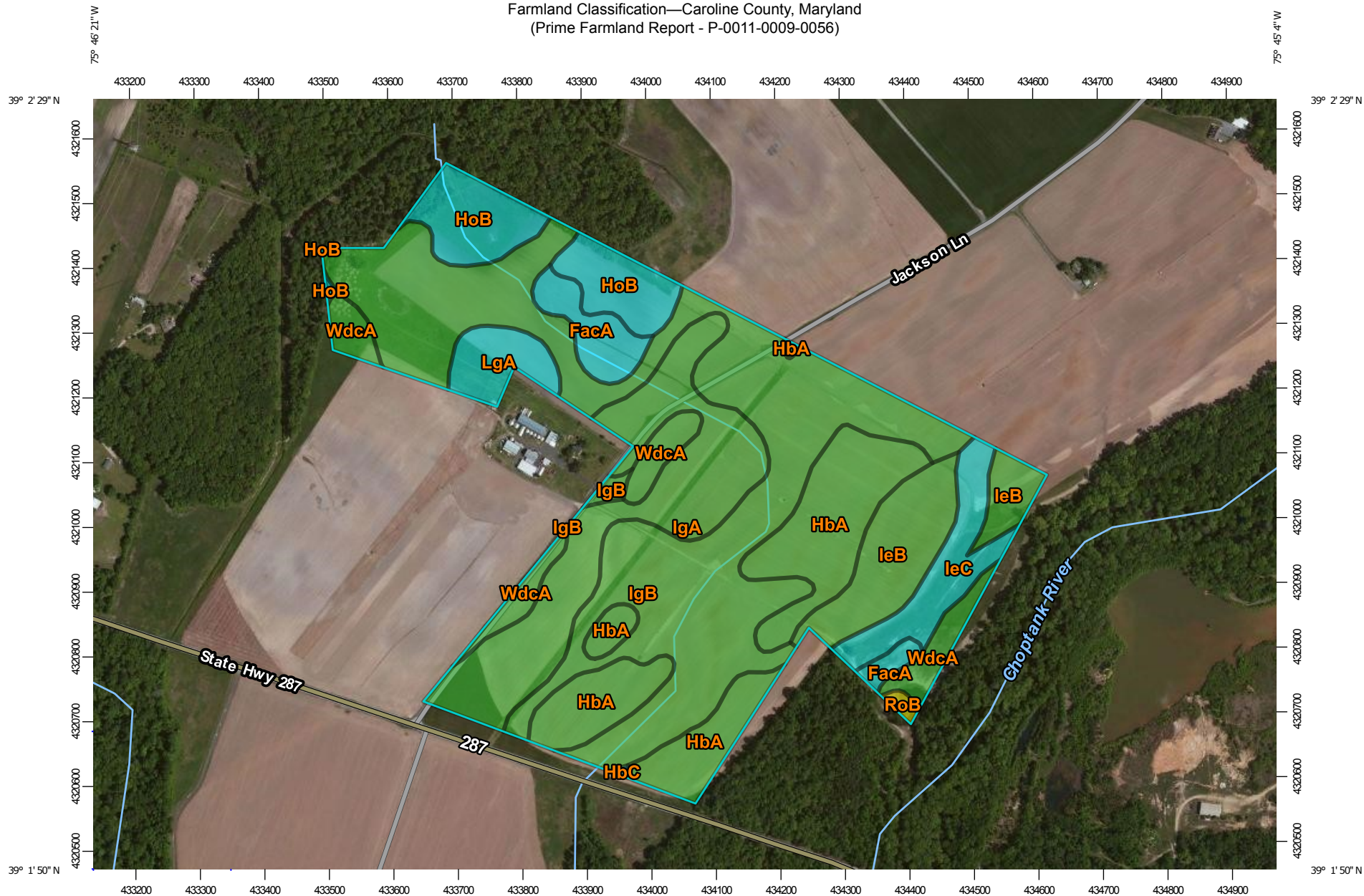
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

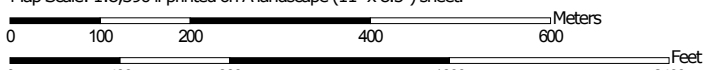
Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0009-0056)



Map Scale: 1:8,390 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 4

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0009-0056)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	4.3	3.3%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	19.8	15.4%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	Farmland of statewide importance	0.1	0.1%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	9.4	7.3%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	9.8	7.6%
IeC	Ingleside loamy sand, 5 to 10 percent slopes	Farmland of statewide importance	6.1	4.8%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	19.2	14.9%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	49.4	38.4%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	3.5	2.8%
RoB	Rosedale loamy sand, 2 to 5 percent slopes	Prime farmland if irrigated	0.4	0.3%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	6.7	5.2%
Totals for Area of Interest			128.8	100.0%

Description

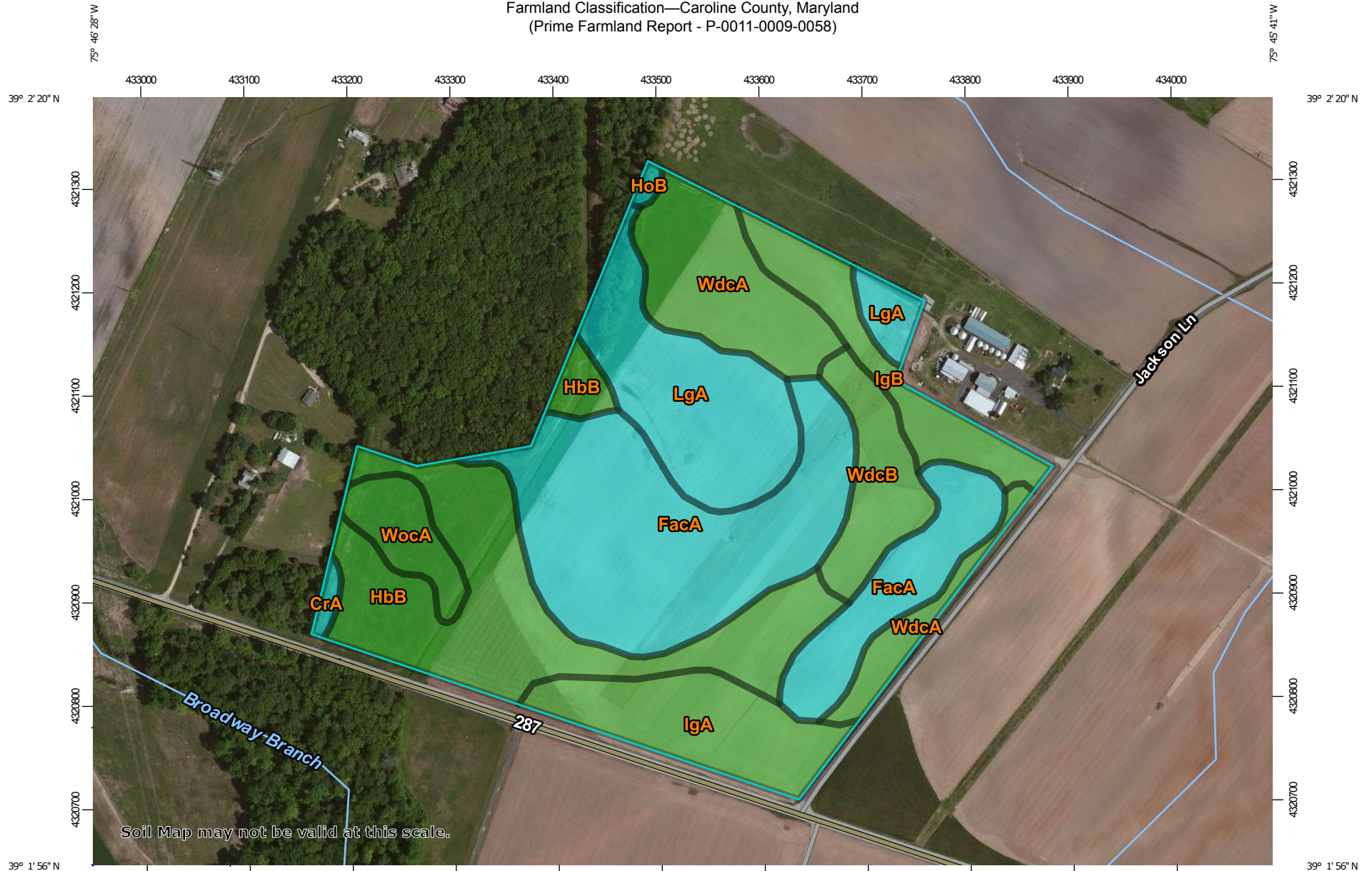
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

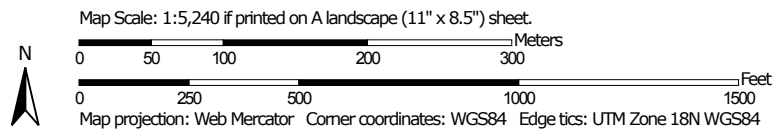
Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0009-0058)



Soil Map may not be valid at this scale.



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 4

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0009-0058)









MAP LEGEND








Area of Interest (AOI)

 Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features


MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	0.3	0.5%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	17.3	29.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	11.6	20.0%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	0.2	0.3%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	5.1	8.7%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	3.6	6.2%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	8.0	13.7%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	6.9	11.8%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	3.3	5.7%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	2.0	3.5%
Totals for Area of Interest			58.3	100.0%

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower


Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0011-0034)



Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0011-0034)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Mar 16, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	Farmland of statewide importance	0.3	2.3%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	6.4	43.4%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	2.5	17.2%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	0.0	0.3%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	1.4	9.4%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	4.0	27.3%
Totals for Area of Interest			14.6	100.0%

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

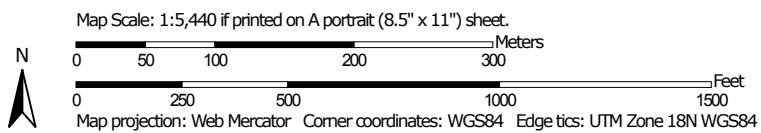
Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0017-0025)



Soil Map may not be valid at this scale.



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 5

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0017-0025)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features


MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	Farmland of statewide importance	0.1	0.1%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	3.1	3.2%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	22.0	22.6%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	2.5	2.6%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	11.8	12.1%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	14.9	15.3%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	12.3	12.6%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	3.1	3.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	4.5	4.6%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	1.5	1.6%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	21.3	21.9%
Totals for Area of Interest			97.2	100.0%

Description

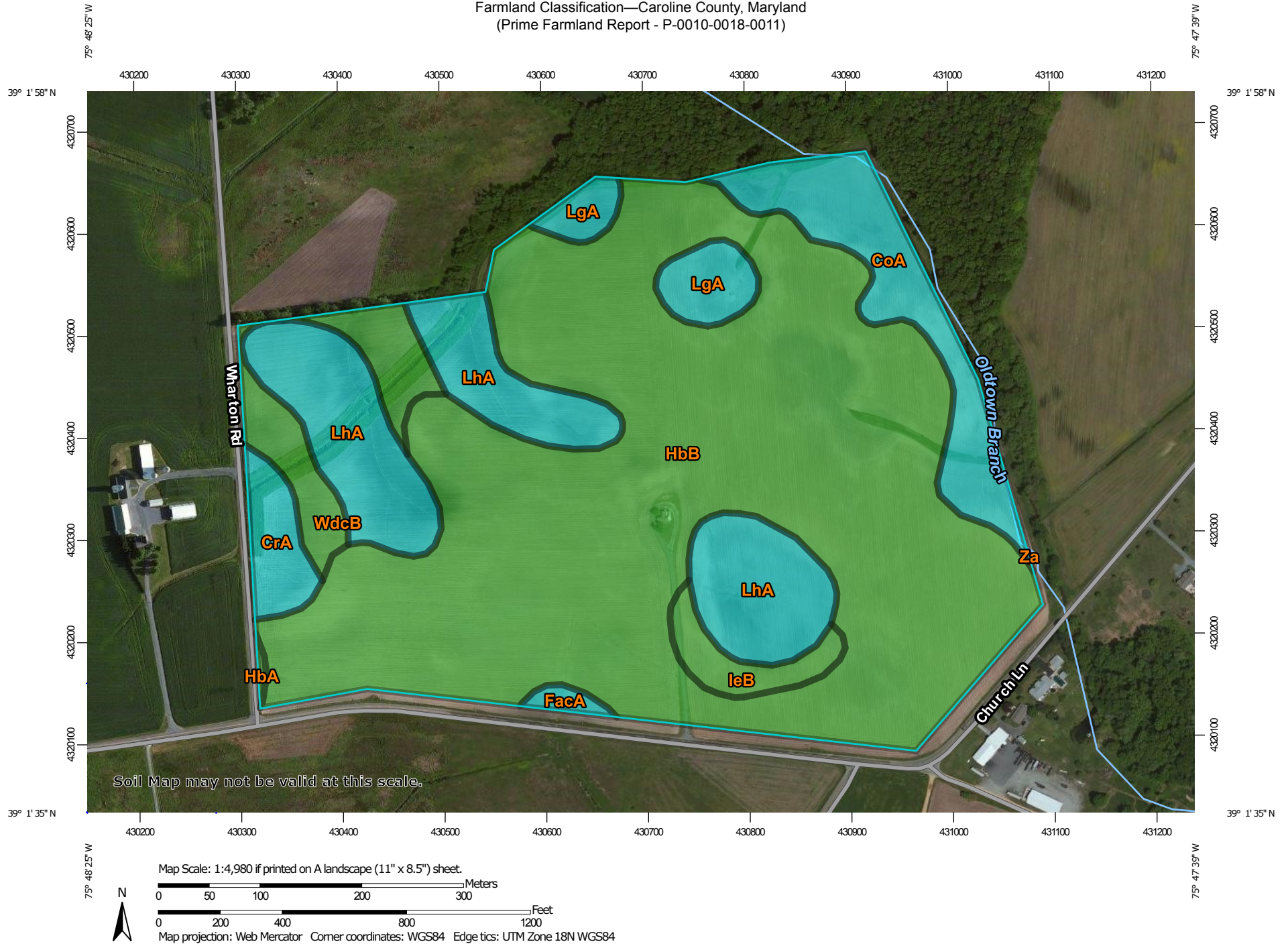
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower


Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0018-0011)



Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0010-0018-0011)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features


MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CoA	Corsica mucky loam, 0 to 2 percent slopes	Farmland of statewide importance	6.3	7.3%
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	1.9	2.2%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	0.4	0.5%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	0.1	0.1%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	56.4	65.6%
IeB	Ingleside loamy sand, 2 to 5 percent slopes	All areas are prime farmland	1.7	2.0%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	2.4	2.8%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	12.9	15.0%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	3.9	4.5%
Za	Zekiah sandy loam, frequently flooded	Not prime farmland	0.0	0.0%
Totals for Area of Interest			85.9	100.0%

Description

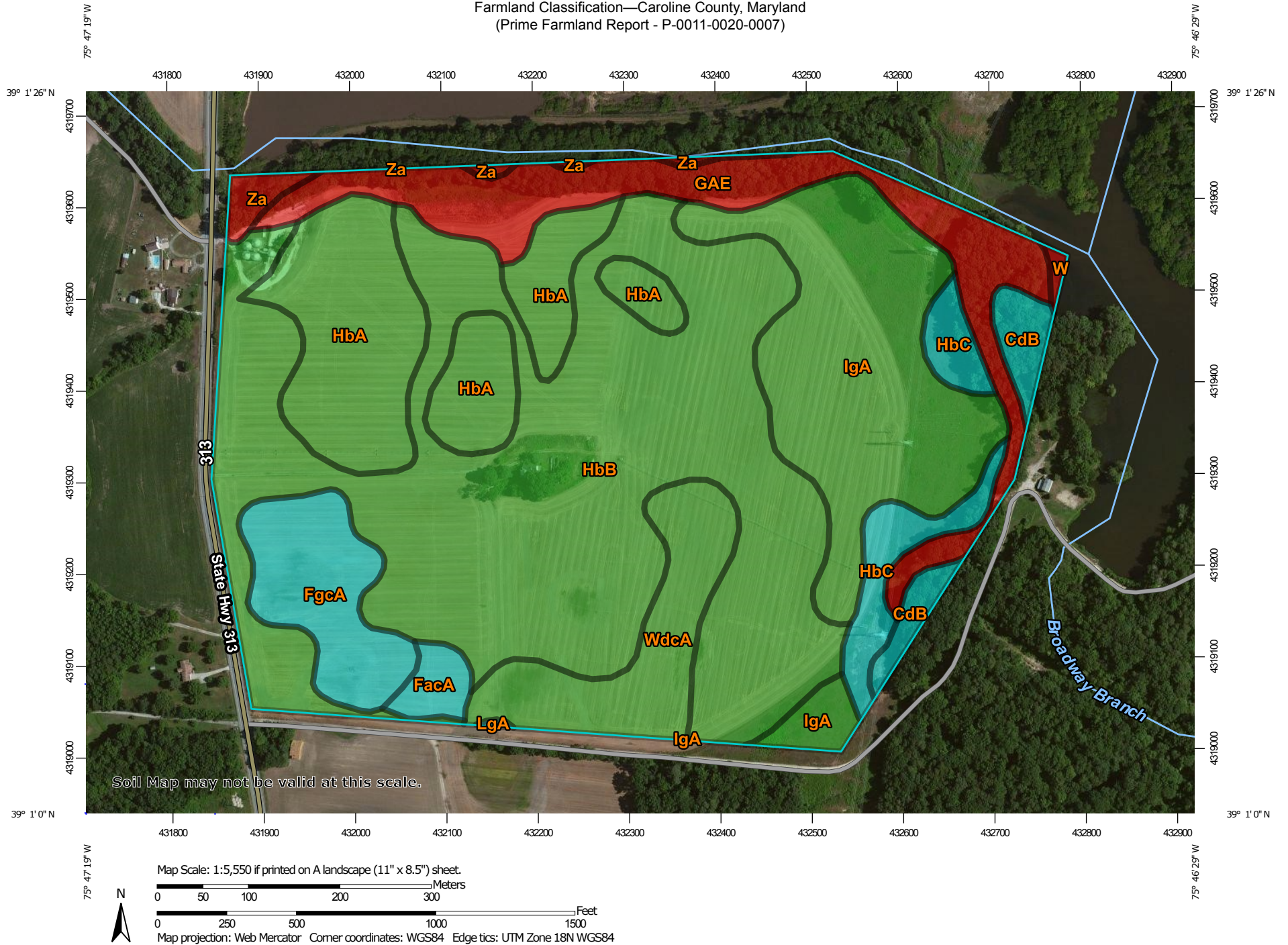
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower


Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0020-0007)



Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0020-0007)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CdB	Cedartown loamy sand, 2 to 5 percent slopes	Farmland of statewide importance	2.5	2.0%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	1.4	1.1%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	6.6	5.2%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	12.8	10.1%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	16.7	13.1%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	53.4	42.1%
HbC	Hambrook sandy loam, 5 to 10 percent slopes	Farmland of statewide importance	4.4	3.5%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	20.0	15.7%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	0.1	0.0%
W	Water	Not prime farmland	0.2	0.2%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	7.7	6.1%
Za	Zekiah sandy loam, frequently flooded	Not prime farmland	1.2	1.0%
Totals for Area of Interest			126.9	100.0%

Description

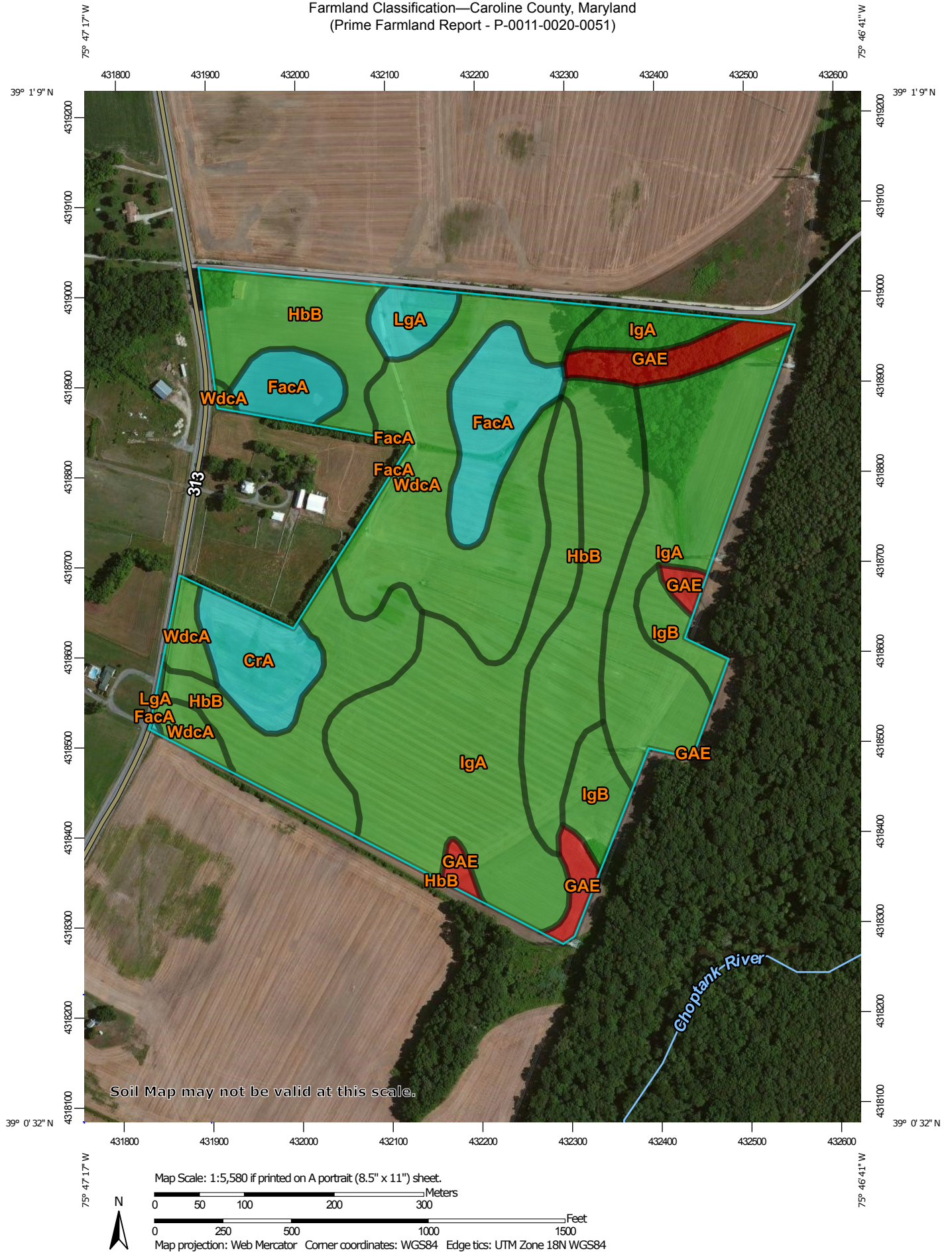
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower


Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0020-0051)



Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0011-0020-0051)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features


MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	3.4	4.2%
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	6.3	7.8%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	3.8	4.7%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	20.0	24.8%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	27.7	34.2%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	3.2	3.9%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	1.5	1.9%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	15.0	18.5%
Totals for Area of Interest			80.9	100.0%

Description

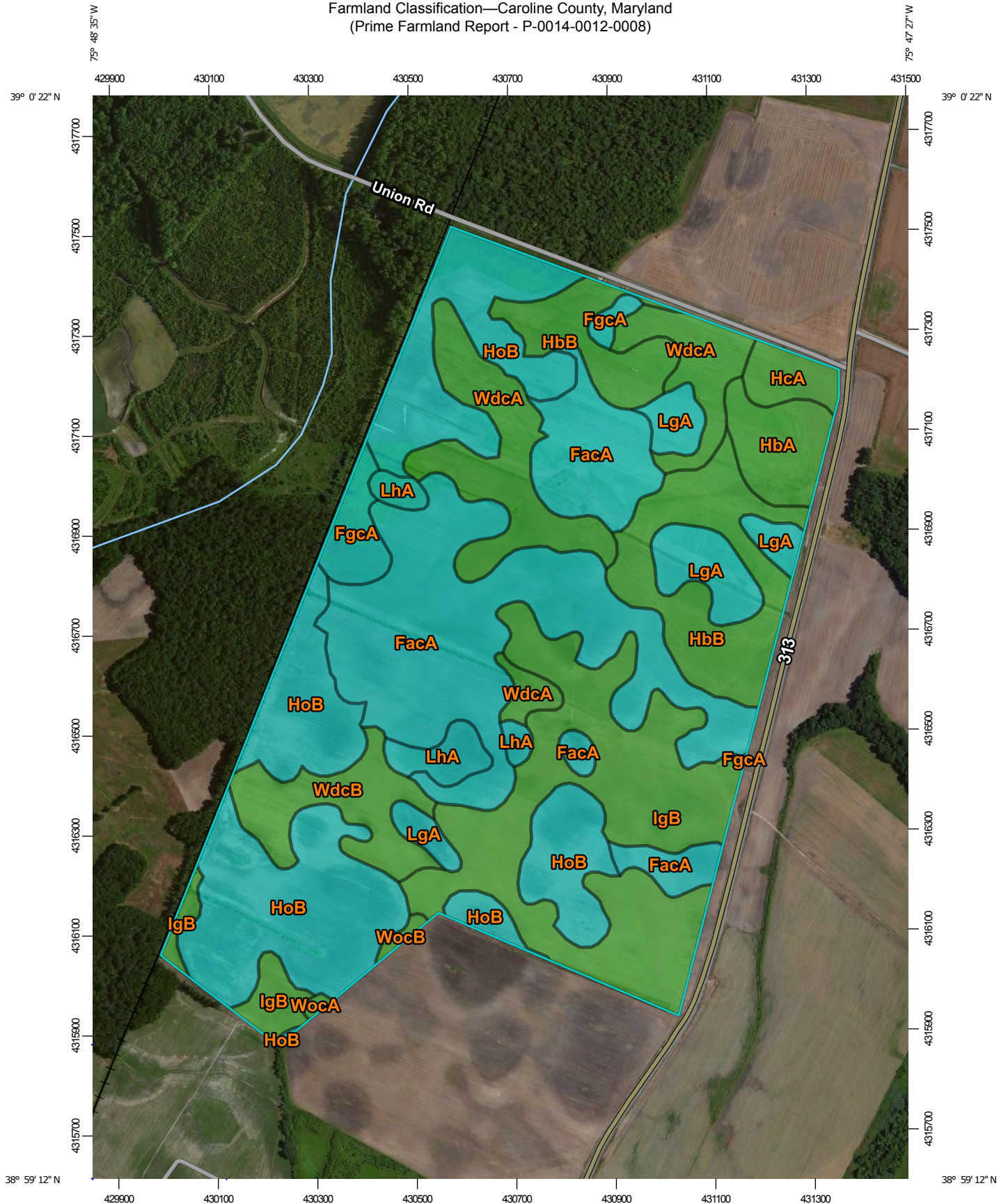
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0014-0012-0008)



Map Scale: 1:10,600 if printed on A portrait (8.5" x 11") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 5

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0014-0012-0008)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	75.8	22.9%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	6.7	2.0%
HbA	Hambrook sandy loam, 0 to 2 percent slopes	All areas are prime farmland	9.2	2.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	33.0	9.9%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	4.6	1.4%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	78.8	23.8%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	57.1	17.2%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	14.4	4.4%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	6.7	2.0%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	30.0	9.0%
WdcB	Woodstown sandy loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	13.9	4.2%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	0.4	0.1%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	0.8	0.2%
Totals for Area of Interest			331.3	100.0%

Description

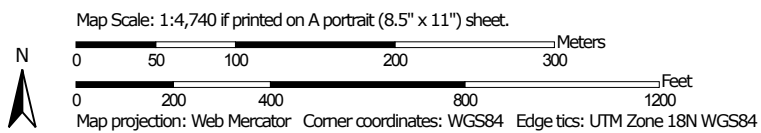
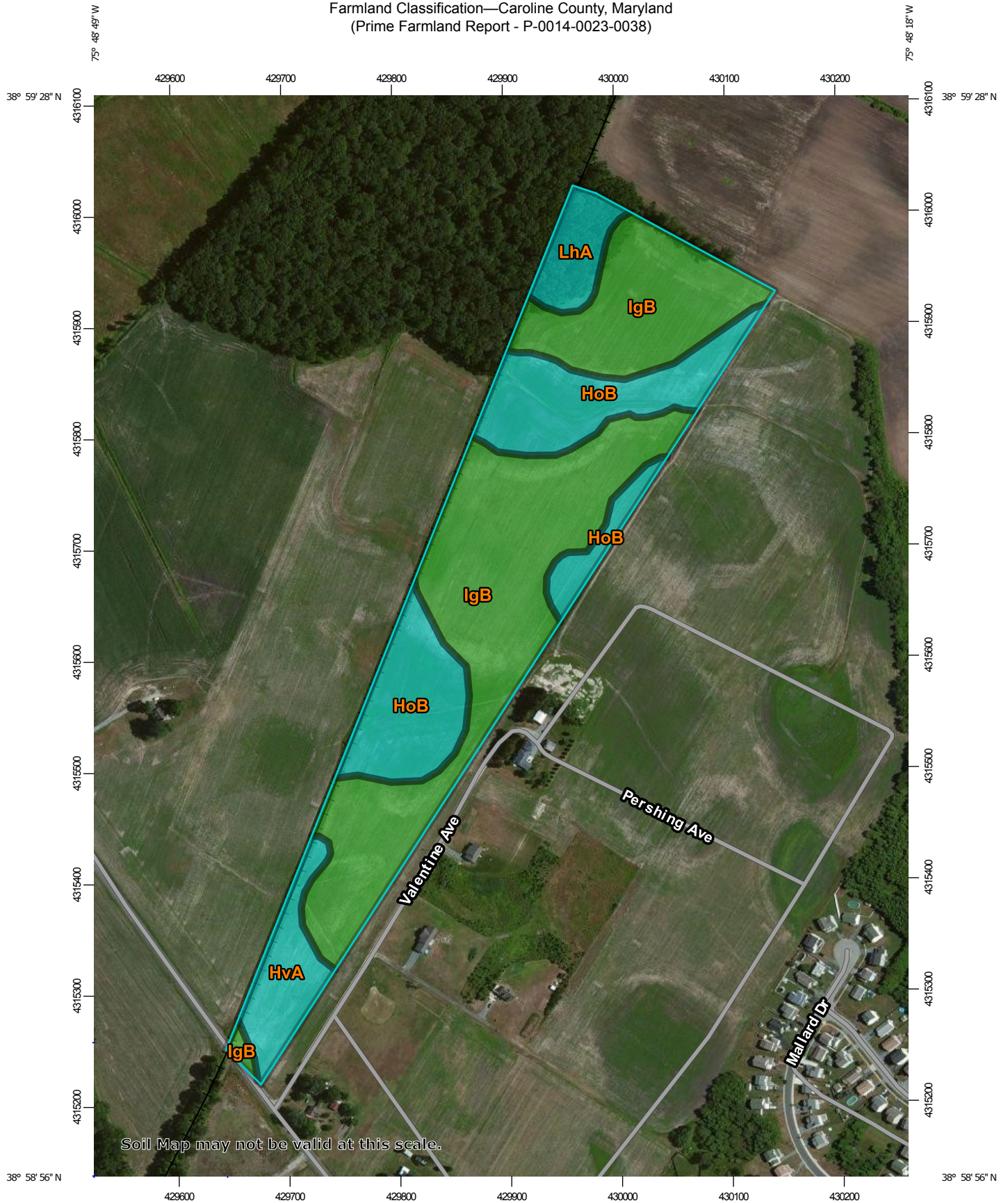
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower


Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0014-0023-0038)



Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0014-0023-0038)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	7.2	27.8%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	Farmland of statewide importance	1.9	7.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	15.5	59.5%
LhA	Lenni silt loam, 0 to 2 percent slopes	Farmland of statewide importance	1.4	5.3%
Totals for Area of Interest			26.0	100.0%

Description

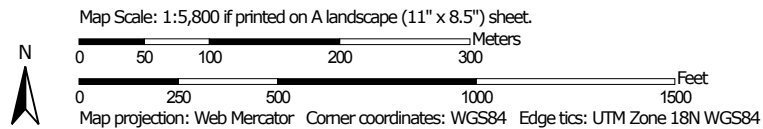
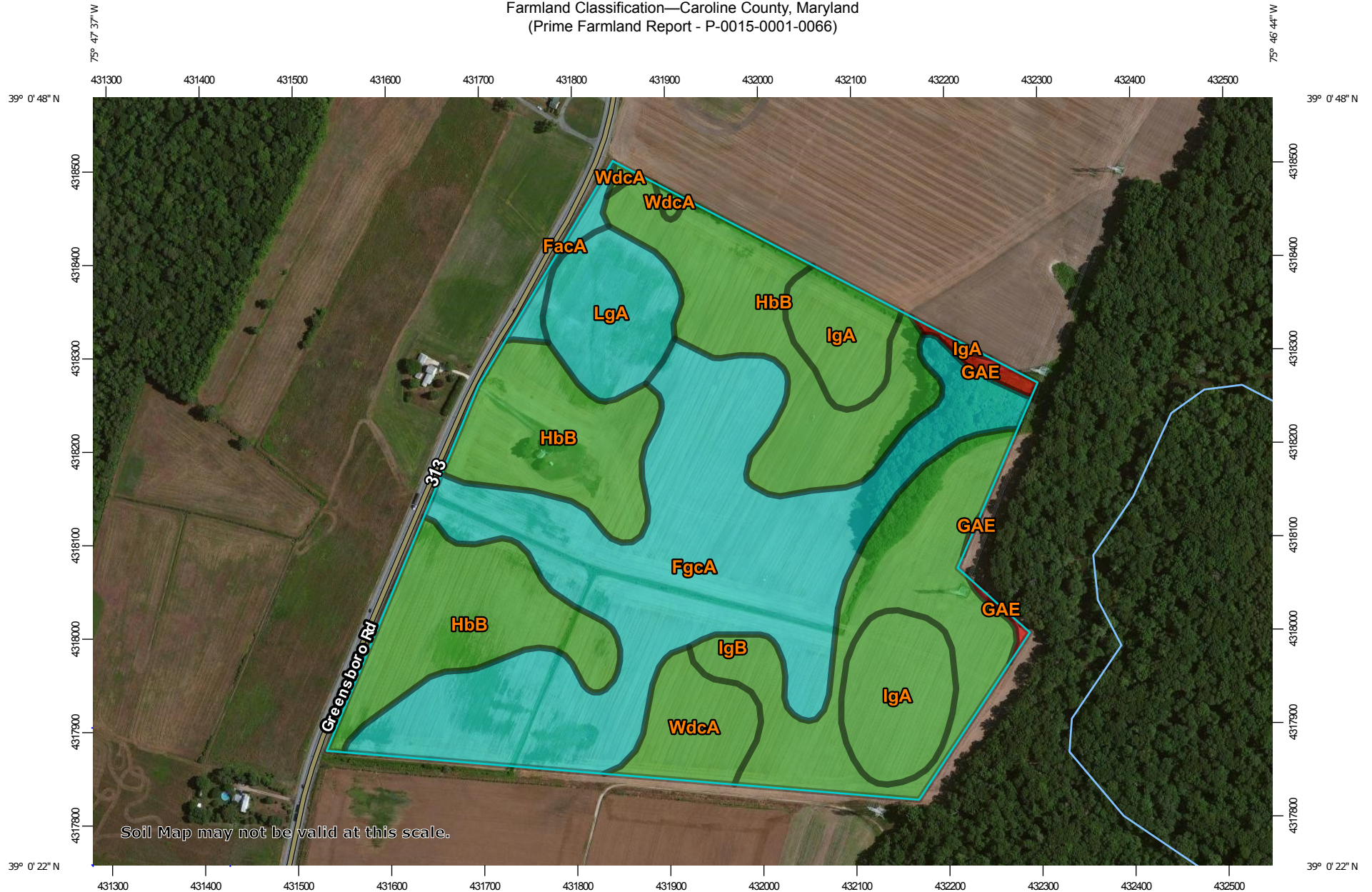
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0015-0001-0066)



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 4

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0015-0001-0066)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available


Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails


 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	0.9	1.0%
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	Farmland of statewide importance	29.7	35.3%
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	Not prime farmland	0.7	0.8%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	25.2	29.9%
IgA	Ingleside sandy loam, 0 to 2 percent slopes	All areas are prime farmland	7.6	9.1%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	11.4	13.5%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	4.9	5.9%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	3.8	4.5%
Totals for Area of Interest			84.2	100.0%

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower


Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0015-0007-0067)



Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0015-0007-0067)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—May 10, 2011

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	Farmland of statewide importance	1.4	1.9%
HbB	Hambrook sandy loam, 2 to 5 percent slopes	All areas are prime farmland	18.8	25.1%
HcA	Hambrook loam, 0 to 2 percent slopes	All areas are prime farmland	6.7	9.0%
HoB	Hammonton-Fallsington- Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	31.8	42.4%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	8.5	11.3%
WdcA	Woodstown sandy loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	7.8	10.4%
Totals for Area of Interest			75.0	100.0%

Description

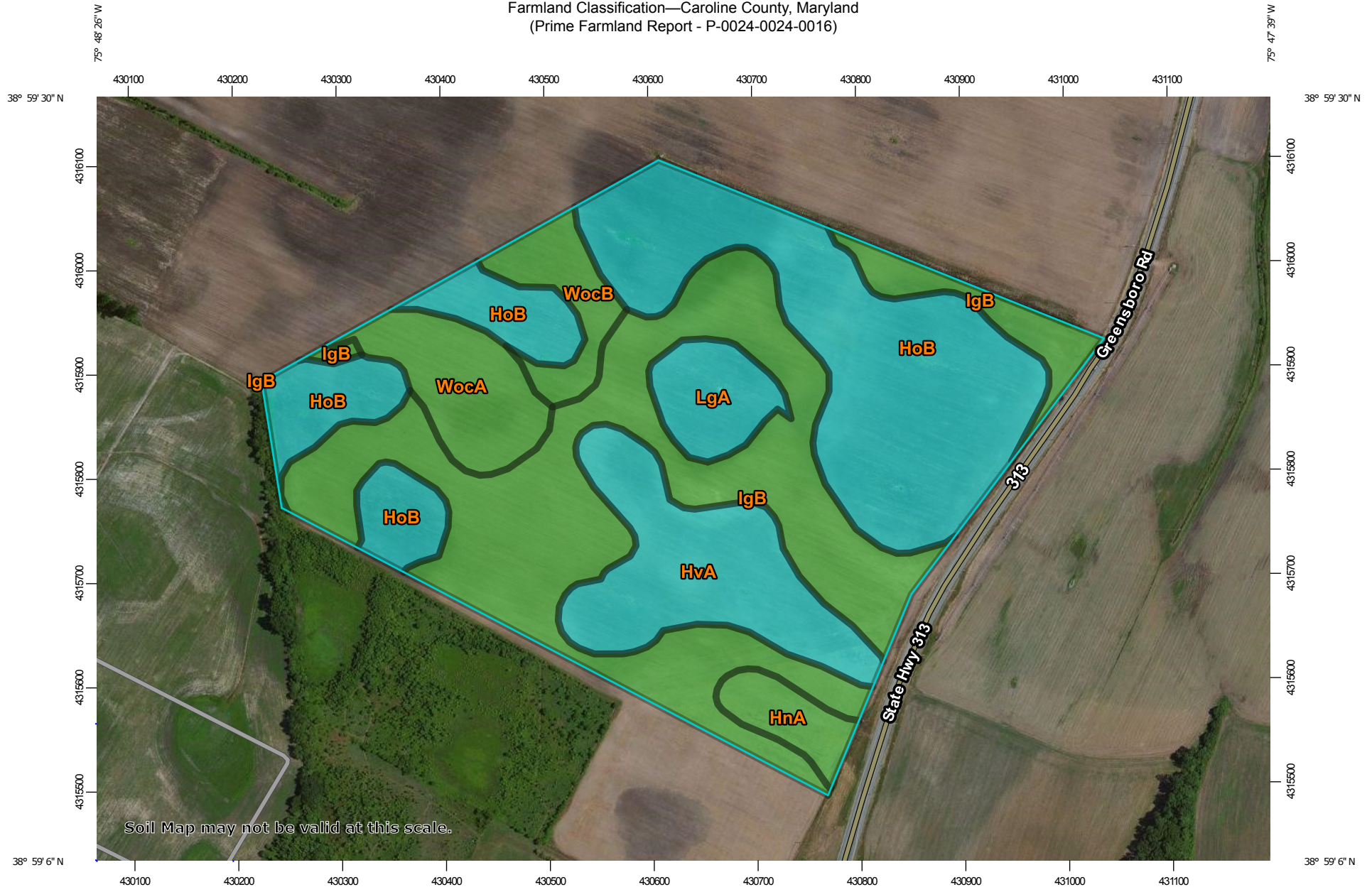
Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

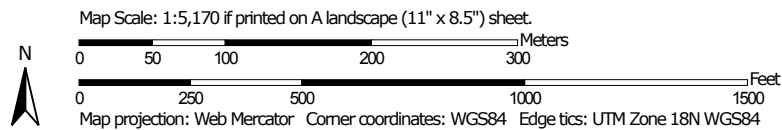
Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0024-0024-0016)



Soil Map may not be valid at this scale.



Natural Resources
Conservation Service


Web Soil Survey
National Cooperative Soil Survey

11/3/2017
Page 1 of 4

Farmland Classification—Caroline County, Maryland
(Prime Farmland Report - P-0024-0024-0016)









MAP LEGEND








Area of Interest (AOI)

-  Area of Interest (AOI)




Soils








Soil Rating Polygons






-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available







Soil Rating Lines










-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained

-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60

-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Soil Rating Points

-  Not prime farmland
-  All areas are prime farmland
-  Prime farmland if drained
-  Prime farmland if protected from flooding or not frequently flooded during the growing season
-  Prime farmland if irrigated
-  Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season

-  Prime farmland if irrigated and drained
-  Prime farmland if irrigated and either protected from flooding or not frequently flooded during the growing season
-  Prime farmland if subsoiled, completely removing the root inhibiting soil layer
-  Prime farmland if irrigated and the product of I (soil erodibility) x C (climate factor) does not exceed 60
-  Prime farmland if irrigated and reclaimed of excess salts and sodium
-  Farmland of statewide importance
-  Farmland of local importance
-  Farmland of unique importance
-  Not rated or not available

Water Features

MAP INFORMATION

 Streams and Canals

Transportation

 Rails

 Interstate Highways

 US Routes

 Major Roads

 Local Roads

Background

 Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service

Web Soil Survey URL:

Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Caroline County, Maryland

Survey Area Data: Version 16, Sep 19, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jun 17, 2010—Jul 4, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Farmland Classification

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
HnA	Hammonton sandy loam, 0 to 2 percent slopes	All areas are prime farmland	1.8	2.6%
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	Farmland of statewide importance	22.5	33.4%
HvA	Hurlock sandy loam, 0 to 2 percent slopes	Farmland of statewide importance	8.3	12.4%
IgB	Ingleside sandy loam, 2 to 5 percent slopes	All areas are prime farmland	25.4	37.6%
LgA	Lenni loam, 0 to 2 percent slopes	Farmland of statewide importance	2.7	4.0%
WocA	Woodstown loam, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	4.2	6.2%
WocB	Woodstown loam, 2 to 5 percent slopes, Mid-Atlantic Coastal Plain	All areas are prime farmland	2.6	3.8%
Totals for Area of Interest			67.4	100.0%

Description

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978.

Rating Options

Aggregation Method: No Aggregation Necessary

Tie-break Rule: Lower

APPENDIX 3

Caroline County Solar Ordinance

COUNTY COMMISSIONERS OF CAROLINE COUNTY, MARYLAND

ORDINANCE #2017-2

PUBLIC HEARING: OCTOBER 17, 2017; BEGINNING AT 6:15 PM
COURTHOUSE, 109 MARKET STREET, ROOM 106,
DENTON, MARYLAND

ENACTED: DECEMBER 12, 2017

EFFECTIVE: DECEMBER 12, 2017

Chapter 175 – Zoning – Solar Energy Systems

AN Act concerning Solar Energy Systems in Caroline County; **FOR** the purpose of revising the Zoning chapter to permit and provide conditions for Accessory and Commercial Solar Energy Systems; **BY** repealing and reenacting, with amendments, and transferring §175-85 to §175-46 of the Code of Public Local Laws of Caroline County and **BY** renumbering §175-86 to §175-85 of the Code of Public Local Laws of Caroline County, Maryland.

Short Title

This Act may be referred to as Chapter 175 – Zoning – Solar Energy Systems.

WHEREAS, the County Commissioners of Caroline County, Maryland (the "County Commissioners") are authorized under the Land Use Article, Title 4 of the Annotated Code of Maryland to enact and administer zoning and land use ordinances; and

WHEREAS, the Commissioners established a temporary moratorium on the permitting of certain solar energy systems via Resolution #2017-008 (the "Resolution") in order to evaluate the taxing, siting and construction of additional solar energy systems and current requirements for such systems in light of changing technology, changing consumer demands, and changes to existing infrastructure in the County; and

WHEREAS, the Resolution established a workgroup to review Land Use Issues (the "Workgroup") related to the subject of the temporary moratorium; and

WHEREAS, the Workgroup held several public meetings to study relevant data, different legislative and regulatory models, industry best practices, and other pertinent information, in the context of the goals of the Caroline County Comprehensive Plan; and

WHEREAS, as the result of its study, the Workgroup recommended certain changes to the Zoning Chapter of the Code of Public Local Laws of Caroline County, Maryland (the "Code") to the Caroline County Planning Commission ("Planning Commission"); and

hiber 2 page 462

WHEREAS, the County Commissioners have received the positive recommendation of the Planning Commission the staff of the Caroline County Department of Planning and Codes regarding the textual amendments proposed in this Ordinance, as reflected herein; and

WHEREAS, the County Commissioners have determined this Ordinance is necessary and appropriate to protect and improve the general health, safety, and welfare of the County and its residents; and

WHEREAS, this Ordinance may also be known by its short title "Chapter 175 – Zoning – Solar Energy Systems."

NOW, THEREFORE, be it enacted by the County Commissioners of Caroline County, Maryland, that:

SECTION 1. §175-8, Definitions, of the Code of Public Local Laws of Caroline County, Maryland is hereby repealed and reenacted, with amendments as follows:

ARTICLE II Definitions

§175-8. Word usage; terms defined

B. Terms defined. As used in this chapter, the following terms shall have the meanings indicated:

Solar power plants **ENERGY SYSTEMS**

~~A mid- or utility-scale commercial facility comprised of one or more freestanding, ground-mounted devices that converts sunlight into electricity, whether by photovoltaics (PV), concentrating solar thermal devices (CST) or various experimental solar technologies, for the primary purpose of wholesale or retail sales of generated electricity.~~

~~(1) Concentrating Solar Thermal Devices~~

~~Also known as "concentrated solar thermal power (CST)" are systems that use lenses or mirrors, and often tracking systems, to focus or reflect a large area of sunlight into a small area. The concentrated energy is absorbed by a transfer fluid or gas and used as a heat source for either a conventional power plant, such as a steam power plant, or a power conversion unit, such as a sterling engine.~~

~~(2) Photovoltaics~~

~~A technology that converts light directly into electricity. Photovoltaic (PV) systems and concentrated photovoltaic (CPV) systems are included within this definition.~~

ACCESSORY: ANY ROOF MOUNTED OR FREESTANDING SOLAR ARRAY THAT IS ACCESSORY TO AND INCORPORATED INTO THE DEVELOPMENT OF AN AUTHORIZED USE ON A PARCEL, AND WHICH ARE DESIGNED FOR THE PURPOSE OF REDUCING OR MEETING ON-SITE ENERGY NEEDS.

liber 2 page 463

COMMERCIAL: A NON-ACCESSORY COMMERCIAL FACILITY, INCLUDING SHARED COMMUNITY FACILITIES, COMPRISED OF ONE OR MORE FREESTANDING, GROUND MOUNTED DEVICES THAT CONVERTS SUNLIGHT INTO ELECTRICITY FOR THE PRIMARY PURPOSE OF WHOLESALE OR RETAIL SALES OF GENERATED ELECTRICITY. A SOLAR ENERGY SYSTEM MAY BE MADE UP OF 1 OR MORE PARCELS. UTILITY CONNECTIONS ARE NOT SUBJECT TO SOLAR ENERGY SYSTEM REGULATIONS.

(1) SMALL SCALE

A SOLAR ENERGY SYSTEM THAT IS ENGINEERED AND DESIGNED TO PRODUCE UP TO TWO MEGAWATTS (2 MW) OF POWER.

(2) LARGE SCALE – A SOLAR ENERGY SYSTEM THAT IS ENGINEERED AND DESIGNED TO PRODUCE OVER TWO MEGAWATTS (2 MW) OF POWER

SECTION 2. §175-85, Solar Power Plants, of the Code of Public Local Laws of Caroline County, Maryland is hereby repealed and reenacted, with amendments as follows:

ARTICLE IX

Accessory Structures and Uses

§ 175-85. Solar ENERGY SYSTEMS ~~power plant~~.

A. SITING. ~~Permitted locations:~~ A COMMERCIAL SOLAR ENERGY SYSTEM solar ~~power plant~~ that complies with the provisions of this section may be permitted as described in § 175-13, table of uses EXCEPT AS FOLLOWS:-

(1) THE COMBINED ADDITIONAL AGGREGATE ACREAGE OF COMMERCIAL SOLAR ENERGY SYSTEMS UTILIZED THROUGHOUT THE COUNTY SHALL NOT EXCEED ~~3000~~ 2000 ACRES.

(2) PARCELS LOCATED IN THE TRANSFERABLE DEVELOPMENT RIGHTS RECEIVING AREAS.

(3) PARCELS UNDER LAND PRESERVATION EASEMENTS EXCEPTING RIGHTS OF WAY FOR INFRASTRUCTURE BURIED AT LEAST THREE (3) FEET.

(4) WHERE SOLAR ENERGY SYSTEMS ARE PROPOSED FOR PARCELS IDENTIFIED AS “GREENBELTS” OR “GROWTH AREAS” IN ANY COMPREHENSIVE PLAN FOR AN INCORPORATED MUNICIPALITY, THE IMPACTED JURISDICTION MUST BE NOTIFIED.

hiber2 page 464

B. Design standards.

~~Minimum lot size. No concentrated solar power plant shall be erected on any lot less than forty (40) acres in size. No photovoltaic solar power plant shall be erected on any lot less than ten (10) acres in size.~~ Siting. Considerations **SHALL** ~~should be~~ made to siting such as avoiding areas/locations with a high potential for biological conflict such as wilderness study areas, areas of environmental concern, county and state parks, historic trails, special management areas or important wildlife habitat or corridors; avoiding **SIGNIFICANT IMPACTS TO** visual corridors that are prominent scenic viewsheds, or scenic areas designated by the county; avoiding **SIGNIFICANT IMPACTS TO** areas of erodible slopes and soils, where concerns for water quality, severe erosion, **AND/or** high storm runoff potential have been identified; and avoiding known sensitive historical, cultural or archeological resources.

(1) **SCREENING. CONSIDERATIONS SHALL BE MADE FOR VISUAL SCREENING TO ENSURE THE SOLAR ENERGY SYSTEM DOES NOT CAUSE NEGATIVE SIGNIFICANT IMPACTS TO THE AESTHETIC AND SCENIC QUALITY OF THE PROJECT AREA/LOCATION. WHERE SCREENING BUFFERS ARE REQUIRED, THEY SHALL BE OPAQUE WITHIN 3 YEARS AND SHALL CONSIST OF MIXED VEGETATION INCLUDING TREES, SHRUBS, AND ORNAMENTAL GRASSES. WHERE APPROPRIATE, POLLINATOR HABITAT MAY BE USED IN LIEU OF SCREENING BUFFERS.**

(2) Tree removal. The structures comprising the solar facility shall be constructed and located in a manner so as to minimize the necessity to remove existing trees upon the ~~PARCEL~~^{lot}, and in no event shall wooded acreage comprising more than 2% of the deeded acreage of the ~~PARCEL~~^{lot} or portion of the ~~PARCEL~~^{lot} devoted to the solar facility use be removed without demonstrating that such removal is necessary for the reasonable construction and efficient performance of the use.

(3) Setbacks.

(A) REQUIRED SETBACKS. SOLAR ENERGY system structures shall meet the minimum zoning setback for the zoning district in which located, or twenty-five (25) feet, whichever is greater. In addition, solar ENERGY SYSTEMS ~~power-plant structures~~ must be located at least **TWO** ~~one-hundred~~ feet from all residentially zoned ~~PARCELS~~^{lot} and existing residences.

(B) SETBACK MODIFICATIONS. MODIFICATIONS FROM THESE REQUIREMENTS MAY BE GRANTED BY OWNERS OF RESIDENTIALLY ZONED PARCELS OR EXISTING RESIDENCES PROVIDED A SETBACK MODIFICATION AGREEMENT IS SUBMITTED. A SETBACK MODIFICATION AGREEMENT SHALL BE REQUIRED FOR EACH PROPERTY LINE ABUTTING A SOLAR ENERGY SYSTEM STRUCTURE FOR WHICH A MODIFICATION IS REQUESTED AND SHALL SET FORTH THE PROPERTY OWNERS' CONSENT TO A MODIFIED SETBACK. SETBACK

hiber 2 page 465

MODIFICATIONS ON ANY PARCEL SHALL NOT BE INTERPRETED AS APPLYING TO REQUIRED SETBACKS FROM ANY OTHER PARCEL. SETBACK MODIFICATION AGREEMENTS SHALL BE IN A FORM PROVIDED FROM THE DEPARTMENT AND AFTER REVIEW SHALL BE FILED IN THE LAND RECORDS FOR CAROLINE COUNTY. WHERE A SOLAR ENERGY SYSTEM ENCOMPASSES MULTIPLE PARCELS, SETBACKS SHALL NOT BE REQUIRED FROM INNER PARCEL BOUNDARY LINES. Additional setbacks may be required to mitigate AESTHETIC, noise, SAFETY, and glare, OR ANY OTHER IDENTIFIED SIGNIFICANT impacts, or to provide for designated road or utility corridors.

(C) INTENT. SETBACK MODIFICATIONS RUN FOR THE DURATION OF THE UNDERLYING SOLAR ENERGY SYSTEM CONTRACT AND DO NOT RUN WITH THE LAND. THIS SECTION SHALL NOT BE CONSTRUED TO ALLOW A PROPERTY OWNER TO MODIFY A SETBACK FOR ANY OTHER PROPERTY OWNER.

- (4) Height. Solar ~~power-electric-generation~~ ENERGY SYSTEM PANEL structures shall not exceed the height of fifteen (15) feet as measured from the grade at the base of the structure to the apex of the structure. NECESSARY ACCESSORY STRUCTURES (E.G. LIGHTNING RODS) ARE SUBJECT TO APPROVAL.
- (5) Utility connections. Reasonable efforts shall be made to place all utility connections from the solar installation underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider. All electrical interconnections and distribution components must comply with all applicable codes and public utility requirements.
- (6) Visibility. Solar ENERGY systems shall be designed to blend into the architecture of the building or be screened from routine view from public right-of-ways or adjacent residentially-zoned PARCELS~~property~~. To the extent reasonably possible, use materials, colors, and textures that will blend the facility into the existing environment.
- (7) Glare. No solar ENERGY SYSTEM ~~power-plant~~ shall produce glare that would constitute a nuisance to occupants of neighboring PARCELS~~properties~~ or persons traveling neighboring roads.
- (8) Lighting. Lighting of the solar ENERGY SYSTEM ~~power-plant~~ and accessory structures shall be limited to the minimum necessary for safety and operational purposes, and shall be reasonably shielded from abutting properties. LIGHTING SHALL BE ACTIVATED BY MOTION SENSORS AND SHALL BE FULLY SHIELDED AND DOWNCAST TO PREVENT LIGHT FROM SHINING ONTO ADJACENT PARCELS OR INTO THE NIGHT SKY.

hiber 2 page 466

- (9) Fencing. A secure chain-link fence at least ~~SIX~~ seven feet in height shall enclose the entire solar **ENERGY SYSTEM** facility to restrict unauthorized access.
- (10) **IN ADDITION TO THESE DESIGN STANDARDS, ALL SOLAR ENERGY SYSTEMS SHALL MEET ALL APPLICABLE STATE REGULATIONS AND PERMIT REQUIREMENTS.** ~~Screening. Every abutting property shall be visually screened from the project through any one or combination of the following: location, distance, plantings, existing vegetation or fencing~~
- C. Decommissioning. The solar **ENERGY SYSTEM** electricity facility shall be completely decommissioned by the facility owner within twelve (12) months after the end of the **ENERGY PRODUCING** ~~useful life~~, abandonment or termination of such facility. Decommissioning shall include removal of all solar electric systems, buildings, cabling, electrical components, roads, foundations, pilings, and any other associated facilities, **TO THE EXTENT** so that any agricultural ground upon which the facility was located is again tillable and suitable for agricultural uses. **ANY COMPONENTS OF THE SOLAR ENERGY SYSTEM BURIED GREATER THAN THREE (3) FEET MAY REMAIN TO AVOID UNECESSARY TOPSOIL DISTRUBANCE.** Disturbed earth shall be graded and re-seeded unless the land owner requests in writing that the access roads or other land surface areas not be restored. The owner of the facility shall secure the costs of decommissioning by appropriate bond, letter of credit, or escrow agreement satisfactory to the county and shall include a mechanism for calculating increased removal costs due to inflation. **BOTH A DECOMISSIONING PLAN AND** ~~Such~~ estimate costs shall be submitted by the owner and subject to approval by the county prior to issuance of any permits required.
- D. Signs. A SIGN, NOT TO EXCEED ONE (1) SQUARE FOOT, SHALL BE POSTED AT EACH ENTRANCE TO THE SOLAR ENERGY SYSTEM TO IDENTIFY THE PROPERTY OWNER, THE SOLAR ENERGY SYSTEM OWNER, AND 24-HOUR EMERGENCY CONTACT PHONE NUMBER, AND ~~The manufacturers' or installers' identification and 24-hour emergency contact phone number.~~ **INFORMATON ON THE SIGN SHALL BE KEPT CURRENT. THE SIGN shall be provided along with appropriate warning signage shall be** posted at the site in a clearly visible manner.
- E. ~~Interconnection agreement. A copy of the interconnection agreement with the local electric utility company must be provided or a written explanation from the utility company outlining why an interconnection agreement is not necessary for the installation of an interconnected customer owned generator.~~ Agreements/easements. If the land on which the project is proposed is to be leased, rather than owned, by the solar energy development company, all property within the project boundary must be included in a recorded easement(s), lease(s) or consent agreement(s) specifying the applicable uses for the duration of the project.
- G. F. Public safety. Identify and address any known or suspected potential hazards to adjacent properties, public roadways, communities, aviation, etc., which may be created by the project.

hiber2 page 467

H. G. FAA. Must demonstrate compliance with federal aviation administration (faa) regulations pertaining to hazards to air navigation.

I. H. Project rationale. Project rationale, including estimated construction schedule, project life, phasing, and likely buyers or markets for the generated energy must be provided.

J. I. Site and development plans. A site plan drawn at an appropriate scale shall be provided identifying the following:

(1) AT THE TIME OF APPLICATION, A CONCEPT PLAN DRAWN AT AN APPROPRIATE SCALE SHALL BE PROVIDED IDENTIFYING THE FOLLOWING:

- i. A COPY OF THE INTERCONNECTION APPLICATION OR A WRITTEN EXPLANATION WHY AN INTERCONNECTION AGREEMENT IS NOT NECESSARY FOR AN INTERCONNECTED CUSTOMER-OWNED GENERATOR.
- 1) ii. ~~PARCEL~~ Property lines, setbacks and physical features including access routes and proposed road improvements;
- 2) iii. All existing and proposed structures including impervious surface calculations;
- 3) iv. Proposed changes to the landscape of the site, grading, vegetation clearing and planting, exterior lighting, and screening vegetation or structures;
- 4) ~~Blueprints or drawings of the solar installation showing the proposed layout of the system and any potential shading from nearby structures or vegetation;~~
- 5) v. Any existing residential dwellings within one-quarter mile of THE SOLAR ENERGY SYSTEM PROJECT a photovoltaic solar project or one-half mile of a concentrated solar project;
- 6) vi. Existing utilities and transmission lines, proposed utility lines, and utility and maintenance structures
- 7) vii. Existing topographic contours and mapped soils;
- 8) viii. Existing vegetation (list type and percent of coverage; i.e. grassland, plowed field, wooded areas, etc.)
- 9) ix. Revegetation areas and methods;
- 10) x. Dust and sediment and erosion control;
- 11) xi. Proposed stormwater management measures;
- 12) xii. Any floodplains or wetlands; and
- 13) xiii. Fencing LOCATION details
- 14) xiv. Total site acreage;
- 15) xv. Landscape and buffer areas;
- 16) ~~The number of panels to be installed, the proposed location and spacing of solar panels, and location of any associated accessory structures~~
- 17) ~~An operation and maintenance plan~~
- 18) ~~Landscape plan.~~

hiber 2 page 468

(2) BEFORE FINAL APPROVAL, A MAJOR SITE PLAN DRAWN AT AN APPROPRIATE SCALE SHALL BE PROVIDED IDENTIFYING ALL ITEMS LISTED IN (1), AS WELL AS:

- i. ENGINEERED DRAWINGS OF THE SOLAR INSTALLATION SHOWING THE PROPOSED LAYOUT OF THE SYSTEM AND ANY POTENTIAL SHADING FROM NEARBY STRUCTURES OR VEGETATION;
- ii. THE NUMBER OF PANELS TO BE INSTALLED, THE PROPOSED LOCATION AND SPACING OF SOLAR PANELS, AND LOCATION OF ANY ASSOCIATED ACCESSORY STRUCTURES
- iii. AN OPERATION AND MAINTENANCE PLAN
- iv. LANDSCAPE AND LANDSCAPE MAINTENANCE PLAN
- v. A COPY OF THE INTERCONNECTION AGREEMENT OR A WRITTEN EXPLANATION WHY AN INTERCONNECTION AGREEMENT IS NOT NECESSARY.

SECTION 3. §175-85, Solar Energy Systems, of the Code of Public Local Laws of Caroline County, Maryland is hereby transferred to § Article V – Supplementary Regulation, Section 175-46.

SECTION 4. §175-86, Accessory Ground-Mounted Solar Power Electric Generation Structures, of the Code of Public Local Laws of Caroline County, Maryland is hereby renumbered as to § Article IV – Accessory Structures and Uses, Section 175-85.

SECTION 5. Matter deleted is shown by ~~striketrough~~. Matter added is shown in **BOLD CAPITALIZATION**. Matter added by Amendment is shown by ***BOLD ITALICIZED CAPITALIZATION***. Matter deleted by Amendment is shown by ~~double striketrough~~.

SECTION 6. The Recitals to this Ordinance are incorporated herein and deemed a substantive part of this Bill.

SECTION 7. The provisions of this Ordinance are declared to be severable. If any section, subsection, sentence, clause, phrase, or portion of this Ordinance is for any reason held invalid or unconstitutional by any court or competent jurisdiction, the same shall be deemed separate, distinct, and independent from, and such holding shall not affect the validity of, the remaining portions of this Ordinance, it being the intent of the County that this Ordinance shall stand, notwithstanding the invalidity of any section, subsection, sentence, clause, phrase, or portion hereof.

SECTION 8. The Publishers of the Code of Public Local Laws of Caroline County, Maryland (the "Code") in consultation with and subject to the approval of the County shall make non-substantive corrections to codification, style, capitalization, punctuation, grammar, spelling, organization, and any internal or external reference or citations to the Code that is incorrect or

hiber 2 page 469

obsolete, with no further action required by the County Commissioners. All such corrections shall be adequately referenced and described in the editor's note following the section affected.

SECTION 9. The title of this Ordinance, or a condensed version thereof, shall be deemed to be, and is, a fair summary of this Ordinance for publication and all other purposes.

SECTION 10. This Ordinance shall take effect on December 12, 2017

Enacted this 12th day of December 2017.

ATTEST:

Jennifer M. Farina
Jennifer M. Farina
Administrative Coordinator

(SEAL)



**COUNTY COMMISSIONERS OF
CAROLINE COUNTY, MARYLAND**

D. J. Franklin
Daniel J. Franklin, President

Larry C. Porter
Larry C. Porter, Vice President

Wilbur Levengood, Jr.
Wilbur Levengood, Jr., Commissioner

STATE OF MARYLAND CAROLINE COUNTY
FILED FOR RECORD

At 11:00 o'clock am on 12/13 2017
and duly recorded in Liber FDM 2
Folio 462 one of the Ordinance
record books for the aforesaid and
Dale Migner Clerk
Recording Fee

liber 2 page 470

RESOLUTION # 2017-037

**LIFTING THE TEMPORARY EXTENDED MORATORIUM ON THE
PERMITTING OF CERTAIN SOLAR ENERGY SYSTEMS**

WHEREAS, the County Commissioners of Caroline County, Maryland (the "County Commissioners") by adoption of Resolution #2017-006 on May 2, 2017, imposed a six (6) month temporary moratorium on the siting and construction of additional solar energy systems in order to study issues related thereto and adopt policy changes to better achieve the goals expressed in the Caroline County Comprehensive Plan;

WHEREAS, during this moratorium period, the County Commissioners appointed workgroups to publicly study these issues and make recommendations, the Caroline County Planning Commission conducted further public review and discussion of those recommendations, and the County Commissioners held a public input process that exceeded the minimum requirements of the legislative process;

WHEREAS, because additional time was required for public discussion of the workgroup recommendations, the County Commissioners by adoption of Resolution #2017-029 on October 31, 2017, extended the temporary moratorium on the siting and construction of additional solar energy systems for an additional two (2) months;

WHEREAS, the County Commissioners have adopted Legislative Bill #2017-4: Chapter 166 – Taxation – Business Personal Property Taxation and Ordinance #2017-2: Chapter 175 – Zoning – Solar Energy Systems; and

WHEREAS, with the adoption of Legislative Bill #2017-4 and Ordinance #2017-2, the County Commissioners have met the purpose of the temporary moratorium, which was to protect the public health, safety and welfare of the residents of Caroline County and to protect natural resources, agricultural, and environmentally sensitive lands, and to conserve and preserve the rural character of the County.

NOW, THEREFORE, BE IT RESOLVED by the County Commissioners for Caroline County, Maryland, that the temporary moratorium on the issuance of permits for approval and construction of certain solar energy systems in Caroline County, imposed by Resolution #2017-006 and extended by Resolution #2017-029, is hereby lifted.

ADOPTED/EFFECTIVE: December 12, 2017

ATTEST:

**COUNTY COMMISSIONERS OF
CAROLINE COUNTY, MARYLAND**


Jennifer M. Farina
Administrative Coordinator


Daniel J. Franklin, President


Larry C. Porter, Vice President



STATE OF MARYLAND
FILED FOR RECORD


Wilbur Levengood, Jr., Commissioner

Approved for Legal Sufficiency:


Heather L. Price, County Attorney

At 11:00 o'clock am on 12/13/2017
and duly recorded in Liber FDM
Folio 42 one of the Real
record books for the aforesaid and
Fidal Munn Clerk
Recording Fee 0

liber 6 page 42

APPENDIX 4

*PJM Generation
Interconnection Feasibility Study
and System Impact Study*

Generation Interconnection Feasibility Study Report Queue Position AB2-037

The Interconnection Customer (IC) has proposed a 250 MW (95 MWC) solar generating facility to be located in Caroline County, Maryland. PJM studied AB2-037 as a 250 MW injection into the Delmarva Power and Light Company (DPL) system at a tap of the Keeney-Steele 230 kV circuit and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date, as stated during the project kick-off call, is October 31, 2019.

Point of Interconnection

The Interconnection Customer requested a transmission level interconnection. As a result, AB2-037 will interconnect with the DPL system at a new three breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit.

Transmission Owner Scope of Work

Substation Interconnection Estimate

Scope: Build a new 230 kV substation with a 3 position ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the substation. The other position will be a terminal configured for the interconnection of a generator.

Estimate: \$6,491,000

Construction Time: 24 months

Major Equipment Included in Estimate:

• Control Enclosure, 20' x 15'	Qty. 1
• Power Circuit Breaker, 230 kV, 2000A, 40kA, 3 cycle	Qty. 3
• Disconnect Switch, 230 kV, 2000A, Manual Wormgear, Arcing Horns	Qty. 9
• CT/VT Combination Units, 230 kV	Qty. 3
• CVT, 230 kV	Qty. 6
• Disconnect Switch Stand, High, 230 kV, Steel	Qty. 5
• Disconnect Switch Stand, Low, 230 kV, Steel	Qty. 4
• CT/VT Stand, Single Phase, Low, 230 kV, Steel	Qty. 3
• CVT Stand, Single Phase, Low, 230 kV, Steel	Qty. 6
• SSVT, 230 kV/240-120 V	Qty. 1
• Relay Panel, Transmission Line, FL/BU (20")	Qty. 6
• Control Panel, 230 kV Circuit Breaker (10")	Qty. 3
• Take-off structure, 230 kV	Qty. 2
• Bus Support Structure, 3 phase, 230 kV, Steel	Qty. 8

Estimate Assumptions:

- Land purchase for the substation is not included.
- A 3.5 acre, relatively square lot is available for use.
- Site clearing and grading performed by Developer.
- Lightning protection (lightning masts) are not required.

Required Relaying and Communications

New protection relays are required for the new terminals.

An SEL-487 will be required for primary protection and an SEL-387 will be required for back-up protection. Two 20" relay panels for each generator terminal will be required for front line and back-up protection (2 total).

New protection relays are required for the new line terminals. An SEL-421 will be required for primary protection and an SEL-311C will be required for back-up protection. Two 20" relay panels will be required for each transmission line terminal (4 total).

An SEL-451 relay on a 20" breaker control panel will be required for the control and operation of each new 230 kV circuit breaker.

The project will require re-wiring and adjustment of existing relay schemes to accommodate the new 230 kV substation.

The cost of the required relay and communications is included in the Substation Interconnection Estimate.

Metering

Three phase 230 kV revenue metering points will need to be established. DPL will purchase and install all metering instrument transformers as well as construct a metering structure. The secondary wiring connections at the instrument transformers will be completed by DPL's metering technicians. The metering control cable and meter cabinets will be supplied and installed by DPL. DPL will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined in the construction phase. DPL will provide both the Primary and the Backup meters. DPL's meter technicians will program and install the Primary & Backup solid state multi-function meters for each new metering position. Each meter will be equipped with load profile, telemetry, and DNP outputs. The IC will be provided with one meter DNP output for each meter. DPL will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

It is the IC's responsibility to send the data that PJM and DPL requires directly to PJM. The IC will grant permission for PJM to send DPL the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH. The estimate for

DPL to design, purchase, and install metering as specified in the aforementioned scope for metering is included in the Substation Interconnection Estimate.

Interconnection Customer Scope of Work

The Interconnection Customer is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC. Protective relaying and metering design and installation must comply with DPL's applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

DPL Interconnection Customer Scope of Direct Connection Work Requirements:

- DPL requires that an IC circuit breaker is located within 500 feet of the new 230 kV substation to facilitate the relay protection scheme between DPL and the IC at the Point of Interconnection (POI).

Special Operating Requirements

1. DPL will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, or other method depending upon the specific circumstances and the evaluation by DPL.
2. DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

Additional Interconnection Customer Responsibilities:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

Summer Peak Analysis - 2020

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

1. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 97.56% to 98.94% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 24.47 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'
DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHI230B1 \$ B
END/* \$ DELCO \$ CHI230B1 \$ B

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 97.56% to 98.94% (DC power flow) of its emergency rating (796 MVA) for the line fault with failed breaker contingency outage of 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'. This project contributes approximately 24.47 MW to the thermal violation.

CONTINGENCY 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'
DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHICH045 \$ STBK
DISCONNECT BUS 213627 /* FOULK8 230.00 \$ DELCO \$
CHICH045 \$ STBK
END/* \$ DELCO \$ CHICH045 \$ STBK

3. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 38.26% to 43.36% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 39.44 MW to the thermal violation.

CONTINGENCY 'DBL_4NC' /* RED LION-CEDAR CREEK
230;RED LION-CARTANZA 230
OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
END

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

- 1&2. To mitigate the (PECO - AE) DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) overloads will require reinforcements to increase the emergency rating of the Delco Tap to Mickleton 230 kV line. Reinforcements include the replacement of substation equipment and substation bus at Mickleton Substation. The estimate to perform this work is **\$905,000** and will take **18 months** to complete.
3. To mitigate the (DP&L) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) over load will require reinforcements to increase the emergency rating of the Townsend to Middletown Tap 138 kV line. Reinforcements include rebuilding a short section of the circuit and installation of new poles and re-mounting of 138 kV disconnect switches. The estimate to perform this work is **\$800,000** and will take **18 months** to complete.

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

(Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Steady-State Voltage Requirements

(Results of the steady-state voltage studies should be inserted here)

To be performed during later study phases.

Short Circuit

(Summary of impacted circuit breakers)

No issues identified.

Stability and Reactive Power Requirement

(Results of the dynamic studies should be inserted here)

To be performed during later study phases.

Light Load Analysis - 2020

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

Facilities Study Estimate

(If a Facilities Study is required, provide the estimated duration and cost estimate to perform the Study)

7 months; \$100,000

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

1. (PECO - PECO) The LINWOOD-CHICHST1 230 kV line (from bus 213750 to bus 213489 ckt 1) loads from 102.07% to 103.42% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 47.62 MW to the thermal violation.

CONTINGENCY '220-39' /* \$ DELCO \$ 220-39 \$ L
TRIP BRANCH FROM BUS 213490 TO BUS 213750 CKT 1 /*
END

2. (PECO - PECO) The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 101.92% to 103.26% (DC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-43/* \$ DELCO \$ 220-43 \$ L'. This project contributes approximately 47.55 MW to the thermal violation.

CONTINGENCY '220-43/* \$ DELCO \$ 220-43 \$ L'
TRIP BRANCH FROM BUS 213489 TO BUS 213750 CKT 1 /*
END/* \$ DELCO \$ 220-43 \$ L

Delmarva Power and Light Costs

Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in

connection with the AB2-037 project. Such costs may include, but are not limited to, any transmission system assets currently in DPL's rate base that are prematurely retired due to the AB2-037 project. PJM shall work with DPL to identify these retirement costs and any additional expenses. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AB2-037 project.

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gauge other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 97.56% to 98.94% (DC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 24.47 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'

DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHI230B1 \$ B
END/* \$ DELCO \$ CHI230B1 \$ B

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
213400	COVANTA DELA	10.48
231916	EM3	3.48
231901	EM4	7.09
231900	EM5	26.32
231908	HR1	5.1
231909	HR2	5.05
231910	HR3	5.1
231505	HR4	10.82
232923	MR1	1.45
232924	MR2	1.45
213888	PHLISCT1	12.48

213889	<i>PHLISCT2</i>	12.48
213890	<i>PHLISCT3</i>	12.48
213893	<i>PHLISST1</i>	11.37
297077	<i>V2-028 E</i>	0.35
904212	<i>V4-022E</i>	0.29
901004	<i>W1-003 E</i>	0.42
901014	<i>W1-004 E</i>	0.42
901024	<i>W1-005 E</i>	0.42
901034	<i>W1-006 E</i>	0.42
905132	<i>W4-015 E</i>	-8.99
907052	<i>X1-032 E</i>	0.37
907324	<i>X1-096 E</i>	8.61
910572	<i>X3-008 E</i>	1.18
910592	<i>X3-015 E</i>	1.14
910822	<i>X3-066 E</i>	0.37
920352	<i>X4-027</i>	0.84
913362	<i>Y1-079 E</i>	0.61
913412	<i>Y1-080 E</i>	0.2
920543	<i>Y3-054 E</i>	1.08
915542	<i>Y3-058 E</i>	0.86
920582	<i>Z1-076 C</i>	0.49
920583	<i>Z1-076 E</i>	0.8
920592	<i>Z1-077 C</i>	0.35
920593	<i>Z1-077 E</i>	0.57
916282	<i>Z1-081 E</i>	0.37
917082	<i>Z2-012 E</i>	1.15
920763	<i>Z2-076 E</i>	0.18
920773	<i>Z2-077 E</i>	0.18
920812	<i>Z2-097 C</i>	0.36
920813	<i>Z2-097 E</i>	0.15
921122	<i>AA1-059 C</i>	0.4
921123	<i>AA1-059 E</i>	0.16
921142	<i>AA1-061 C</i>	1.27
921143	<i>AA1-061 E</i>	0.62
921442	<i>AA1-110 C</i>	0.4
921443	<i>AA1-110 E</i>	0.2
921592	<i>AA1-140 C</i>	0.69
921593	<i>AA1-140 E</i>	1.13
921602	<i>AA1-141 C</i>	0.53
921603	<i>AA1-141 E</i>	0.86
921872	<i>AA2-069</i>	45.33
922213	<i>AA2-129 E</i>	1.85
922222	<i>AA2-130</i>	0.19
922752	<i>AB1-056 C OP</i>	5.86
922753	<i>AB1-056 E OP</i>	16.68

922762	<i>AB1-057 C</i>	5.95
922763	<i>AB1-057 E</i>	16.95
923282	<i>AB1-137 C</i>	1.28
923283	<i>AB1-137 E</i>	0.55
923322	<i>AB1-141 C OP</i>	1.35
923323	<i>AB1-141 E OP</i>	0.63
923332	<i>AB1-142 C OP</i>	1.35
923333	<i>AB1-142 E OP</i>	0.63
923452	<i>AB1-162 C OP</i>	0.63
923453	<i>AB1-162 E OP</i>	1.03
923602	<i>AB1-176 C</i>	0.34
923603	<i>AB1-176 E</i>	0.56
923902	<i>AB2-030 E</i>	0.37
923921	<i>AB2-032 C</i>	1.36
923922	<i>AB2-032 E</i>	0.64
923931	<i>AB2-033 C</i>	0.66
923932	<i>AB2-033 E</i>	0.26
923951	<i>AB2-036 C</i>	4.51
923952	<i>AB2-036 E</i>	7.35
923961	<i>AB2-037 C</i>	9.3
923962	<i>AB2-037 E</i>	15.17
924191	<i>AB2-063 C</i>	0.76
924192	<i>AB2-063 E</i>	1.23
924361	<i>AB2-084 C</i>	0.35
924362	<i>AB2-084 E</i>	0.57
924461	<i>AB2-095 C</i>	1.04
924462	<i>AB2-095 E</i>	1.7
924562	<i>AB2-105 E</i>	0.02
924681	<i>AB2-120 C OP</i>	3.51
924682	<i>AB2-120 E OP</i>	5.72
924781	<i>AB2-130 C OP</i>	3.49
924782	<i>AB2-130 E OP</i>	5.7
924801	<i>AB2-133 C OP</i>	3.21
924802	<i>AB2-133 E OP</i>	4.31
924821	<i>AB2-135 C</i>	2.93
924822	<i>AB2-135 E</i>	4.43
924831	<i>AB2-136 C OP</i>	2.34
924832	<i>AB2-136 E OP</i>	3.32
924881	<i>AB2-142 C</i>	0.5
924882	<i>AB2-142 E</i>	0.81
924891	<i>AB2-143 C OP</i>	0.76
924892	<i>AB2-143 E OP</i>	1.24
924971	<i>AB2-153 C</i>	0.76
924972	<i>AB2-153 E</i>	1.24
925071	<i>AB2-164 C OP</i>	0.7

925072	AB2-164 E OP	1.15
925081	AB2-165 C OP	0.7
925082	AB2-165 E OP	1.15
925091	AB2-166 C	0.18
925092	AB2-166 E	0.32
925101	AB2-167 C	0.49
925102	AB2-167 E	0.8
925111	AB2-168 C	0.43
925112	AB2-168 E	0.7
925151	AB2-172 C OP	1.8
925152	AB2-172 E OP	2.94
925231	AB2-177 C	0.23
925232	AB2-177 E	0.38
925251	AB2-179 C OP	3.99
925252	AB2-179 E OP	1.32
925261	AB2-180 C	1.3
925262	AB2-180 E	0.56
925271	AB2-185 C OP	1.38
925272	AB2-185 E OP	0.59
925311	AB2-192 C OP	0.7
925312	AB2-192 E OP	1.15

Appendix 2

(DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 38.26% to 43.36% (DC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 39.44 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'

/* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232900	DEMECSMY	2.15
232851	DUP-SFR1	0.41
232902	EASTMUNI	3.4
232923	MR1	3.36
232924	MR2	3.36
232910	NRG_G1	2.43
232911	NRG_G2	2.43

292089	<i>T-011</i>	<i>0.17</i>
297076	<i>V2-028 C</i>	<i>0.09</i>
297077	<i>V2-028 E</i>	<i>0.75</i>
904212	<i>V4-022E</i>	<i>0.61</i>
232813	<i>VAUGHN</i>	<i>0.15</i>
232919	<i>VN10</i>	<i>0.57</i>
901004	<i>W1-003 E</i>	<i>0.89</i>
901014	<i>W1-004 E</i>	<i>0.89</i>
901024	<i>W1-005 E</i>	<i>0.89</i>
901034	<i>W1-006 E</i>	<i>0.89</i>
901411	<i>W1-062</i>	<i>2.28</i>
907052	<i>X1-032 E</i>	<i>0.79</i>
907324	<i>X1-096 E</i>	<i>18.27</i>
910571	<i>X3-008 C</i>	<i>0.32</i>
910572	<i>X3-008 E</i>	<i>2.68</i>
910591	<i>X3-015 C</i>	<i>0.3</i>
910592	<i>X3-015 E</i>	<i>2.51</i>
910821	<i>X3-066 C</i>	<i>0.17</i>
910822	<i>X3-066 E</i>	<i>1.41</i>
913361	<i>Y1-079 C</i>	<i>0.24</i>
913362	<i>Y1-079 E</i>	<i>1.96</i>
913411	<i>Y1-080 C</i>	<i>0.05</i>
913412	<i>Y1-080 E</i>	<i>0.43</i>
915751	<i>Y3-033</i>	<i>1.46</i>
915752	<i>Y3-033</i>	<i>9.76</i>
920543	<i>Y3-054 E</i>	<i>2.48</i>
915541	<i>Y3-058 C</i>	<i>0.22</i>
915542	<i>Y3-058 E</i>	<i>1.86</i>
920582	<i>Z1-076 C</i>	<i>1.05</i>
920583	<i>Z1-076 E</i>	<i>1.71</i>
920592	<i>Z1-077 C</i>	<i>0.75</i>
920593	<i>Z1-077 E</i>	<i>1.22</i>
916281	<i>Z1-081 C</i>	<i>0.2</i>
916282	<i>Z1-081 E</i>	<i>1.65</i>
917082	<i>Z2-012 E</i>	<i>2.44</i>
920763	<i>Z2-076 E</i>	<i>0.4</i>
920773	<i>Z2-077 E</i>	<i>0.4</i>
920812	<i>Z2-097 C</i>	<i>1.57</i>
920813	<i>Z2-097 E</i>	<i>0.65</i>
921122	<i>AA1-059 C</i>	<i>0.84</i>
921123	<i>AA1-059 E</i>	<i>0.33</i>
921142	<i>AA1-061 C</i>	<i>2.87</i>
921143	<i>AA1-061 E</i>	<i>1.41</i>
921442	<i>AA1-110 C</i>	<i>1.78</i>
921443	<i>AA1-110 E</i>	<i>0.89</i>

921592	AA1-140 C	1.51
921593	AA1-140 E	2.47
921602	AA1-141 C	1.13
921603	AA1-141 E	1.84
921872	AA2-069	104.81
922213	AA2-129 E	3.94
922222	AA2-130	0.39
922752	AB1-056 C OP	12.79
922753	AB1-056 E OP	36.43
922762	AB1-057 C	12.99
922763	AB1-057 E	37.03
923282	AB1-137 C	2.79
923283	AB1-137 E	1.2
923322	AB1-141 C OP	5.3
923323	AB1-141 E OP	2.47
923332	AB1-142 C OP	5.3
923333	AB1-142 E OP	2.47
923452	AB1-162 C OP	2.4
923453	AB1-162 E OP	3.92
923602	AB1-176 C	1.29
923603	AB1-176 E	2.12
923902	AB2-030 E	0.79
923921	AB2-032 C	5.34
923922	AB2-032 E	2.51
923931	AB2-033 C	1.41
923932	AB2-033 E	0.56
923951	AB2-036 C	13.81
923952	AB2-036 E	22.54
923961	AB2-037 C	14.99
923962	AB2-037 E	24.45
924191	AB2-063 C	2.87
924192	AB2-063 E	4.69
924361	AB2-084 C	0.75
924362	AB2-084 E	1.22
924461	AB2-095 C	2.27
924462	AB2-095 E	3.7
924681	AB2-120 C OP	7.49
924682	AB2-120 E OP	12.21
924781	AB2-130 C OP	7.73
924782	AB2-130 E OP	12.62
924801	AB2-133 C OP	14.2
924802	AB2-133 E OP	19.08
924821	AB2-135 C	12.06
924822	AB2-135 E	18.18
924831	AB2-136 C OP	5.19

924832	AB2-136 E OP	7.37
924881	AB2-142 C	1.14
924882	AB2-142 E	1.85
924891	AB2-143 C OP	3.37
924892	AB2-143 E OP	5.5
924971	AB2-153 C	2.98
924972	AB2-153 E	4.87
925071	AB2-164 C OP	1.5
925072	AB2-164 E OP	2.44
925081	AB2-165 C OP	1.5
925082	AB2-165 E OP	2.44
925091	AB2-166 C	0.4
925092	AB2-166 E	0.7
925101	AB2-167 C	1.05
925102	AB2-167 E	1.72
925151	AB2-172 C OP	4.11
925152	AB2-172 E OP	6.7
925231	AB2-177 C	0.49
925232	AB2-177 E	0.81
925251	AB2-179 C OP	26.29
925252	AB2-179 E OP	8.67
925261	AB2-180 C	2.8
925262	AB2-180 E	1.2
925271	AB2-185 C OP	4.42
925272	AB2-185 E OP	1.89
925311	AB2-192 C OP	1.5
925312	AB2-192 E OP	2.44

***Generation Interconnection
System Impact Study Report***

For

***PJM Generation Interconnection Request
Queue Position AB2-037***

“Keeney-Steele 230 kV”

April 2017

Preface

The intent of the System Impact Study is to determine a plan, with approximate cost and construction time estimates, to connect the subject generation interconnection project to the PJM network at a location specified by the Interconnection Customer. As a requirement for interconnection, the Interconnection Customer may be responsible for the cost of constructing: Network Upgrades, which are facility additions, or upgrades to existing facilities, that are needed to maintain the reliability of the PJM system. All facilities required for interconnection of a generation interconnection project must be designed to meet the technical specifications (on PJM web site) for the appropriate transmission owner.

In some instances an Interconnection Customer may not be responsible for 100% of the identified network upgrade cost because other transmission network uses, e.g. another generation interconnection or merchant transmission upgrade, may also contribute to the need for the same network reinforcement. The possibility of sharing the reinforcement costs with other projects may be identified in the Feasibility Study, but the actual allocation will be deferred until the System Impact Study is performed.

The System Impact Study estimates do not include the feasibility, cost, or time required to obtain property rights and permits for construction of the required facilities. The Interconnection Customer is responsible for the right of way, real estate, and construction permit issues. For properties currently owned by Transmission Owners, the costs may be included in the study.

General

Cherrywood Solar 1, LLC, the Interconnection Customer (IC), has proposed a 212.5 MW (80.75 MWC) solar generating facility to be located in Caroline County, Maryland. PJM studied AB2-037 as a 212.5 MW injection into the Delmarva Power and Light Company (DPL) system at a tap of the Keeney-Steele 230 kV circuit and evaluated it for compliance with reliability criteria for summer peak conditions in 2020. The planned in-service date, as stated during the project kick-off call, is October 31, 2019.

Point of Interconnection

The Interconnection Customer requested a transmission level interconnection. As a result, AB2-037 will interconnect with the DPL system at a new three breaker 230 kV ring bus substation to be constructed adjacent to the Keeney-Steele 230 kV circuit (see Attachment 1).

Transmission Owner Scope of Work

Substation Interconnection Estimate

Scope: Build a new 230 kV substation with a 3 position ring bus. Two of the positions on the ring bus will be transmission line terminals for the tie-in of Line 23009 to the

substation. The other position will be a terminal configured for the interconnection of a generator.

Estimate: \$6,491,000

Construction Time: 24 months

Major Equipment Included in Estimate:

• Control Enclosure, 20' x 15'	Qty. 1
• Power Circuit Breaker, 230 kV, 2000A, 40kA, 3 cycle	Qty. 3
• Disconnect Switch, 230 kV, 2000A, Manual Wormgear, Arcing Horns	Qty. 9
• CT/VT Combination Units, 230 kV	Qty. 3
• CVT, 230 kV	Qty. 6
• Disconnect Switch Stand, High, 230 kV, Steel	Qty. 5
• Disconnect Switch Stand, Low, 230 kV, Steel	Qty. 4
• CT/VT Stand, Single Phase, Low, 230 kV, Steel	Qty. 3
• CVT Stand, Single Phase, Low, 230 kV, Steel	Qty. 6
• SSVT, 230 kV/240-120 V	Qty. 1
• Relay Panel, Transmission Line, FL/BU (20")	Qty. 6
• Control Panel, 230 kV Circuit Breaker (10")	Qty. 3
• Take-off structure, 230 kV	Qty. 2
• Bus Support Structure, 3 phase, 230 kV, Steel	Qty. 8

Estimate Assumptions:

- Land purchase for the substation is not included.
- A 3.5 acre, relatively square lot is available for use.
- Site clearing and grading performed by Developer.
- Lightning protection (lightning masts) are not required.

Required Relaying and Communications

New protection relays are required for the new terminals.

An SEL-487 will be required for primary protection and an SEL-387 will be required for back-up protection. Two 20" relay panels for each generator terminal will be required for front line and back-up protection (2 total).

New protection relays are required for the new line terminals. An SEL-421 will be required for primary protection and an SEL-311C will be required for back-up protection. Two 20" relay panels will be required for each transmission line terminal (4 total).

An SEL-451 relay on a 20" breaker control panel will be required for the control and operation of each new 230 kV circuit breaker.

The project will require re-wiring and adjustment of existing relay schemes to accommodate the new 230 kV substation.

The cost of the required relay and communications is included in the Substation Interconnection Estimate.

Metering

Three phase 230 kV revenue metering points will need to be established. DPL will purchase and install all metering instrument transformers as well as construct a metering structure. The secondary wiring connections at the instrument transformers will be completed by DPL's metering technicians. The metering control cable and meter cabinets will be supplied and installed by DPL. DPL will install conduit for the control cable between the instrument transformers and the metering enclosure. The location of the metering enclosure will be determined in the construction phase. DPL will provide both the Primary and the Backup meters. DPL's meter technicians will program and install the Primary & Backup solid state multi-function meters for each new metering position. Each meter will be equipped with load profile, telemetry, and DNP outputs. The IC will be provided with one meter DNP output for each meter. DPL will own the metering equipment for the interconnection point, unless the IC asserts its right to install, own, and operate the metering system.

The Interconnection Customer will be required to make provisions for a voice quality phone line within approximately 3 feet of each Company metering position to facilitate remote interrogation and data collection.

It is the IC's responsibility to send the data that PJM and DPL requires directly to PJM. The IC will grant permission for PJM to send DPL the following telemetry that the IC sends to PJM: real time MW, MVAR, volts, amperes, generator status, and interval MWH and MVARH.

The estimate for DPL to design, purchase, and install metering as specified in the aforementioned scope for metering is included in the Substation Interconnection Estimate.

Interconnection Customer Scope of Work

The Interconnection Customer is responsible for all design and construction related to activities on their side of the Point of Interconnection. Site preparation, including grading and an access road, as necessary, is assumed to be by the IC. Route selection, line design, and right-of-way acquisition of the direct connect facilities is not included in this report, and is the responsibility of the IC. Protective relaying and metering design and installation must comply with DPL's applicable standards. The IC is also required to provide revenue metering and real-time telemetering data to PJM in conformance with the requirements contained in PJM Manuals M-01 and M-14 and the PJM Tariff.

DPL Interconnection Customer Scope of Direct Connection Work Requirements:

- DPL requires that an IC circuit breaker is located within 500 feet of the new 230 kV substation to facilitate the relay protection scheme between DPL and the IC at the Point of Interconnection (POI).

Special Operating Requirements

1. DPL will require the capability to remotely disconnect the generator from the grid by communication from its System Operations facility. Such disconnection may be facilitated by a generator breaker, or other method depending upon the specific circumstances and the evaluation by DPL.
2. DPL reserves the right to charge the Interconnection Customer operation and maintenance expenses to maintain the Interconnection Customer attachment facilities, including metering and telecommunications facilities, owned by DPL.

Additional Interconnection Customer Responsibilities:

1. An Interconnection Customer entering the New Services Queue on or after October 1, 2012 with a proposed new Customer Facility that has a Maximum Facility Output equal to or greater than 100 MW shall install and maintain, at its expense, phasor measurement units (PMUs). See Section 8.5.3 of Appendix 2 to the Interconnection Service Agreement as well as section 4.3 of PJM Manual 14D for additional information.

Summer Peak Analysis - 2020

Transmission Network Impacts

Potential transmission network impacts are as follows:

Generator Deliverability

(Single or N-1 contingencies for the Capacity portion only of the interconnection)

None

Multiple Facility Contingency

(Double Circuit Tower Line, Fault with a Stuck Breaker, and Bus Fault contingencies for the full energy output)

1. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 95.87% to 98.09% (AC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 20.77 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'

DISCONNECT BUS 213489/* CHICHST1 230.00 \$ DELCO \$ CHI230B1 \$ B
END/* \$ DELCO \$ CHI230B1 \$ B

Please refer to Appendix 1 for a table containing the generators having contribution to this flowgate.

2. (PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 95.87% to 98.09% (AC power flow) of its emergency rating (796 MVA) for the line fault with failed breaker contingency outage of 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'. This project contributes approximately 20.77 MW to the thermal violation.

CONTINGENCY 'CHICH045/* \$ DELCO \$ CHICH045 \$ STBK'
DISCONNECT BUS 213489/* CHICHST1 230.00 \$ DELCO \$ CHICH045 \$ STBK
DISCONNECT BUS 213627/* FOULK8 230.00 \$ DELCO \$ CHICH045 \$ STBK
END/*\$ DELCO \$ CHICH045 \$ STBK

3. (DP&L - PECO) The CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) loads from 91.58% to 94.62% (AC power flow) of its emergency rating (1071 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'. This project contributes approximately 38.36 MW to the thermal violation.

CONTINGENCY 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'
TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1/* LINWOOD 230.00
EDGEMR 5 230.00 \$ DELCO \$ LINWO225 \$ STBK
REMOVE MACHINE 1 FROM BUS 213888/* PHLISCT1 18.00 \$ DELCO \$ LINWO225 \$ STBK
REMOVE MACHINE 1 FROM BUS 213889/* PHLISCT2 18.00 \$ DELCO \$ LINWO225 \$ STBK
END/*\$ DELCO \$ LINWO225 \$ STBK

Please refer to Appendix 2 for a table containing the generators having contribution to this flowgate.

4. (DP&L - DP&L) The EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 92.39% to 95.26% (AC power flow) of its emergency rating (1035 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'. This project contributes approximately 34.86 MW to the thermal violation.

CONTINGENCY 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'
TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1/* LINWOOD 230.00
EDGEMR 5 230.00 \$ DELCO \$ LINWO225 \$ STBK

REMOVE MACHINE 1 FROM BUS 213888/* PHLISCT1 18.00 \$ DELCO \$
 LINWO225 \$ STBK
 REMOVE MACHINE 1 FROM BUS 213889/* PHLISCT2 18.00 \$ DELCO \$
 LINWO225 \$ STBK
 END/*\$ DELCO \$ LINWO225 \$ STBK

Please refer to Appendix 3 for a table containing the generators having contribution to this flowgate.

5. (DP&L - DP&L) The MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) loads from 94.27% to 95.57% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'/* RED LION-CEDAR CREEK 230;RED LION-CARTANZA 230
 OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
 OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
 END

Please refer to Appendix 4 for a table containing the generators having contribution to this flowgate.

6. (DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 88.61% to 92.13% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'/* RED LION-CEDAR CREEK 230;RED LION-CARTANZA 230
 OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1
 OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1
 END

Please refer to Appendix 5 for a table containing the generators having contribution to this flowgate.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

Summer Peak Load Flow Analysis Reinforcements

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

- 1&2. To mitigate the (PECO - AE) DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) overloads will require reinforcements to increase the emergency rating of the Delco Tap to Mickleton 230 kV line. Reinforcements include the replacement of substation equipment and substation bus at Mickleton Substation. The estimate to perform this work is **\$905,000** and will take **18 months** to complete.

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost(\$0.905M)	Contingency Name	Contingency Type
AB2-036	10.05	21.01%	\$190,118.10	'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'	bus
AB2-037	20.77	43.42%	\$392,910.74	'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'	bus
AB2-120	9.22	19.27%	\$174,416.81	CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'	bus
AB2-130	7.80	16.30%	\$147,554.35	CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'	bus

3. To mitigate the (DP&L - PECO) CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) overload will require terminal upgrades at both the Claymont and Linwood Substations. The estimate to perform this work is **\$800,000**. The final ratings would be 1253/1519 MVA.

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost(\$0.8M)	Contingency Name	Contingency Type
AB2-036	18.43	15.97%	127764.298	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-037	38.36	33.24%	265927.21	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-120	17.19	14.90%	119168.111	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-130	14.56	12.62%	100935.875	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-133	11.63	10.08%	80623.9168	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-135	11.59	10.04%	80346.6205	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-153	3.64	3.15%	25233.9688	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker

Note: There is a potential baseline to upgrade the ratings from 805 emergency to 1035 MVA, which is required to be built before this project can go into service.

4. To mitigate the (DP&L - DP&L) EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) overload will require terminal upgrades at both the Edgemore and Claymont Substations. The estimate to perform this work is \$800,000. The final ratings would be 1253/1519 MVA.

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost(\$0.8M)	Contingency Name	Contingency Type
AB2-036	16.56	19.64%	\$157,134.39	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-037	34.86	41.35%	\$330,779.27	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-120	15.56	18.46%	\$147,645.59	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-130	13.17	15.62%	\$124,967.38	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker
AB2-136	4.16	4.93%	\$39,473.37	LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'	breaker

Note: There is a potential baseline to upgrade the ratings from 805 emergency to 1035 MVA, which is required to be built before this project can go into service.

5. To mitigate the (DP&L) MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) overload will require reinforcements to increase the emergency rating of the Middletown Tap to Mount Pleasant 138 kV line. Those reinforcements include rebuilding a small section of the circuit and installing new poles and the re-mounting of 138 kV disconnect switches. The estimated cost to perform this work is **\$800,000** and will take **18 months** to complete following a fully executed Interconnection Services Agreement (ISA) and Interconnection Construction Services Agreement (CSA). (PJM Network Upgrade Number n5300)

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost(\$0.8M)	Contingency Name	Contingency Type
AB2-032	7.84	3.32%	\$26,546	DBL_4NC'	tower
AB2-036	30.169	12.77%	\$102,151	DBL_4NC'	tower
AB2-037	33.53	14.19%	\$113,532	DBL_4NC'	tower
AB2-063	7.56	3.20%	\$25,598	DBL_4NC'	tower
AB2-120	19.70	8.34%	\$66,704	DBL_4NC'	tower
AB2-130	17.30	7.32%	\$58,577	DBL_4NC'	tower
AB2-133	28.36	12.00%	\$96,026	DBL_4NC'	tower
AB2-135	27.49	11.64%	\$93,080	DBL_4NC'	tower
AB2-136	10.70	4.53%	\$36,230	DBL_4NC'	tower

AB2-153	7.85	3.32%	\$26,580	DBL_4NC'	tower
AB2-172	10.81	4.58%	\$36,602	DBL_4NC'	tower
AB2-179	34.96	14.80%	\$118,374	DBL_4NC'	tower

6. To mitigate the (DP&L) TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) overload will require reinforcements to increase the emergency rating of the Townsend to Middletown Tap 138 kV line. Those reinforcements include rebuilding a small section of the circuit and installing new poles and the re-mounting of 138 kV disconnect switches. The estimated cost to perform this work is **\$800,000** and will take **18 months** to complete following a fully executed Interconnection Services Agreement (ISA) and Interconnection Construction Services Agreement (CSA). (PJM Network Upgrade Number n5301)

Cost allocation is as follows:

Queue	MW contribution	Percentage of Cost	Cost(\$0.8M)	Contingency Name	Contingency Type
AB2-032	7.84	3.32%	\$26,547.02	DBL_4NC'	tower
AB2-036	30.16	12.77%	\$102,124.78	DBL_4NC'	tower
AB2-037	33.53	14.19%	\$113,535.93	DBL_4NC'	tower
AB2-063	7.56	3.20%	\$25,598.92	DBL_4NC'	tower
AB2-120	19.70	8.34%	\$66,706.17	DBL_4NC'	tower
AB2-130	17.30	7.32%	\$58,579.53	DBL_4NC'	tower
AB2-133	28.36	12.00%	\$96,029.80	DBL_4NC'	tower
AB2-135	27.49	11.64%	\$93,083.89	DBL_4NC'	tower
AB2-136	10.70	4.53%	\$36,231.27	DBL_4NC'	tower
AB2-153	7.85	3.32%	\$26,580.89	DBL_4NC'	tower
AB2-172	10.81	4.58%	\$36,603.74	DBL_4NC'	tower
AB2-179	34.96	14.80%	\$118,378.06	DBL_4NC'	tower

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study) (Summary form of Cost allocation for transmission lines and transformers will be inserted here if any)

None

Steady-State Voltage Requirements

No issues identified.

Short Circuit

No issues identified.

Stability and Reactive Power Requirement

No issues identified. See Attachment 2 for full report.

Light Load Analysis - 2020

Light Load Studies to be conducted during later study phases (as required by PJM Manual 14B).

Facilities Study Estimate

7 months; \$100,000

Delivery of Energy Portion of Interconnection Request

PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.

Only the most severely overloaded conditions are listed. There is no guarantee of full delivery of energy for this project by fixing only the conditions listed in this section. With a Transmission Interconnection Request, a subsequent analysis will be performed, which will study all overload conditions associated with the overloaded element(s) identified.

1. (PECO - PECO) The CHICHST1-EDDYSTN4 230 kV line (from bus 213489 to bus 213588 ckt 1) loads from 94.12% to 96.22% (AC power flow) of its emergency rating (1078 MVA) for the single line contingency outage of '220-04/* \$ DELCO \$ 220-04 \$ L'. This project contributes approximately 26.66 MW to the thermal violation.

CONTINGENCY '220-04/* \$ DELCO \$ 220-04 \$ L'

DISCONNECT BUS 213627/* CHICHST1 230.00 FOULK8 230.00 \$ DELCO \$ 220-04 \$ L

END/*\$ DELCO \$ 220-04 \$ L

2. (PECO - PECO) The LINWOOD-CHICHST1 230 kV line (from bus 213750 to bus 213489 ckt 1) loads from 104.54% to 106.7% (AC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-39'. This project contributes approximately 40.43 MW to the thermal violation.

CONTINGENCY '220-39'/* \$ DELCO \$ 220-39 \$ L

TRIP BRANCH FROM BUS 213490 TO BUS 213750 CKT 1/*
END

3. (PECO - PECO) The LINWOOD-CHICHST2 230 kV line (from bus 213750 to bus 213490 ckt 1) loads from 104.54% to 106.69% (AC power flow) of its emergency rating (1593 MVA) for the single line contingency outage of '220-43/* \$ DELCO \$ 220-43 \$ L'. This project contributes approximately 40.37 MW to the thermal violation.

CONTINGENCY '220-43/* \$ DELCO \$ 220-43 \$ L'

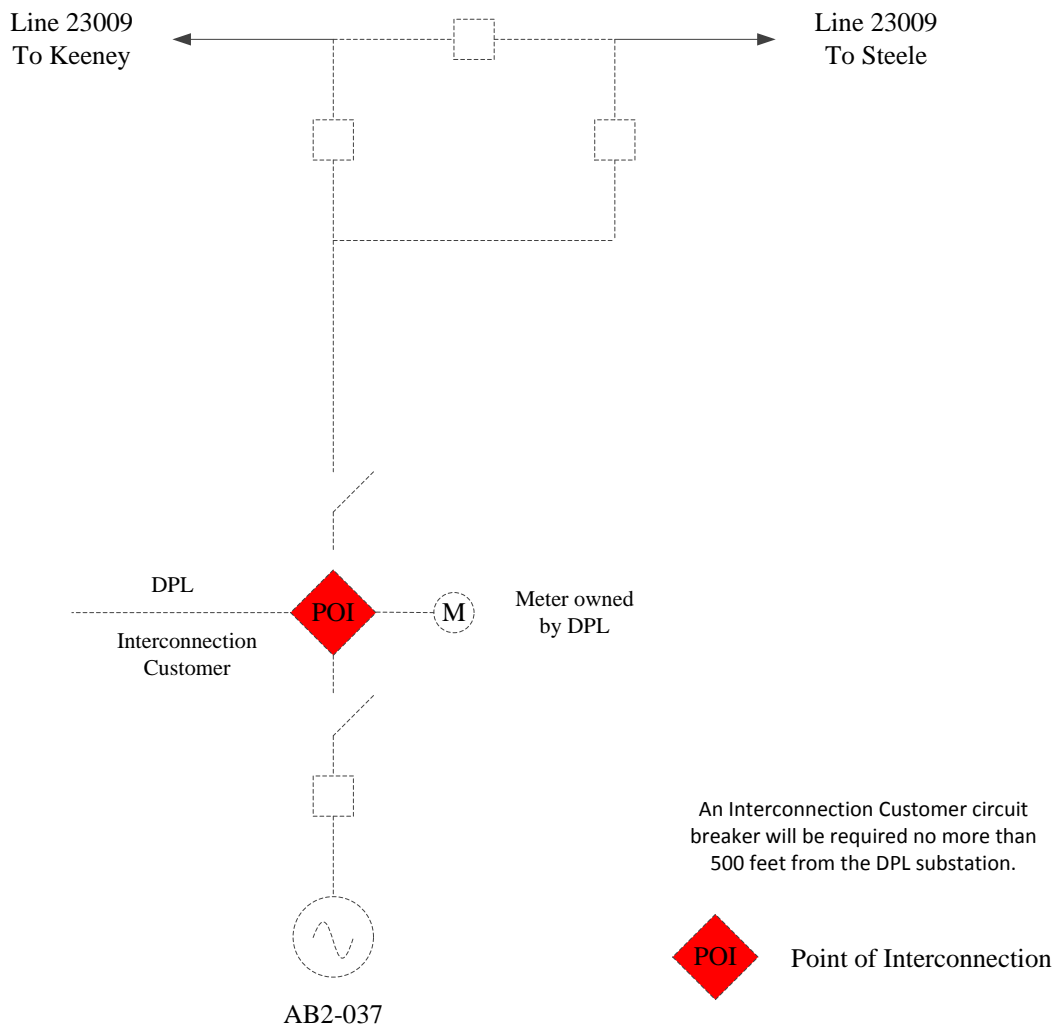
TRIP BRANCH FROM BUS 213489 TO BUS 213750 CKT 1/*
END/* \$ DELCO \$ 220-43 \$ L

Delmarva Power and Light Costs

Cost estimates will further be refined as a part of the Impact Study and Facilities Study for this project. The Interconnection Customer will be responsible for all costs incurred by DPL in connection with the AB2-037 project. Such costs may include, but are not limited to, any transmission system assets currently in DPL's rate base that are prematurely retired due to the AB2-037 project. PJM shall work with DPL to identify these retirement costs and any additional expenses. DPL reserves the right to reassess issues presented in this document and, upon appropriate justification, submit additional costs related to the AB2-037 project.

AB2-037

Keeney – Steele 230 kV New 230 kV Substation



Attachment 2



Specialist Consultants
to the Electricity Industry



AB2-037

System Impact Study

Dynamic Simulation Analysis

Prepared by	Michael Yang PSC Australia
For	PJM Interconnection, LLC
Reference	AB2-037-3-0
Date	February 15, 2017
	Proprietary & Confidential

Revision Table

Revision	Issue Date	Description
0	February 15, 2017	Initial Release

Reviewers

Name	Interest	Date
Christopher Spencer	Peer Review	February 15, 2017

Approval

Name	Position	Date
Christopher Spencer	Senior Power Systems Engineer	February 15, 2017

TABLE OF CONTENTS

Executive Summary	18
1. Introduction	19
2. Description of Project.....	20
3. Loadflow and Dynamics Case Setup	23
4. Fault Cases.....	24
5. Evaluation Criteria	25
6. Summary of Results	26
7. Recommendations and Mitigations.....	27
Attachment 1. Impact Study Data	34
Attachment 2. DPL One Line Diagram	34
Attachment 3. PSS/E Model One Line Diagram.....	34
Attachment 4. AB2-037 PSS/E Dynamic Model	34
Attachment 5. AB2-037 PSS/E Case Dispatch.....	34
Attachment 6. Plots from Dynamic Simulations	34

Executive Summary

Generator Interconnection Request AB2-037 is for a 212.5 MW Maximum Facility Output (MFO) solar powered generating facility with a Point of Interconnection (POI) at a tap of the Keeney – Steele 230kV circuit in the Delmarva Power and Light Company (DPL) system, Caroline County, Maryland.

This report describes a dynamic simulation analysis of AB2-037 as part of the overall system impact study.

The load flow scenario for the analysis was based on the RTEP 2020 Summer Peak case, modified to include applicable queue projects. AB2-037 has been dispatched online at maximum power output, with 1.0 pu voltage at the generator bus.

AB2-037 was tested for compliance with NERC, PJM, Transmission Owner and other applicable criteria. 55 contingencies were studied, each with a 10 second simulation time period. Studied faults included:

- a) Steady state operation (20 second simulation);
- b) Three phase faults with normal clearing time;
- c) Single phase faults with stuck breaker;
- d) Single phase faults placed at 80% of the line with delayed (Zone 2) clearing at line end remote from fault due to primary communications/relaying failure.
- e) Three-phase faults with loss of multi-circuit tower line.

No relevant bus or High Speed Reclosing (HSR) contingencies were found.

For all simulations, the queue project under study along with the rest of the PJM system were required to maintain synchronism and with all states returning to an acceptable new condition following the disturbance.

For the all 55 fault contingencies tested on the 2020 Summer Peak case:

- a) Post-contingency oscillations were positively damped with a damping margin of at least 3%.
- b) The AB2-037 generator was able to ride through all faults (except for faults where protective action trips a generator(s)).
- c) Following fault clearing, all bus voltages recovered to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).
- d) No transmission element tripped, other than those either directly connected or designed to trip as a consequence of that fault.

A spike in the PELEC output, greater than Pmax, was noted for the AB2-037 generator at fault clearance for contingencies 1B.04 - 1B.12, 1D.01 and 1D.03 - 1D.09.

No mitigations were found to be required.

1. Introduction

Generator Interconnection Request AB2-037 is for a 212.5 MW Maximum Facility Output (MFO) solar powered generating facility with a Point of Interconnection (POI) at a tap of the Keeney-Steele 230kV circuit in the Delmarva Power and Light Company (DPL) system, Caroline County, Maryland.

This analysis is effectively a screening study to determine whether the addition of AB2-037 will meet the dynamic requirements of the NERC, PJM and Transmission Owner reliability standards.

In this report the AB2-037 project and how it is proposed to be connected to the grid are first described, followed by a description of how the project is modeled in this study. The fault cases are then described and analyzed, and lastly a discussion of the results is provided.

2. Description of Project

AB2-037 consists of 102 x SMASC 2.08 MW inverters. AB2-037 will be connected to the POI via a 230 / 34.5 kV main collector transformer with a rating of 250 MVA (OA) connected to a 34.5 / 0.385 kV lumped equivalent transformer representing 102 x 2.25 MVA generator step up (GSU) transformers.

The AB2-037 Point of Interconnection (POI) is at a tap of the Keeney – Steele 230kV circuit in the Delmarva Power and Light Company (DPL) system, Caroline County, Maryland as shown in Figure 1.

Table 1 lists the parameters given in the impact study data and the corresponding parameters of the AB2-037 loadflow models.

The dynamic model for the AB2-037 plant is based on the SMA Sunny Central 2200-US PSS/E user defined model supplied by PJM, as indicated by the Developer.

Additional project details are provided in Attachments 1 through 4:

- Attachment 1 contains the Impact Study Data which details the proposed AB2-037 project.
- Attachment 2 shows the one line diagram of the DPL network in the vicinity of AB2-037.
- Attachment 3 provides a diagram of the PSS/E model in the vicinity of AB2-037.
- Attachment 4 gives the AB2-037 PSS/E loadflow and dynamic models of the AB2-037 plant.

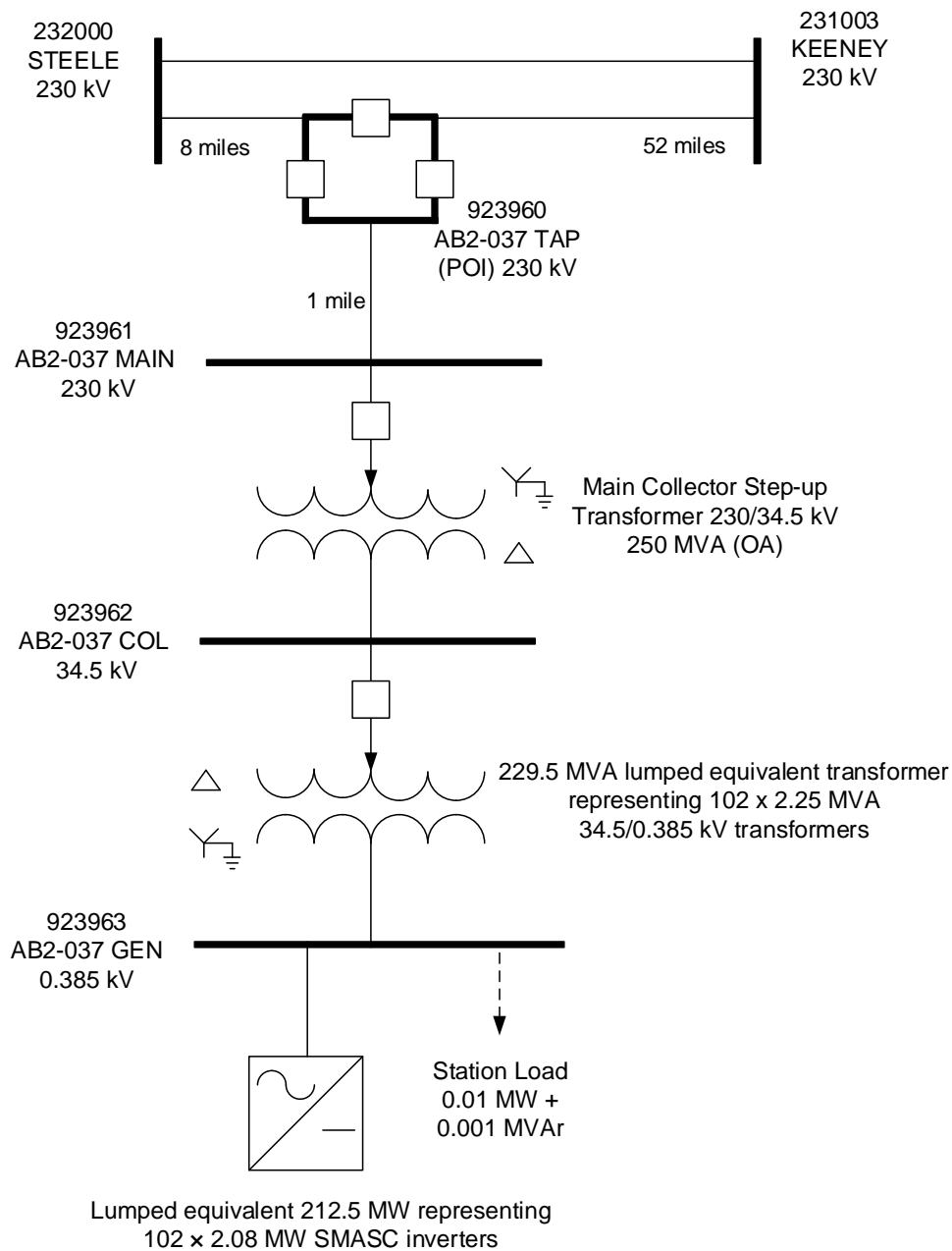


Figure 1: AB2-037 Plant Model

Table 1: AB2-037 Plant Model

	Impact Study Data	Model
Inverter Type	<p>102 × 2.080 MW SMA Sunny Central 2200-US inverters</p> <p>MVA base = 224.4 MVA Vt = 0.385 kV</p> <p>Unsaturated sub-transient reactance = j10000 pu @ MVA base</p>	<p>Lumped equivalent representing 102 × 2.080 MW SMA Sunny Central 2200-US inverters</p> <p>Pgen 212.5 MW Pmax 212.5 MW Pmin 0 MW Qmax 69.8 MVA_r Qmin -69.8 MVA_r Mbase 224.4 MVA Zsorce j10000 pu @ Mbase</p>
GSU transformer(s)	<p>102 x 34.5/0.385 kV 2.25 MVA two winding transformers Dyn</p> <p>Rating = 2.25 MVA</p> <p>Transformer base = 2.25 MVA (OA)</p> <p>Impedance = 0.01 + j0.0575 pu @ MVA base</p> <p>Number of taps = 5 Tap step size = 2.5%</p>	<p>Lumped equivalent representing 102 x 34.5/0.385 kV 2.25 MVA transformers</p> <p>Transformer base = 229.5 MVA</p> <p>Rating = 229.5 MVA</p> <p>Impedance = 0.01 + j0.0575 pu @ MVA base</p> <p>Number of taps = 5 Tap step size = 2.5%</p>
Main collector step-up transformer	<p>1 x 230/34.5 kV Two winding transformer YNd</p> <p>Rating = 250 MVA (OA/F1/F2)</p> <p>Transformer base = 250 MVA</p> <p>Impedance = 0.0018 + j0.09 pu @ MVA base</p> <p>Number of taps = 5 Tap step size = 2.5%</p>	<p>1 x 230/34.5 kV Two winding transformer</p> <p>Rating = 250 MVA</p> <p>Transformer base = 250 MVA</p> <p>Impedance = 0.0018 + j0.09 pu @ MVA base</p> <p>Number of taps = 5 Tap step size = 2.5%</p>
Station load	0.01 MW + 0.001 MVA _r	0.01 MW + 0.001 MVA _r (Switched off)
Auxiliary load	N/A	N/A
Transmission line	<p>230 kV 230 MVA</p> <p>Length = 1 mile</p> <p>Impedance = 0.00002 + j0.00014</p> <p>B = 0.0003</p>	<p>230 kV 230 MVA</p> <p>Length = 1 mile</p> <p>Impedance = 0.00002 + j0.00014</p> <p>B = 0.0003</p>

3. Loadflow and Dynamics Case Setup

The dynamics simulation analysis was carried out using PSS/E Version 33.7.0.

The load flow scenario and fault cases for this study are based on PJM's Regional Transmission Planning Process¹.

The selected load flow scenario is the RTEP 2020 Summer Peak case with the following modifications:

- a) Addition of all applicable queue projects prior to AB2-037.
- b) Addition of AB2-037 queue project.
- c) Removal of withdrawn and subsequent queue projects in the vicinity of AB2-037.
- d) Dispatch of units in the PJM system to maintain slack generators within limits.
- e) Merchant transmission projects X3-028 and S57/S58 set online and at maximum power import into PJM.

The AB2-037 initial conditions are listed in Table 2, indicating maximum power output, with 1.0 pu voltage at the generator bus.

Table 2: AB2-037 machine initial conditions

Bus	Name	Unit	PGEN	QGEN	ETERM	POI Voltage
923963	AB2-037GEN	1	212.5	-9.38 MVar	1.000 pu	1.003 pu

Generation within the PJM500 system (area 225 in the PSS/E case) and within the vicinity of AB2-037 has been dispatched online at maximum output (P_{MAX}). The dispatch of generation in the vicinity of AB2-037 is given in Attachment 5.

¹ Manual 14B: PJM Region Transmission Planning Process, Rev 33, May 5 2016, Attachment G : PJM Stability, Short Circuit, and Special RTEP Practices and Procedures.

© PJM Interconnection 2017. All rights reserved.

4. Fault Cases

Tables 3 to 7 list the contingencies that were studied, with representative worst case total clearing times provided by PJM. Each contingency was studied over a 10 second simulation time interval.

The studied contingencies include:

- a) Steady state operation (20 second simulation);
- b) Three phase faults with normal clearing time;
- c) Single phase faults with stuck breaker;
- d) Single phase faults placed at 80% of the line with delayed (Zone 2) clearing at line end remote from fault due to primary communications/relaying failure.
- e) Three-phase faults with loss of multi-circuit tower line.

No relevant bus or High Speed Reclosing (HSR) contingencies were found.

Buses at which the faults listed above will be applied are

- AB2-037 TAP 230 kV POI
- Steele 230 kV
- Keeney EHV 230 kV

The three phase faults with normal clearing time were performed under network intact conditions.

Additional delayed (Zone 2) clearing at remote and faults will be applied on lines from Harmony 230 kV, Red Lion 230 kV, Milford 230 kV and Vienna 230 kV towards the queue project.

Clearing times listed in Tables 4 to 7 are as per Revision 19 of “*2016 Revised Clearing times for each PJM company*” spreadsheet.

Attachment 2 contains the one-line diagrams of the DPL network in the vicinity of AB2-037, showing where faults were applied.

The positive sequence fault impedances for single line to ground faults were derived from a separate short circuit case, modified to ensure that connected generators in the vicinity of AB2-037 have not withdrawn from the PJM queue, and are not greater than the queue position under study.

5. Evaluation Criteria

This study is focused on AB2-037, along with the rest of the PJM system, maintaining synchronism and having all states return to an acceptable new condition following the disturbance. The recovery criteria applicable to this study are as per PJM's Regional Transmission Planning Process and Transmission Owner criteria:

- a) The system with AB2-037 included is transiently stable and post-contingency oscillations should be positively damped with a damping margin of at least 3%.
- b) The AB2-037 is able to ride through faults (except for faults where protective action trips AB2-037).
- c) Following fault clearing, all bus voltages recover to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).
- d) No transmission element trips, other than those either directly connected or designed to trip as a consequence of that fault.

6. Summary of Results

Plots from the dynamic simulations are provided in Attachment 6, with results summarized in Table 3 through Table 7.

For the 55 fault contingencies tested on the 2020 summer peak case:

- a) Post-contingency oscillations were positively damped with a damping margin of at least 3%.
- b) The AB2-037 generator was able to ride through all faults (except for faults where protective action trips a generator(s)).
- c) Following fault clearing, all bus voltages recover to a minimum of 0.7 per unit after 2.5 seconds (except where protective action isolates that bus).
- d) No transmission element trips, other than those either directly connected or designed to trip as a consequence of that fault.

A spike in the PELEC output, greater than P_{max} , was noted for the AB2-037 generator at fault clearance for contingencies 1B.04 – 1B.12, 1D.01, 1D.03 – 1D.09.

7. Recommendations and Mitigations

No adverse impacts attributable to the queue project under study were found and as such, no mitigations were found to be required.

Table 3: Steady State Operation

Fault ID	Duration	AB2-037 No Mitigation
SS.01	Steady state 20 sec	Stable

Table 4: Three-phase Faults With Normal Clearing

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
3N.01	Fault at AB2-037 POI 230 kV on AB2-037 (Trips AB2-037).	7	Stable
3N.02	Fault at AB2-037 POI 230 kV on Keeney EHV circuit 23009.	7	Stable
3N.03	Fault at AB2-037 POI 230 kV on Steele circuit 23009.	7	Stable
3N.04	Fault at Keeney EHV 230 kV on AB2-037 POI circuit 23009.	7	Stable
3N.05	Fault at Keeney EHV 230 kV on Harmony circuit 23010.	7	Stable
3N.06	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 34.5 kV Transformer T2.	7	Stable
3N.07	Fault at Keeney EHV 230 kV on Steele circuit 23001.	7	Stable
3N.08	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT50.	7	Stable
3N.09	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT51.	7	Stable
3N.10	Fault at Keeney EHV 230 kV on Harmony circuit 23013.	7	Stable
3N.11	Fault at Keeney EHV 230 kV on Red Lion circuit 23011.	7	Stable
3N.12	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 138 kV Transformer AT20.	7	Stable
3N.13	Fault at Steele 230 kV on AB2-037 POI circuit 23009.	7	Stable
3N.14	Fault at Steele 230 kV on Milford circuit 23076.	7	Stable
3N.15	Fault at Steele 230 kV on Vienna circuit 23085.	7	Stable
3N.16	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT21.	7	Stable
3N.17	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT20.	7	Stable
3N.18	Fault at Steele 230 kV on Keeney EHV circuit 23001.	7	Stable
3N.19	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT22.	7	Stable

Table 5: Single-phase Faults With Stuck Breaker

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
1B.01	Fault at AB2-037 POI 230 kV on AB2-037. Breaker to Keeney EHV circuit 23009 stuck. Fault cleared with loss of Keeney EHV circuit 23009 (Trips AB2-037).	7 / 17.5	Stable*
1B.02	Fault at AB2-037 POI 230 kV on Keeney EHV circuit 23009. Breaker to Steele circuit 23009 stuck. Fault cleared with loss of Steele circuit 23009 (Trips AB2-037).	7 / 17.5	Stable*
1B.03	Fault at AB2-037 POI 230 kV on Steele circuit 23009. Breaker to Keeney EHV circuit 23009 stuck. Fault cleared with loss of Keeney EHV circuit 23009 (Trips AB2-037).	7 / 17.5	Stable*
1B.04	Fault at Keeney EHV 230 kV on AB2-037 POI circuit 23009. Breaker 240 stuck. Fault cleared with loss of Harmony circuit 23010.	7 / 17.5	Stable
1B.05	Fault at Keeney EHV 230 kV on Harmony circuit 23010. Breaker 240 stuck. Fault cleared with loss of AB2-037 POI circuit 23009.	7 / 17.5	Stable
1B.06	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 34.5 kV Transformer T2. Breaker 232 stuck. Fault cleared with loss of Red Lion circuit 23011.	7 / 17.5	Stable
1B.07	Fault at Keeney EHV 230 kV on Steele circuit 23001. Breaker 237 stuck. Fault cleared with loss of Keeney EHV 230 / 500 kV Transformer AT50.	7 / 17.5	Stable
1B.08	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT50. Breaker 237 stuck. Fault cleared with loss of Steele circuit 23001.	7 / 17.5	Stable
1B.09	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 500 kV Transformer AT51. Breaker 234 stuck. Fault cleared with loss of Harmony circuit 23013.	7 / 17.5	Stable
1B.10	Fault at Keeney EHV 230 kV on Harmony circuit 23013. Breaker 234 stuck. Fault cleared with loss of Keeney EHV 230 / 500 kV Transformer AT51.	7 / 17.5	Stable
1B.11	Fault at Keeney EHV 230 kV on Red Lion circuit 23011. Breaker 231 stuck. Fault cleared with loss of Keeney EHV 230 / 138 kV Transformer AT20.	7 / 17.5	Stable
1B.12	Fault at Keeney EHV 230 kV on Keeney EHV 230 / 138 kV Transformer AT20. Breaker 231 stuck. Fault cleared with loss of Red Lion circuit 23011.	7 / 17.5	Stable

* One instance of non-convergence at AB2-037 generator bus was observed during the fault application (at 0.1125s).

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
1B.13	Fault at Steele 230 kV on AB2-037 POI circuit 23009. Breaker 256 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT22.	7 / 17.5	Stable*
1B.14	Fault at Steele 230 kV on AB2-037 POI circuit 23009. Breaker 9240 stuck. Fault cleared with loss of Milford circuit 23076.	7 / 17.5	Stable*
1B.15	Fault at Steele 230 kV on Milford circuit 23076. Breaker 9240 stuck. Fault cleared with loss of AB2-037 POI circuit 23009.	7 / 17.5	Stable*
1B.16	Fault at Steele 230 kV on Milford circuit 23076. Breaker 9230 stuck. Fault cleared with loss of Vienna circuit 23085.	7 / 17.5	Stable*
1B.17	Fault at Steele 230 kV on Vienna circuit 23085. Breaker 9230 stuck. Fault cleared with loss of Milford circuit 23076.	7 / 17.5	Stable*
1B.18	Fault at Steele 230 kV on Vienna circuit 23085. Breaker 252 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT21.	7 / 17.5	Stable*
1B.19	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT21. Breaker 252 stuck. Fault cleared with loss of Vienna circuit 23085.	7 / 17.5	Stable*
1B.20	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT20. Breaker 9210 stuck. Fault cleared with loss of Keeney EHV circuit 23001.	7 / 17.5	Stable*
1B.21	Fault at Steele 230 kV on Keeney EHV circuit 23001. Breaker 9210 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT20.	7 / 17.5	Stable*
1B.22	Fault at Steele 230 kV on Keeney EHV circuit 23001. Breaker 257 stuck. Fault cleared with loss of Steele 230 / 138 kV Transformer AT22.	7 / 17.5	Stable*
1B.23	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT22. Breaker 257 stuck. Fault cleared with loss of Keeney EHV circuit 23001.	7 / 17.5	Stable*
1B.24	Fault at Steele 230 kV on Steele 230 / 138 kV Transformer AT22. Breaker 256 stuck. Fault cleared with loss of AB2-037 POI circuit 23009.	7 / 17.5	Stable*

* One instance of non-convergence at AB2-037 generator bus was observed during the fault application (at 0.1s).

Table 6: Single-phase Faults With Delayed (Zone 2) Clearing at line end closest to AB2-037 POI

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
1D.01	Fault at 80% of 230 kV line from AB2-037 POI on Keeney EHV circuit 23009. Delayed clearing at AB2-037 POI 230 kV.	7 / 25	Stable
1D.02	Fault at 80% of 230 kV line from AB2-037 POI on Steele circuit 23009. Delayed clearing at AB2-037 POI 230 kV.	7 / 25	Stable *
1D.03	Fault at 80% of 230 kV line from Keeney EHV on Harmony circuit 23010. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.04	Fault at 80% of 230 kV line from Keeney EHV on Steele circuit 23001. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.05	Fault at 80% of 230 kV line from Keeney EHV on Harmony circuit 23013. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.06	Fault at 80% of 230 kV line from Keeney EHV on Red Lion circuit 23011. Delayed clearing at Keeney EHV 230 kV.	7 / 25	Stable
1D.07	Fault at 80% of 230 kV line from Steele on Milford circuit 23076. Delayed clearing at Steele 230 kV.	7 / 25	Stable
1D.08	Fault at 80% of 230 kV line from Steele on Vienna circuit 23085. Delayed clearing at Steele 230 kV.	7 / 25	Stable
1D.09	Fault at 80% of 230 kV line from Steele on Keeney EHV circuit 23001. Delayed clearing at Steele 230 kV.	7 / 25	Stable

* One instance of non-convergence at AB2-037 generator bus was observed during the fault application (at 0.1s).

Table 7: Three-phase Faults With Loss of Multiple-Circuit Tower Line

Fault ID	Fault description	Clearing Time Near & Remote (Cycles)	AB2-037 No Mitigation
3T.01	Fault at Keeney EHV 230 kV on Harmony circuit 23010 resulting in tower failure. Fault cleared with loss of Redlion - Hay Road circuit 23020 (Trips Hay Road Generating units HR5, HR6, HR7, HR8 and X1-074). CONTINGENCY 'B47_DPL2	7	Stable
3T.02	Fault at Keeney EHV 230 kV on Red Lion circuit 23011 resulting in tower failure. Fault cleared with loss of Redlion - Hay Road circuit 23020 (Trips Hay Road Generating units HR5, HR6, HR7, HR8 and X1-074). CONTINGENCY 'B47_DPL1	7	Stable

Attachment 1. Impact Study Data

Attachment 2. DPL One Line Diagram

Attachment 3. PSS/E Model One Line Diagram

Attachment 4. AB2-037 PSS/E Dynamic Model

Attachment 5. AB2-037 PSS/E Case Dispatch

Attachment 6. Plots from Dynamic Simulations

Appendices

The following appendices contain additional information about each flowgate presented in the body of the report. For each appendix, a description of the flowgate and its contingency was included for convenience. However, the intent of the appendix section is to provide more information on which projects/generators have contributions to the flowgate in question. Although this information is not used "as is" for cost allocation purposes, it can be used to gauge other generators impact.

It should be noted the generator contributions presented in the appendices sections are full contributions, whereas in the body of the report, those contributions take into consideration the commercial probability of each project.

Appendix 1

(PECO - AE) The DELCOTAP-MCKLTON 230 kV line (from bus 213559 to bus 228401 ckt 1) loads from 95.87% to 98.09% (AC power flow) of its emergency rating (796 MVA) for the bus fault outage of 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'. This project contributes approximately 20.77 MW to the thermal violation.

CONTINGENCY 'CHI230B1/* \$ DELCO \$ CHI230B1 \$ B'

DISCONNECT BUS 213489 /* CHICHST1 230.00 \$ DELCO \$
CHI230B1 \$ B

END/* \$ DELCO \$ CHI230B1 \$ B

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
213400	COVANTA DELA	11.
231916	EM3	3.65
231901	EM4	7.44
231900	EM5	27.6
231908	HR1	5.34
231909	HR2	5.3
231910	HR3	5.34
231505	HR4	11.35
232923	MR1	1.45
232924	MR2	1.45
213888	PHLISCT1	13.09
213889	PHLISCT2	13.09
213890	PHLISCT3	13.09
213893	PHLISST1	11.47
297077	V2-028 E	0.35
904212	V4-022E	0.29
901004	W1-003 E	0.42
901014	W1-004 E	0.42
901024	W1-005 E	0.42
901034	W1-006 E	0.42

905143	W4-016	-41.35
907052	X1-032 E	0.37
907324	X1-096 E	8.6
910572	X3-008 E	1.17
910592	X3-015 E	1.14
910822	X3-066 E	0.37
920352	X4-027	0.88
913362	Y1-079 E	0.61
913412	Y1-080 E	0.2
915542	Y3-058 E	0.86
920582	Z1-076 C	0.49
920583	Z1-076 E	0.8
920592	Z1-077 C	0.35
920593	Z1-077 E	0.57
916282	Z1-081 E	0.37
917082	Z2-012 E	1.14
920763	Z2-076 E	0.18
920773	Z2-077 E	0.18
920813	Z2-097 E	0.15
921123	AA1-059 E	0.16
921142	AA1-061 C	1.27
921143	AA1-061 E	0.62
921443	AA1-110 E	0.2
921592	AA1-140 C	0.69
921593	AA1-140 E	1.13
921602	AA1-141 C	0.53
921603	AA1-141 E	0.86
921872	AA2-069	45.25
922213	AA2-129 E	1.84
922222	AA2-130	0.18
922752	AB1-056 C OP	5.85
922753	AB1-056 E OP	16.65
922762	AB1-057 C	5.94
922763	AB1-057 E	16.92
923282	AB1-137 C	1.27
923283	AB1-137 E	0.55
923322	AB1-141 C OP	1.35
923323	AB1-141 E OP	0.63
923332	AB1-142 C OP	1.35
923333	AB1-142 E OP	0.63
923452	AB1-162 C OP	0.63
923453	AB1-162 E OP	1.03
923602	AB1-176 C	0.34
923603	AB1-176 E	0.56
923902	AB2-030 E	0.37

923921	AB2-032 C	1.36
923922	AB2-032 E	0.64
923931	AB2-033 C	0.66
923932	AB2-033 E	0.26
923951	AB2-036 C	3.82
923952	AB2-036 E	6.24
923961	AB2-037 C	7.89
923962	AB2-037 E	12.88
924191	AB2-063 C	0.76
924192	AB2-063 E	1.23
924361	AB2-084 C	0.35
924362	AB2-084 E	0.57
924681	AB2-120 C OP	3.5
924682	AB2-120 E OP	5.72
924781	AB2-130 C OP	2.97
924782	AB2-130 E OP	4.84
924801	AB2-133 C OP	3.21
924802	AB2-133 E OP	3.2
924821	AB2-135 C	2.97
924822	AB2-135 E	3.39
924832	AB2-136 E OP	2.48
924881	AB2-142 C	0.5
924882	AB2-142 E	0.81
924971	AB2-153 C	0.76
924972	AB2-153 E	1.24
925091	AB2-166 C	0.18
925092	AB2-166 E	0.32
925101	AB2-167 C	0.49
925102	AB2-167 E	0.8
925111	AB2-168 C	0.43
925112	AB2-168 E	0.59
925151	AB2-172 C OP	1.8
925152	AB2-172 E OP	2.93
925231	AB2-177 C	0.23
925232	AB2-177 E	0.38
925251	AB2-179 C OP	3.98
925252	AB2-179 E OP	1.31
925261	AB2-180 C	1.3
925262	AB2-180 E	0.56
925271	AB2-185 C OP	1.38
925272	AB2-185 E OP	0.59

Appendix 2

(DP&L - PECO) The CLAY_230-LINWOOD 230 kV line (from bus 231000 to bus 213750 ckt 1) loads from 91.58% to 94.62% (AC power flow) of its emergency rating (1071 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'. This project contributes approximately 38.36 MW to the thermal violation.

CONTINGENCY 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'

TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1 /* LINWOOD 230.00

EDGEMR 5 230.00 \$ DELCO \$ LINWO225 \$ STBK

REMOVE MACHINE 1 FROM BUS 213888 /* PHLISCT1 18.00 \$ DELCO \$ LINWO225 \$ STBK

REMOVE MACHINE 1 FROM BUS 213889 /* PHLISCT2 18.00 \$ DELCO \$ LINWO225 \$ STBK

END/* \$ DELCO \$ LINWO225 \$ STBK

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
231917	EM10	1.08
231916	EM3	6.49
231901	EM4	13.02
231900	EM5	46.78
231908	HR1	9.36
231909	HR2	9.43
231910	HR3	9.36
231505	HR4	19.23
232923	MR1	2.75
232924	MR2	2.75
213641	PELTZ	-0.32
297077	V2-028 E	0.65
904212	V4-022E	0.53
901004	W1-003 E	0.78
901014	W1-004 E	0.78
901024	W1-005 E	0.78
901034	W1-006 E	0.78
907052	X1-032 E	0.69
907211	X1-074	44.04
907324	X1-096 E	16.03
910572	X3-008 E	2.18
910592	X3-015 E	2.11
910822	X3-066 E	0.67
910902	X3-081 E	-0.07
913362	Y1-079 E	1.12
913412	Y1-080 E	0.37
915542	Y3-058 E	1.61
920582	Z1-076 C	0.91
920583	Z1-076 E	1.49

920592	Z1-077 C	0.65
920593	Z1-077 E	1.07
916282	Z1-081 E	0.68
917082	Z2-012 E	2.13
920763	Z2-076 E	0.34
920773	Z2-077 E	0.34
920813	Z2-097 E	0.27
921123	AA1-059 E	0.29
921142	AA1-061 C	2.35
921143	AA1-061 E	1.16
921443	AA1-110 E	0.36
921592	AA1-140 C	1.29
921593	AA1-140 E	2.11
921602	AA1-141 C	0.98
921603	AA1-141 E	1.6
921872	AA2-069	85.66
922213	AA2-129 E	3.44
922222	AA2-130	0.34
922752	AB1-056 C OP	10.93
922753	AB1-056 E OP	31.14
922762	AB1-057 C	11.1
922763	AB1-057 E	31.65
923282	AB1-137 C	2.38
923283	AB1-137 E	1.02
923322	AB1-141 C OP	2.46
923323	AB1-141 E OP	1.15
923332	AB1-142 C OP	2.46
923333	AB1-142 E OP	1.15
923452	AB1-162 C OP	1.15
923453	AB1-162 E OP	1.88
923602	AB1-176 C	0.62
923603	AB1-176 E	1.02
923902	AB2-030 E	0.69
923921	AB2-032 C	2.48
923922	AB2-032 E	1.17
923931	AB2-033 C	1.23
923932	AB2-033 E	0.49
923951	AB2-036 C	7.
923952	AB2-036 E	11.44
923961	AB2-037 C	14.57
923962	AB2-037 E	23.79
924191	AB2-063 C	1.38
924192	AB2-063 E	2.25
924361	AB2-084 C	0.65
924362	AB2-084 E	1.07

924681	AB2-120 C OP	6.53
924682	AB2-120 E OP	10.66
924781	AB2-130 C OP	5.53
924782	AB2-130 E OP	9.03
924801	AB2-133 C OP	5.83
924802	AB2-133 E OP	5.81
924821	AB2-135 C	5.41
924822	AB2-135 E	6.17
924832	AB2-136 E OP	4.6
924881	AB2-142 C	0.92
924882	AB2-142 E	1.49
924971	AB2-153 C	1.38
924972	AB2-153 E	2.26
925091	AB2-166 C	0.34
925092	AB2-166 E	0.6
925101	AB2-167 C	0.91
925102	AB2-167 E	1.5
925111	AB2-168 C	0.74
925112	AB2-168 E	1.01
925151	AB2-172 C OP	3.33
925152	AB2-172 E OP	5.44
925231	AB2-177 C	0.43
925232	AB2-177 E	0.7
925251	AB2-179 C OP	7.1
925252	AB2-179 E OP	2.34
925261	AB2-180 C	2.42
925262	AB2-180 E	1.04
925271	AB2-185 C OP	2.53
925272	AB2-185 E OP	1.08

Appendix 3

(DP&L - DP&L) The EDGEMR 5-CLAY_230 230 kV line (from bus 231001 to bus 231000 ckt 1) loads from 92.39% to 95.26% (AC power flow) of its emergency rating (1035 MVA) for the line fault with failed breaker contingency outage of 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'. This project contributes approximately 34.86 MW to the thermal violation.

CONTINGENCY 'LINWO225/* \$ DELCO \$ LINWO225 \$ STBK'

TRIP BRANCH FROM BUS 213750 TO BUS 231001 CKT 1 /* LINWOOD 230.00

EDGEMR 5 230.00 \$ DELCO \$ LINWO225 \$ STBK

REMOVE MACHINE 1 FROM BUS 213888 /* PHLISCT1 18.00 \$ DELCO \$ LINWO225 \$ STBK

REMOVE MACHINE 1 FROM BUS 213889 /* PHLISCT2 18.00 \$ DELCO \$ LINWO225 \$ STBK

END/* \$ DELCO \$ LINWO225 \$ STBK

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
231920	CHRIST2	1.45
231901	EM4	10.27
231900	EM5	46.62
231908	HR1	7.37
231910	HR3	7.37
231505	HR4	19.17
232923	MR1	2.48
232924	MR2	2.48
213641	PELTZ	-0.29
297077	V2-028 E	0.59
904212	V4-022E	0.48
901004	W1-003 E	0.71
901014	W1-004 E	0.71
901024	W1-005 E	0.71
901034	W1-006 E	0.71
907052	X1-032 E	0.62
907211	X1-074	39.74
907324	X1-096 E	14.51
910572	X3-008 E	1.97
910592	X3-015 E	1.91
910822	X3-066 E	0.6
910902	X3-081 E	-0.06
913362	Y1-079 E	1.01
913412	Y1-080 E	0.33
915542	Y3-058 E	1.45
920582	Z1-076 C	0.83
920583	Z1-076 E	1.35
920592	Z1-077 C	0.59
920593	Z1-077 E	0.96

916282	Z1-081 E	0.6
917082	Z2-012 E	1.93
920763	Z2-076 E	0.31
920773	Z2-077 E	0.31
920813	Z2-097 E	0.24
921123	AA1-059 E	0.27
921142	AA1-061 C	2.12
921143	AA1-061 E	1.05
921443	AA1-110 E	0.32
921592	AA1-140 C	1.17
921593	AA1-140 E	1.91
921602	AA1-141 C	0.89
921603	AA1-141 E	1.45
921872	AA2-069	77.44
922213	AA2-129 E	3.11
922222	AA2-130	0.31
922752	AB1-056 C OP	9.89
922753	AB1-056 E OP	28.18
922762	AB1-057 C	10.05
922763	AB1-057 E	28.64
923282	AB1-137 C	2.15
923283	AB1-137 E	0.92
923322	AB1-141 C OP	2.19
923323	AB1-141 E OP	1.02
923332	AB1-142 C OP	2.19
923333	AB1-142 E OP	1.02
923452	AB1-162 C OP	1.03
923453	AB1-162 E OP	1.68
923602	AB1-176 C	0.55
923603	AB1-176 E	0.91
923902	AB2-030 E	0.62
923921	AB2-032 C	2.21
923922	AB2-032 E	1.04
923931	AB2-033 C	1.11
923932	AB2-033 E	0.44
923951	AB2-036 C	6.29
923952	AB2-036 E	10.28
923961	AB2-037 C	13.24
923962	AB2-037 E	21.62
924191	AB2-063 C	1.23
924192	AB2-063 E	2.01
924361	AB2-084 C	0.59
924362	AB2-084 E	0.97
924681	AB2-120 C OP	5.91
924682	AB2-120 E OP	9.65

924781	AB2-130 C OP	5.
924782	AB2-130 E OP	8.17
924801	AB2-133 C OP	5.17
924802	AB2-133 E OP	5.16
924821	AB2-135 C	4.81
924822	AB2-135 E	5.49
924832	AB2-136 E OP	4.16
924881	AB2-142 C	0.83
924882	AB2-142 E	1.35
924971	AB2-153 C	1.23
924972	AB2-153 E	2.01
925091	AB2-166 C	0.31
925092	AB2-166 E	0.55
925101	AB2-167 C	0.82
925102	AB2-167 E	1.35
925111	AB2-168 C	0.63
925112	AB2-168 E	0.87
925151	AB2-172 C OP	3.01
925152	AB2-172 E OP	4.92
925231	AB2-177 C	0.39
925232	AB2-177 E	0.64
925251	AB2-179 C OP	6.19
925252	AB2-179 E OP	2.04
925261	AB2-180 C	2.19
925262	AB2-180 E	0.94
925271	AB2-185 C OP	2.27
925272	AB2-185 E OP	0.97

Appendix 4

(DP&L - DP&L) The MIDLTNTP-MT PLSNT 138 kV line (from bus 232106 to bus 232104 ckt 1) loads from 94.27% to 95.57% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'

/* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232900	DEMECSMY	2.25
232851	DUP-SFR1	0.43
232902	EASTMUNI	3.57
232923	MR1	3.36
232924	MR2	3.36
232910	NRG_G1	2.55
232911	NRG_G2	2.55
297077	V2-028 E	0.75
904212	V4-022E	0.61
232813	VAUGHN	0.16
901004	W1-003 E	0.89
901014	W1-004 E	0.89
901024	W1-005 E	0.89
901034	W1-006 E	0.89
901411	W1-062	2.39
907052	X1-032 E	0.79
907324	X1-096 E	18.27
910571	X3-008 C	0.34
910572	X3-008 E	2.68
910591	X3-015 C	0.32
910592	X3-015 E	2.51
910821	X3-066 C	0.18
910822	X3-066 E	1.41
913361	Y1-079 C	0.25
913362	Y1-079 E	1.96
913411	Y1-080 C	0.05
913412	Y1-080 E	0.43
915751	Y3-033	1.19
915752	Y3-033	7.93
915542	Y3-058 E	1.86
920582	Z1-076 C	1.05
920583	Z1-076 E	1.71

920592	Z1-077 C	0.75
920593	Z1-077 E	1.22
916281	Z1-081 C	0.21
916282	Z1-081 E	1.65
917082	Z2-012 E	2.44
920763	Z2-076 E	0.4
920773	Z2-077 E	0.4
920812	Z2-097 C	0.32
920813	Z2-097 E	0.65
921123	AA1-059 E	0.33
921142	AA1-061 C	2.87
921143	AA1-061 E	1.42
921442	AA1-110 C	0.36
921443	AA1-110 E	0.89
921592	AA1-140 C	1.51
921593	AA1-140 E	2.47
921602	AA1-141 C	1.13
921603	AA1-141 E	1.84
921872	AA2-069	104.83
922213	AA2-129 E	3.94
922222	AA2-130	0.39
922752	AB1-056 C OP	12.8
922753	AB1-056 E OP	36.44
922762	AB1-057 C	12.99
922763	AB1-057 E	37.04
923282	AB1-137 C	2.79
923283	AB1-137 E	1.2
923322	AB1-141 C OP	5.3
923323	AB1-141 E OP	2.47
923332	AB1-142 C OP	5.3
923333	AB1-142 E OP	2.47
923452	AB1-162 C OP	2.4
923453	AB1-162 E OP	3.92
923602	AB1-176 C	1.29
923603	AB1-176 E	2.12
923902	AB2-030 E	0.79
923921	AB2-032 C	5.34
923922	AB2-032 E	2.51
923931	AB2-033 C	1.41
923932	AB2-033 E	0.56
923951	AB2-036 C	11.45
923952	AB2-036 E	18.72
923961	AB2-037 C	12.73
923962	AB2-037 E	20.8
924191	AB2-063 C	2.87

924192	AB2-063 E	4.69
924361	AB2-084 C	0.75
924362	AB2-084 E	1.22
924681	AB2-120 C OP	7.49
924682	AB2-120 E OP	12.22
924781	AB2-130 C OP	6.58
924782	AB2-130 E OP	10.73
924801	AB2-133 C OP	14.2
924802	AB2-133 E OP	14.16
924821	AB2-135 C	12.84
924822	AB2-135 E	14.65
924832	AB2-136 E OP	5.51
924831	AB2-136C OP	1.07
924881	AB2-142 C	1.14
924882	AB2-142 E	1.85
924971	AB2-153 C	2.98
924972	AB2-153 E	4.87
925091	AB2-166 C	0.4
925092	AB2-166 E	0.7
925101	AB2-167 C	1.05
925102	AB2-167 E	1.72
925151	AB2-172 C OP	4.11
925152	AB2-172 E OP	6.7
925231	AB2-177 C	0.49
925232	AB2-177 E	0.81
925251	AB2-179 C OP	26.29
925252	AB2-179 E OP	8.67
925261	AB2-180 C	2.8
925262	AB2-180 E	1.2
925271	AB2-185 C OP	4.42
925272	AB2-185 E OP	1.89

Appendix 5

(DP&L - DP&L) The TOWNSEND-MIDLTNTP 138 kV line (from bus 232107 to bus 232106 ckt 1) loads from 88.61% to 92.13% (AC power flow) of its emergency rating (348 MVA) for the tower line contingency outage of 'DBL_4NC'. This project contributes approximately 33.53 MW to the thermal violation.

CONTINGENCY 'DBL_4NC'

/* RED LION-CEDAR CREEK

230;RED LION-CARTANZA 230

OPEN LINE FROM BUS 231004 TO BUS 232002 CKT 1

OPEN LINE FROM BUS 231004 TO BUS 232003 CKT 1

END

<i>Bus Number</i>	<i>Bus Name</i>	<i>Full Contribution</i>
232900	DEMECSMY	2.25
232851	DUP-SFR1	0.43
232902	EASTMUNI	3.57
232923	MR1	3.36
232924	MR2	3.36
232910	NRG_G1	2.55
232911	NRG_G2	2.55
297077	V2-028 E	0.75
904212	V4-022E	0.61
232813	VAUGHN	0.16
901004	W1-003 E	0.89
901014	W1-004 E	0.89
901024	W1-005 E	0.89
901034	W1-006 E	0.89
901411	W1-062	2.39
907052	X1-032 E	0.79
907324	X1-096 E	18.27
910571	X3-008 C	0.34
910572	X3-008 E	2.68
910591	X3-015 C	0.32
910592	X3-015 E	2.51
910821	X3-066 C	0.18
910822	X3-066 E	1.41
913361	Y1-079 C	0.25
913362	Y1-079 E	1.96
913411	Y1-080 C	0.05
913412	Y1-080 E	0.43
915751	Y3-033	1.19
915752	Y3-033	7.93
915542	Y3-058 E	1.86
920582	Z1-076 C	1.05
920583	Z1-076 E	1.71

920592	Z1-077 C	0.75
920593	Z1-077 E	1.22
916281	Z1-081 C	0.21
916282	Z1-081 E	1.65
917082	Z2-012 E	2.44
920763	Z2-076 E	0.4
920773	Z2-077 E	0.4
920812	Z2-097 C	0.32
920813	Z2-097 E	0.65
921123	AA1-059 E	0.33
921142	AA1-061 C	2.87
921143	AA1-061 E	1.42
921442	AA1-110 C	0.36
921443	AA1-110 E	0.89
921592	AA1-140 C	1.51
921593	AA1-140 E	2.47
921602	AA1-141 C	1.13
921603	AA1-141 E	1.84
921872	AA2-069	104.83
922213	AA2-129 E	3.94
922222	AA2-130	0.39
922752	AB1-056 C OP	12.8
922753	AB1-056 E OP	36.44
922762	AB1-057 C	12.99
922763	AB1-057 E	37.04
923282	AB1-137 C	2.79
923283	AB1-137 E	1.2
923322	AB1-141 C OP	5.3
923323	AB1-141 E OP	2.47
923332	AB1-142 C OP	5.3
923333	AB1-142 E OP	2.47
923452	AB1-162 C OP	2.4
923453	AB1-162 E OP	3.92
923602	AB1-176 C	1.29
923603	AB1-176 E	2.12
923902	AB2-030 E	0.79
923921	AB2-032 C	5.34
923922	AB2-032 E	2.51
923931	AB2-033 C	1.41
923932	AB2-033 E	0.56
923951	AB2-036 C	11.45
923952	AB2-036 E	18.72
923961	AB2-037 C	12.73
923962	AB2-037 E	20.8
924191	AB2-063 C	2.87

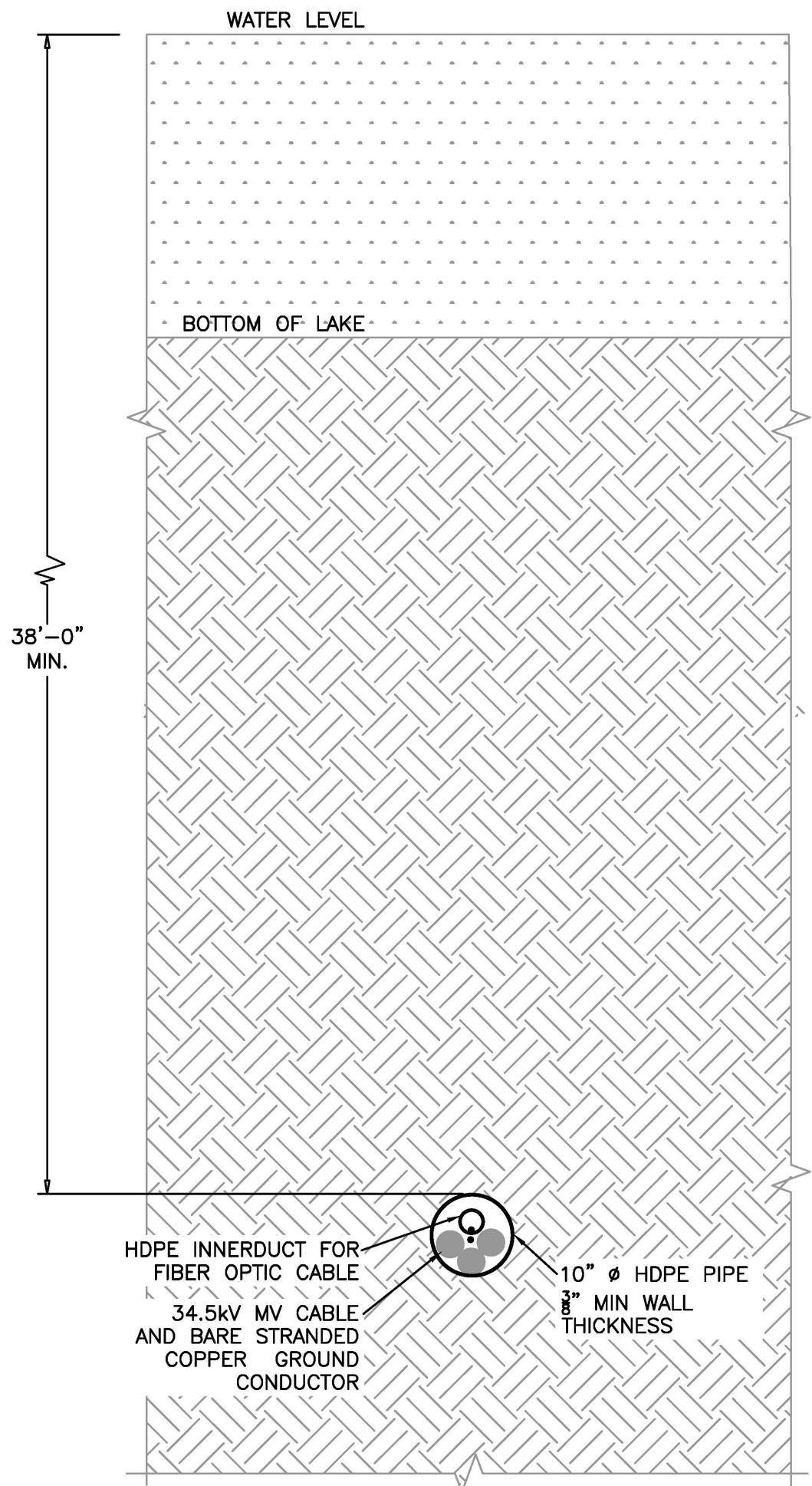
924192	AB2-063 E	4.69
924361	AB2-084 C	0.75
924362	AB2-084 E	1.22
924681	AB2-120 C OP	7.49
924682	AB2-120 E OP	12.22
924781	AB2-130 C OP	6.58
924782	AB2-130 E OP	10.73
924801	AB2-133 C OP	14.2
924802	AB2-133 E OP	14.16
924821	AB2-135 C	12.84
924822	AB2-135 E	14.65
924832	AB2-136 E OP	5.51
924831	AB2-136C OP	1.07
924881	AB2-142 C	1.14
924882	AB2-142 E	1.85
924971	AB2-153 C	2.98
924972	AB2-153 E	4.87
925091	AB2-166 C	0.4
925092	AB2-166 E	0.7
925101	AB2-167 C	1.05
925102	AB2-167 E	1.72
925151	AB2-172 C OP	4.11
925152	AB2-172 E OP	6.7
925231	AB2-177 C	0.49
925232	AB2-177 E	0.81
925251	AB2-179 C OP	26.29
925252	AB2-179 E OP	8.67
925261	AB2-180 C	2.8
925262	AB2-180 E	1.2
925271	AB2-185 C OP	4.42
925272	AB2-185 E OP	1.89

APPENDIX 5

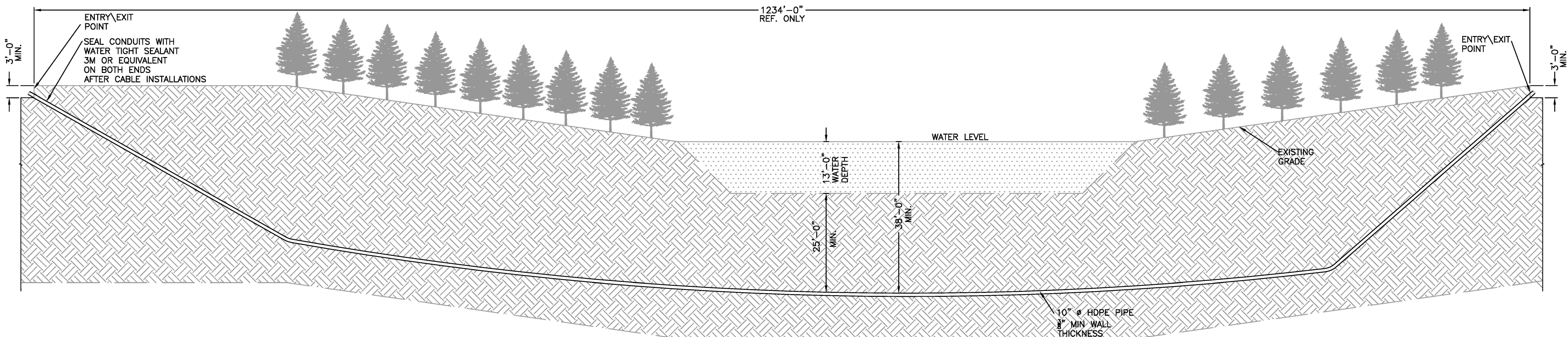
Conceptual Underground Crossing Detail



DIRECTIONAL BORING WATER CROSSING
CAROLINE COUNTY, MD
SCALE: 1"=30'-0"



SECTION B-B
SCALE: NONE



SECTION A-A
SCALE: NONE

GENERAL NOTES:

1. ALL NEW UNDERGROUND POWER CABLES AND FIBER OPTIC TRENCHES/BORES WITHIN ROUTE/ROW PROVIDED BY CLIENT.
2. THE CONTRACTOR SHALL EXCAVATE THE TRENCHES TO A WIDTH SUFFICIENT FOR SATISFACTORY AND SAFE WORKING CONDITIONS AND SHALL COMPLY WITH ALL RELEVANT ACTS, REGULATIONS AND REQUIREMENTS OF PUBLIC OR STATUTORY AUTHORITIES IN STATE OF MARYLAND AND CAROLINE COUNTY.
3. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS REQUIRED FOR THE EXCAVATION INCLUDING, BUT NOT LIMITED TO PUMPING EQUIPMENT, SHORING, BACKFILL, ETC.
4. EXCAVATION IN EXCESS OF THAT SPECIFIED FOR THE LAYING OF THE CONDUITS/CABLES SHALL BE MADE GOOD AT THE CONTRACTOR'S EXPENSE. IN THE CASE OF EXCESSIVE EXCAVATIONS, APPROVED SAND FILLING FOR THE BOTTOM OF TRENCHES SHALL BE USED.
5. EXCAVATION WILL BE FULLY PROTECTED AGAINST HAZARD TO THE PUBLIC AND WILL BE BRACED TO PREVENT CAVING. PROPER PROTECTIVE MEASURES WILL BE USED WHERE EXCESSIVE CAVING IS ENCOUNTERED OR WHERE PROTECTION IS REQUIRED FOR ADJACENT EXISTING STRUCTURES OR ROADS.
6. CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, AND PROCEDURES. CONTRACTOR SHALL PROVIDE TEMPORARY ERECTION BRACING AND SHORING AS REQUIRED DURING EXCAVATION AND DURING DRILLING, COMPLYING WITH ALL OSHA REGULATIONS. EXCAVATION, TRENCHING, DRILLING AND SHORING SHALL BE PER OSHA REGULATIONS, 29 CFR CH. XVII, STANDARD 1926, SUBPART "P".
7. PRIOR TO PERFORMING DIRECTIONAL BORING, THE CONTRACTOR SHALL CALL "MISS UTILITY" SERVICE FOR ANY UNDERGROUND UTILITY LOCATIONS.
8. THE CONTRACTOR SHALL FURNISH ALL MATERIALS, EQUIPMENT, LABOR, TOOLS, SUPERVISION REQUIRED TO PERFORM THE DIRECTIONAL BORES.
9. THE CONTRACTOR SHALL PLACE CONDUITS/PIPES AT THE DESIGN DEPTH AND INLINE WITH THE TRENCH LINE. THIS SHALL BE ACCOMPLISHED USING A LOCATER WITH DEPTH READING AT EVERY 10FT MINIMUM.

LEGEND:

- EXISTING UTILITY POLE
- EXIST. OVERHEAD LINE
- EXIST. CONTOUR LINES
- COLLECTION CIRCUIT LINE (UNDERGROUND)
- COLLECTION CIRCUIT CROSSING UNDER WATER (DIRECTIONAL BORING)
- 10" Ø HDPE PIPE
- PROPERTY LINE

NOTES

REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	DRWN	CHK'D	APRV'D
A	10/27/17	ISSUED FOR REVIEW	DS	DS	MJN

PRELIMINARY
DRAWING
NOT FOR
CONSTRUCTION

MSE Engineering, LLC

1843 CENTRAL AVE.
SUITE 196
ALBANY, NY 12205

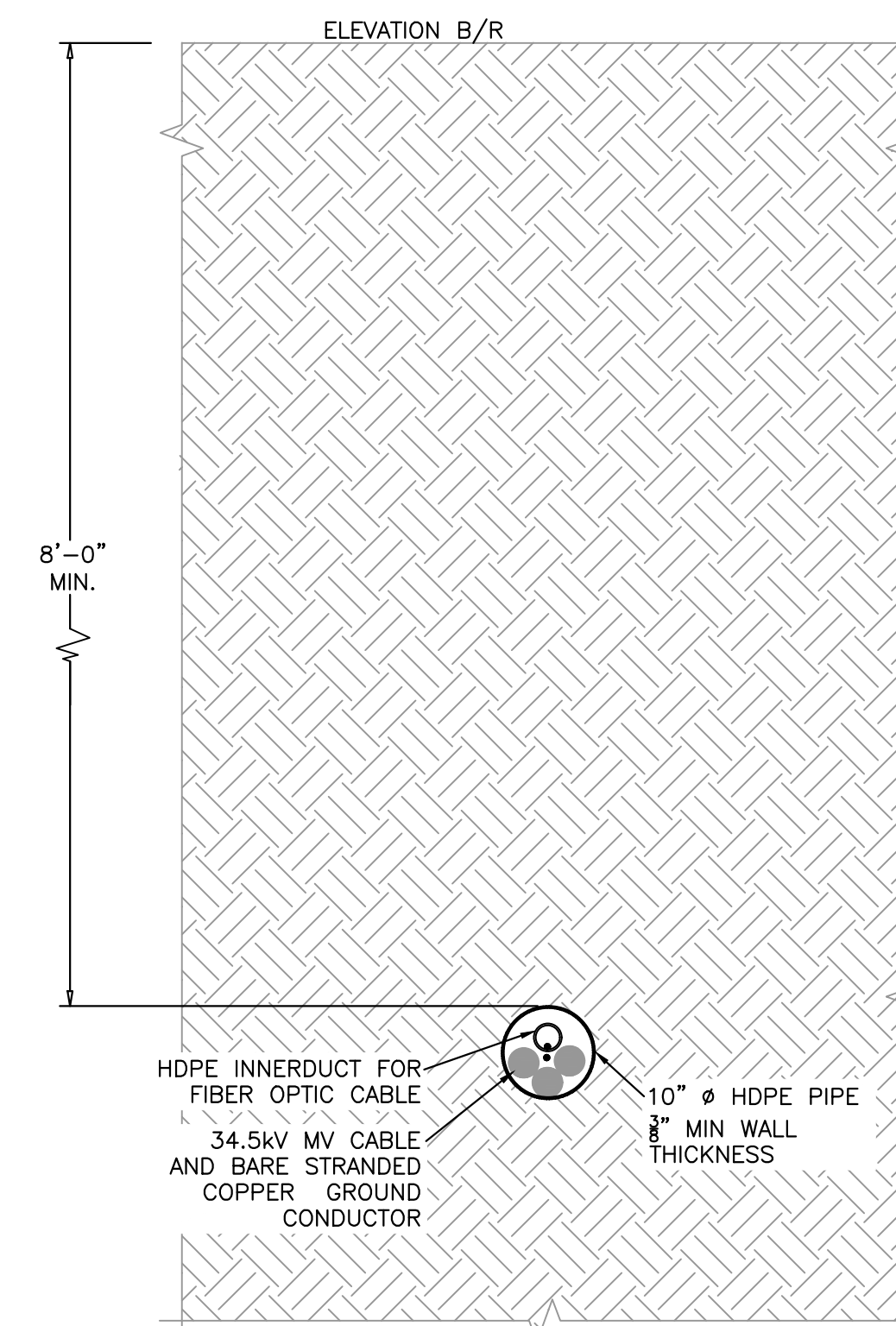
CHERRYWOOD SOLAR
CHERRYWOOD SOLAR, LLC

34.5kV COLLECTOR SYSTEM
UNDERGROUND WATER CROSSING DETAILS

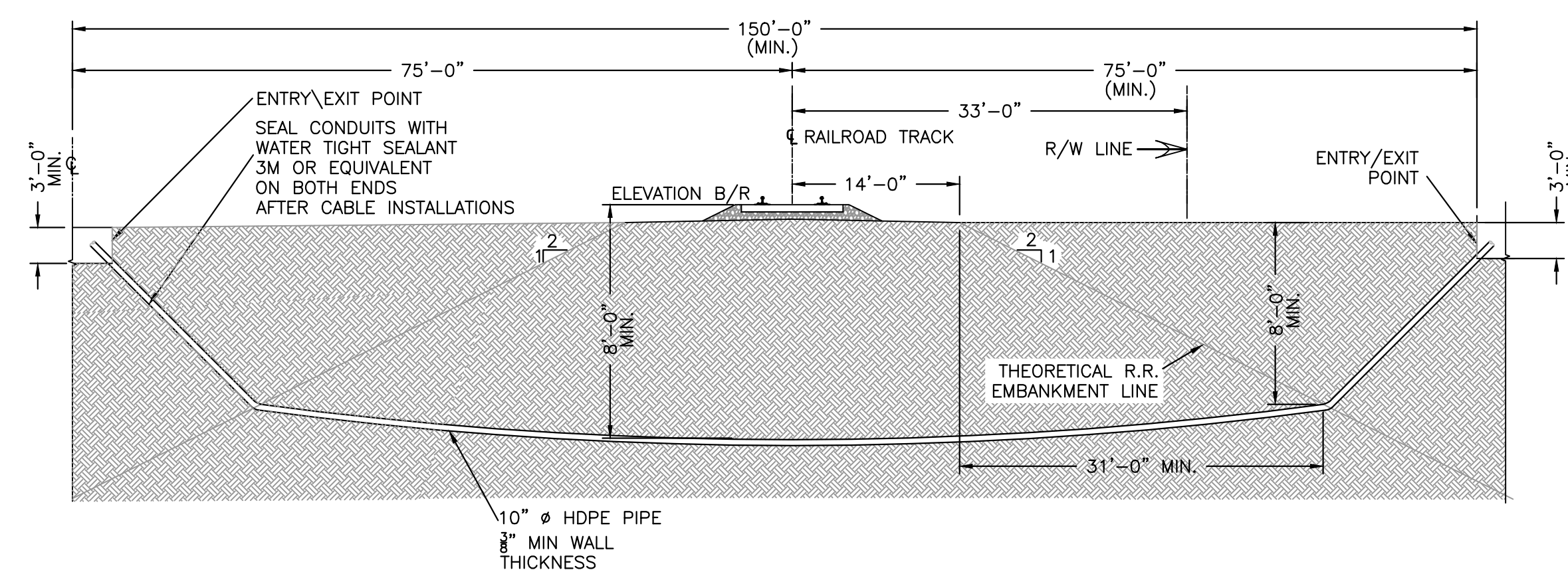
PROJ. NO.:	SCALE:	DWG. NO.:	SHEET:	REV.:
	AS NOTED	800	01	A



DIRECTIONAL BORING RAILROAD TRACK CROSSING
CAROLINE COUNTY, MD
SCALE: 1"=10'-0"



SECTION B-B
SCALE: NONE






SECTION A-A
SCALE: 3/32"=1'-0'

GENERAL NOTES:

1. ALL NEW UNDERGROUND POWER CABLES AND FIBER OPTIC TRENCHES/BORES WITHIN ROUTE/ROW PROVIDED BY CLIENT.
2. THE CONTRACTOR SHALL EXCAVATE THE TRENCHES TO A WIDTH SUFFICIENT FOR SATISFACTORY AND SAFE WORKING CONDITIONS AND SHALL COMPLY WITH ALL RELEVANT ACTS, REGULATIONS AND REQUIREMENTS OF PUBLIC OR STATUTORY AUTHORITIES IN STATE OF MARYLAND AND CAROLINE COUNTY.
3. THE CONTRACTOR SHALL PROVIDE ALL MATERIALS REQUIRED FOR THE EXCAVATION INCLUDING, BUT NOT LIMITED TO PUMPING EQUIPMENT, SHORING, BACKFILL, ETC.
4. EXCAVATION IN EXCESS OF THAT SPECIFIED FOR THE LAYING OF THE CONDUITS/CABLES SHALL BE MADE GOOD AT THE CONTRACTOR'S EXPENSE. IN THE CASE OF EXCESSIVE EXCAVATIONS, APPROVED SAND FILLING FOR THE BOTTOM OF TRENCHES SHALL BE USED.
5. EXCAVATION WILL BE FULLY PROTECTED AGAINST HAZARD TO THE PUBLIC AND WILL BE BRACED TO PREVENT CAVING. PROPER PROTECTIVE MEASURES WILL BE USED WHERE EXCESSIVE CAVING IS ENCOUNTERED OR WHERE PROTECTION IS REQUIRED FOR ADJACENT EXISTING STRUCTURES OR ROADS.
6. CONTRACTOR IS SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, AND PROCEDURES. CONTRACTOR SHALL PROVIDE TEMPORARY ERECTION BRACING AND SHORING AS REQUIRED DURING EXCAVATION AND DURING DRILLING, COMPLYING WITH ALL LOCAL, STATE, AND FEDERAL REGULATIONS. EXCAVATION, TRENCHING, DRILLING AND SHORING SHALL BE PER OSHA REGULATIONS, 29 CFR CH. XVII, STANDARD 1926, SUBPART "P".
7. PRIOR TO PERFORMING DIRECTIONAL BORING, THE CONTRACTOR SHALL CALL "MISS UTILITY" SERVICE FOR ANY UNDERGROUND UTILITY LOCATIONS.
8. THE CONTRACTOR SHALL FURNISH ALL MATERIALS, EQUIPMENT, LABOR, TOOLS, SUPERVISION REQUIRED TO PERFORM THE DIRECTIONAL BORES.
9. THE CONTRACTOR SHALL PLACE CONDUITS/PIPES AT THE DESIGN DEPTH AND INLINE WITH THE TRENCH LINE. THIS SHALL BE ACCOMPLISHED USING A LOCATOR WITH DEPTH READING AT EVERY 10' MINIMUM.

LEGEND:

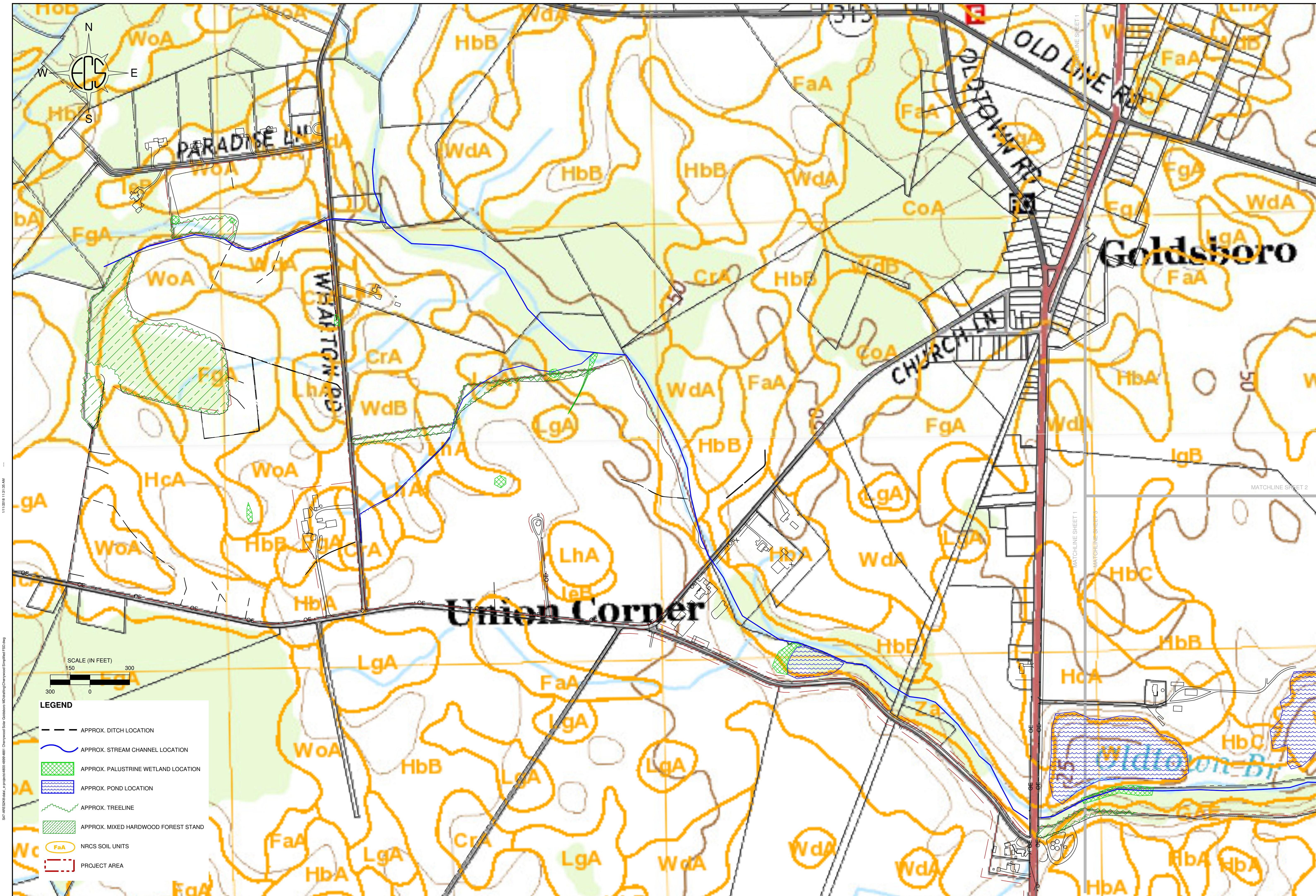
- 24' EXIST. CONTOUR LINES
 COLLECTION CIRCUIT LINE (UNDERGROUND)
 COLLECTION CIRCUIT CROSSING UNDER WATER (DIRECTIONAL BORING)
 10" Ø HDPE PIPE
 ROW

NOTES					
REFERENCE DRAWINGS					
REV.	DATE	DESCRIPTION	DRWN	CHK'D	APRV'D
A	11/29/17	ISSUED FOR REVIEW	DS	DS	MJN
<u>PRELIMINARY DRAWING NOT FOR CONSTRUCTION</u>		 MSE Engineering, LLC			
		1843 CENTRAL AVE. SUITE 196 ALBANY, NY 12205			
CHERRYWOOD SOLAR CHERRYWOOD SOLAR, LLC					
34.5kV COLLECTOR SYSTEM RAILROAD TRACK CROSSING DETAILS					
PROJ. NO.:	SCALE:	DWG. NO.:	SHEET:	REV.:	
2017023	AS NOTED	810	01	A	

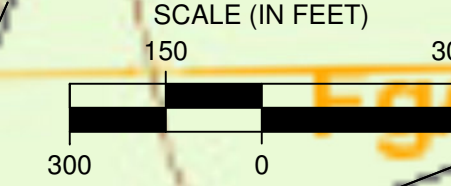
APPENDIX 6

*ECS Mid-Atlantic
Simplified Forest Stand
Delineation Report & Draft FCA
Worksheet*

ECS – Simplified Forest Stand Delineation



S:\PROJECTS\2018\4881 - Cherrywood Solar\Delin\Map\Cherrywood\Delin\FSD.dwg
11/1/2018 11:31:35 AM



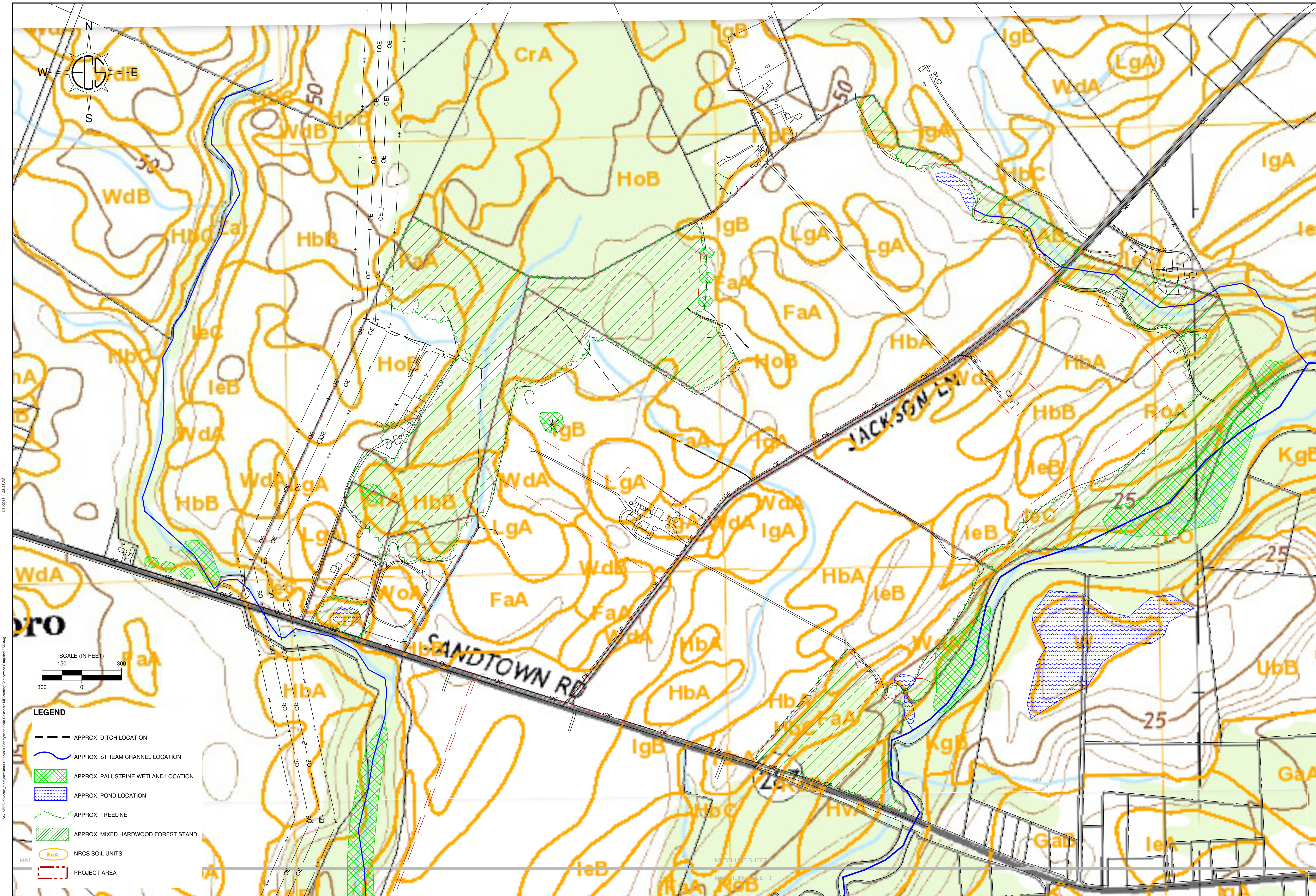
- LEGEND**
- APPROX. DITCH LOCATION
 - APPROX. STREAM CHANNEL LOCATION
 - APPROX. PALUSTRINE WETLAND LOCATION
 - APPROX. POND LOCATION
 - APPROX. TREELINE
 - APPROX. MIXED HARDWOOD FOREST STAND
 - NRCS SOIL UNITS
 - PROJECT AREA

		CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO CAROLINE COUNTY, MARYLAND
SIMPLIFIED FOREST STAND DELINEATION MAP CHERRYWOOD SOLAR I, LLC		
ECS REVISIONS		
ENGINEER AMM	DRAFTING AEA	
SCALE		1" = 300'
PROJECT NO.		47:4881
SHEET		1 OF 5
DATE		12-6-17


ECS MID-ATLANTIC LLC
14008 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-971-8400
(FAX) 703-894-5527

CELEBRATING
OVER 25 YEARS
OF EXCELLENCE

"SETTING THE STANDARD FOR SERVICE"



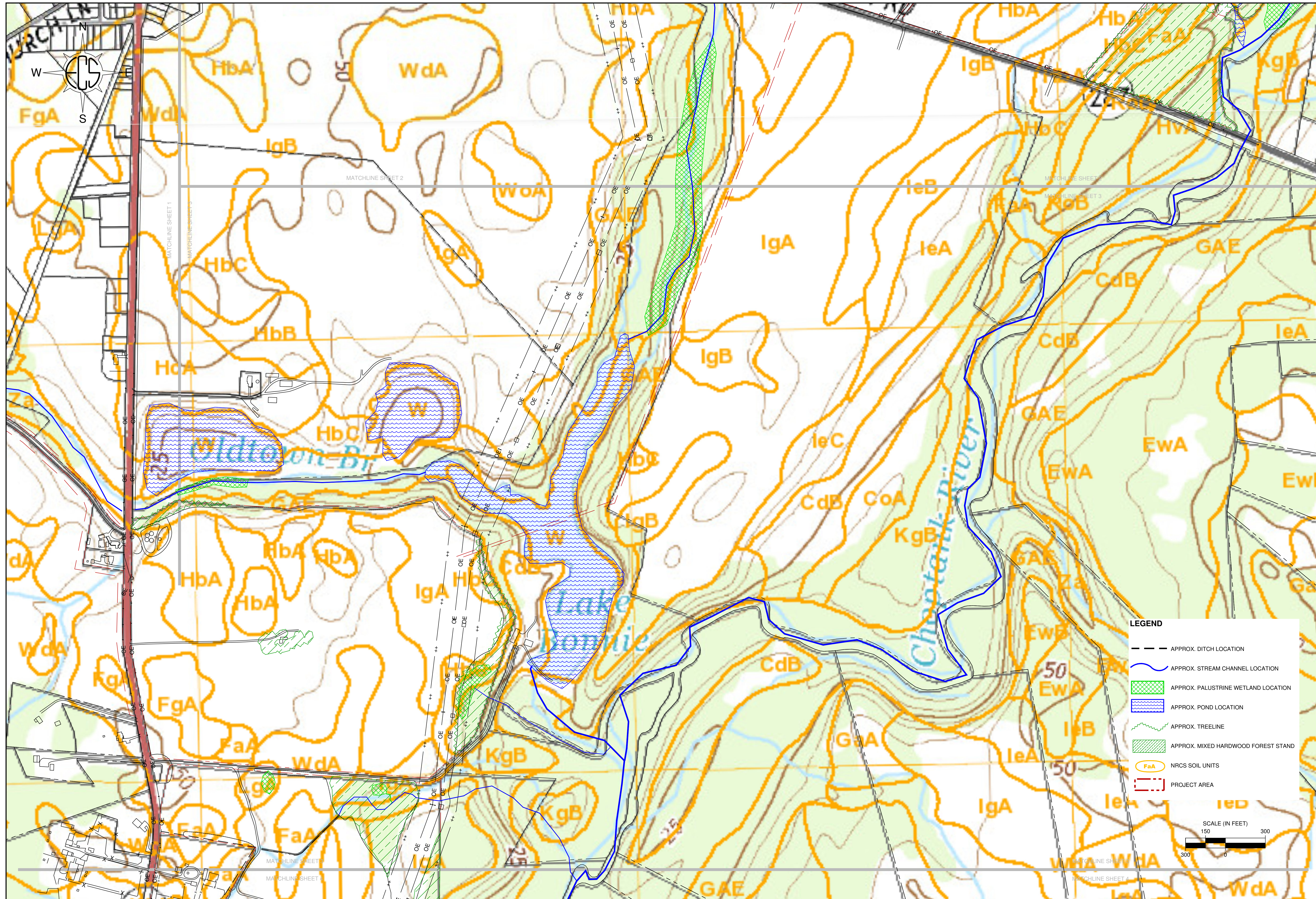
S:\AREAS\2016\1600-0899\081 Cherrywood Solar\GIS\Map\Cherrywood\Cherrywood Simplified FSD.mxd 11/10/2016 11:38:29 AM


		CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO CAROLINE COUNTY, MARYLAND	
SIMPLIFIED FOREST STAND DELINEATION MAP		CHERRYWOOD SOLAR I, LLC	
ECS REVISIONS			
ENGINEER AMM		DRAFTING AEA	
SCALE		1" = 300'	
PROJECT NO.		47:4881	
SHEET		2 OF 5	
DATE		12-6-17	

CELEBRATING
OVER 25 YEARS
OF EXCELLENCE

ECS MID-ATLANTIC, LLC
14028 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-9489
703-471-8400
(FAX) 703-834-5527

"SETTING THE STANDARD FOR SERVICE"



		CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO CAROLINE COUNTY, MARYLAND		SIMPLIFIED FOREST STAND DELINEATION MAP CHERRYWOOD SOLAR I, LLC	
ECS - MID ATLANTIC, LLC 14026 THUNDERBOLT PLACE SUITE 100 CHANTILLY, VA 20151 (703) 834-5527 (FAX) 703-834-5527		CELEBRATING OVER 25 YEARS OF EXCELLENCE		"SETTING THE STANDARD FOR SERVICE"	
ENGINEER AMM		DRAWING AEA		SCALE 1" = 300'	
PROJECT NO. 47-4881		SHEET 3 OF 5		DATE 12-6-17	

ECS – Draft FCA Worksheet

FOREST CONSERVATION WORKSHEET

Note: Use 0 for all negative numbers that result from the calculations.

A= 1667-ac
B= 51-ac
C= 1616-ac

Net Tract Area

- A.** *Total Tract Area*
B. *Deductions* (Critical Area, area restricted by local ordinance or program)
C. *Net Tract Area* Net Tract Area = Total Tract (A) - Deductions (B)

Land Use Category: Agricultural

- D.** *Afforestation Threshold* (Net Tract Area [C] x 20 %)
E. *Conservation Threshold* (Net Tract Area [C] x 50 %)

D = 323-ac
E = 808-ac

Existing Forest Cover

- F.** *Existing Forest Cover within the Net Tract Area*
G. *Area of Forest Above Conservation Threshold*
If the Existing Forest Cover (F) is greater than the Conservation Threshold (E), then
G = F – E; otherwise G = 0.

F = 226-ac
G = 0-ac

Breakeven Point

- H.** *Breakeven Point* (Amount of forest that must be retained so that no mitigation is required)
(1) If the Area of Forest Above Conservation Threshold (G) is greater than 0, then
H = (0.2 x the Area of Forest Above Conservation Threshold (G)) + the Conservation Threshold (E);
(2) If the Area of Forest Above Conservation Threshold (G) is equal to 0, then
H = Existing Forest Cover (F)
I. *Forest Clearing Permitted Without Mitigation*
I = Existing Forest Cover (F) – Breakeven point (H)

H = 226-ac

I = 0-ac

Proposed Forest Clearing

- J.** *Total Area of Forest to be Cleared*
K. *Total Area of Forest to be Retained*
K = Existing Forest Cover (F) – Forest to be Cleared (J)

J = 0-ac

K = 226-ac

Planting Requirements

If the Total Area of Forest to be Retained (K) is at or above the Breakeven Point (H), no planting is required, and no further calculations are necessary (L=0, M=0, N=0, P=0, Q=0, R=0).

Otherwise, calculate the planting requirement(s) as follows:

- L.** *Reforestation for Clearing Above the Conservation Threshold*
(1) If the Total Area of Forest to be Retained (K) is greater than the Conservation Threshold (E), then L = the Area of Forest to be Cleared (J) x 0.25;
(2) If the Forest to be Retained (K) is less than or equal to the Conservation Threshold (E), then L = Area of Forest Above Conservation Threshold (G) x 0.25
M. *Reforestation for Clearing Below the Conservation Threshold*
(1) If Existing Forest Cover (F) is greater than the Conservation Threshold (E) and the Forest to be Retained (K) is less than or equal to the Conservation Threshold (E), then M = 2.0 x (Conservation Threshold (E) – Forest to be Retained (K))
(2) If Existing Forest Cover (F) is less than or equal to the Conservation Threshold (E), then M = 2.0 x Forest to be Cleared (J)
N. *Credit for Retention Above the Conservation Threshold*
If the area of Forest to be Retained (K) is greater than the Conservation Threshold (E), then N = K – E; Otherwise N=0
P. *Total Reforestation Required* P = L + M – N
Q. *Total Afforestation Required*
If Existing Forest Cover (F) is less than the Afforestation Threshold (D), then
Q = Afforestation Threshold (D) – Existing Forest Cover (F)
R. *Total Planting Requirement* R = P + Q

L = 0

M = 0

N = 0

P = 0

Q = 97-ac*
R = 97-ac*

* Although the afforestation threshold indicates 97-ac of planting required, it should be noted that there is no net loss of forested area proposed by this project, and numerous acres will be planted as part of the landscape buffers.

APPENDIX 7

***ECS Mid-Atlantic Preliminary
Geotechnical Assessment Report***



**REPORT OF PRELIMINARY
SUBSURFACE EXPLORATION, LABORATORY TESTING, AND
GEOTECHNICAL ENGINEERING ANALYSES**

**Cherrywood Solar
Goldsboro, Caroline County, Maryland**

ECS Project No. 02-8631

Prepared For:

**OPEN ROAD RENEWABLES
1105 NAVASOTA STREET
AUSTIN, TX 78702**

January 17, 2018



January 17, 2018

Cyrus Tashakkori
Open Road Renewables
1105 Navasota Street
Austin, TX 78702

ECS Project No. 02-8631

Reference: Report of Preliminary Subsurface Exploration, Laboratory Testing and Geotechnical Engineering Analyses for **Cherrywood Solar**, Goldsboro, Caroline County, Maryland

Dear Mr. Tashakkori:

As requested, ECS Mid-Atlantic, LLC (ECS) has completed the preliminary subsurface exploration, laboratory testing and geotechnical engineering analyses for the above-referenced project. This work was performed in accordance with ECS Proposal No. 02-17704-P, dated September 21, 2017. This report contains a discussion of our current understanding of the proposed development, the subsurface exploration procedures employed, the exploration and laboratory test results, and our preliminary recommendations for the design and construction of the geotechnical aspects of the proposed development.

It has been our pleasure to be of service to Open Road Renewables for this project. We would appreciate the opportunity to continue our role as Geotechnical Engineer of Record during final design and subsequent construction. If you have any questions with regard to the information contained in the enclosed report, or if we can be of further assistance to you during the planning or construction phases of the project, please contact us.

Most sincerely,

ECS Mid-Atlantic, LLC

Katie Buckley, E.I.T.
Project Manager



Hasan M. Aboumatar, Ph.D., P.E.
Principal Engineer

Professional Certification I hereby certify that these documents were prepared or approved by me, and that I am a duly licensed professional engineer under the laws of the State of Maryland.

License No. 29553. Expiration Date: 12/31/2019

**REPORT OF PRELIMINARY
SUBSURFACE EXPLORATION,
LABORATORY TESTING,
AND GEOTECHNICAL ENGINEERING ANALYSES**

**Cherrywood Solar
Goldsboro, Caroline County, Maryland**

ECS Project No. 02-8631

Prepared For:

<p>OPEN ROAD RENEWABLES 1105 NAVASOTA STREET AUSTIN, TX 78702</p>
--

Submitted by:

**ECS Mid-Atlantic, LLC
1340 Charwood Road, Suite B
Hanover, Maryland 21076**

January 17, 2018

CHERRYWOOD SOLAR

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
<u>INTRODUCTION</u>	<u>1</u>
Project Location	1
Project Information and Site Conditions	1
Scope of Services	1
<u>EXPLORATION PROCEDURES</u>	<u>2</u>
Subsurface Exploration Procedures	2
Laboratory Testing Program	3
<u>EXPLORATION RESULTS</u>	<u>3</u>
Geologic Conditions	3
Subsurface Conditions	4
Water Level Observations	4
<u>PRELIMINARY ANALYSES AND RECOMMENDATIONS</u>	<u>5</u>
Solar Array Foundation Considerations	5
Ground Supported Floor Slabs/Pads	8
Seismic Design	9
General Site Development Considerations	10
Earthwork Operations	10
Construction Considerations	12
<u>CLOSING</u>	<u>11</u>
<u>APPENDIX</u>	

CHERRYWOOD SOLAR

INTRODUCTION

Project Location

The site location is near 15642 Jackson Lane in the Goldsboro area of Caroline County, Maryland. A Site Location Diagram is provided in the Appendix.

Project Information and Site Conditions

Our understanding of the project is based on the information provided to us, which included a site plan dated July 25, 2017 prepared by Open Road Renewables. The provided site plan depicts the proposed parcels for the solar panel project. In addition, we have discussed the project and soil boring locations with you.

Based on the provided information, we understand that the proposed construction consists of solar arrays. The proposed solar arrays will be located in open fields in the parcels depicted in the provided plan. Based on our previous experience with such structures, we anticipate the ground mount solar panels will be supported on driven beams. In addition, we understand that direction drilling will be required for the transmission lines at multiple locations.

The sites are currently agricultural fields. Site grading information was not provided at the time this report was prepared; however, we anticipate minor or no grading will be required.

Structural loading for the solar panels was not available at the time this report was prepared; therefore, we provided preliminary soil properties for preliminary driven beam considerations.

Scope of Services

Our scope of services included drilling twenty-four (24) soil borings, designated as B-1 through B-25, to evaluate the subsurface conditions for the proposed solar arrays and directional drilling for transmission lines. Boring B-23 was not drilled due to the presence of drain tiles in the field. The borings were drilled to depths of 20 feet to 60 feet, each below existing grades and in general accordance with ASTM D 1586 standards. The approximate boring locations are presented on the Boring Location Plan in the Appendix.

The scope of work also included visually classifying soil boring samples, performing laboratory testing on selected soil samples from the borings, performing various engineering analyses, and providing this preliminary written report of findings, evaluations and preliminary recommendations.

The report contains the following information:

- a. Observations from our site reconnaissance including current site conditions, surface drainage features, and surface topographic conditions.
- b. A review of the published geologic conditions and their relevance to your planned development.
- c. A subsurface characterization and a description of the field exploration and laboratory tests performed. Ground water concerns relative to the planned construction, if any, are summarized.
- d. Final logs of the soil borings and records of the field exploration prepared in accordance with the standard practice for geotechnical engineering. A boring location plan is included, and the results of the laboratory tests is plotted on the final boring logs or included on a separate test report sheet.
- e. Preliminary recommendations for soil parameters for the design of driven piles and L-pile analysis for the mounted solar array.
- f. Preliminary recommendations for equipment pad construction and roadways, including recommendations for subgrade improvements, if needed.
- g. Evaluation of the on-site soil characteristics encountered in the soil borings. Specifically, the suitability of the on-site materials for reuse as engineered fill to support grade slab. We also included compaction requirements and suitable material guidelines.
- h. Recommendations for seismic site classification in accordance with the International Building Code (IBC 2015). This analysis is based on the Standard Penetration Test (SPT) method described in Section 1615.1.5 of IBC.

EXPLORATION PROCEDURES

Subsurface Exploration Procedures

The soil borings were drilled with an ATV-mounted drill rig, using continuous-flight, hollow-stem augers to advance the boreholes. Drilling fluid was not used during advancement of the boreholes. The boring locations were located in the field by ECS personnel using GPS methods.

Representative soil samples were obtained by means of the split-barrel sampling procedure in general accordance with ASTM D 1586. In the split-barrel sampling procedure, a 2-inch O.D. split-barrel sampler is driven into the soil a distance of 18 inches by means of a 140-pound hammer falling 30 inches.

The number of hammer blows required to drive the sampler through the second and third 6-inch drive increments is termed the Standard Penetration Test (SPT) value (blow count, or N-value) and is indicated for each sample on the Boring Logs. In the borings, split-barrel sampling was performed at 2.5 ft intervals to depths of 10 ft and at 5.0 ft intervals thereafter.

N-values can be used to provide a qualitative indication of the in-place relative density of cohesionless soils. In a less reliable way, N-values also provide an indication of consistency for cohesive soils. The indications of relative density and consistency are qualitative, since many

factors can significantly affect N-values and prevent direct correlations, including differences among drill crews, drill rigs, drilling procedures, and hammer-rod-sampler assemblies.

A field log of the subsurface conditions encountered in the borings was maintained by the Drill Crew during the drilling operations. Each recovered soil sample was removed from the sampler and visually classified by the Drill Crew. Representative portions of soil samples were sealed in glass jars and returned to the ECS laboratory for further visual examination and possible laboratory testing.

Laboratory Testing Program

The laboratory testing program included visual classification of the boring samples by an experienced Geotechnical Engineer. The classifications were based on texture and plasticity in accordance with the Unified Soil Classification System (USCS). A brief explanation of the USCS is included in the Appendix of this report. The USCS group symbol for each soil type is indicated in parentheses following the soil descriptions on the Boring Logs.

During the visual classification procedures, the Geotechnical Engineer grouped the various soil types into the major strata noted on the Boring Logs. The stratification lines designating the interfaces between various soil strata on the Boring Logs are approximate. In situ, these transitions will likely be gradual and could occur at slightly different levels from those shown on the Boring Logs.

The limited laboratory testing program included moisture contents, gradation analysis, and Atterberg Limit tests on selected samples from the soil borings. The results of the laboratory testing are included in the Appendix. In addition, laboratory thermal resistivity testing is being performed on selected samples. However, the thermal resistivity tests were not completed at the time this report was prepared and will be submitted as an Addendum to this report once completed.

The soil samples will be retained in the ECS laboratory for a period of 60 days. After that holding period, the samples will be discarded, unless ECS receives other instructions regarding their disposition.

EXPLORATION RESULTS

Geologic Conditions

The project site is located within the Atlantic Coastal Plain Physiographic Province, which is characterized by marine and river sediments deposited during successive periods of fluctuating sea level and moving shorelines. Generally, the sediments thicken from west to east, towards the Atlantic Ocean. The uppermost sediments are often comprised of interbedded sands, gravels, clays, and silts.

Based on the results of the test borings and a review of the *Geologic Map of Maryland*, dated 1968, the natural soils at the project site are generally described as Upland Deposits (Eastern Shore) which is described as:

“Gravel, sand, silt, and clay. Mostly cross-bedded, poorly sorted, medium- to coarse-grained white to red sand and gravel, boulders near base; minor pink and yellow silts and clays; (Wicomico Formation of earlier reports); thickness 0 to 90 feet, locally thicker in paleochannels.”

Subsurface Conditions

In general, the subsurface conditions encountered during our field exploration consisted of 6 inches to 16 inches of topsoil overlying natural soils.

Natural soils were encountered below the surficial material in all of the borings. The natural soils were generally brown, gray, tan, orangish brown, grayish brown, greenish brown, greenish gray, and orangish gray in color and generally consisted of SAND (SP), SAND with Silt (SP-SM), Silty SAND (SM), Clayey SAND (SC), Sandy SILT (ML), SILT (ML), Sandy Clayey SILT (ML/CL), Clayey SILT (ML/CL), Sandy Silty CLAY (CL/ML), Silty CLAY (CL/ML), Sandy Lean CLAY (CL), Lean CLAY (CL), Sandy Organic CLAY (OH), Organic CLAY (OH), and Fat CLAY (CH) soil types. The N-values recorded in the natural granular soils ranged from 3 blows per foot (bpf) to 46 bpf, indicating very loose to dense relative densities. The N-Values recorded in the natural cohesive soils ranged from 2 bpf to 22 bpf, indicating very soft to very stiff relative consistencies.

More detailed descriptions of the encountered subsurface conditions are provided on the boring log in the Appendix.

Water Level Observations

Groundwater level observations were made in the boreholes, generally during the drilling operations and at completion of drilling operations, both before and after removal of the drilling augers. Groundwater was encountered in all borings, with the exception of Boring B-18, at depths ranging from 3 ft to 23 ft below existing grades. Groundwater was not encountered in Boring B-18 to the depth explored. Cave-in depths for the borings also were observed after removal of the drilling augers from the boreholes and ranged from 4.9 ft to 19.3 ft below existing grades.

Observations regarding the presence and absence of groundwater levels reflect the conditions at the time of this exploration only. Fluctuations in the locations of groundwater tables or perched water levels could occur as a result of seasonal variations in evaporation, precipitation, surface water run-off, and other factors. Therefore, water levels at future times could vary from those observed at the time of the borings.

PRELIMINARY ANALYSES AND RECOMMENDATIONS

Solar Array Foundation Considerations

Based on the provided information, we anticipate that the solar panel construction and pads will generally follow the existing grades and minor grading, if any, would be required to establish final grades. Based on the project characteristics, the encountered subsurface conditions and the geotechnical engineering analysis, it is ECS' opinion that the solar panel array can be supported on a driven beam foundation system. Equipment pads and any other light weight structures can be supported on shallow foundations and slabs-on-grade.

Driven Beam Considerations for Solar Panels (Preliminary)

Based on the subsurface conditions encountered during our preliminary subsurface exploration, it should be feasible for the proposed solar panels to be supported on a deep foundation system consisting of driven beams embedded at a sufficient depth to resist compression loads, lateral loads, uplift and overturning. Specific design information was not available at this preliminary stage. Therefore, we have provided tables of soil properties anticipated for encountered soils for use in the preliminary foundation design.

Considering the size of the site and in order to provide more specific preliminary recommendations for the different sections of the site, we have divided the site into four areas: the Northeastern area is represented by Borings B-1 through B-7; the Northwestern area is represented by Borings B-8 through B-12; the Central area is represented by Borings B-13 through B-20; and the Southern area is represented by Borings B-21 through B-25. The recommendations for each area are presented below.

Northeastern Area (B-1 through B-7)

The following table summarizes the engineering characteristics of the soils encountered at the northeastern portion of the site as represented by Borings B-1 through B-7. Organic silty clay material was encountered in Boring B-1 at depths of 4 ft to 12 ft below existing grades and in B-2 at depths of 13 ft to 20 ft. Based on the boring results, groundwater level was estimated at a depth of 7 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E ₅₀ Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' - 4.00'	Granular	120.0	30	----	----	25	50
4.00' - 7.00'	Cohesive (B-1)	100.0	----	250	0.02	----	100
	Granular	120.0	31	----	----	90	100
7.00' - 15.00'	Cohesive (B-1 & B-2)	37.6	----	250	0.02	----	100
	Granular	57.6	31	----	----	60	200
15.00' - 20.00'	Cohesive (B-1 & B-2)	37.6	----	350	0.02	----	150
	Granular	57.6	30	----	----	20	250

Northwestern Area (B-8 through B-12)

The following table summarizes the engineering characteristics of the soils encountered at the northwestern portion of the site as represented by Borings B-8 through B-12. Organic silty clay material was encountered in Boring B-11 at depths 9 ft to 17 ft below existing grades. Based on the boring results, groundwater level was estimated at a depth of 5 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E ₅₀ Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' - 5.00'	Granular	120.0	31	----	----	25	50
5.00' - 10.00'	Granular	57.6	31	----	----	60	150
10.00' - 15.00'	Cohesive (B-11)	37.6	----	250	0.02	----	100
	Granular	57.6	30	----	----	20	200
15.00' - 20.00'	Cohesive (B-11)	37.6	----	350	0.02	----	150
	Granular	57.6	31	----	----	60	250

Central Area (B-13 through B-20)

The following table summarizes the engineering characteristics of the soils encountered at the central portion of the site as represented by Borings B-13 through B-20. Organic silty clay material was encountered in B-14 at depths of 22 ft to 42 ft below existing grades and in B-15 at depths of 31 ft to 47 ft below existing grades. Based on the boring results, groundwater level was estimated at a depth of 10 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E ₅₀ Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' – 5.00'	Granular	120.0	30	----	----	25	50
5.00' – 10.00'	Granular	120.0	31	----	----	90	150
10.00' – 15.00'	Granular	57.6	31	----	----	60	250
15.00' – 20.00'	Granular	57.6	30	----	----	20	300

Southern Area (B-21 through B-25)

The following table summarizes the engineering characteristics of the soils encountered at the southern portion of the site as represented by Borings B-21 through B-25. Based on the boring results, groundwater level was estimated at a depth of 7 ft for these preliminary recommendations.

Approx. Depth (ft)	Soil Type	Effective Total Unit Weight (pcf)	Internal Angle of Friction (ϕ)	Cohesion (psf)	E ₅₀ Value	Soil Modulus k (pci)	Unit Skin Friction (psf)
0.00' - 3.00'	Granular	120.0	30	----	----	25	25
3.00' – 7.00'	Granular	120.0	31	----	----	90	100
7.00' – 12.00'	Cohesive (B-25)	52.6	----	500	0.01	----	200
	Granular	57.6	31	----	----	60	200
12.00' – 16.00'	Granular	57.6	30	----	----	60	250
16.00' – 20.00'	Granular	57.6	30	----	----	60	200

Shallow Foundation Considerations

No information regarding equipment pads (substation, inverter, etc.) were available at the time this report was prepared. However, should such structures be required to be supported on foundations or if light weight structures are needed for the project, the following preliminary recommendations are provided for shallow foundation design.

Based on the soil boring results, lightly loaded structures can be supported on spread footings designed for net allowable bearing pressure on the order of 2,000 pounds per square foot (psf). The net allowable soil bearing pressure refers to the pressure that can be transmitted to the foundation bearing soils in excess of the final overburden pressure at the base of a footing.

Prior to the placement of reinforcement and concrete for footings, the bases of the footing excavations should be observed, tested, and approved by a qualified representative of the Geotechnical Engineer to verify that soil conditions at each footing location are suitable for the design bearing pressure. If unsuitable soils are encountered at planned subgrade levels for any footing, the unsuitable soils should be undercut to suitable bearing materials. The footing can be directly supported on the competent soils at greater depths or, alternatively, the design footing bearing level can be restored through placement of lean concrete or select engineered fill materials.

If the design bearing level is restored using select engineered fill, then the excavation to remove the unsuitable soils should extend at least 0.5 ft laterally beyond the bottom edge of the footing for each 1 ft of vertical undercut below the footing bearing level. The select engineered fill materials should be placed and compacted as discussed in greater detail later in this report.

Settlement of the equipment pad foundations will be a function of the compressibility of the underlying subgrade soils, the actual applied loads, and other factors. The anticipated total settlements of individual footings, designed and constructed as outlined in this report, should be less than 1 inch. Maximum differential settlements within the proposed solar panel array and equipment pads are expected to be ½ inch over a horizontal distance of 30 feet.

In order to reduce the possibility of foundation bearing failure and excessive settlement due to local shear or "punching" action, we recommend that continuous footings have a minimum width of 1.5 feet and that isolated footings have a minimum lateral dimension of 2.5 feet. In addition, footings should be placed at a sufficient depth to provide adequate protection against frost heave. We recommend that all footings be placed at a minimum depth of 30 inches below finished grade.

Ground Supported Floor Slabs/Pads

Equipment pads, if required, may be ground-supported on subgrades prepared in accordance with the recommendations in the sections titled Subgrade Preparation and Fill Placement. It is important that pad/slab subgrade be firm and stable before the placement of the granular subbase materials, and the concrete. Based on the test boring results and the anticipated

planned finished grades, the anticipated slab subgrade should generally consist of firm natural soils, or new engineered fill.

The existing subgrade should be thoroughly proofrolled with suitable equipment and/or probed by a qualified representative of the Geotechnical Engineer in an effort to detect unstable or otherwise unacceptable soil conditions. Soils in any excessively unstable areas should be undercut and replaced with new engineered fill. Recommendations for construction of engineered fill are presented in the Fill Placement section of this report.

It is recommended that equipment pads and ground-supported slabs be underlain by a minimum of 4 inches of CR-6 or GA S/B dense-graded aggregate or approved equivalents. Acceptable granular subbase materials should have no aggregate size greater than 1.5 inches, 95 to 100 percent passing the 1 inch sieve, and less than 12 percent by total weight passing the Number 200 sieve. The granular subbase materials will provide a capillary break between the subgrade and the concrete slab, a higher modulus of subgrade reaction, and more uniform support conditions.

All granular materials should be compacted; however, if the granular subbase materials have more than 5 percent fines, those materials should be compacted to a minimum of 98 percent of the maximum dry density as determined by the Standard Proctor compaction test method (ASTM D 698). For structural design purposes, a modulus of subgrade reaction (k) of 100 pounds per cubic inch (pci) may be utilized for the structural design of slabs, provided a 4-inch subbase is utilized and the subgrade has been prepared in accordance with the recommendations presented herein.

The majority of the encountered soils near the surface are considered susceptible to frost. Should frost heave be an issue for the planned equipment pads, we recommend either lowering the pad bottoms to 30 inches below finished grade or over-excavating and replacing the upper 30 inches with a non-susceptible frost material such as CR-6/RC-6 material.

In the event there is a significant time lag between the site grading work and the fine grading of concrete slab areas prior to the placement of the subbase stone or concrete, the Geotechnical Engineer should verify the condition of the prepared subgrade. Prior to final pad/slab construction, the subgrade may require scarification and re-compaction to provide firm and stable conditions.

Seismic Design

Section 1613.3.2 of the IBC 2012 refers to Chapter 20 of ASCE7 for seismic site classification, which is based on various criteria, one of which is the Standard Penetration Resistance, N_{bar} , derived from the Standard Penetration Test Procedure (ASTM D-1586). ASCE7 Table 20.3.1 provides correlations for Site Classes C, D, and E with various ranges of N_{bar} to be calculated for the top 100 feet of the subsurface materials at a site in accordance with procedures described in Section 20.4.2 of ASCE7. In addition, the table presents criteria related to various soil properties for Site Classes E and F. ECS has used Table 20.3.1 of ASCE7 and the procedures outlined in Section 20.4.2 of ASCE7 to evaluate the Site Class for this project site.

Based on our review of the soil test boring results, it appears that the average N_{bar} value should be in the range of 15 to 50 blows per foot over a depth of 100 ft. This N_{bar} places the project site within the Site Classification of D, according to Table 20.3.1 of ASCE7.

General Site Development Considerations

Based on the provided project information, we anticipate that access roadways may be required for the site development. Based on the boring results, generally the near-surface soils should be adequate to remain in-place to support grass roadways; however, very loose granular soils were encountered below the topsoil in several areas of the site. Such material may be densified in-place or over-excavated to firm subgrade and backfilled as recommended in this report. In addition, subgrade compaction may be required for the construction of grass roadways.

Based on the borings, some of the natural soils consisted of granular soils, which may be considered suitable to support infiltration practices, if required. It is our opinion that the site conditions should be adequate to support SWM facilities, perimeter roads, access roads, and other civil site improvements planned for the project. Additionally, standard sediment and erosion control measures would be suitable for the project.

Construction entrances to the site will be subjected to heavy loads, which will require additional support. For such entrances, 12 inches to 18 inches of No. 2 stone may be required to provide a stable construction entrance, provided that the topsoil has been removed.

We understand that directional drilling will be required in some areas for the transmission lines. Based on the boring results in such areas, the subgrade soils generally consisted of Silty Sand (SM), Sandy to Clayey Silt (ML to ML/CL), Clayey Sand (SC), and Organic Clay (OH), which should not be problematic for directional drilling.

Earthwork Operations

The following paragraphs detail our recommendations regarding subgrade preparation and compaction requirements, if required.

Subgrade Preparation

Subgrade preparation for structures requiring footings and slabs-on-grade should generally include the stripping of any unsuitable surface materials from the planned structure areas. It is recommended that the stripping of unsuitable surficial materials should extend to a minimum of 10 feet beyond the structure area limits, where feasible.

Subsequent to stripping operations, the exposed subgrade soils in the planned solar panel array areas should be examined by a qualified representative of the Geotechnical Engineer. The exposed soils should be thoroughly proofrolled by a vehicle having an axle weight of at least 20 tons, such as a fully-loaded tandem-axle dump truck. This procedure is intended to

assist in identifying any localized loose or yielding materials. In the event that any yielding materials are encountered during the proofrolling operations, those subgrade soils should either be thoroughly densified in-place, or undercut to firm ground and replaced with controlled, compacted fill to final subgrade elevations.

Fill Placement

Prior to placement of compacted fill, representative bulk samples (about 50 pounds) should be taken of the proposed fill soils and laboratory tests should be conducted to determine Atterberg limits, natural moisture content, grain-size distribution, and moisture-density relationships for compaction. These test results will be necessary for proper control of construction for new engineered fill.

Upon achieving competent subgrade conditions, the Contractor can place and compact engineered fill to reach final subgrade levels. In general, any materials to be used as structural fill should consist of soil types classified as ML or more granular, in accordance with ASTM D 2487, and should have a Liquid Limit less than 40 and a Plasticity Index less than 15.

Finer-grained, more plastic, and organic soil types, if encountered at the site, may be used as fill materials in non-structural areas. Any such materials encountered during grading operations should be either stockpiled for later use in landscape fills, or should be placed in approved disposal areas either on-site or off-site.

Prior to the utilization of any on-site or off-site borrow materials, the Geotechnical Engineer should be provided with representative samples in order to determine the suitability of the materials for use as a controlled compacted fill and to develop moisture-density relationships. In order to expedite the earthwork operations, it is recommended that any off-site borrow materials generally should be comprised of SM or more granular soil types.

All structural fill should be placed in loose lifts, which do not exceed 8 inches in thickness, and should be compacted to at least 95 percent of the maximum dry density, as determined by the Standard Proctor Compaction Test (ASTM D 698). Fill placed in non-structural areas should be compacted to at least 90 percent of the Standard Proctor maximum dry density in order to avoid significant subsidence. Generally, the moisture content of the fill material should be maintained within ± 2 percentage points of the optimum moisture content for the fill material, as determined by ASTM D 698.

All filling operations should be observed on a full-time basis by a qualified representative of the Geotechnical Engineer to determine that minimum compaction requirements are being achieved. A minimum of one compaction test per lift should be made per 2,500 square feet of fill lift area, but not fewer than two tests per lift should be made for any lift. The elevations and locations of the field density tests should be clearly identified at the time of fill placement and compaction.

Compaction equipment suitable for the soil types being used as fill should be selected to compact the fill. Theoretically, any equipment type can be used, so long as the required density is achieved. Ideally, a steel drum roller generally will be the most efficient for compaction of

granular soil types and for sealing the surface soils, while a sheepsfoot roller or pneumatic-tire roller generally will be most efficient for compaction of cohesive soil types.

At the end of each work day, all fill areas should be graded to facilitate surface drainage of any surface runoff associated with precipitation, and should be sealed by use of a smooth-drum roller to limit infiltration of surface water. During placement and compaction of new fill at the beginning of each workday, the Contractor should scarify existing subgrade soils so that a weak plane will not be formed between the new fill and the existing subgrade soils. We recommend that subgrade soils should be scarified to depths of about 4 inches prior to placement of new fill.

Fill materials should not be placed on frozen soils, frost-heaved soils, and/or excessively wet soils. All frozen, frost-heaved, or excessively wet soils should be removed prior to continuation of fill operations. Borrow fill materials should not contain frozen materials at the time of placement. All frozen, frost-heaved, or excavated wet soils should be removed prior to placement of controlled, compacted fill. Moisture contents for excessively wet soils will need to be lowered to the range limits previously discussed.

If any problems are encountered during the earthwork operations, or if site conditions deviate from those indicated by the borings, the Geotechnical Engineer should be notified immediately.

Construction Considerations

The on-site soils contain silt and clay fines that will be sensitive to moisture increases and to construction disturbance. Construction activities in the presence of excessive moisture can lead to softening of the subgrade soils and loss of bearing capacity. Therefore, it will be prudent to schedule earthwork operations during the warmer and drier seasons that generally occur from late spring to early fall. Measures should also be taken to limit site disturbance, especially from rubber-tired heavy construction equipment, and to provide for drainage of surface water from areas being developed.

A firm working surface for the placement of engineered fill should be established prior to construction of new fills. The moisture content of the fill soils at the time of placement should be carefully controlled to ensure that the required compaction effort can be achieved without excessive pumping or movement of the fill mass.

In the event that the earthwork operations are accomplished during the cooler and wetter periods of the year, delays and additional costs should be anticipated. At these times, reduction of soil moisture may need to be accomplished by a combination of mechanical manipulation and the use of chemical additives, such as lime or cement, in order to lower moisture contents to levels appropriate for compaction.

As noted in the **Water Level Observations** section of this report, groundwater was encountered in all borings, with the exception of Boring B-18, at depths ranging from 3 ft to 23 ft below existing grade. Any other groundwater encountered during construction should be the result of perched water and should be readily managed by interceptor trenches and localized systems of sumps and pumps.

Foundation excavations must be protected to prevent the disturbance of the subgrade materials and to minimize any potential loss of support capacity. Foundation concrete generally should be placed for foundations during the same day that the foundation excavations are made and approved. Should excavating and placing the foundation concrete the same day not be practical, we recommend that a concrete mud mat, 2 to 3 inches thick, be placed to protect the subgrade soils from moisture changes and disturbance. If protection of the soils is not provided, then undercutting of softened or loosened soils may be necessary prior to the placement of reinforcing steel and foundation concrete.

Prior to the placement of any foundation concrete or mud mat, the subgrade soils must be carefully examined and tested by a qualified representative of the Geotechnical Engineer to confirm the availability of the design soil bearing capacity. To minimize disturbance to the subgrade soils during excavation, we recommend that a bucket without scarifying teeth, in addition to hand excavation methods, be used during the final phases of the excavation for the foundations.

Any cuts or excavations associated with solar panel array and utility excavations may require forming or bracing, slope flattening, or other physical measures to control sloughing and/or to prevent slope failures. An examination of the applicable OSHA codes and requirements should be made by the appropriate Contractor to ensure that adequate protection of the excavations and trench walls is provided. The surface soils contain some silt and fine sands and are considered erodible. The Contractor should provide and maintain good site drainage during earthwork operations to help to maintain the integrity of the surface soils.

All erosion and sedimentation shall be controlled in accordance with sound engineering practice and current local requirements. Surface water should be directed away from the construction area, and the site should be sloped at gradients of 1 to 2 percent to reduce the potential for ponding water and the subsequent saturation of the surface soils.

CLOSING

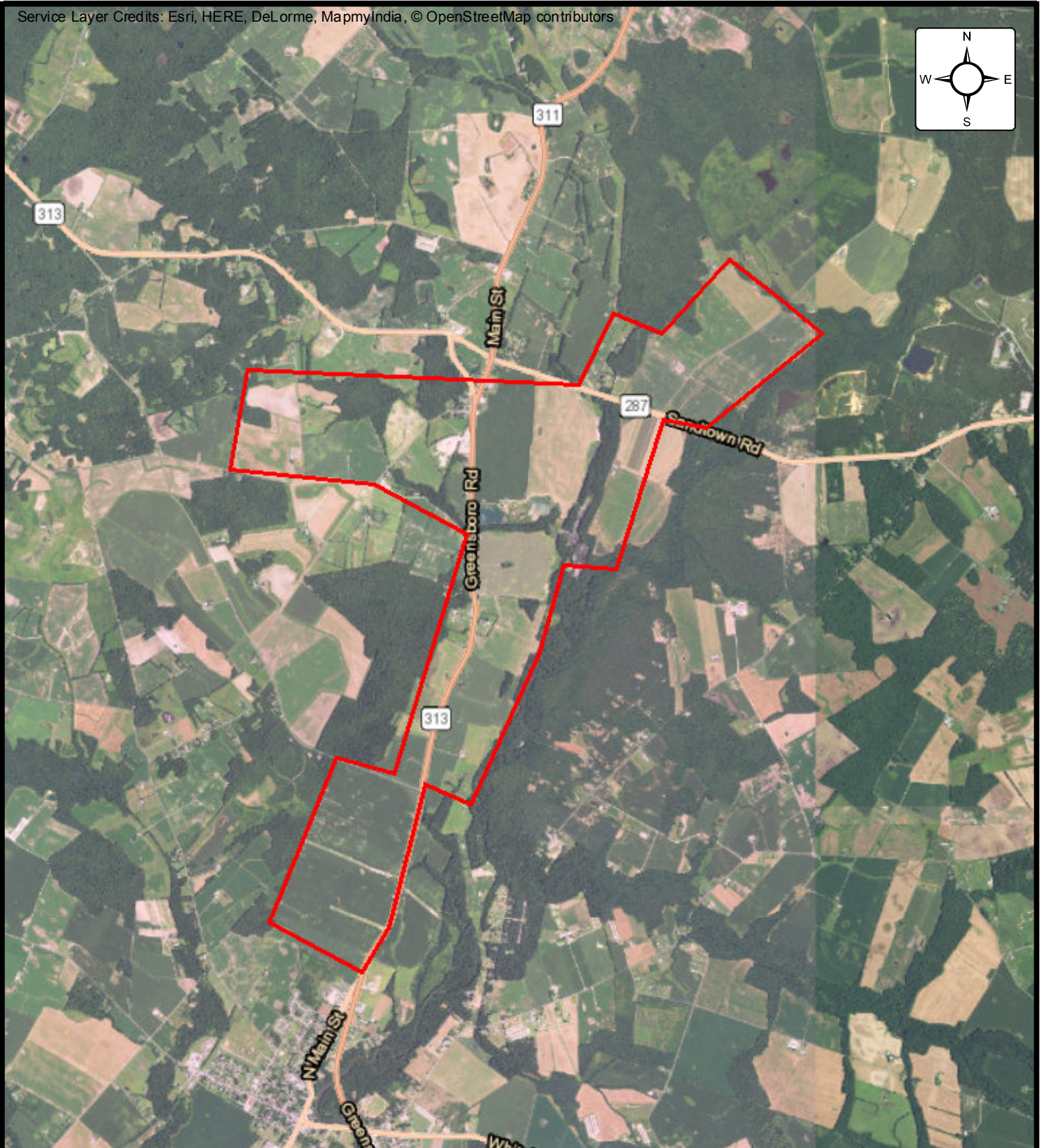
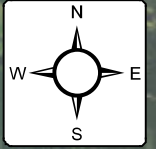
This report has been prepared to provide Open Road Renewables with subsurface information and evaluations and recommendations to guide geotechnical-related design and construction for development of the site. The report scope is limited to this specific project and the location described. The project description represents our current understanding of the significant aspects of the proposed development relevant to geotechnical considerations for the project.

The evaluations and recommendations presented in this report are, of necessity, based on the information made available to us at the time of the actual writing of the report and the site conditions, surface and subsurface, that existed at the time the exploratory borings were drilled. Further assumption has been made that the limited exploratory borings, in relation both to the aerial extent of the site and to depth, are representative of general subsurface conditions across the site. If subsurface conditions are encountered that differ significantly from those reported herein, the Geotechnical Engineer should be notified immediately so that the analyses and recommendations presented in this report can be reviewed for validity.

Should there be significant changes to the proposed construction; ECS may need to review the changes to determine whether the evaluations and recommendations of this report will remain valid. ECS should be provided with appropriate plans and other information as project design progresses, so that we can review the information and provide additional geotechnical exploration, testing analyses, and guidance, as needed. In addition, the Geotechnical Engineer should be retained to prepare, or at least to review, the earthwork specifications, to assure that the recommendations of the geotechnical report have been properly interpreted and included in the construction documents.

APPENDIX

- **Site Location Diagram**
- **Reference Notes for Boring Logs**
- **Laboratory Test Results**
- **Boring Logs**
- **Generalized Subsurface Profiles**
- **Boring Location Plan**



SITE LOCATION DIAGRAM CHERRYWOOD SOLAR

GOLDSBORO MD 21636
OPEN ROAD RENEWABLES

ENGINEER	KFB
SCALE	NTS
PROJECT NO.	02:8631
SHEET	1 OF 1
DATE	12/28/2017



REFERENCE NOTES FOR BORING LOGS

MATERIAL ^{1,2}	
	ASPHALT
	CONCRETE
	GRAVEL
	TOPSOIL
	VOID
	BRICK
	AGGREGATE BASE COURSE
	FILL³ MAN-PLACED SOILS
	GW WELL-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GP POORLY-GRADED GRAVEL gravel-sand mixtures, little or no fines
	GM SILTY GRAVEL gravel-sand-silt mixtures
	GC CLAYEY GRAVEL gravel-sand-clay mixtures
	SW WELL-GRADED SAND gravelly sand, little or no fines
	SP POORLY-GRADED SAND gravelly sand, little or no fines
	SM SILTY SAND sand-silt mixtures
	SC CLAYEY SAND sand-clay mixtures
	ML SILT non-plastic to medium plasticity
	MH ELASTIC SILT high plasticity
	CL LEAN CLAY low to medium plasticity
	CH FAT CLAY high plasticity
	OL ORGANIC SILT or CLAY non-plastic to low plasticity
	OH ORGANIC SILT or CLAY high plasticity
	PT PEAT highly organic soils

DRILLING SAMPLING SYMBOLS & ABBREVIATIONS			
SS	Split Spoon Sampler	PM	Pressuremeter Test
ST	Shelby Tube Sampler	RD	Rock Bit Drilling
WS	Wash Sample	RC	Rock Core, NX, BX, AX
BS	Bulk Sample of Cuttings	REC	Rock Sample Recovery %
PA	Power Auger (no sample)	RQD	Rock Quality Designation %
HSA	Hollow Stem Auger		

PARTICLE SIZE IDENTIFICATION		
DESIGNATION	PARTICLE SIZES	
Boulders	12 inches (300 mm) or larger	
Cobbles	3 inches to 12 inches (75 mm to 300 mm)	
Gravel:	Coarse	¾ inch to 3 inches (19 mm to 75 mm)
	Fine	4.75 mm to 19 mm (No. 4 sieve to ¾ inch)
Sand:	Coarse	2.00 mm to 4.75 mm (No. 10 to No. 4 sieve)
	Medium	0.425 mm to 2.00 mm (No. 40 to No. 10 sieve)
	Fine	0.074 mm to 0.425 mm (No. 200 to No. 40 sieve)
Silt & Clay ("Fines")	<0.074 mm (smaller than a No. 200 sieve)	

COHESIVE SILTS & CLAYS		
UNCONFINED COMPRESSIVE STRENGTH, Q_p ⁴	SPT ⁵ (BPF)	CONSISTENCY ⁷ (COHESIVE)
<0.25	<3	Very Soft
0.25 - <0.50	3 - 4	Soft
0.50 - <1.00	5 - 8	Medium Stiff
1.00 - <2.00	9 - 15	Stiff
2.00 - <4.00	16 - 30	Very Stiff
4.00 - 8.00	31 - 50	Hard
>8.00	>50	Very Hard

RELATIVE AMOUNT ⁷	COARSE GRAINED (%)	FINE GRAINED (%)
Trace	<5	<5
Dual Symbol (ex: SW-SM)	10	10
With	15 - 20	15-25
Adjective (ex: "Silty")	25 - <50	30 - <50

GRAVELS, SANDS & NON-COHESIVE SILTS	
SPT ⁵	DENSITY
<5	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
>50	Very Dense

WATER LEVELS ⁶		
	WL	Water Level (WS)(WD) (WS) While Sampling (WD) While Drilling
	SHW	Seasonal High WT
	ACR	After Casing Removal
	SWT	Stabilized Water Table
	DCI	Dry Cave-In
	WCI	Wet Cave-In

¹Classifications and symbols per ASTM D 2488-09 (Visual-Manual Procedure) unless noted otherwise.

²To be consistent with general practice, "POORLY GRADED" has been removed from GP, GP-GM, GP-GC, SP, SP-SM, SP-SC soil types on the boring logs.

³Non-ASTM designations are included in soil descriptions and symbols along with ASTM symbol [Ex: (SM-FILL)].

⁴Typically estimated via pocket penetrometer or Torvane shear test and expressed in tons per square foot (tsf).

⁵Standard Penetration Test (SPT) refers to the number of hammer blows (blow count) of a 140 lb. hammer falling 30 inches on a 2 inch OD split spoon sampler required to drive the sampler 12 inches (ASTM D 1586). "N-value" is another term for "blow count" and is expressed in blows per foot (bpf).

⁶The water levels are those levels actually measured in the borehole at the times indicated by the symbol. The measurements are relatively reliable when augering, without adding fluids, in granular soils. In clay and cohesive silts, the determination of water levels may require several days for the water level to stabilize. In such cases, additional methods of measurement are generally employed.

⁷Minor deviation from ASTM D 2488-09.

Laboratory Testing Summary

Page 1 of 3

Sample Source	Sample Number	Depth (feet)	MC ¹ (%)	Soil Type ²	Atterberg Limits ³			Percent Passing No. 200 Sieve ⁴	Moisture - Density (Corr.) ⁵		CBR Value ⁶	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B-1												
	S-1	1.00 - 2.50	15.4									
	S-2	3.50 - 5.00	60.3									
	S-3	6.00 - 7.50	57.7	OH	87	31	56	57.7				
	S-4	8.50 - 10.00	51.8									
	S-5	13.50 - 15.00	59.1									
B-4												
	S-1	1.00 - 2.50	8.5									
	S-2	3.50 - 5.00	4.6									
	S-3	6.00 - 7.50	10.5									
	S-4	8.50 - 10.00	18.8	SM	19	NP	NP	22.0				
	S-5	13.50 - 15.00	18.3									
B-7												
	S-1	1.00 - 2.50	4.3									
	S-2	3.50 - 5.00	4.3									
	S-3	6.00 - 7.50	2.7									
	S-4	8.50 - 10.00	14.0									
	S-5	13.50 - 15.00	13.3									
B-8												
	S-1	1.00 - 2.50	11.9									
	S-2	3.50 - 5.00	13.0									
	S-3	6.00 - 7.50	20.9									
	S-4	8.50 - 10.00	34.6									
	S-5	13.50 - 15.00	24.7									
B-11												
	S-1	1.00 - 2.50	8.9									
	S-2	3.50 - 5.00	16.9									
	S-3	6.00 - 7.50	18.1									

Notes:

1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions:

MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 02:8631
 Project Name: Cherrywood Solar
 PM: Katie Buckley
 PE: Hasan M. Aboumatar
 Printed On: Wednesday, January 10, 2018



Laboratory Testing Summary

Sample Source	Sample Number	Depth (feet)	MC ¹ (%)	Soil Type ²	Atterberg Limits ³			Percent Passing No. 200 Sieve ⁴	Moisture - Density (Corr.) ⁵		CBR Value ⁶	Other
					LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
	S-4	8.50 - 10.00	7.6									
	S-5	13.50 - 15.00	63.4									
B-12												
	S-1	1.00 - 2.50	18.2									
	S-2	3.50 - 5.00	16.0									
	S-3	6.00 - 7.50	19.5									
	S-4	8.50 - 10.00	21.6									
	S-5	13.50 - 15.00	24.7	SP-SM	20	NP	NP	10.0				
B-14												
	S-1	1.00 - 2.50	12.6									
	S-2	3.50 - 5.00	10.2									
	S-3	6.00 - 7.50	6.8									
	S-4	8.50 - 10.00	8.2									
	S-5	13.50 - 15.00	6.2									
	S-7	23.50 - 25.00	64.2	OH	92	37	55	63.8				
B-15												
	S-1	1.00 - 2.50	13.0									
	S-2	3.50 - 5.00	8.6									
	S-3	6.00 - 7.50	3.6									
	S-4	8.50 - 10.00	11.9									
	S-5	13.50 - 15.00	20.7									
B-18												
	S-1	1.00 - 2.50	7.9									
	S-2	3.50 - 5.00	4.1									
	S-3	6.00 - 7.50	9.5									
	S-4	8.50 - 10.00	13.2									
	S-5	13.50 - 15.00	10.2									
B-20												

Notes:

1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions:

MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No. 02:8631
 Project Name: Cherrywood Solar
 PM: Katie Buckley
 PE: Hasan M. Aboumatar
 Printed On: Wednesday, January 10, 2018



Page 3 of 3

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

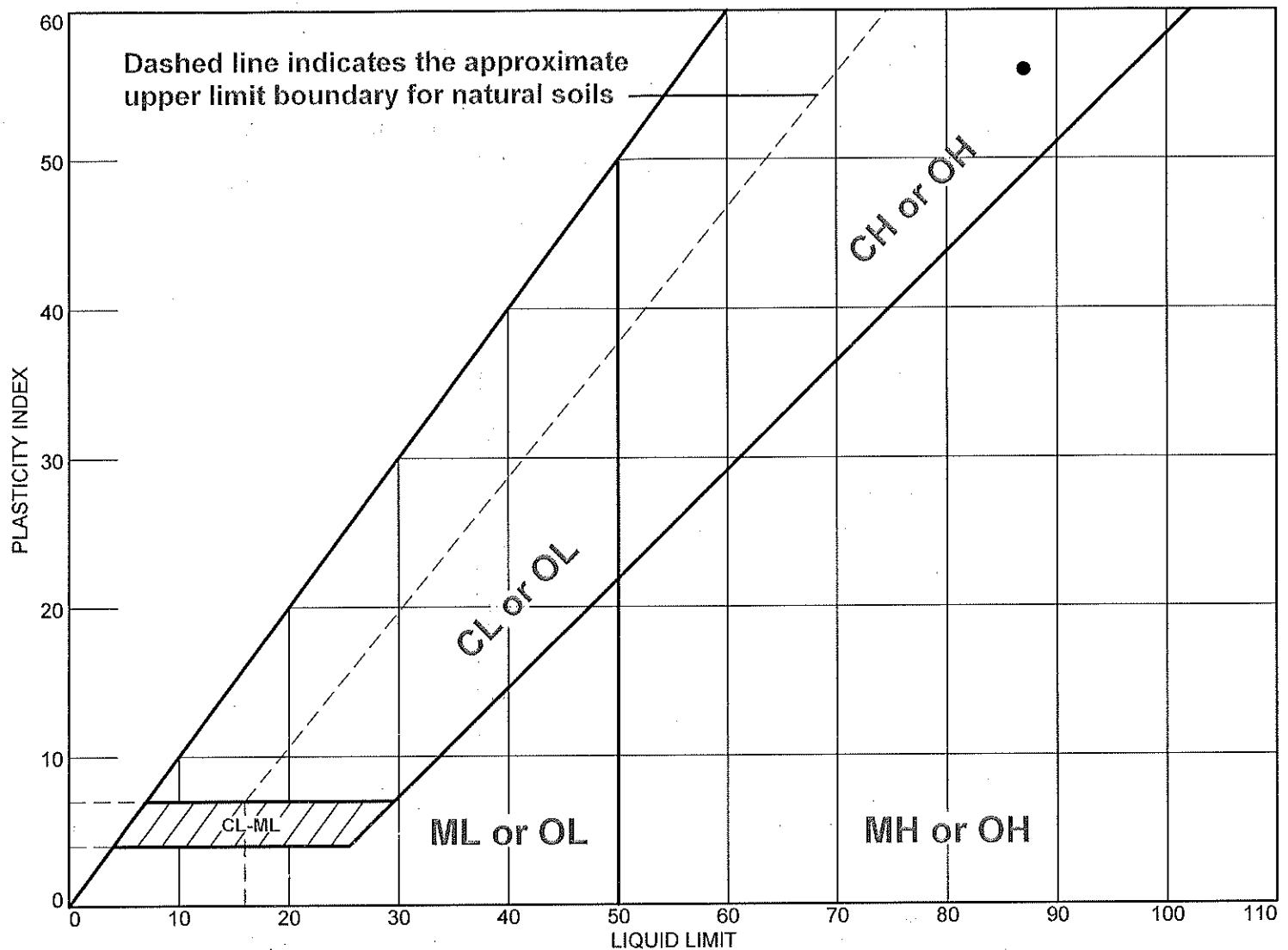
Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No.	02:8631
Project Name:	Cherrywood Solar
PM:	Katie Buckley
PE:	Hasan M. Aboumatar
Printed On:	Wednesday, January 10, 2018



ECS MID-ATLANTIC, LLC
1340 Charwood Road, Suite A
Hanover, MD 21076
Phone: (410) 859-4300
Fax: (410) 859-4324

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
● (ML/CL) CLAYEY SILT, dark gray, moist, firm to stiff	87	31	56		57.7	OH

Project No. 8631

Client: Open Road Renewables

Project: Cherrywood Solar

● **Source of Sample:** B-1

Depth: 6.00-7.50

Sample Number: S-3

Remarks:

● 2nd Liquid Limit = 50



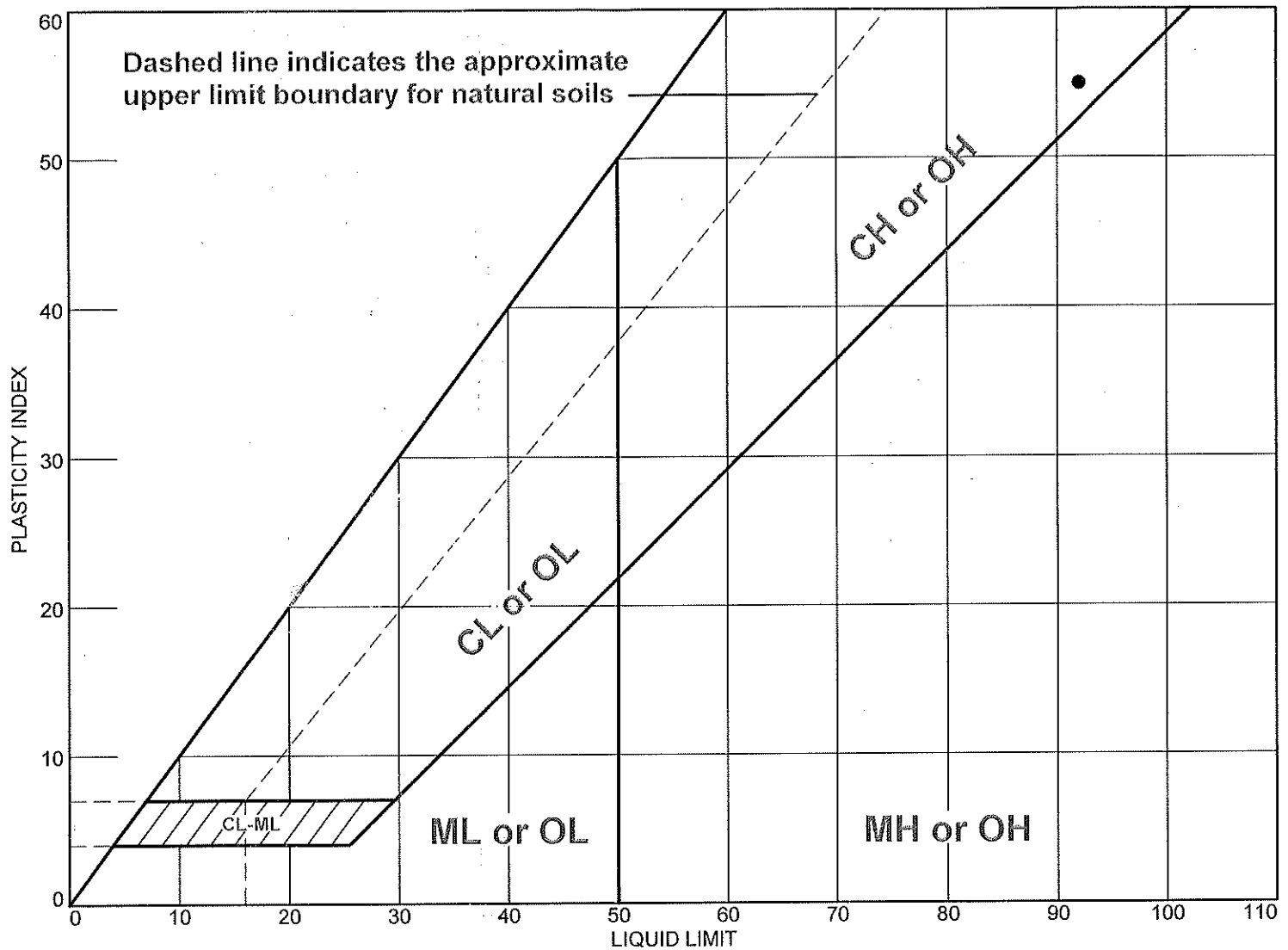
ECS MID-ATLANTIC, LLC

1340 Charwood Road, Suite A
Hanover, MD 21076

Phone: (410) 859-4300
Fax: (410) 859-4324

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
● (CL/ML) SILTY CLAY, dark gray, moist, soft to firm	92	37	55		63.8	OH

Project No. 8631

Client: Open Road Renewables

Project: Cherrywood Solar

● **Source of Sample:** B-14

Depth: 23.50-25.00

Sample Number: S-7

Remarks:

● 2nd Liquid Limit = 52



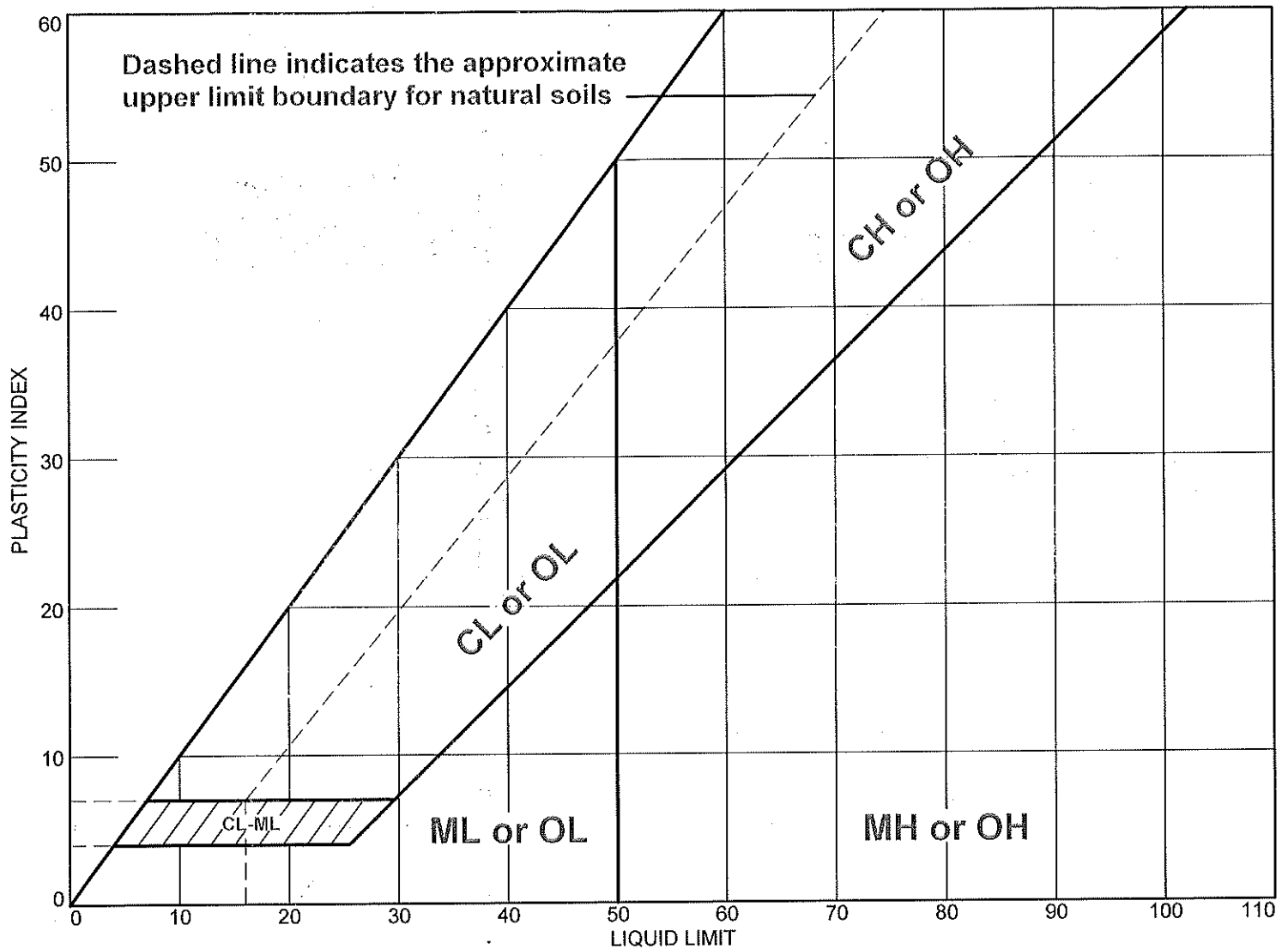
ECS MID-ATLANTIC, LLC

1340 Charwood Road, Suite A
Hanover, MD 21076

Phone: (410) 859-4300
Fax: (410) 859-4324

Figure

LIQUID AND PLASTIC LIMITS TEST REPORT



MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
● (CL/ML) SILTY CLAY, dark gray, moist, firm	28	NP	NP		62.2	ML

Project No. 8631

Client: Open Road Renewables

Project: Cherrywood Solar

● Source of Sample: B-20

Depth: 23.50-25.00

Sample Number: S-7

Remarks:

● 2nd Liquid Limit = 22



ECS MID-ATLANTIC, LLC

1340 Charwood Road, Suite A
Hanover, MD 21076

Phone: (410) 859-4300
Fax: (410) 859-4324

Figure

CLIENT Open Road Renewables				Job #: 02:8631	BORING # B-1	SHEET 1 OF 1																																																																																																					
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables																																																																																																							
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD																																																																																																											
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">NORTHING</td> <td style="width: 25%;">EASTING</td> <td style="width: 50%;">STATION</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>				NORTHING	EASTING	STATION				<div style="display: flex; justify-content: space-between;"> <div> <p>—○— CALIBRATED PENETROMETER TONS/FT²</p> <p>ROCK QUALITY DESIGNATION & RECOVERY</p> <p>RQD% — — — REC% — — —</p> </div> <div> <p>PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%</p> <p>⊗ STANDARD PENETRATION BLOWS/FT</p> </div> </div>																																																																																																	
NORTHING	EASTING	STATION																																																																																																									
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>DEPTH (FT)</th> <th>SAMPLE NO.</th> <th>SAMPLE TYPE</th> <th>SAMPLE DIST. (IN)</th> <th>RECOVERY (IN)</th> <th>DESCRIPTION OF MATERIAL</th> <th>ENGLISH UNITS</th> <th>WATER LEVELS</th> <th>ELEVATION (FT)</th> <th>BLOWS/6"</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>Topsoil Depth [6.00"]</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td>S-1</td> <td>SS</td> <td>18</td> <td>12</td> <td>(SC) CLAYEY SAND, brown, moist, loose</td> <td></td> <td></td> <td></td> <td>6-15.4</td> </tr> <tr> <td>5</td> <td>S-2</td> <td>SS</td> <td>18</td> <td>18</td> <td>(OH) ORGANIC CLAY, dark gray, moist, medium stiff to soft</td> <td></td> <td></td> <td></td> <td>5-60.3</td> </tr> <tr> <td></td> <td>S-3</td> <td>SS</td> <td>18</td> <td>18</td> <td>(OH) ORGANIC CLAY, dark gray, wet, very soft</td> <td></td> <td></td> <td></td> <td>3-57.7</td> </tr> <tr> <td>10</td> <td>S-4</td> <td>SS</td> <td>18</td> <td>18</td> <td>(OH) ORGANIC CLAY, dark gray, wet, very soft</td> <td></td> <td></td> <td></td> <td>2-51.8</td> </tr> <tr> <td>15</td> <td>S-5</td> <td>SS</td> <td>18</td> <td>18</td> <td>(ML/CL) SANDY CLAYEY SILT, dark gray, moist, medium stiff to stiff</td> <td></td> <td></td> <td></td> <td>6-59.1</td> </tr> <tr> <td>20</td> <td>S-6</td> <td>SS</td> <td>18</td> <td>18</td> <td>END OF BORING @ 20'</td> <td></td> <td></td> <td></td> <td>10-</td> </tr> <tr> <td>25</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	0					Topsoil Depth [6.00"]						S-1	SS	18	12	(SC) CLAYEY SAND, brown, moist, loose				6-15.4	5	S-2	SS	18	18	(OH) ORGANIC CLAY, dark gray, moist, medium stiff to soft				5-60.3		S-3	SS	18	18	(OH) ORGANIC CLAY, dark gray, wet, very soft				3-57.7	10	S-4	SS	18	18	(OH) ORGANIC CLAY, dark gray, wet, very soft				2-51.8	15	S-5	SS	18	18	(ML/CL) SANDY CLAYEY SILT, dark gray, moist, medium stiff to stiff				6-59.1	20	S-6	SS	18	18	END OF BORING @ 20'				10-	25										30													
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"																																																																																																		
0					Topsoil Depth [6.00"]																																																																																																						
	S-1	SS	18	12	(SC) CLAYEY SAND, brown, moist, loose				6-15.4																																																																																																		
5	S-2	SS	18	18	(OH) ORGANIC CLAY, dark gray, moist, medium stiff to soft				5-60.3																																																																																																		
	S-3	SS	18	18	(OH) ORGANIC CLAY, dark gray, wet, very soft				3-57.7																																																																																																		
10	S-4	SS	18	18	(OH) ORGANIC CLAY, dark gray, wet, very soft				2-51.8																																																																																																		
15	S-5	SS	18	18	(ML/CL) SANDY CLAYEY SILT, dark gray, moist, medium stiff to stiff				6-59.1																																																																																																		
20	S-6	SS	18	18	END OF BORING @ 20'				10-																																																																																																		
25																																																																																																											
30																																																																																																											

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

<div style="display: flex; justify-content: space-between;"> <div> <div></div> WL 8.0 <div></div> WS <input type="checkbox"/> <div></div> WD <input checked="" type="checkbox"/> </div> <div> BORING STARTED 12/04/17 </div> <div> CAVE IN DEPTH @ 17.7' </div> </div>
<div style="display: flex; justify-content: space-between;"> <div> <div></div> WL(SHW) <div></div> WL(ACR) 2.1 </div> <div> BORING COMPLETED 12/04/17 </div> <div> HAMMER TYPE Auto </div> </div>
<div style="display: flex; justify-content: space-between;"> <div> <div></div> WL </div> <div> RIG ATV FOREMAN Dale Price </div> <div> DRILLING METHOD </div> </div>

CLIENT Open Road Renewables				Job #: 02:8631	BORING # B-2	SHEET 1 OF 1																																																																																																																																																																													
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables																																																																																																																																																																															
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD																																																																																																																																																																																			
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width: 25%;">NORTHING</td> <td style="width: 25%;">EASTING</td> <td style="width: 50%;">STATION</td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </table>				NORTHING	EASTING	STATION				<div style="display: flex; justify-content: space-between;"> <div> <p>—○— CALIBRATED PENETROMETER TONS/FT²</p> <p>ROCK QUALITY DESIGNATION & RECOVERY</p> <p>RQD% — — — REC% — — —</p> <p>PLASTIC LIMIT% X WATER CONTENT% ● LIQUID LIMIT% △</p> <p>⊗ STANDARD PENETRATION BLOWS/FT</p> </div> </div>																																																																																																																																																																									
NORTHING	EASTING	STATION																																																																																																																																																																																	
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">DEPTH (FT)</th> <th rowspan="2">SAMPLE NO.</th> <th rowspan="2">SAMPLE TYPE</th> <th rowspan="2">SAMPLE DIST. (IN)</th> <th rowspan="2">RECOVERY (IN)</th> <th>DESCRIPTION OF MATERIAL</th> <th>ENGLISH UNITS</th> <th rowspan="2">WATER LEVELS</th> <th rowspan="2">ELEVATION (FT)</th> <th rowspan="2">BLOWS/6"</th> </tr> <tr> <th>BOTTOM OF CASING ▶</th> <th>LOSS OF CIRCULATION ⋈</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>Topsoil Depth [10.00"]</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td>S-1</td> <td>SS</td> <td>18</td> <td>12</td> <td>(SM) SILTY SAND, trace clay, light gray, moist, loose</td> <td></td> <td></td> <td></td> <td>9</td> </tr> <tr> <td>4</td> <td>S-2</td> <td>SS</td> <td>18</td> <td>16</td> <td>(SM) SILTY SAND, trace clay, light gray, wet, medium dense</td> <td></td> <td></td> <td></td> <td>15</td> </tr> <tr> <td>6</td> <td>S-3</td> <td>SS</td> <td>18</td> <td>16</td> <td></td> <td></td> <td></td> <td></td> <td>11</td> </tr> <tr> <td>8</td> <td>S-4</td> <td>SS</td> <td>18</td> <td>16</td> <td>(ML/CL) SANDY CLAYEY SILT, trace gravel, light gray, wet, medium stiff</td> <td></td> <td></td> <td></td> <td>8</td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>12</td> <td>S-5</td> <td>SS</td> <td>18</td> <td>18</td> <td>(OH) ORGANIC CLAY, trace silt, dark gray, moist, soft to medium stiff</td> <td></td> <td></td> <td></td> <td>4</td> </tr> <tr> <td>14</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>16</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>18</td> <td>S-6</td> <td>SS</td> <td>18</td> <td>18</td> <td></td> <td></td> <td></td> <td></td> <td>6</td> </tr> <tr> <td>20</td> <td></td> <td></td> <td></td> <td></td> <td>END OF BORING @ 20'</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>22</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>24</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>26</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>28</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>				DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	BOTTOM OF CASING ▶	LOSS OF CIRCULATION ⋈	0					Topsoil Depth [10.00"]					2	S-1	SS	18	12	(SM) SILTY SAND, trace clay, light gray, moist, loose				9	4	S-2	SS	18	16	(SM) SILTY SAND, trace clay, light gray, wet, medium dense				15	6	S-3	SS	18	16					11	8	S-4	SS	18	16	(ML/CL) SANDY CLAYEY SILT, trace gravel, light gray, wet, medium stiff				8	10										12	S-5	SS	18	18	(OH) ORGANIC CLAY, trace silt, dark gray, moist, soft to medium stiff				4	14										16										18	S-6	SS	18	18					6	20					END OF BORING @ 20'					22										24										26										28										30													
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)						RECOVERY (IN)	DESCRIPTION OF MATERIAL				ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"																																																																																																																																																																		
				BOTTOM OF CASING ▶	LOSS OF CIRCULATION ⋈																																																																																																																																																																														
0					Topsoil Depth [10.00"]																																																																																																																																																																														
2	S-1	SS	18	12	(SM) SILTY SAND, trace clay, light gray, moist, loose				9																																																																																																																																																																										
4	S-2	SS	18	16	(SM) SILTY SAND, trace clay, light gray, wet, medium dense				15																																																																																																																																																																										
6	S-3	SS	18	16					11																																																																																																																																																																										
8	S-4	SS	18	16	(ML/CL) SANDY CLAYEY SILT, trace gravel, light gray, wet, medium stiff				8																																																																																																																																																																										
10																																																																																																																																																																																			
12	S-5	SS	18	18	(OH) ORGANIC CLAY, trace silt, dark gray, moist, soft to medium stiff				4																																																																																																																																																																										
14																																																																																																																																																																																			
16																																																																																																																																																																																			
18	S-6	SS	18	18					6																																																																																																																																																																										
20					END OF BORING @ 20'																																																																																																																																																																														
22																																																																																																																																																																																			
24																																																																																																																																																																																			
26																																																																																																																																																																																			
28																																																																																																																																																																																			
30																																																																																																																																																																																			
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.																																																																																																																																																																																			
WL 8.0		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/04/17		CAVE IN DEPTH @ 14.2'																																																																																																																																																																													
WL(SHW)		WL(ACR) 3.1		BORING COMPLETED 12/04/17		HAMMER TYPE Auto																																																																																																																																																																													
WL				RIG ATV FOREMAN Dale Price		DRILLING METHOD																																																																																																																																																																													

CLIENT Open Road Renewables			Job #: 02:8631		BORING # B-3		SHEET 1 OF 1		
PROJECT NAME Cherrywood Solar			ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD									
NORTHING			EASTING			STATION			-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ● △ ⊗ STANDARD PENETRATION BLOWS/FT
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [6.00"] (SM) SILTY SAND, brown, moist, loose				
2	S-1	SS	18	16					6
4					(SM) SILTY SAND, tan, moist, medium dense				15
5	S-2	SS	18	18					5
7									7
8	S-3	SS	18	18					16
10					(SC) CLAYEY SAND, trace gravel, tan, wet, loose				10
11	S-4	SS	18	18					5
12									5
13	S-5	SS	18	18					5
14									3
15					(SM) SILTY SAND WITH GRAVEL, gray, wet, medium dense				11
16	S-6	SS	18	16					4
17					(ML) SANDY SILT, greenish gray, wet, stiff				7
18					END OF BORING @ 20'				
20									
25									
30									
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.									
WL 11.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>			BORING STARTED 12/04/17			CAVE IN DEPTH @ 6.5'			
WL(SHW) WL(ACR) DRY			BORING COMPLETED 12/04/17			HAMMER TYPE Auto			
WL			RIG ATV FOREMAN Dale Price			DRILLING METHOD			

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-4		SHEET 1 OF 1		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> -○- CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% </div> </div> <div style="text-align: center; margin-top: 10px;"> ⊗ STANDARD PENETRATION BLOWS/FT </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	
					BOTTOM OF CASING LOSS OF CIRCULATION					
					SURFACE ELEVATION					
0					Topsoil Depth [12.00"]					
	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, loose to medium dense				5-8.5	
	S-2	SS	18	18					4.6	
	S-3	SS	18	18					10.5	
	S-4	SS	18	18	(SM) SILTY SAND, light gray, wet, loose				5-12	
	S-5	SS	18	18					19-18.8	
	S-6	SS	18	18	(SC) CLAYEY SAND WITH GRAVEL, tan, wet, very loose				6-18.3	
					END OF BORING @ 20'				4	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 9.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 12/04/17	CAVE IN DEPTH @ 8.1'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-6		SHEET 1 OF 1		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> -○- CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% </div> </div> <div style="text-align: center; margin-top: 10px;"> ⊗ STANDARD PENETRATION BLOWS/FT </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL ENGLISH UNITS	WATER LEVELS ELEVATION (FT)	BLOWS/6"			
					BOTTOM OF CASING LOSS OF CIRCULATION					
0					Topsoil Depth [6.00"]					
	S-1	SS	18	14	(SM) SILTY SAND, brown, moist, very loose to loose		1 2 2			
	S-2	SS	18	18			2 3 3			
5							3 4 5			
	S-3	SS	18	18			3 4 5			
	S-4	SS	18	18			3 4 6			
10							3 6 9			
	S-5	SS	18	18	(SM) SILTY SAND WITH GRAVEL, orangish brown, wet, medium dense to loose		3 6 9			
15							3 4 5			
	S-6	SS	18	18			3 4 5			
20					END OF BORING @ 20'					
25										
30										

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 12.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 12/04/17	CAVE IN DEPTH @ 5.9'
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/04/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-9		SHEET 1 OF 1		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> -○- CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% </div> </div> <div style="text-align: center; margin-top: 10px;"> ⊗ STANDARD PENETRATION BLOWS/FT </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	
0					Topsoil Depth [10.00"]					
1	S-1	SS	18	18	(ML/CL) SANDY CLAYEY SILT, gray, moist, medium stiff				6	
2									3	
3									3	
4	S-2	SS	18	18	(SM) SILTY SAND, trace clay, gray, moist, medium dense				14	
5									5	
6									9	
7	S-3	SS	18	14	(SC) CLAYEY SAND, gray, moist, loose				9	
8									4	
9	S-4	SS	18	18					8	
10									4	
11									3	
12									4	
13									4	
14									3	
15	S-5	SS	18	18	(SM) SILTY SAND, trace gravel, tan and gray, wet, loose to medium dense				10	
16									4	
17									6	
18										
19										
20	S-6	SS	18	16					13	
21									6	
22									7	
23										
24										
25										
26										
27										
28										
29										
30					END OF BORING @ 20'					

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> WL 12.0 </div> <div style="margin-right: 10px;"> <div style="border: 1px solid black; width: 10px; height: 10px; display: flex; align-items: center; justify-content: center;"> <div style="width: 5px; height: 5px; background-color: black;"></div> </div> WS </div> <div style="margin-right: 10px;"> <div style="border: 1px solid black; width: 10px; height: 10px; display: flex; align-items: center; justify-content: center;"> <div style="width: 5px; height: 5px; background-color: black;"></div> </div> WD </div> <div> BORING STARTED 12/12/17 </div> </div>	CAVE IN DEPTH @ 10.3'
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> WL(SHW) </div> <div style="margin-right: 10px;"> <div style="display: flex; align-items: center;"> <div style="width: 10px; height: 10px; background-color: black; margin-right: 5px;"></div> <div>WL(ACR) DRY</div> </div> </div> <div> BORING COMPLETED 12/12/17 </div> </div>	HAMMER TYPE Auto
<div style="display: flex; align-items: center;"> <div style="margin-right: 10px;"> WL </div> <div> RIG ATV FOREMAN Dale Price </div> </div>	DRILLING METHOD

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-12		SHEET 1 OF 2				
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables								
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD												
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> ○ — CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% — — — </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ⊗ STANDARD PENETRATION BLOWS/FT </div> </div>						
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	BOTTOM OF CASING	LOSS OF CIRCULATION	SURFACE ELEVATION	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [12.00"]							
	S-1	SS	18	18	(CL/ML) SANDY SILTY CLAY, brown, moist, medium stiff							2 5-⊗ 18.2-●
	S-2	SS	18	18	(SC) CLAYEY SAND, brown, moist, loose							2 6-⊗ 16.0-●
5												2 10-⊗ 19.5-●
	S-3	SS	18	18								3 9-⊗ 21.6-●
	S-4	SS	18	18	(SP-SM) SAND WITH SILT, brown, wet, loose							4 8-⊗ 20-△ 24.7-●
10												4 17-⊗
	S-5	SS	18	18	(SC) CLAYEY SAND WITH GRAVEL, gray and brown, wet, medium dense							5 27-⊗
	S-6	SS	18	12								37 46-⊗
20												9 11
	S-7	SS	18	14	(SM) SILTY SAND WITH GRAVEL, orangish brown, wet, medium dense to dense							15 12
	S-8	SS	18	12								16 19
25												27
30												

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.			
WL 12.0 WL(SHW) WL	WS <input type="checkbox"/> WL(ACR) 14.1 WL	WD <input checked="" type="checkbox"/> BORING COMPLETED 12/13/17 RIG ATV	BORING STARTED 12/13/17 FOREMAN Dale Price DRILLING METHOD
CAVE IN DEPTH @ 19.3'		HAMMER TYPE Auto	

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-12		SHEET 2 OF 2		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> ○— CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ——— </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ————— ● ————— △ ⊗ STANDARD PENETRATION BLOWS/FT </div> </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL					
					BOTTOM OF CASING	LOSS OF CIRCULATION				
					SURFACE ELEVATION					
35	S-9	SS	18	18	(SM) SILTY SAND WITH GRAVEL, orangish brown, wet, medium dense to dense				3 5 6	
40	S-10	SS	18	18	(CL/ML) SANDY SILTY CLAY, dark gray, moist, stiff to medium stiff				3 4 5	
45	S-11	SS	18	18					3 4 4	
50	S-12	SS	18	18					3 4 6	
55	S-13	SS	18	18	(SM) SILTY SAND, dark greenish gray, moist, medium dense				5 6 8	
60	S-14	SS	18	18					6 9 10	
					END OF BORING @ 60'					
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.										
WL 12.0		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/13/17		CAVE IN DEPTH @ 19.3'				
WL(SHW)		WL(ACR) 14.1		BORING COMPLETED 12/13/17		HAMMER TYPE Auto				
WL				RIG ATV FOREMAN Dale Price		DRILLING METHOD				

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-13		SHEET 1 OF 2		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> -○- CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% </div> </div> <div style="text-align: center; margin-top: 10px;"> ⊗ STANDARD PENETRATION BLOWS/FT </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	
					BOTTOM OF CASING	LOSS OF CIRCULATION				
					SURFACE ELEVATION					
0					Topsoil Depth [12.00"]					
1	S-1	SS	18	18	(SM) SILTY SAND, brown, moist, very loose to loose				3	
2									9	
3	S-2	SS	18	18					14	
4									21	
5	S-3	SS	18	18	(SM) SILTY SAND, gray and brown, moist, medium dense				15	
6									5	
7	S-4	SS	18	18					8	
8									13	
9	S-5	SS	18	18					4	
10									6	
11									9	
12	S-6	SS	18	18	(CL) LEAN CLAY, gray, moist, medium stiff				5	
13									2	
14									2	
15									3	
16										
17										
18										
19										
20										
21										
22										
23	S-7	SS	18	14	(SM) SILTY SAND WITH GRAVEL, gray, wet, loose to medium dense				8	
24									13	
25										
26										
27										
28										
29	S-8	SS	18	12					4	
30									6	
31									7	

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.									
WL 23.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/05/17		CAVE IN DEPTH @ 13.9'					
WL(SHW) WL(ACR) DRY		BORING COMPLETED 12/05/17		HAMMER TYPE Auto					
WL		RIG ATV FOREMAN Dale Price		DRILLING METHOD					

CLIENT Open Road Renewables			Job #: 02:8631		BORING # B-13		SHEET 2 OF 2																																																																																																															
PROJECT NAME Cherrywood Solar			ARCHITECT-ENGINEER Open Road Renewables																																																																																																																			
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD																																																																																																																						
NORTHING			EASTING			STATION			-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ● △ ⊗ STANDARD PENETRATION BLOWS/FT																																																																																																													
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DEPTH (FT)</th> <th>SAMPLE NO.</th> <th>SAMPLE TYPE</th> <th>SAMPLE DIST. (IN)</th> <th>RECOVERY (IN)</th> <th>DESCRIPTION OF MATERIAL</th> <th>ENGLISH UNITS</th> <th>WATER LEVELS</th> <th>ELEVATION (FT)</th> <th>BLOWS/6"</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>BOTTOM OF CASING </td> <td>LOSS OF CIRCULATION </td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="5">SURFACE ELEVATION</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td>(SM) SILTY SAND WITH GRAVEL, gray, wet, loose to medium dense</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>35</td> <td>S-9</td> <td>SS</td> <td>18</td> <td>18</td> <td>(ML/CL) CLAYEY SILT, dark gray, moist, stiff</td> <td></td> <td></td> <td></td> <td>3 5 7</td> </tr> <tr> <td>40</td> <td>S-10</td> <td>SS</td> <td>18</td> <td>18</td> <td>(ML/CL) SANDY CLAYEY SILT, dark gray, moist, stiff</td> <td></td> <td></td> <td></td> <td>4 5 6</td> </tr> <tr> <td>45</td> <td>S-11</td> <td>SS</td> <td>18</td> <td>18</td> <td></td> <td></td> <td></td> <td></td> <td>4 4 6</td> </tr> <tr> <td>50</td> <td>S-12</td> <td>SS</td> <td>18</td> <td>18</td> <td></td> <td></td> <td></td> <td></td> <td>3 4 4</td> </tr> <tr> <td>55</td> <td>S-13</td> <td>SS</td> <td>18</td> <td>18</td> <td>(ML) SANDY SILT, gray, moist, medium stiff, contains shells</td> <td></td> <td></td> <td></td> <td>3 3 4</td> </tr> <tr> <td>60</td> <td>S-14</td> <td>SS</td> <td>18</td> <td>14</td> <td>(SM) SILTY SAND, gray, wet, medium dense, contains significant shells</td> <td></td> <td></td> <td></td> <td>5 7 10</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td colspan="5">END OF BORING @ 60'</td> </tr> </tbody> </table>										DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"						BOTTOM OF CASING	LOSS OF CIRCULATION									SURFACE ELEVATION										(SM) SILTY SAND WITH GRAVEL, gray, wet, loose to medium dense					35	S-9	SS	18	18	(ML/CL) CLAYEY SILT, dark gray, moist, stiff				3 5 7	40	S-10	SS	18	18	(ML/CL) SANDY CLAYEY SILT, dark gray, moist, stiff				4 5 6	45	S-11	SS	18	18					4 4 6	50	S-12	SS	18	18					3 4 4	55	S-13	SS	18	18	(ML) SANDY SILT, gray, moist, medium stiff, contains shells				3 3 4	60	S-14	SS	18	14	(SM) SILTY SAND, gray, wet, medium dense, contains significant shells				5 7 10						END OF BORING @ 60'			
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"																																																																																																													
					BOTTOM OF CASING	LOSS OF CIRCULATION																																																																																																																
					SURFACE ELEVATION																																																																																																																	
					(SM) SILTY SAND WITH GRAVEL, gray, wet, loose to medium dense																																																																																																																	
35	S-9	SS	18	18	(ML/CL) CLAYEY SILT, dark gray, moist, stiff				3 5 7																																																																																																													
40	S-10	SS	18	18	(ML/CL) SANDY CLAYEY SILT, dark gray, moist, stiff				4 5 6																																																																																																													
45	S-11	SS	18	18					4 4 6																																																																																																													
50	S-12	SS	18	18					3 4 4																																																																																																													
55	S-13	SS	18	18	(ML) SANDY SILT, gray, moist, medium stiff, contains shells				3 3 4																																																																																																													
60	S-14	SS	18	14	(SM) SILTY SAND, gray, wet, medium dense, contains significant shells				5 7 10																																																																																																													
					END OF BORING @ 60'																																																																																																																	
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.																																																																																																																						
WL 23.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>			BORING STARTED 12/05/17			CAVE IN DEPTH @ 13.9'																																																																																																																
WL(SHW) WL(ACR) DRY			BORING COMPLETED 12/05/17			HAMMER TYPE Auto																																																																																																																
WL			RIG ATV FOREMAN Dale Price			DRILLING METHOD																																																																																																																

CLIENT Open Road Renewables				Job #: 02:8631	BORING # B-14	SHEET 1 OF 2	
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables			
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD							

NORTHING	EASTING	STATION	—○— CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ——— PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ————— ● ————— Δ ⊗ STANDARD PENETRATION BLOWS/FT						
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [6.00"]				
	S-1	SS	18	10	(SM) SILTY SAND, trace clay, brown, moist, loose	LOSS OF CIRCULATION >10%			9-12.6
	S-2	SS	18	14	(SM) SILTY SAND, brown, moist, medium dense				10.2-12
5	S-3	SS	18	18	(SM) SILTY SAND, trace clay, gray and brown, moist, medium dense				6.8-14
	S-4	SS	18	16					8.2-17
10									
	S-5	SS	18	16	(SM) SILTY SAND, trace gravel, orangish brown, moist, medium dense				6.2-18
15									
	S-6	SS	18	12	(SC) CLAYEY SAND, trace gravel, orangish brown, wet, very loose				4-4
20									
	S-7	SS	18	18	(OH) ORGANIC CLAY, trace sand, dark gray, moist, soft to medium stiff				4-4
25									
	S-8	SS	18	18					5-5
30									

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.					
WL 18.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 12/07/17		CAVE IN DEPTH @ 15.2'		
WL(SHW) WL(ACR) DRY	BORING COMPLETED 12/07/17		HAMMER TYPE Auto		
WL	RIG ATV	FOREMAN Dale Price	DRILLING METHOD		

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-14		SHEET 2 OF 2		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> ○— CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ——— </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ————— ● ————— △ ⊗ STANDARD PENETRATION BLOWS/FT </div> </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL					
					BOTTOM OF CASING	LOSS OF CIRCULATION				
					SURFACE ELEVATION					
35	S-9	SS	18	14	(OH) ORGANIC CLAY, trace sand, dark gray, moist, soft to medium stiff				2 3 5	
40	S-10	SS	18	18					2 3 4	
45	S-11	SS	18	18	(CL/ML) SILTY CLAY, trace sand, dark gray, moist, stiff				3 4 5	
50	S-12	SS	18	18	(SM) SILTY SAND, dark greenish gray, moist, medium dense, contains slight shells				4 6 7	
55	S-13	SS	18	16	(SM) SILTY SAND, dark gray, moist, dense, contains significant shells				10 14 17	
60	S-14	SS	18	15					15 19 27	
					END OF BORING @ 60'					
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.										
WL 18.0		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/07/17		CAVE IN DEPTH @ 15.2'				
WL(SHW)		WL(ACR) DRY		BORING COMPLETED 12/07/17		HAMMER TYPE Auto				
WL		RIG ATV		FOREMAN Dale Price		DRILLING METHOD				

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-15		SHEET 1 OF 2		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> -○- CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% </div> </div> <div style="text-align: center; margin-top: 10px;"> ⊗ STANDARD PENETRATION BLOWS/FT </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	
					BOTTOM OF CASING	LOSS OF CIRCULATION				
					SURFACE ELEVATION					
0					Topsoil Depth [10.00"]					
	S-1	SS	18	12	(SC) CLAYEY SAND, brown, moist, loose				5-13.0	
					(SM) SILTY SAND, brown, moist, medium dense				8.6-12	
5	S-2	SS	18	16						
	S-3	SS	18	18						
	S-4	SS	18	18	(SM) SILTY SAND WITH GRAVEL, brown, moist, medium dense				3.6-11.9	
10										
	S-5	SS	18	16	(SC) CLAYEY SAND, trace gravel, brown, moist, medium dense				17-20.7	
15										
	S-6	SS	18	12	(SM) SILTY SAND WITH GRAVEL, gray and brown, wet, medium dense to dense				19	
20										
	S-7	SS	18	16					33	
25										
	S-8	SS	18	18	(OH) ORGANIC CLAY, trace sand, dark gray, moist, stiff to medium stiff				14	
30										

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.					
WL 18.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/08/17		CAVE IN DEPTH @ 16.3'	
WL(SHW) WL(ACR) DRY		BORING COMPLETED 12/08/17		HAMMER TYPE Auto	
WL		RIG ATV FOREMAN Dale Price		DRILLING METHOD	

CLIENT Open Road Renewables				Job #: 02:8631	BORING # B-15	SHEET 2 OF 2	
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables			
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD							
NORTHING		EASTING		STATION		○— CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% ——— PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ● △ ⊗ STANDARD PENETRATION BLOWS/FT	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL ENGLISH UNITS BOTTOM OF CASING LOSS OF CIRCULATION SURFACE ELEVATION	WATER LEVELS ELEVATION (FT)	BLOWS/6"
35	S-9	SS	18	18	(OH) ORGANIC CLAY, trace sand, dark gray, moist, stiff to medium stiff		4 4 5 9
40	S-10	SS	18	18			3 3 4 7
45	S-11	SS	18	18			4 5 5 10
50	S-12	SS	18	18	(CL/ML) SILTY CLAY WITH SAND, dark gray, moist, very stiff		7 10 11 21
55	S-13	SS	18	18	(SM) SILTY SAND, dark gray, wet, medium dense, contains slight shells		9 11 15 26
60	S-14	SS	18	16			14 17 22 39
END OF BORING @ 60'							
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.							
WL 18.0		WS <input type="checkbox"/>	WD <input checked="" type="checkbox"/>	BORING STARTED 12/08/17		CAVE IN DEPTH @ 16.3'	
WL(SHW)		WL(ACR) DRY		BORING COMPLETED 12/08/17		HAMMER TYPE Auto	
WL		RIG ATV		FOREMAN Dale Price		DRILLING METHOD	

CLIENT Open Road Renewables				Job #: 02:8631		BORING # B-17		SHEET 1 OF 1		
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD										
NORTHING		EASTING		STATION		<div style="display: flex; justify-content: space-between;"> <div> -○- CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - </div> <div> PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% </div> </div> <div style="text-align: center; margin-top: 10px;"> ⊗ STANDARD PENETRATION BLOWS/FT </div>				
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	
0					Topsoil Depth [8.00"]					
	S-1	SS	18	14	(SM) SILTY SAND, brown, moist, loose to medium dense				10	
	S-2	SS	18	14					11	
5	S-3	SS	18	18					11	
	S-4	SS	18	18	(SC) CLAYEY SAND, orangish brown, moist, loose				9	
10										
	S-5	SS	18	18	(SC) CLAYEY SAND, trace gravel, orangish brown, wet, loose				7	
15										
	S-6	SS	18	18	(CH) FAT CLAY, trace silt, dark gray, moist, stiff				9	
20					END OF BORING @ 20'					
25										
30										
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.										
WL 12.0		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/08/17		CAVE IN DEPTH @ 6.9'				
WL(SHW)		WL(ACR) DRY		BORING COMPLETED 12/08/17		HAMMER TYPE Auto				
WL				RIG ATV FOREMAN Dale Price		DRILLING METHOD				

CLIENT Open Road Renewables			Job #: 02:8631		BORING # B-20		SHEET 1 OF 2		
PROJECT NAME Cherrywood Solar			ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD									
NORTHING			EASTING			STATION			○ — CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% — — — REC% — — — PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% ✕ ————— ● ————— △ ⊗ STANDARD PENETRATION BLOWS/FT
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [4.00"] (SM) SILTY SAND, trace clay, gray, moist, loose to medium dense				
2	S-1	SS	18	14					10.9
4									13.8
6	S-2	SS	18	15					20.9
8									
10	S-3	SS	18	18					12.0
12					(SC) CLAYEY SAND, gray, wet, loose				13
14	S-4	SS	18	18					16.8
16					(SC) CLAYEY SAND WITH GRAVEL, gray, wet, loose				
18	S-5	SS	18	12					8.7
20					(ML/CL) CLAYEY SILT, trace sand, dark gray, moist, medium stiff				10
22	S-6	SS	18	18					7
24					(ML) SILT, dark gray, moist, medium stiff				
26	S-7	SS	18	18					NP
28					(ML/CL) CLAYEY SILT, dark gray, moist, medium stiff to stiff				28
30	S-8	SS	18	18					54.8
32									
34									
36									
38									
40									
42									
44									
46									
48									
50									
52									
54									
56									
58									
60									
62									
64									
66									
68									
70									
72									
74									
76									
78									
80									
82									
84									
86									
88									
90									
92									
94									
96									
98									
100									

CONTINUED ON NEXT PAGE.

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.					
WL 3.0	WS <input type="checkbox"/>	WD <input checked="" type="checkbox"/>	BORING STARTED	12/11/17	CAVE IN DEPTH @ 12.8'
WL(SHW)	WL(ACR) 2.9		BORING COMPLETED	12/11/17	HAMMER TYPE Auto
WL			RIG ATV	FOREMAN Dale Price	DRILLING METHOD

CLIENT Open Road Renewables				Job #: 02:8631	BORING # B-20	SHEET 2 OF 2	
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables			
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD							
NORTHING		EASTING		STATION		-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ● △ ⊗ STANDARD PENETRATION BLOWS/FT	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL		
					BOTTOM OF CASING	LOSS OF CIRCULATION	
					SURFACE ELEVATION		WATER LEVELS ELEVATION (FT) BLOWS/6"
35	S-9	SS	18	18	(ML/CL) CLAYEY SILT, dark gray, moist, medium stiff to stiff		3 4 4 8 ⊗
40	S-10	SS	18	18			3 4 5 9 ⊗
45	S-11	SS	18	18			4 5 7 12 ⊗
50	S-12	SS	18	18	(ML/CL) SANDY CLAYEY SILT, dark gray, moist, very stiff		7 8 9 17 ⊗
55	S-13	SS	18	18	(SC) CLAYEY SAND, dark gray, moist, medium dense		6 8 11 19 ⊗
60	S-14	SS	18	18	(ML/CL) SANDY CLAYEY SILT, dark gray, moist, very stiff		16 10 12 22 ⊗
					END OF BORING @ 60'		
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.							
WL 3.0		WS <input type="checkbox"/>	WD <input checked="" type="checkbox"/>	BORING STARTED 12/11/17		CAVE IN DEPTH @ 12.8'	
WL(SHW)		WL(ACR) 2.9		BORING COMPLETED 12/11/17		HAMMER TYPE Auto	
WL				RIG ATV	FOREMAN Dale Price	DRILLING METHOD	

CLIENT Open Road Renewables				Job #: 02:8631	BORING # B-21	SHEET 1 OF 1																																																																																																																																																																																																																																																																																																																																											
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables																																																																																																																																																																																																																																																																																																																																													
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD																																																																																																																																																																																																																																																																																																																																																	
NORTHING EASTING STATION				ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - -																																																																																																																																																																																																																																																																																																																																													
PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT%				STANDARD PENETRATION BLOWS/FT																																																																																																																																																																																																																																																																																																																																													
<div style="display: flex; justify-content: space-between;"> <div style="width: 60%;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>DEPTH (FT)</th> <th>SAMPLE NO.</th> <th>SAMPLE TYPE</th> <th>SAMPLE DIST. (IN)</th> <th>RECOVERY (IN)</th> <th>DESCRIPTION OF MATERIAL</th> <th>ENGLISH UNITS</th> <th>WATER LEVELS</th> <th>ELEVATION (FT)</th> <th>BLOWS/6"</th> </tr> </thead> <tbody> <tr> <td>0</td> <td></td> <td></td> <td></td> <td></td> <td>Topsoil Depth [10.00"]</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>1</td> <td>S-1</td> <td>SS</td> <td>18</td> <td>10</td> <td>(SM) SILTY SAND, tan and dark brown, moist, loose</td> <td></td> <td></td> <td></td> <td>6</td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>10.1</td> </tr> <tr> <td>3</td> <td>S-2</td> <td>SS</td> <td>18</td> <td>14</td> <td>(SC) CLAYEY SAND, gray, moist, medium dense</td> <td></td> <td></td> <td></td> <td>11.9</td> </tr> <tr> <td>4</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>19</td> </tr> <tr> <td>5</td> <td>S-3</td> <td>SS</td> <td>18</td> <td>12</td> <td>(SM) SILTY SAND WITH GRAVEL, gray, wet, medium dense</td> <td></td> <td></td> <td></td> <td>13.4</td> </tr> <tr> <td>6</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>23</td> </tr> <tr> <td>7</td> <td>S-4</td> <td>SS</td> <td>18</td> <td>14</td> <td></td> <td></td> <td></td> <td></td> <td>9.0</td> </tr> <tr> <td>8</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>29</td> </tr> <tr> <td>9</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>10</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>11</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>12</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>13</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>14</td> <td>S-5</td> <td>SS</td> <td>18</td> <td>14</td> <td>(SC) CLAYEY SAND WITH GRAVEL, gray, wet, medium dense</td> <td></td> <td></td> <td></td> <td>13.0</td> </tr> <tr> <td>15</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>21</td> </tr> <tr> <td>16</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>17</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>18</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>19</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>20</td> <td>S-6</td> <td>SS</td> <td>18</td> <td>12</td> <td>(SM) SILTY SAND, grayish brown, wet, loose</td> <td></td> <td></td> <td></td> <td>9</td> </tr> <tr> <td>21</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>22</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>23</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>24</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>25</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>26</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>27</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>28</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>29</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>30</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="10" style="text-align: center;">END OF BORING @ 20'</td> </tr> </tbody> </table> </div> <div style="width: 40%;"> <p> -○- CALIBRATED PENETROMETER TONS/FT² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% STANDARD PENETRATION BLOWS/FT </p> </div> </div>								DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"	0					Topsoil Depth [10.00"]					1	S-1	SS	18	10	(SM) SILTY SAND, tan and dark brown, moist, loose				6	2									10.1	3	S-2	SS	18	14	(SC) CLAYEY SAND, gray, moist, medium dense				11.9	4									19	5	S-3	SS	18	12	(SM) SILTY SAND WITH GRAVEL, gray, wet, medium dense				13.4	6									23	7	S-4	SS	18	14					9.0	8									29	9										10										11										12										13										14	S-5	SS	18	14	(SC) CLAYEY SAND WITH GRAVEL, gray, wet, medium dense				13.0	15									21	16										17										18										19										20	S-6	SS	18	12	(SM) SILTY SAND, grayish brown, wet, loose				9	21										22										23										24										25										26										27										28										29										30										END OF BORING @ 20'									
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"																																																																																																																																																																																																																																																																																																																																								
0					Topsoil Depth [10.00"]																																																																																																																																																																																																																																																																																																																																												
1	S-1	SS	18	10	(SM) SILTY SAND, tan and dark brown, moist, loose				6																																																																																																																																																																																																																																																																																																																																								
2									10.1																																																																																																																																																																																																																																																																																																																																								
3	S-2	SS	18	14	(SC) CLAYEY SAND, gray, moist, medium dense				11.9																																																																																																																																																																																																																																																																																																																																								
4									19																																																																																																																																																																																																																																																																																																																																								
5	S-3	SS	18	12	(SM) SILTY SAND WITH GRAVEL, gray, wet, medium dense				13.4																																																																																																																																																																																																																																																																																																																																								
6									23																																																																																																																																																																																																																																																																																																																																								
7	S-4	SS	18	14					9.0																																																																																																																																																																																																																																																																																																																																								
8									29																																																																																																																																																																																																																																																																																																																																								
9																																																																																																																																																																																																																																																																																																																																																	
10																																																																																																																																																																																																																																																																																																																																																	
11																																																																																																																																																																																																																																																																																																																																																	
12																																																																																																																																																																																																																																																																																																																																																	
13																																																																																																																																																																																																																																																																																																																																																	
14	S-5	SS	18	14	(SC) CLAYEY SAND WITH GRAVEL, gray, wet, medium dense				13.0																																																																																																																																																																																																																																																																																																																																								
15									21																																																																																																																																																																																																																																																																																																																																								
16																																																																																																																																																																																																																																																																																																																																																	
17																																																																																																																																																																																																																																																																																																																																																	
18																																																																																																																																																																																																																																																																																																																																																	
19																																																																																																																																																																																																																																																																																																																																																	
20	S-6	SS	18	12	(SM) SILTY SAND, grayish brown, wet, loose				9																																																																																																																																																																																																																																																																																																																																								
21																																																																																																																																																																																																																																																																																																																																																	
22																																																																																																																																																																																																																																																																																																																																																	
23																																																																																																																																																																																																																																																																																																																																																	
24																																																																																																																																																																																																																																																																																																																																																	
25																																																																																																																																																																																																																																																																																																																																																	
26																																																																																																																																																																																																																																																																																																																																																	
27																																																																																																																																																																																																																																																																																																																																																	
28																																																																																																																																																																																																																																																																																																																																																	
29																																																																																																																																																																																																																																																																																																																																																	
30																																																																																																																																																																																																																																																																																																																																																	
END OF BORING @ 20'																																																																																																																																																																																																																																																																																																																																																	

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 7.0 WL(SHW) WL	WS WL(ACR) 4.1	WD BORING STARTED 12/11/17 BORING COMPLETED 12/11/17 RIG ATV FOREMAN Dale Price	CAVE IN DEPTH @ 4.9' HAMMER TYPE Auto DRILLING METHOD
-------------------------	-------------------	--	---

CLIENT Open Road Renewables				Job #: 02:8631	BORING # B-22	SHEET 1 OF 1	
PROJECT NAME Cherrywood Solar				ARCHITECT-ENGINEER Open Road Renewables			
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD							
NORTHING		EASTING		STATION		-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ● △ ⊗ STANDARD PENETRATION BLOWS/FT	
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS ELEVATION (FT)
					BOTTOM OF CASING LOSS OF CIRCULATION		
					SURFACE ELEVATION		
0					Topsoil Depth [10.00"]		
	S-1	SS	18	18	(SC) CLAYEY SAND, orangish brown, moist, very loose		1 2 2
	S-2	SS	18	18	(SC) CLAYEY SAND, orangish brown, moist, medium dense		3 5 7
5	S-3	SS	18	18			4 7 6
	S-4	SS	18	16	(SC) CLAYEY SAND, trace gravel, orangish brown, wet, loose		3 4 5
10							
	S-5	SS	18	18	(ML) SANDY SILT, orangish brown, wet, soft		1 1 2
15							
	S-6	SS	18	1	(SC) CLAYEY SAND, greenish brown, wet, medium dense, cemented sandstone		8 11 12
20					END OF BORING @ 20'		
25							
30							
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.							
WL 8.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/12/17		CAVE IN DEPTH @ 9.5'			
WL(SHW) WL(ACR) 7.3		BORING COMPLETED 12/12/17		HAMMER TYPE Auto			
WL		RIG ATV FOREMAN Dale Price		DRILLING METHOD			

CLIENT Open Road Renewables			Job #: 02:8631		BORING # B-24		SHEET 1 OF 1		
PROJECT NAME Cherrywood Solar			ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD									
NORTHING			EASTING			STATION			-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ● △ ⊗ STANDARD PENETRATION BLOWS/FT
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [16.00"]				
3	S-1	SS	18	14	(SM) SILTY SAND, gray, moist, loose to medium dense				10
4									16
5	S-2	SS	18	14	(SM) SILTY SAND, gray, wet, medium dense				11
6									8
7	S-3	SS	18	14	(ML) SANDY SILT, trace clay, light gray, wet, medium stiff				10
8									7
9	S-4	SS	18	18	(SC) CLAYEY SAND WITH GRAVEL, light gray and tan, wet, loose				10
10									
11	S-5	SS	18	12	(SC) CLAYEY SAND WITH GRAVEL, tan, wet, loose				
12									
13	S-6	SS	18	2					
14									
15									
16									
17									
18									
19									
20					END OF BORING @ 20'				
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.

WL 8.0 WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>	BORING STARTED 12/12/17	CAVE IN DEPTH @ 7.2'
WL(SHW) WL(ACR) 5.8	BORING COMPLETED 12/12/17	HAMMER TYPE Auto
WL	RIG ATV FOREMAN Dale Price	DRILLING METHOD

CLIENT Open Road Renewables			Job #: 02:8631		BORING # B-25		SHEET 1 OF 1		
PROJECT NAME Cherrywood Solar			ARCHITECT-ENGINEER Open Road Renewables						
SITE LOCATION 15642 Jackson Lane, Goldsboro, Caroline County, MD									
NORTHING			EASTING			STATION			-○- CALIBRATED PENETROMETER TONS/FT ² ROCK QUALITY DESIGNATION & RECOVERY RQD% - - - REC% - - - PLASTIC LIMIT% WATER CONTENT% LIQUID LIMIT% X ● △ ⊗ STANDARD PENETRATION BLOWS/FT
DEPTH (FT)	SAMPLE NO.	SAMPLE TYPE	SAMPLE DIST. (IN)	RECOVERY (IN)	DESCRIPTION OF MATERIAL	ENGLISH UNITS	WATER LEVELS	ELEVATION (FT)	BLOWS/6"
0					Topsoil Depth [10.00"]				
	S-1	SS	18	12	(SM) SILTY SAND, brown, moist, loose				5-12.6
	S-2	SS	18	18	(SM) SILTY SAND, trace clay, trace gravel, brown, moist, loose				10-10.4
5	S-3	SS	18	16	(SC) CLAYEY SAND, trace gravel, tan, moist, medium dense				12-17.8
	S-4	SS	18	18	(CH) FAT CLAY, gray, moist, medium stiff				8-24
10									25.3
	S-5	SS	18	18	(SC) CLAYEY SAND, orangish brown, wet, loose				7-23.1
15									
	S-6	SS	18	18	(SM) SILTY SAND, trace clay, orangish brown, wet, loose				8-
20					END OF BORING @ 20'				
25									
30									
THE STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARY LINES BETWEEN SOIL TYPES. IN-SITU THE TRANSITION MAY BE GRADUAL.									
WL 12.0		WS <input type="checkbox"/> WD <input checked="" type="checkbox"/>		BORING STARTED 12/12/17		CAVE IN DEPTH @ 10.2'			
WL(SHW)		WL(ACR) 10.1		BORING COMPLETED 12/12/17		HAMMER TYPE Auto			
WL				RIG ATV FOREMAN Dale Price		DRILLING METHOD			

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL

GM - SILTY GRAVEL

GP - POORLY GRADED GRAVEL

GC - CLAYEY GRAVEL

SW - WELL GRADED SAND

ML - LOW PLASTICITY SILT

CL - LOW PLASTICITY CLAY

MH - HIGH PLASTICITY SILT

SM - SILTY SAND

SP - POORLY GRADED SAND

SC - CLAYEY SAND

CH - HIGH PLASTICITY CLAY

ST - SHELBY TUBE

RC - ROCK CORE

PM - PRESSURE METER

OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS

OL - LOW PLASTICITY ORGANIC SILTS AND CLAY

PT - PEAT

WR - WEATHERED ROCK

PWR - PARTIALLY WEATHERED ROCK

- FILL

- POSSIBLE FILL

- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL

CONCRETE

ASPHALT

VOID

GRAVEL

ROCK TYPES

IGNEOUS

METAMORPHIC

SEDIMENTARY

SYMBOL LEGEND

▽ WATER LEVEL - DURING DRILLING/SAMPLING

▽ WATER LEVEL - SEASONAL, HIGH WATER

▽ WATER LEVEL - AFTER CASING REMOVAL

▽ WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% WATER % PASSING #200 SIEVE [88%] LIQUID LIMIT%

B-1

SC

OH

ML/CL

ML

END OF BORING @ 20'

B-2

SM

ML/CL

OH

END OF BORING @ 20'

B-3

SM

SC

ML

END OF BORING @ 20'

B-4

SM

SC

END OF BORING @ 20'

NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

Subsurface Soil Profile

(NORTHEAST AREA)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631

DATE: 1/15/2018

VERTICAL SCALE: 1"=5'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL

GM - SILTY GRAVEL

GP - POORLY GRADED GRAVEL

GC - CLAYEY GRAVEL

SW - WELL GRADED SAND

ML - LOW PLASTICITY SILT

CL - LOW PLASTICITY CLAY

MH - HIGH PLASTICITY SILT

SM - SILTY SAND

SP - POORLY GRADED SAND

SC - CLAYEY SAND

CH - HIGH PLASTICITY CLAY

PM - PRESSURE METER

OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS

OL - LOW PLASTICITY ORGANIC SILTS AND CLAY

PT - PEAT

WR - WEATHERED ROCK

PWR - PARTIALLY WEATHERED ROCK

- FILL

- POSSIBLE FILL

- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL

CONCRETE

ASPHALT

VOID

GRAVEL

ROCK TYPES

IGNEOUS

METAMORPHIC

SEDIMENTARY

SYMBOL LEGEND

▽ WATER LEVEL - DURING DRILLING/SAMPLING

▽ WATER LEVEL - SEASONAL, HIGH WATER

▽ WATER LEVEL - AFTER CASING REMOVAL

▽ WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% WATER % PASSING #200 SIEVE [88%] LIQUID LIMIT%

Depth (ft)	B-5 Soil Type	B-6 Soil Type	B-7 Soil Type	Penetration (blows/ft)	Water Level (ft)
0	SM	4	3	4.3	
3					
4					
6		6	7	4.3	
7					
9		9	11	2.7	
10		10	10	14.0	10
11					11
13					
14					
15		15	19	13.3	
17					
19					
20	END OF BORING @ 20'	END OF BORING @ 20'	END OF BORING @ 20'		

NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

Subsurface Soil Profile (NORTHEAST AREA)

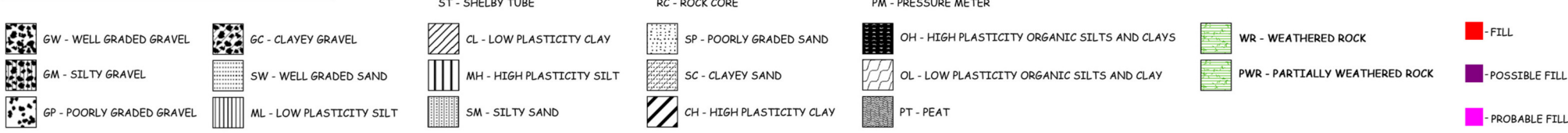
Cherrywood Solar

Open Road Renewables

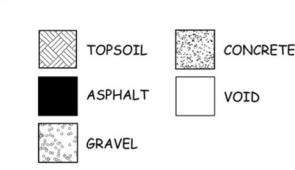
15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'

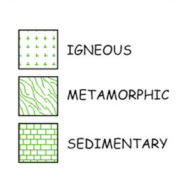
SOIL CLASSIFICATION LEGEND



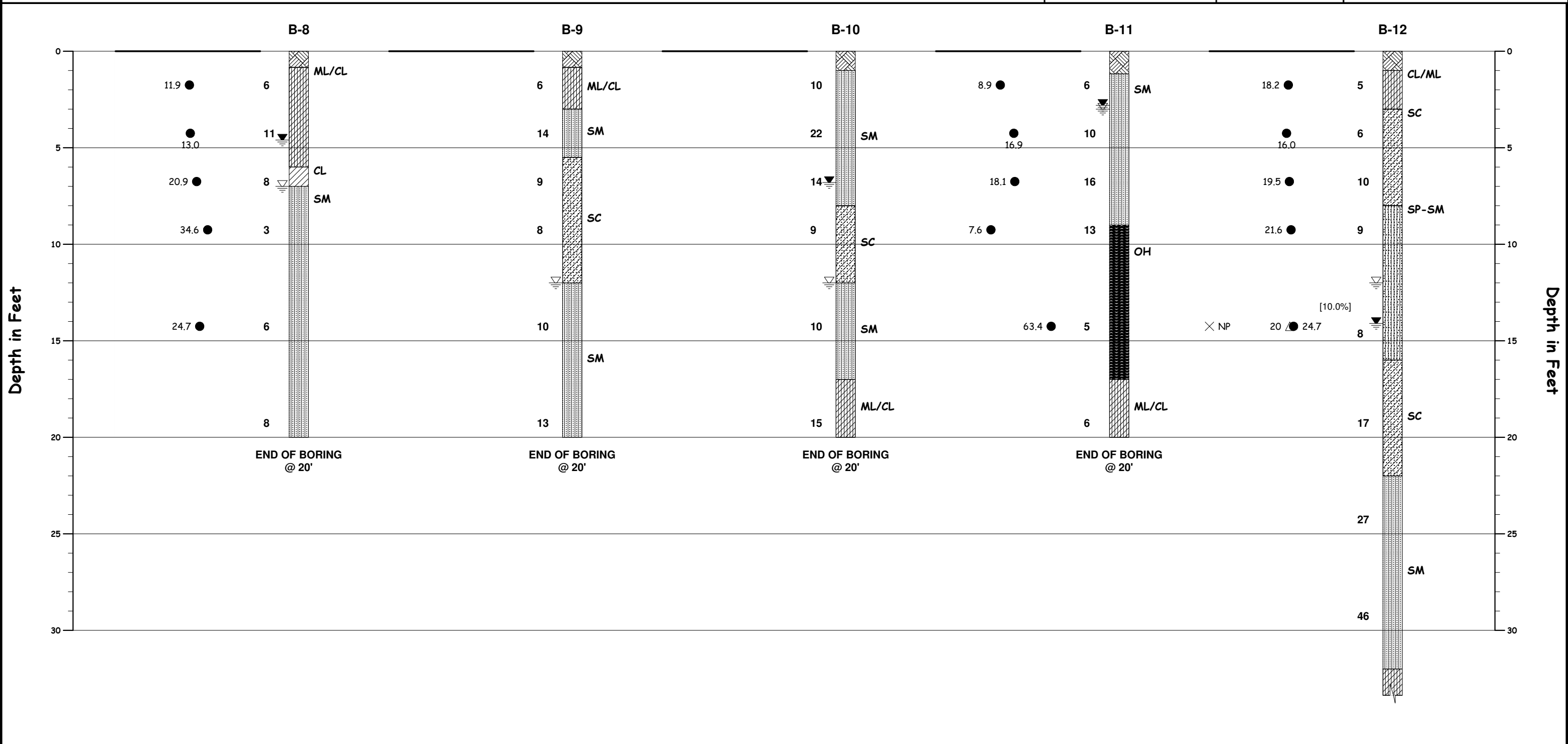
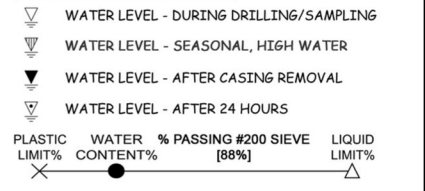
SURFACE MATERIALS



ROCK TYPES



SYMBOL LEGEND



NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.



Subsurface Soil Profile
(NORTHWEST AREA)

Cherrywood Solar
Open Road Renewables
15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 DATE: 1/15/2018 VERTICAL SCALE: 1"=5'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL

GM - SILTY GRAVEL

GP - POORLY GRADED GRAVEL

GC - CLAYEY GRAVEL

SW - WELL GRADED SAND

ML - LOW PLASTICITY SILT

CL - LOW PLASTICITY CLAY

MH - HIGH PLASTICITY SILT

SM - SILTY SAND

SP - POORLY GRADED SAND

SC - CLAYEY SAND

CH - HIGH PLASTICITY CLAY

ST - SHELBY TUBE

RC - ROCK CORE

PM - PRESSURE METER

OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS

OL - LOW PLASTICITY ORGANIC SILTS AND CLAY

PT - PEAT

WR - WEATHERED ROCK

PWR - PARTIALLY WEATHERED ROCK

- FILL

- POSSIBLE FILL

- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL

CONCRETE

ASPHALT

VOID

GRAVEL

ROCK TYPES

IGNEOUS

METAMORPHIC

SEDIMENTARY

SYMBOL LEGEND

▽ WATER LEVEL - DURING DRILLING/SAMPLING

▽ WATER LEVEL - SEASONAL, HIGH WATER

▽ WATER LEVEL - AFTER CASING REMOVAL

▽ WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% WATER % PASSING #200 SIEVE [88%] LIQUID LIMIT%

B-13

Depth (ft)	Soil Type	Penetration (blows/ft)	Water Level (ft)
0	CL		
3	SM		
9	SM		
14	SM		
21	SM		
15	SM		
5	CL		
8	SM		
13	SM		

B-14

Depth (ft)	Soil Type	Penetration (blows/ft)	Water Level (ft)	Pressure Meter (%)
0	SM			
9	SM			
12	SM			
14	SM			
17	SM			
18	SM			
4	SC			
22	OH			
4	OH			63.8%
5	OH			

B-15

Depth (ft)	Soil Type	Penetration (blows/ft)	Water Level (ft)
0	SC		
5	SM		
12	SM		
13	SM		
15	SM		
17	SC		
19	SM		
33	SM		
14	SM		

B-16

Depth (ft)	Soil Type	Penetration (blows/ft)	Water Level (ft)
0	SC		
7	SC		
13	SM		
14	SM		
16	SM		
11	ML		
11	SP		
10	SC		

END OF BORING @ 20'

NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

Subsurface Soil Profile

(CENTRAL AREA)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631

DATE: 1/15/2018

VERTICAL SCALE: 1"=5'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL

GM - SILTY GRAVEL

GP - POORLY GRADED GRAVEL

GC - CLAYEY GRAVEL

SW - WELL GRADED SAND

ML - LOW PLASTICITY SILT

CL - LOW PLASTICITY CLAY

MH - HIGH PLASTICITY SILT

SM - SILTY SAND

SP - POORLY GRADED SAND

SC - CLAYEY SAND

CH - HIGH PLASTICITY CLAY

ST - SHELBY TUBE

RC - ROCK CORE

PM - PRESSURE METER

OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS

OL - LOW PLASTICITY ORGANIC SILTS AND CLAY

PT - PEAT

WR - WEATHERED ROCK

PWR - PARTIALLY WEATHERED ROCK

- FILL

- POSSIBLE FILL

- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL

CONCRETE

ASPHALT

VOID

GRAVEL

ROCK TYPES

IGNEOUS

METAMORPHIC

SEDIMENTARY

SYMBOL LEGEND

▽ WATER LEVEL - DURING DRILLING/SAMPLING

▽ WATER LEVEL - SEASONAL, HIGH WATER

▽ WATER LEVEL - AFTER CASING REMOVAL

▽ WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% WATER % PASSING #200 SIEVE [88%] LIQUID LIMIT%

Boring	Depth (ft)	Soil Type	Penetration (blows/ft)	Water Level (ft)	Notes
B-17	0-10	CL			
	10-11	SM			
	11-12	SM			
	12-9	SC			
	9-7	SC			
B-18	0-4	SM			
	4-8	SM			
	8-12	SM			
	12-13	SC			
	13-11	SC			
B-19	0-8	CL			
	8-15	SM			
	15-17	SM			
	17-12	SC			
	12-6	SC			
B-20	0-10	SM			
	10-13	SC			
	13-9	SC			
	9-10	SC			
	10-7	ML/CL			
B-20 (Continued)	7-28	ML			
	28-6	ML			[62.2%] at 28 ft, NP at 28 ft, 54.8 at 6 ft
	6-7	ML			

NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

Subsurface Soil Profile

(CENTRAL AREA)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'

SOIL CLASSIFICATION LEGEND

GW - WELL GRADED GRAVEL

GM - SILTY GRAVEL

GP - POORLY GRADED GRAVEL

GC - CLAYEY GRAVEL

SW - WELL GRADED SAND

ML - LOW PLASTICITY SILT

CL - LOW PLASTICITY CLAY

MH - HIGH PLASTICITY SILT

SM - SILTY SAND

SP - POORLY GRADED SAND

SC - CLAYEY SAND

CH - HIGH PLASTICITY CLAY

RC - ROCK CORE

PM - PRESSURE METER

OH - HIGH PLASTICITY ORGANIC SILTS AND CLAYS

OL - LOW PLASTICITY ORGANIC SILTS AND CLAY

PT - PEAT

WR - WEATHERED ROCK

PWR - PARTIALLY WEATHERED ROCK

- FILL

- POSSIBLE FILL

- PROBABLE FILL

SURFACE MATERIALS

TOPSOIL

CONCRETE

ASPHALT

VOID

GRAVEL

ROCK TYPES

IGNEOUS

METAMORPHIC

SEDIMENTARY

SYMBOL LEGEND

▽ WATER LEVEL - DURING DRILLING/SAMPLING

▽ WATER LEVEL - SEASONAL, HIGH WATER

▽ WATER LEVEL - AFTER CASING REMOVAL

▽ WATER LEVEL - AFTER 24 HOURS

PLASTIC LIMIT% WATER % PASSING #200 SIEVE [88%] LIQUID LIMIT%

Boring	Depth (ft)	Soil Type	Penetration (blows/ft)	Water Level (ft)	Notes
B-21	0-6	SM	10.1		
	6-19	SC	11.9		
	19-23	SM	13.4		
	23-29	SC	9.0		
	29-21	SC	13.0		
B-22	0-4	SC			
	4-12	SC			
	12-13	ML			
	13-9	SC			
B-24	0-10	SM			
	10-16	SM			
	16-11	ML			
	11-8	SC			
B-25	0-5	SM	12.6		
	5-10	SC	10.4		
	10-12	CH	17.8		
	12-8	SC	24		[81.2%] at 24 ft
	8-7	SC	25.3		

NOTES:
1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.
2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).
3 HORIZONTAL DISTANCES ARE NOT TO SCALE.

Subsurface Soil Profile

(SOUTHERN AREA)

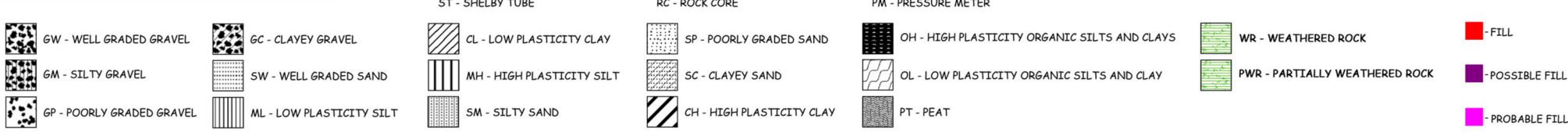
Cherrywood Solar

Open Road Renewables

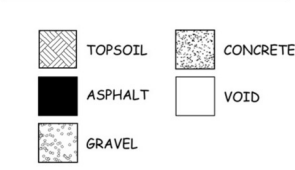
15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 | DATE: 1/15/2018 | VERTICAL SCALE: 1"=5'

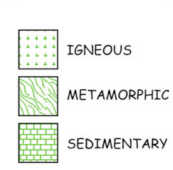
SOIL CLASSIFICATION LEGEND



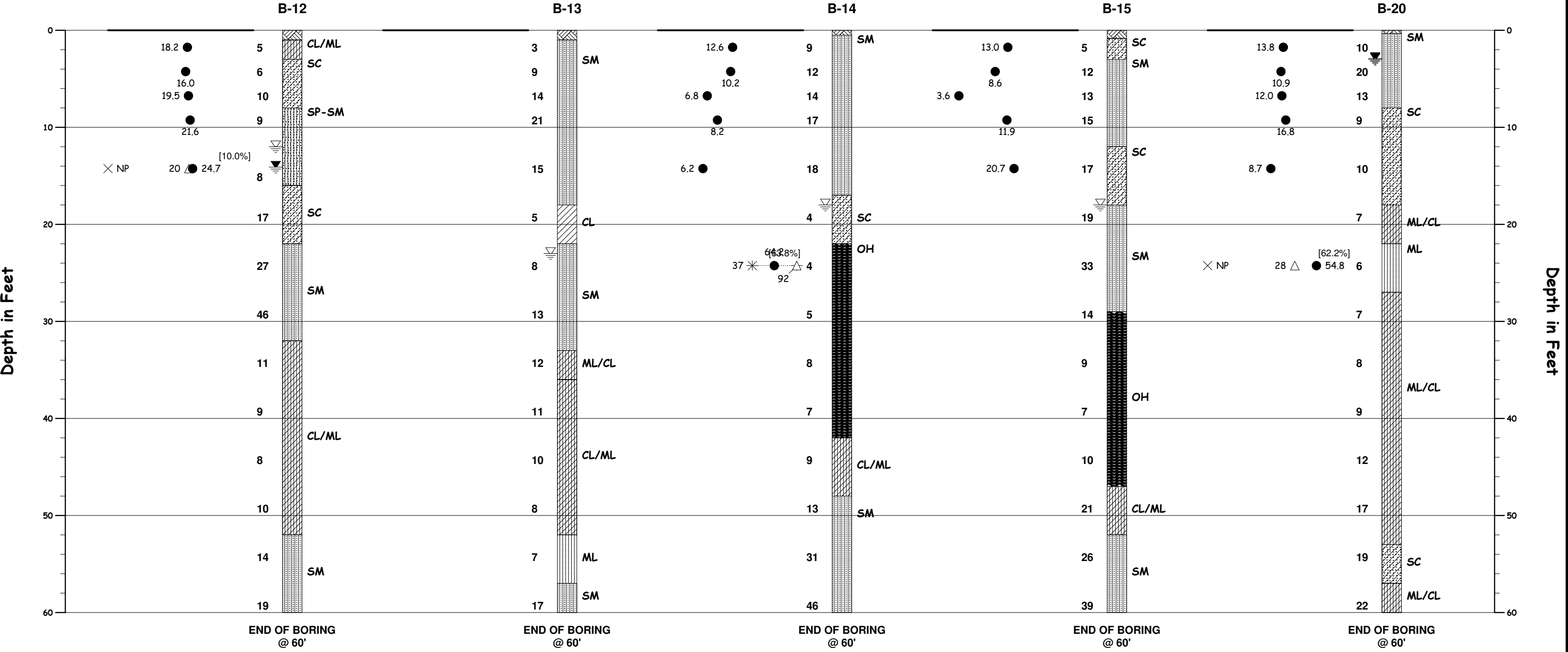
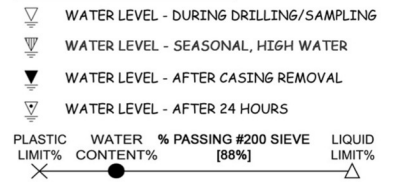
SURFACE MATERIALS



ROCK TYPES



SYMBOL LEGEND



NOTES:

1 SEE INDIVIDUAL BORING LOG AND GEOTECHNICAL REPORT FOR ADDITIONAL INFORMATION.

2 PENETRATION TEST RESISTANCE IN BLOWS PER FOOT (ASTM D1586).

3 HORIZONTAL DISTANCES ARE NOT TO SCALE.



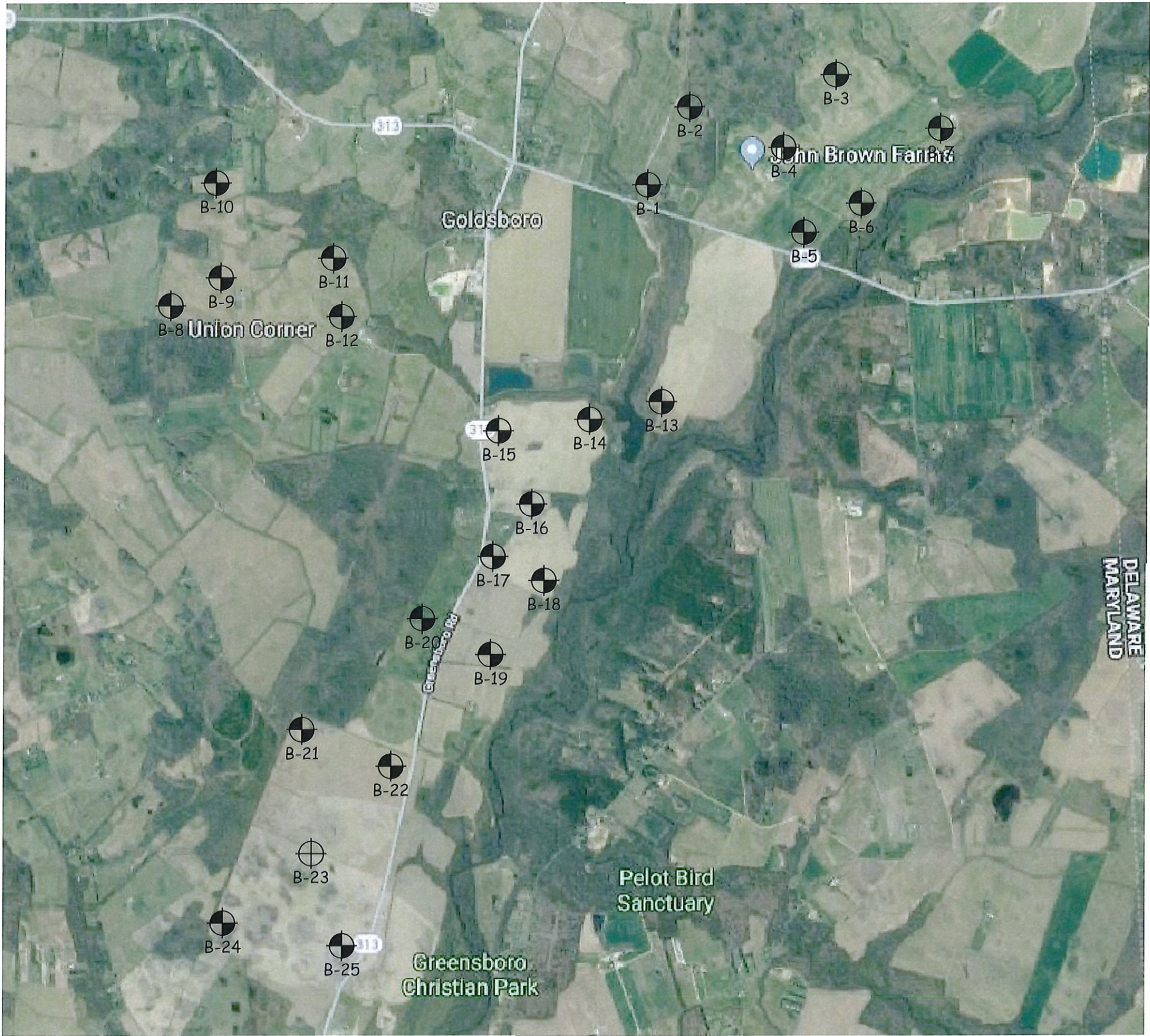
Subsurface Soil Profile (DEEP BORINGS)

Cherrywood Solar

Open Road Renewables

15642 Jackson Lane, Goldsboro, Caroline County, MD

PROJECT NO.: 8631 DATE: 1/15/2018 VERTICAL SCALE: 1"=10'



LEGEND

- ⊗ ECS Boring Location
- ⊕ Boring Not Drilled

REVISIONS



Boring Location Plan
Cherrywood Solar

Open Road Renewables

APPENDIX 8

FEMA Flood Insurance Rate Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 18. **Horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA/NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov/>.

BASE MAP SOURCE: Base map information shown on this FIRM was provided in digital format. Streamline files and road centerlines were supplied by Caroline County. Political boundaries were obtained from the Maryland State Highway Administration and Caroline County. Adjustments were made to specific base map features to align them to 2008 aerial photography. 2003 and 2006 LIDAR data derived from the National Oceanic and Atmospheric Administration (NOAA) were utilized to delineate floodplain boundaries.

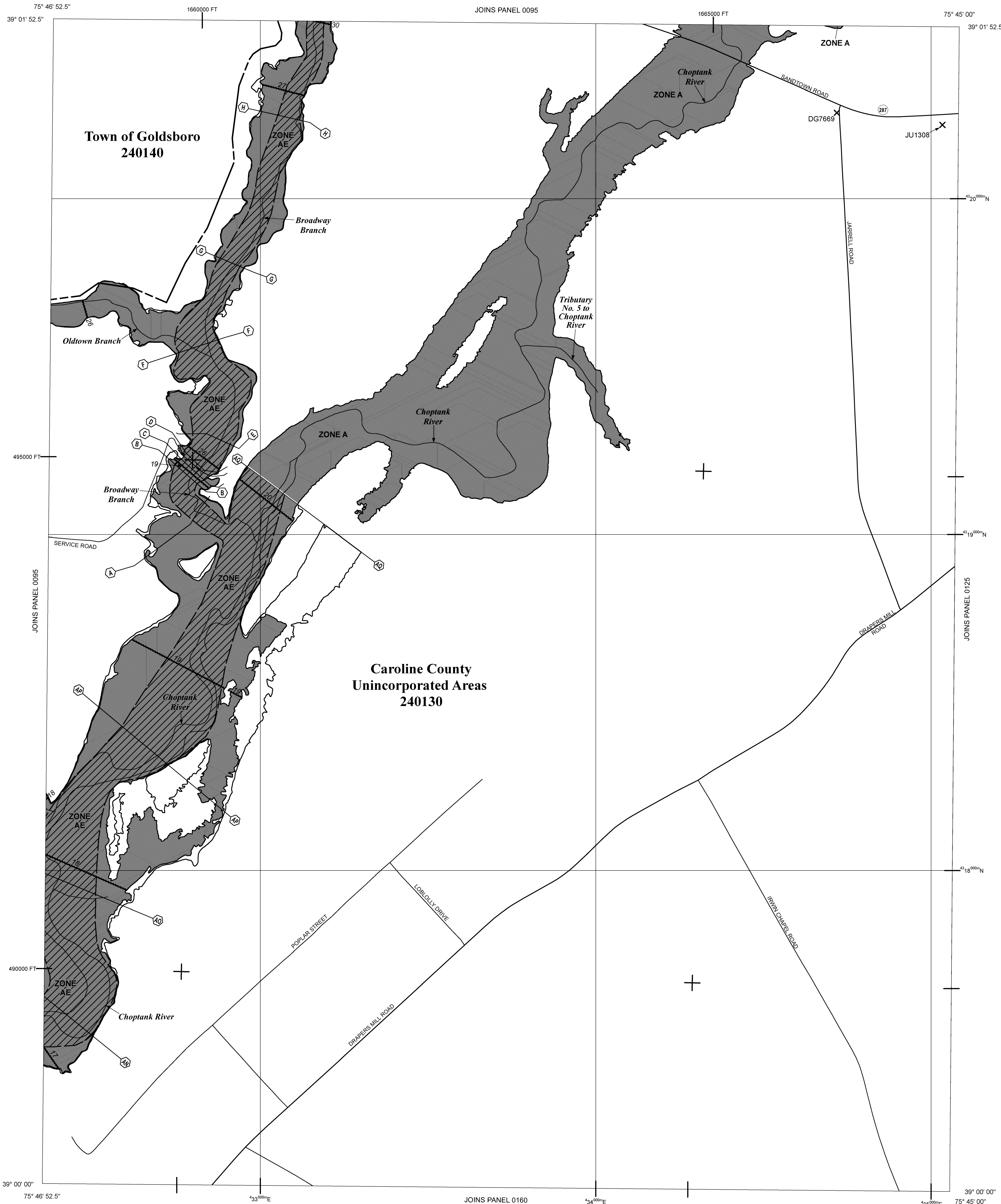
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

The AE Zone category has been divided by a **Limit of Moderate Wave Action (LIMWA)**. The LIMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LIMWA (or between the shoreline and the LIMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

For information on available products associated with the FIRM visit the **Map Service Center website** at <http://msc.fema.gov/>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.



LEGEND

- SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD**
- The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.
- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.
- FLOODWAY AREAS IN ZONE AE**
- The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.
- OTHER FLOOD AREAS**
- ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
- OTHER AREAS**
- ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAS)**
- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- 1% annual chance floodplain boundary
 - 0.2% annual chance floodplain boundary
 - Floodway boundary
 - Zone D boundary
 - CBRS and OPA boundary
 - Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
 - Limit of Moderate Wave Action
 - Base Flood Elevation line and value; elevation in feet*
 - Base Flood Elevation value where uniform within zone; elevation in feet*
- * Referenced to the North American Vertical Datum of 1988
- Bridge
 - Footbridge
 - Culvert
 - Cross section line
 - Transect line
 - Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
 - 1000-meter Universal Transverse Mercator grid values, zone 18 North
 - 5000-foot grid ticks: Maryland State Plane coordinate system (FIPSZONE 1900), Lambert Conformal Conic projection
 - Bench mark (see explanation in Notes to Users section of this FIRM panel)
 - River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
JANUARY 16, 2015

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0094D

FIRM
FLOOD INSURANCE RATE MAP

CAROLINE COUNTY, MARYLAND AND INCORPORATED AREAS

PANEL 94 OF 375
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CAROLINE COUNTY	240130	0094	D
GOLDSBORO, TOWN OF	240140	0094	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
24011C0094D

EFFECTIVE DATE
JANUARY 16, 2015

Federal Emergency Management Agency

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) Zone 18. **Horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NINGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at (301) 713-3242, or visit its website at <http://www.ngs.noaa.gov/>.

BASE MAP SOURCE: Base map information shown on this FIRM was provided in digital format. Streamline files and road centerlines were supplied by Caroline County. Political boundaries were obtained from the Maryland State Highway Administration and Caroline County. Adjustments were made to specific base map features to align them to 2008 aerial photography. 2003 and 2006 LIDAR data derived from the National Oceanic and Atmospheric Administration (NOAA) were utilized to delineate floodplain boundaries.

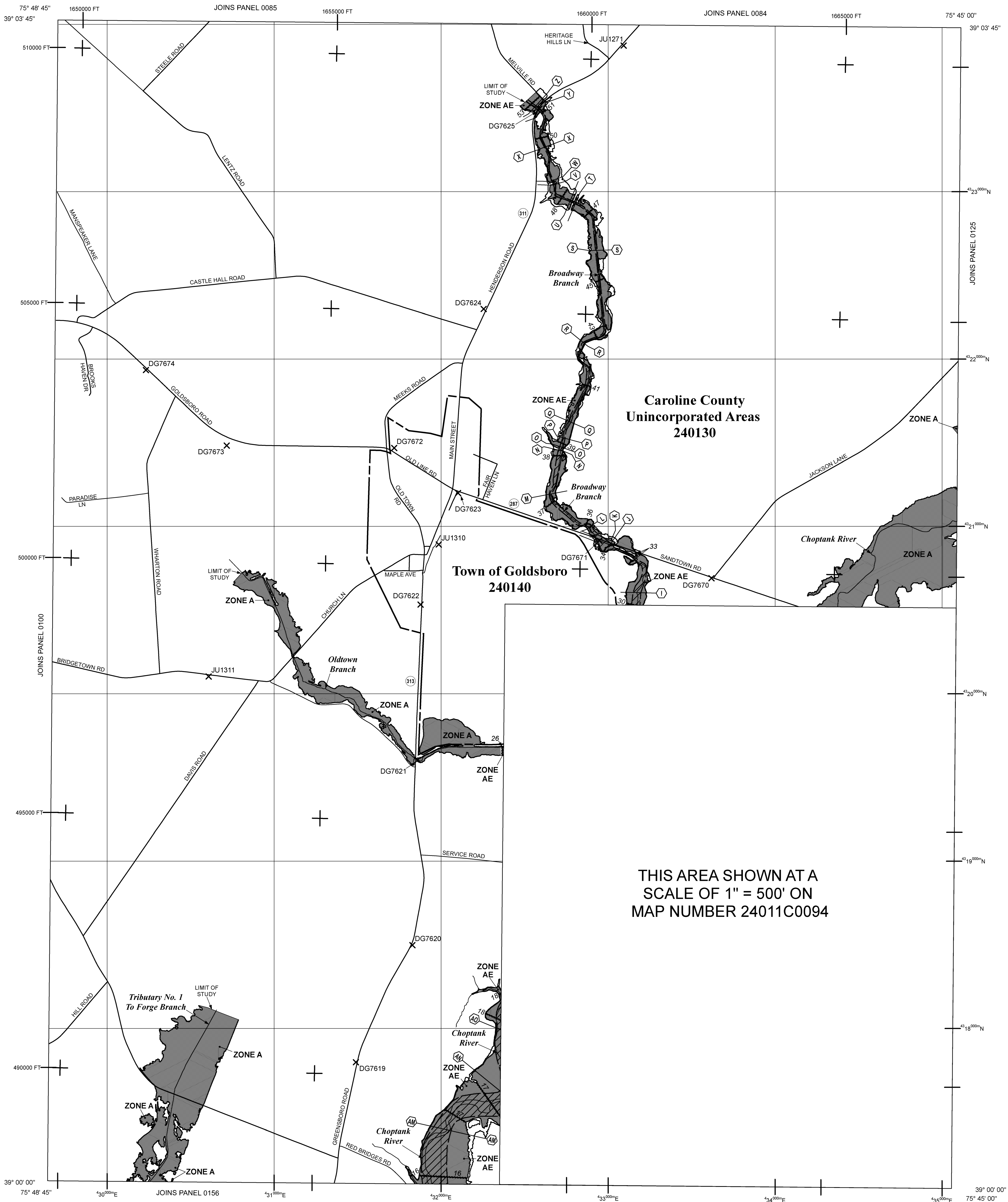
Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

The AE Zone category has been divided by a **Limit of Moderate Wave Action (LIMWA)**. The LIMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LIMWA (or between the shoreline and the LIMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

For information on available products associated with the FIRM visit the **Map Service Center** website at <http://msc.fema.gov/>. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at 1-877-FEMA MAP (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- ZONE A** No Base Flood Elevations determined.
- ZONE AE** Base Flood Elevations determined.
- ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE
The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

- OTHER FLOOD AREAS**
 - ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

- OTHER AREAS**
 - ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
 - ZONE D** Areas in which flood hazards are undetermined, but possible.
- COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS**
- OTHERWISE PROTECTED AREAS (OPAS)**

- CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.
- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
- Limit of Moderate Wave Action
- Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

- * Referenced to the North American Vertical Datum of 1988
- Bridge
- Footbridge
- Culvert
- Cross section line
- Transect line
- Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 1000-meter Universal Transverse Mercator grid values, zone 18 North
- 5000-foot grid ticks: Maryland State Plane coordinate system (FIPSZONE 1900), Lambert Conformal Conic projection
- Bench mark (see explanation in Notes to Users section of this FIRM panel)
- DX5510 x
- M1.5
- River Mile

- MAP REPOSITORY
Refer to listing of Map Repositories on Map Index
- EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
JANUARY 16, 2015
- EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

PANEL 0095D

FIRM

FLOOD INSURANCE RATE MAP

CAROLINE COUNTY, MARYLAND AND INCORPORATED AREAS

PANEL 95 OF 375

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
CAROLINE COUNTY	240130	0095	D
GOLDSBORO, TOWN OF	240140	0095	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER

24011C0095D

EFFECTIVE DATE

JANUARY 16, 2015

Federal Emergency Management Agency

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

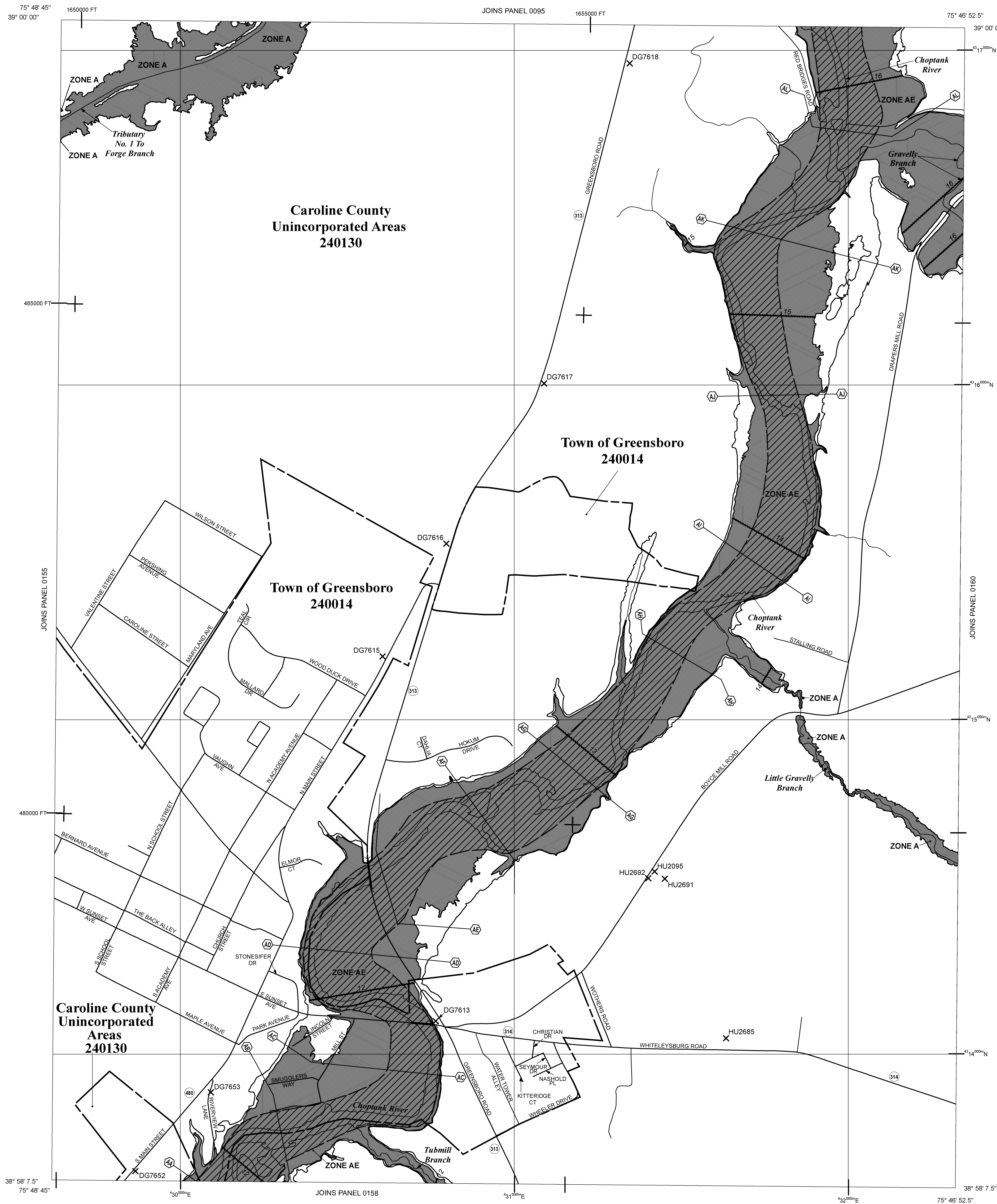
Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at <http://www.ngs.noaa.gov/> or contact the National Geodetic Survey at the following address:

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at <http://www.ngs.noaa.gov/>.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

The AE Zone category has been divided by a **Limit of Moderate Wave Action (LiMWA)**. The LiMWA represents the approximate landward limit of the 1.5-foot breaking wave. The effects of wave hazards between the VE Zone and the LiMWA (or between the shoreline and the LiMWA for areas where VE Zones are not identified) will be similar to, but less severe than those in the VE Zone.

If you have **questions about this map**, how to order products or the National Flood Insurance Program in general, please call the FEMA Map Information eXchange (FMIX) at **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at <http://www.fema.gov/business/nfip>.



SPECIAL FLOOD HAZARD AREAS (SFHAS) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has the 1% annual chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A
No Base Flood Elevations determined.

ZONE AE
Base Flood Elevations determined.

ZONE AH
Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO
Flood depths of 1 to 3 feet (usually areas of ponding); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR
Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently deteriorated. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99
Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V
Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE
Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X
Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X
Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D
Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities
Limit of Moderate Wave Action
Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*

(EL 987)

* Referenced to the North American Vertical Datum of 1988

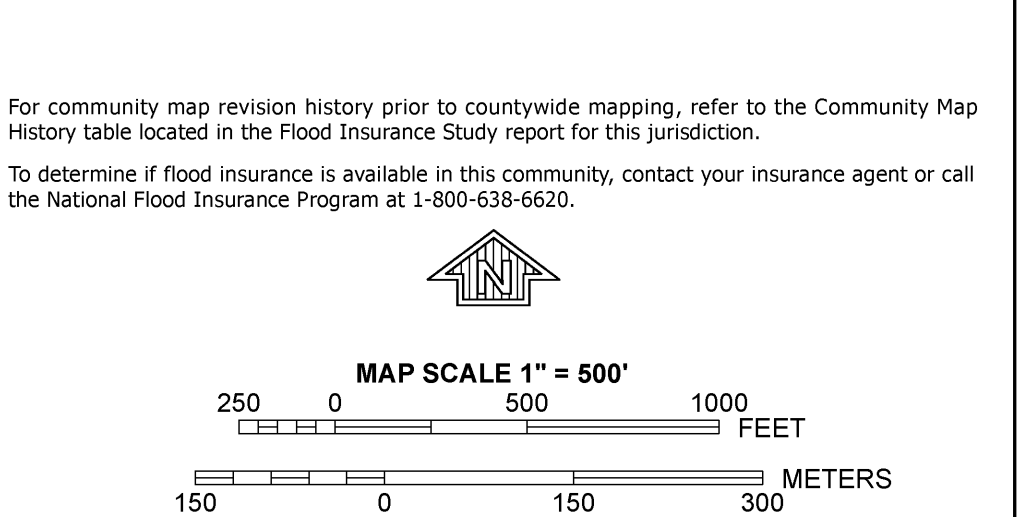
Bridge
Footbridge
Culvert
Cross section line
Transect line
Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
1000-meter Universal Transverse Mercator grid values, zone 18 North
5000-foot grid ticks: Maryland State Plane coordinate system (FIPSZONE 1900), Lambert Conformal Conic projection
Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5
River Mile


MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP

JANUARY 16, 2015

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL



<div style="writing-mode: vertical-rl; transform: rotate(180deg); font-weight: bold; font-size: 1.2em;">NATIONAL FLOOD INSURANCE PROGRAM</div>	<div style="border: 1px solid black; padding: 2px; display: inline-block;">PANEL 0156D</div>															
	<div style="font-size: 2.5em; font-weight: bold; margin-bottom: 10px;">FIRM</div> <div style="font-size: 1.5em; font-weight: bold; margin-bottom: 10px;">FLOOD INSURANCE RATE MAP</div> <div style="font-size: 1.5em; font-weight: bold; margin-bottom: 10px;">CAROLINE COUNTY, MARYLAND AND INCORPORATED AREAS</div> <div style="font-size: 1.5em; font-weight: bold; margin-bottom: 10px;">PANEL 156 OF 375</div> <div style="font-size: 1.2em;">(SEE MAP INDEX FOR FIRM PANEL LAYOUT)</div>															
	<p><u>CONTAINS:</u></p> <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: left; border-bottom: 1px solid black; padding: 5px;">COMMUNITY</th> <th style="text-align: left; border-bottom: 1px solid black; padding: 5px;">NUMBER</th> <th style="text-align: left; border-bottom: 1px solid black; padding: 5px;">PANEL</th> <th style="text-align: left; border-bottom: 1px solid black; padding: 5px;">SUFFIX</th> </tr> <tr> <td style="padding: 5px;">CAROLINE COUNTY</td> <td style="padding: 5px;">240100</td> <td style="padding: 5px;">0156</td> <td style="padding: 5px;">D</td> </tr> <tr> <td style="padding: 5px;">GREENSBORO, TOWN OF</td> <td style="padding: 5px;">240014</td> <td style="padding: 5px;">0156</td> <td style="padding: 5px;">D</td> </tr> </table>				COMMUNITY	NUMBER	PANEL	SUFFIX	CAROLINE COUNTY	240100	0156	D	GREENSBORO, TOWN OF	240014	0156	D
	COMMUNITY	NUMBER	PANEL	SUFFIX												
	CAROLINE COUNTY	240100	0156	D												
	GREENSBORO, TOWN OF	240014	0156	D												
	<p>Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.</p>															
																
	<div style="font-size: 1.5em; font-weight: bold; margin-bottom: 5px;">MAP NUMBER</div> <div style="font-size: 1.5em; font-weight: bold; margin-bottom: 5px;">2401C0156D</div> <div style="font-size: 1.5em; font-weight: bold; margin-bottom: 5px;">EFFECTIVE DATE</div> <div style="font-size: 1.5em; font-weight: bold; margin-bottom: 5px;">JANUARY 16, 2015</div>															
	<div style="font-size: 1.2em; font-weight: bold;">Federal Emergency Management Agency</div>															

APPENDIX 9

Critical Area Commission Confirmation Memo

From: [Claudia Jones -DNR-](#)
To: [Dane Bauer](#)
Cc: [Melissa Hall](#); [Julie Roberts -DNR-](#); [Nick Kelly -DNR-](#)
Subject: Re: CAC - Confirmations
Date: Tuesday, August 8, 2017 11:49:15 AM

Dane,

These are All outside of the Critical Area even the one on Tax Map 15, Par 68.

All of Tax Map 15 is outside the CA.

Claudia

MD Logo.png



dnr.maryland.gov/criticalarea

Claudia Jones
Science Advisor
Critical Area Commission for the
Chesapeake & Atlantic Coastal Bays
1804 West Street, Suite 100
Annapolis, MD 21401
410-260-3482 (office)
claudia.jones@maryland.gov

On Tue, Aug 1, 2017 at 10:52 AM, Dane Bauer <dbauer@hallandbauer.com> wrote:

Claudia:

We are working on a new project and have used the ESRGC Maps to provide a desktop review of the parcels to determine if they are in the Critical Area. Only one parcel may be slightly impacted, however the designs will most likely avoid any impact.

Could you please confirm the following tax maps/parcels are not within the Critical Area.

TM	G	Parcel
0011	0004	0052
0011	0005	0158
0011	0004	0053
0011	0009	0056
0011	0009	0058
0011	0003	0005
0010	0018	0011
0010	0011	0034
0010	0017	0025
0011	0020	0007
0011	0020	0051
0015	0001	0066
0015	0007	0067
0015	0007	0068 - partially within CA
0014	0012	0008

0014 0023 0038

Thanks for your help.

Dane S. Bauer

[410.812.9109](tel:410.812.9109)



37534 Oliver Dr.
Selbyville, DE 19975

APPENDIX 10

ECS Mid-Atlantic Wetland Field Assessment Report



**PRELIMINARY WATERS OF THE U.S. DETERMINATION REPORT
CHERRYWOOD SOLAR PROJECT**

CAROLINE COUNTY, MARYLAND

ECS PROJECT NO. 47: 4881

FOR

**CHERRYWOOD SOLAR I, LLC
(c/o H&B Solutions)**

NOVEMBER 2017



November 27, 2017

Mr. David Savage
Cherrywood Solar I, LLC
1105 Navasota Street
Austin, Texas 78702
david@openroadrenewables.com

ECS Project No. 47:4881

Reference: Preliminary Waters of the U.S. Determination, Cherrywood Solar Project,
Greensboro and Goldsboro, Caroline County, Maryland

Dear Mr. Savage:

ECS Mid-Atlantic (ECS) is pleased to present this Preliminary Waters of the U.S. Determination for the above-referenced project in general accordance with ECS Proposal No. 47:5529-EPR, dated September 20, 2017. A Preliminary Waters of the U.S. Determination entails the gathering of appropriate secondary information; including but not limited to, USGS, NWI, county soils mapping, and aerial photography. Secondly, a site visit is made to determine if areas of concern may be present and exhibit wetland or other Waters of the United States characteristics. Some field data is gathered to make these determinations but it is not adequate for submittal to the U.S. Army Corps of Engineers or Maryland Department of the Environment for confirmation, nor are the boundaries of such areas flagged.

PROPERTY DESCRIPTION

The site is comprised of parcels and easements totaling approximately 1,900-acres located generally along Greensboro Road between Goldsboro and Greensboro in Caroline County, Maryland. The study area can generally be described as agricultural with some wooded areas. Proposed development of the site includes a solar power generating facility.

SECONDARY INFORMATION

Secondary Information entails the background research and review of recorded data and mapping pertaining to the project site. Resources include but are not limited to the:

- U. S. Geological Survey (USGS) Topographic Map, Denton and Goldsboro Quadrangles, 2016
- U. S. Fish and Wildlife Service (USFWS), National Wetlands Inventory (NWI) Online Mapper, http://wetlands.fws.gov/mapper_tool.htm
- Natural Resources Conservation Service (NRCS), Electronic Field Office Technical Guide, Caroline County Soils, www.nrcs.usda.gov/technical/efotg/
- Available aerial photography and GIS data.

The USGS Denton and Goldsboro quadrangle maps show elevations ranging from approximately 25 to 50 feet above mean sea level (MSL) throughout the site (Figure 2). As shown on the USGS Map, the project site drains to the Choptank River, located along portions of the eastern site boundary, and is within the Choptank watershed, identified as Hydrologic Unit Code (HUC) 02060005. The NWI map depicts freshwater forested and emergent wetlands, ponds, and riverine features within the study area (Figure 3). The soil survey indicates that the site is underlain primarily by the soil units listed in Table 1 below (also see Figure 4).

Table 1: Soil Map Units Onsite

Map unit symbol	Map unit name	Hydric Rating (%)
CdB	Cedartown loamy sand, 2 to 5 percent slopes	0
CoA	Corsica mucky loam, 0 to 2 percent slopes	95
CrA	Corsica mucky loam, Carolina Bay, 0 to 2 percent slopes	82
EwB	Evesboro sand, 2 to 5 percent slopes	0
FacA	Fallsington sandy loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	78
FgcA	Fallsington loams, 0 to 2 percent slopes, Mid-Atlantic Coastal Plain	81
GAE	Galestown and Rosedale soils, 15 to 30 percent slopes	0
HbA/B/C	Hambrook sandy loam, 0 to 2/2 to 5/5 to 10 percent slopes	0
HcA	Hambrook loam, 0 to 2 percent slopes	0
HnA	Hammonton sandy loam, 0 to 2 percent slopes	5
HoB	Hammonton-Fallsington-Corsica complex, 0 to 5 percent slopes	53
HvA	Hurlock sandy loam, 0 to 2 percent slopes	85
IeB/C	Ingleside loamy sand, 2 to 5/5 to 10 percent slopes	0
IgA/B	Ingleside sandy loam, 0 to 2/2 to 5 percent slopes	0
KgB	Klej-Galloway complex, 0 to 5 percent slopes	15
LgA	Lenni loam, 0 to 2 percent slopes	85
LhA	Lenni silt loam, 0 to 2 percent slopes	85
LO	Longmarsh and Indiantown soils, frequently flooded	95
RoA/B	Rosedale loamy sand, 0 to 2/2 to 5 percent slopes	0
UbB	Udorthents, borrow area, 0 to 5 percent slopes	5
WdcA/B	Woodstown sandy loam, 0 to 2/2 to 5 percent slopes, Mid-Atlantic Coastal Plain	6
WocA/B	Woodstown loam, 0 to 2/2 to 5 percent slopes, Mid-Atlantic Coastal Plain	6
Za	Zekiah sandy loam, frequently flooded	95

FIELD VISIT FINDINGS

A field evaluation was conducted on October 25 and 26, 2017, during which time ECS observed potentially jurisdictional Waters onsite (see attached map). The agricultural fields were transected by numerous ditches. Small areas of potential wetlands were also observed in the fields. Oldtown Branch is located along the property boundaries in the central portion of the site, draining to the Choptank River along the eastern site boundary. Unnamed tributary stream channels and forested wetlands located within the wooded areas of the site drained primarily to the east. The locations of wetlands and streams appear to be governed primarily by topography with wetland areas present in low-lying topographical positions. A photographic log of site conditions is included in Appendix II.

Based on these findings, ECS recommends avoidance of these areas. Please refer to these areas as field mapping which needs to be confirmed through a Maryland Department of the Environment (MDE) site visit. We look forward to meeting with H&B Solutions and MDE to conduct the site visit to confirm the findings of this report. Please let us know when H&B Solutions and MDE are available to meet.

ECS would like to thank Cherrywood Solar I, LLC for the opportunity to provide you with this Preliminary Waters of the U.S. Determination. We look forward to assisting you further with this project and other environmental concerns you may have. If you have any questions, please feel free to contact us at any time at 703-471-8400.

Sincerely,

ECS MID-ATLANTIC, LLC



Anna Allie, MEM, ISA-CA
Environmental Project Manager
AAllie@ecslimited.com



Adam M. Meurer, CHMM, PWS
Environmental Principal
AMeurer@ecslimited.com

\\S47-ARES2K8\data_e-projects\4800-4899\4881 Cherrywood Solar Goldsboro MD\Preliminary Wetlands Letter.doc

Appendix 1 – Figures

Appendix 2 – Site Photographs

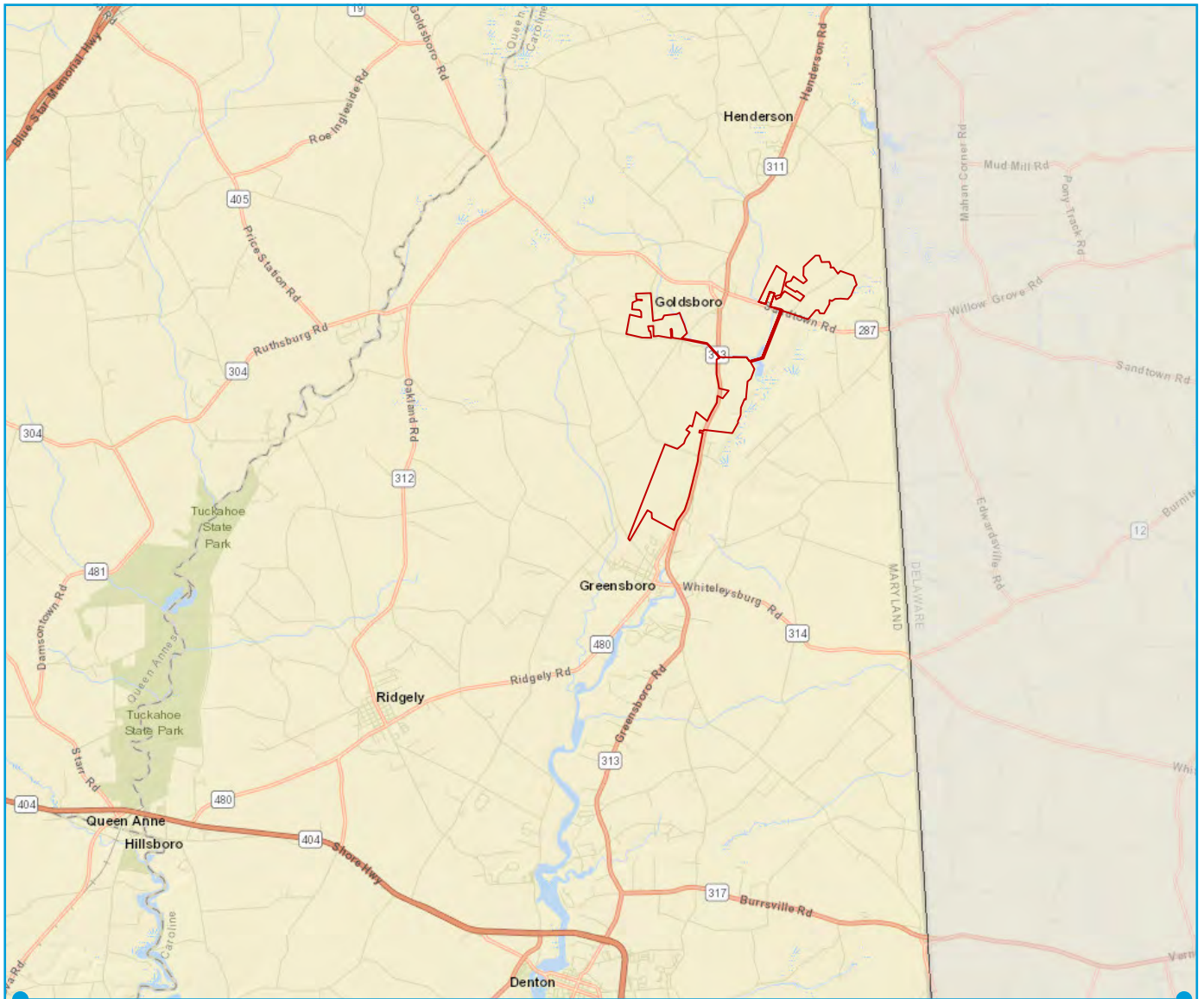
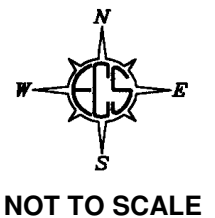


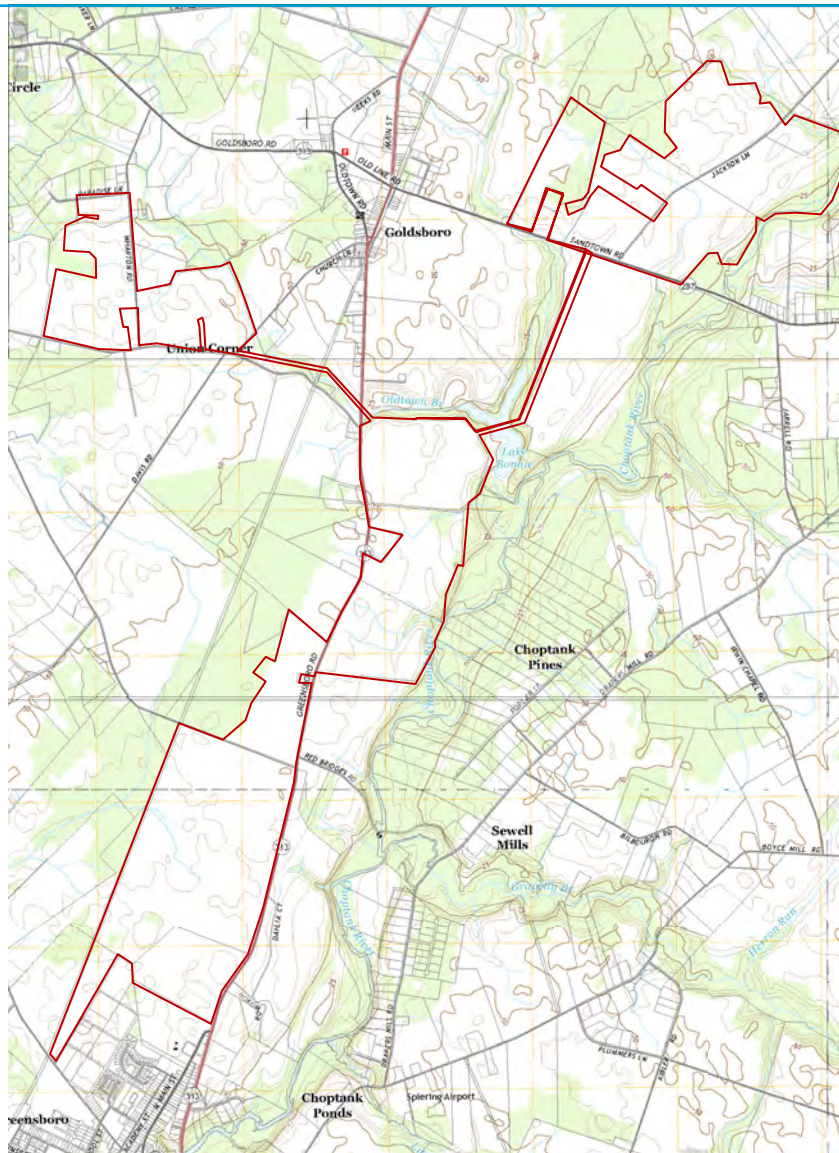
FIGURE 1: SITE LOCATION MAP
PROJECT #47:4881 — CHERRYWOOD PROJECT
CAROLINE COUNTY, MARYLAND



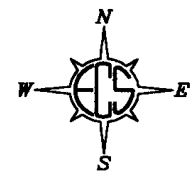
PRELIMINARY WETLAND DETERMINATION
 FOR: CHERRYWOOD SOLAR I, LLC
 NOVEMBER 2017
 SOURCE: MERLIN

ECS MID-ATLANTIC, LLC
 14026 THUNDERBOLT PLACE
 SUITE 100
 CHANTILLY, VA 20151
 703-471-8400





**FIGURE 2: USGS TOPOGRAPHIC MAP
PROJECT #47:4881 — CHERRYWOOD PROJECT
CAROLINE COUNTY, MARYLAND**

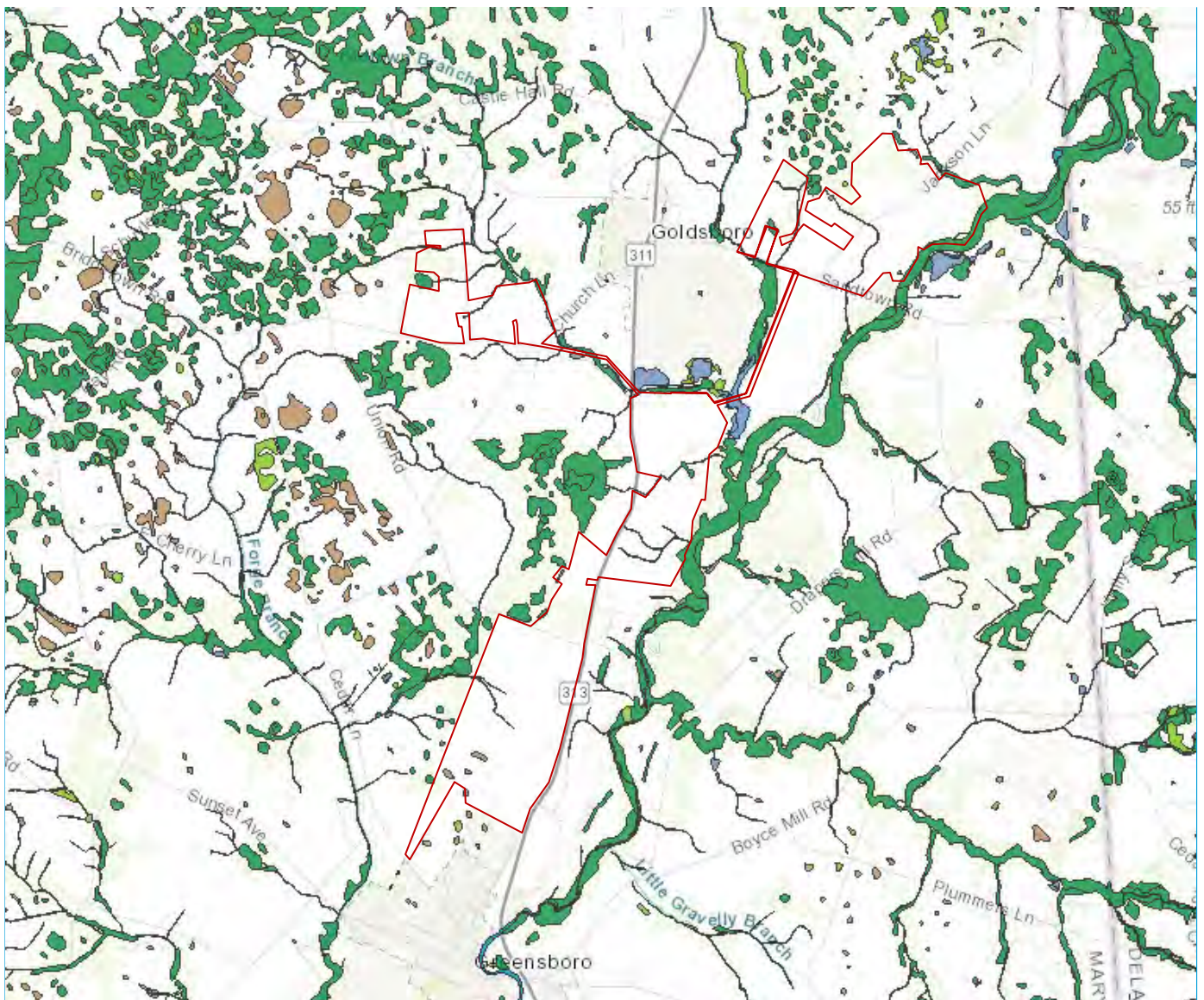


NOT TO SCALE

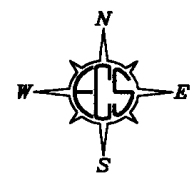
PRELIMINARY WETLAND DETERMINATION
FOR: CHERRYWOOD SOLAR I, LLC
NOVEMBER 2017
SOURCE: MERLIN

ECS MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
703-471-8400





**FIGURE 4: NATIONAL WETLANDS INVENTORY MAP
PROJECT #47:4881 — CHERRYWOOD PROJECT
CAROLINE COUNTY, MARYLAND**



NOT TO SCALE

PRELIMINARY WETLAND DETERMINATION
FOR: CHERRYWOOD SOLAR I, LLC
NOVEMBER 2017
SOURCE: USFWS WETLANDS MAPPER

ECS MID-ATLANTIC, LLC
14026 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
703-471-8400





Photograph 1: Oldtown Branch on eastern property line of the northwest portion of the study area.



Photograph 2: View of a typical potentially jurisdictional wetland area observed within the study area limits.



Photograph 3: View of drainage channel the northwest portion of the site.



Photograph 4: View of drainage channel/potentially jurisdictional wetland area.



Photograph 5: View of drainage channel.



Photograph 6: View of drainage channel.



Photograph 7: View of typical drainage channel the northwest portion of the site.



Photograph 8: View of a typical potentially jurisdictional wetland area observed along Choptank River in the northeast portion of the study area.



Photograph 9: View of typical potentially jurisdictional wetland area observed along Choptank River.



Photograph 10: View of drainage channel.



Photograph 11: View of pond on east side of northeast portion of the study area limits.



Photograph 12: View of Choptank River on east side study area limits.



Photograph 13: View of a potentially jurisdictional wetland within the study area limits.



Photograph 14: View of a potentially jurisdictional wetland within the study area limits.



Photograph 15: View of drainage channel.



Photograph 16: View of potentially jurisdictional wetland adjacent to Broadway Branch north side of Sandtown Road.



Photograph 17: Transmission line easement to the northeast portion of the site.



Photograph 18: Transmission line easement along Route 313.



Photograph 19: Transmission line easement along Bridgetown Road.



Photograph 20: Transmission line easement along Bridgetown Road.



Photograph 21: Lake Bonnie.



Photograph 22: Transmission line to the northeast portion of the site.



Photograph 23: Transmission line to the north of Lake Bonnie.



Photograph 24: View of a potentially jurisdictional wetland area observed near transmission lines in the southeast portion of the site.



Photograph 25: View of same potentially jurisdictional wetland area observed within the study area limits.



Photograph 26: View of a typical ditch in the central portion of the site.



Photograph 27: View of a stream channel in the central portion of the site.



Photograph 28: Stream and wetland area beneath transmission line in the central portion of the site.



Photograph 29: Potentially jurisdictional wetland area and farm fields in the central portion of the site.



Photograph 30: View of potential wetland area and farm fields in the southern portion of the site.



Photograph 31: View of ditch along the western property boundary in the southern portion of the site.



Photograph 32: View of ditch and fields in the southern portion of the site.



Photograph 33: View towards a typical potentially jurisdictional wetland area observed in the southern portion of the site.



Photograph 34: View of a potentially jurisdictional wetland area in the southern portion of the site.



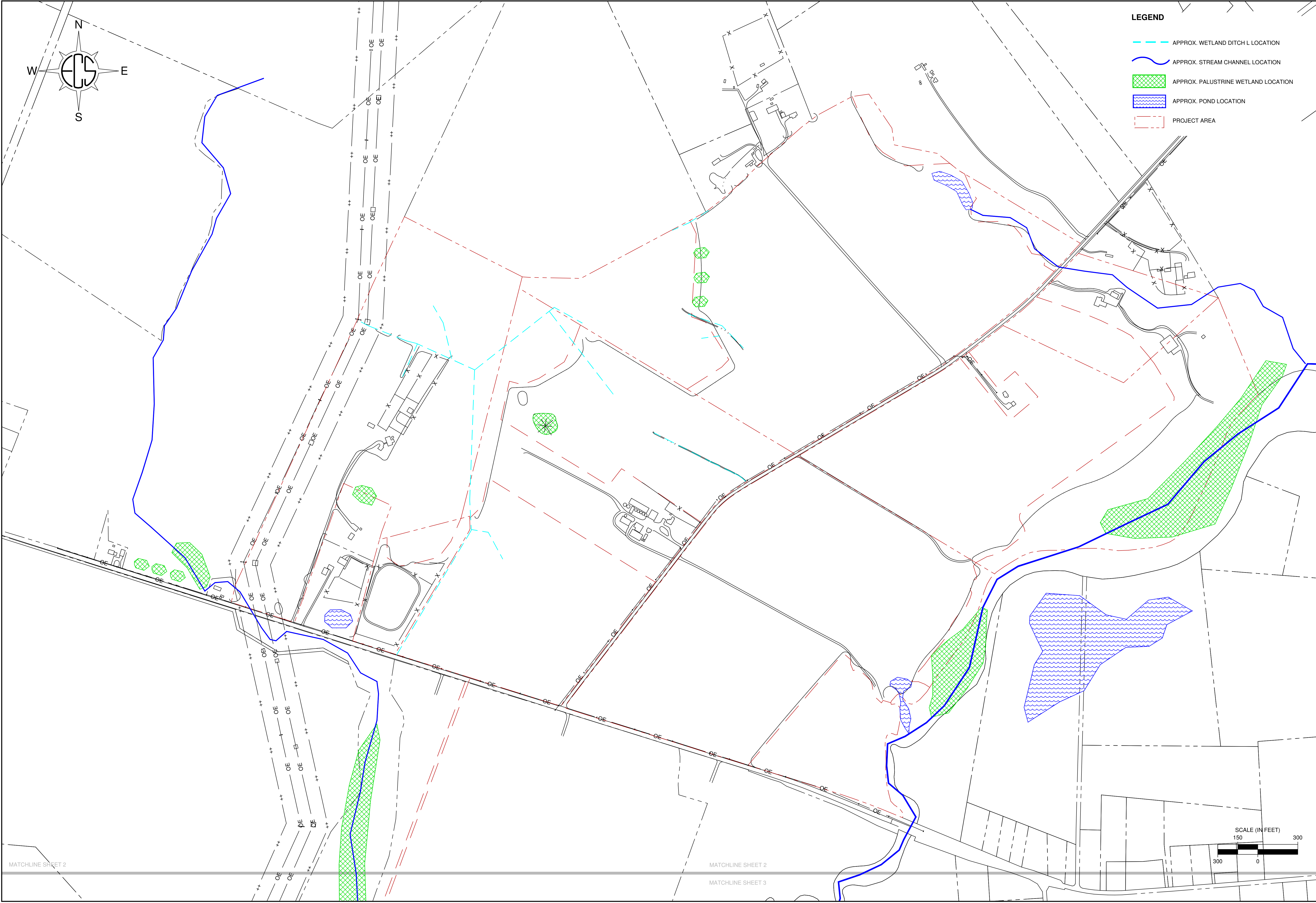
Photograph 35: View of a typical potentially jurisdictional wetland area observed within the study area limits.



Photograph 36: View of a typical potentially jurisdictional wetland area observed within the study area limits.

1/17/2018 4:18:58 PM

S:\4\B2329\data_s\project\480_489\481 Cherrywood Solar Goldboro Maryland\Cherrywood wetlands.dwg



LEGEND

- APPROX. WETLAND DITCH L LOCATION
- APPROX. STREAM CHANNEL LOCATION
- APPROX. PALUSTRINE WETLAND LOCATION
- APPROX. POND LOCATION
- PROJECT AREA

ECS - MID-ATLANTIC, LLC
14028 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-822-3489
703-494-9400
(FAX) 703-834-5227

CELEBRATING
OVER 25 YEARS
OF EXCELLENCE

"SETTING THE STANDARD FOR SERVICE"



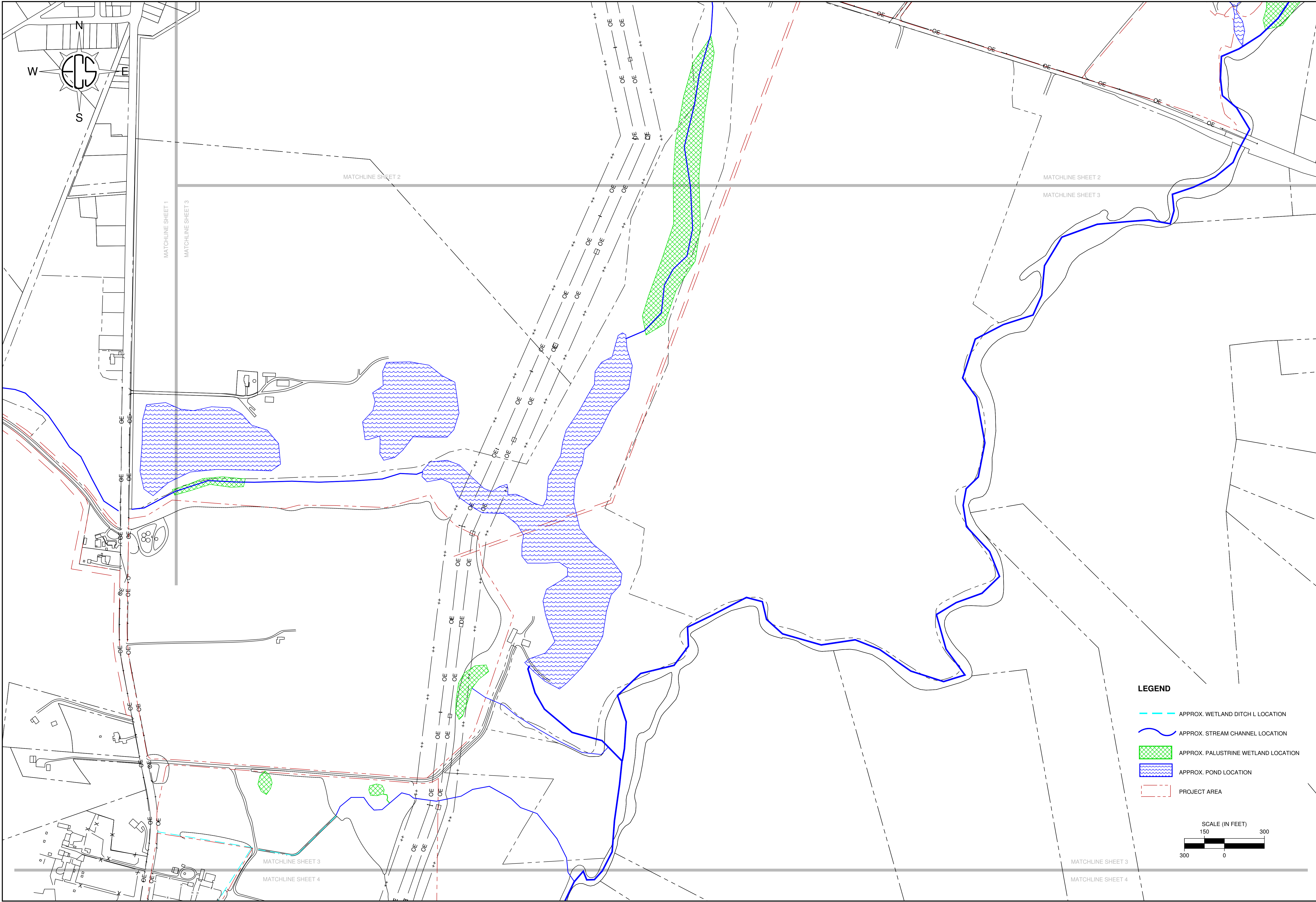
CHERRYWOOD PROJECT
GREENSBORO AND GOLDSBORO
CAROLINE COUNTY, MARYLAND

WATERS OF THE U.S.
DETERMINATION MAP
CHERRYWOOD SOLAR I, LLC

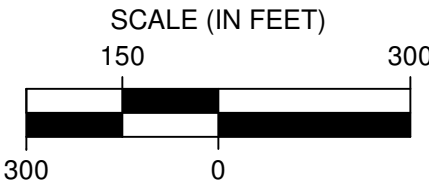
ECS REVISIONS	
12-20-17 AEA	
ENGINEER	DRAFTING
AMM	AEA
SCALE	1" = 300'
PROJECT NO.	47:4881
SHEET	2 OF 5
DATE	11-20-17

1/17/2018 4:18:17 PM

C:\AEC\2018\001-000000001 Cherrywood Solar Goldboro MD\dwg\Cherrywood\Cherrywood\Cherrywood\Cherrywood.dwg



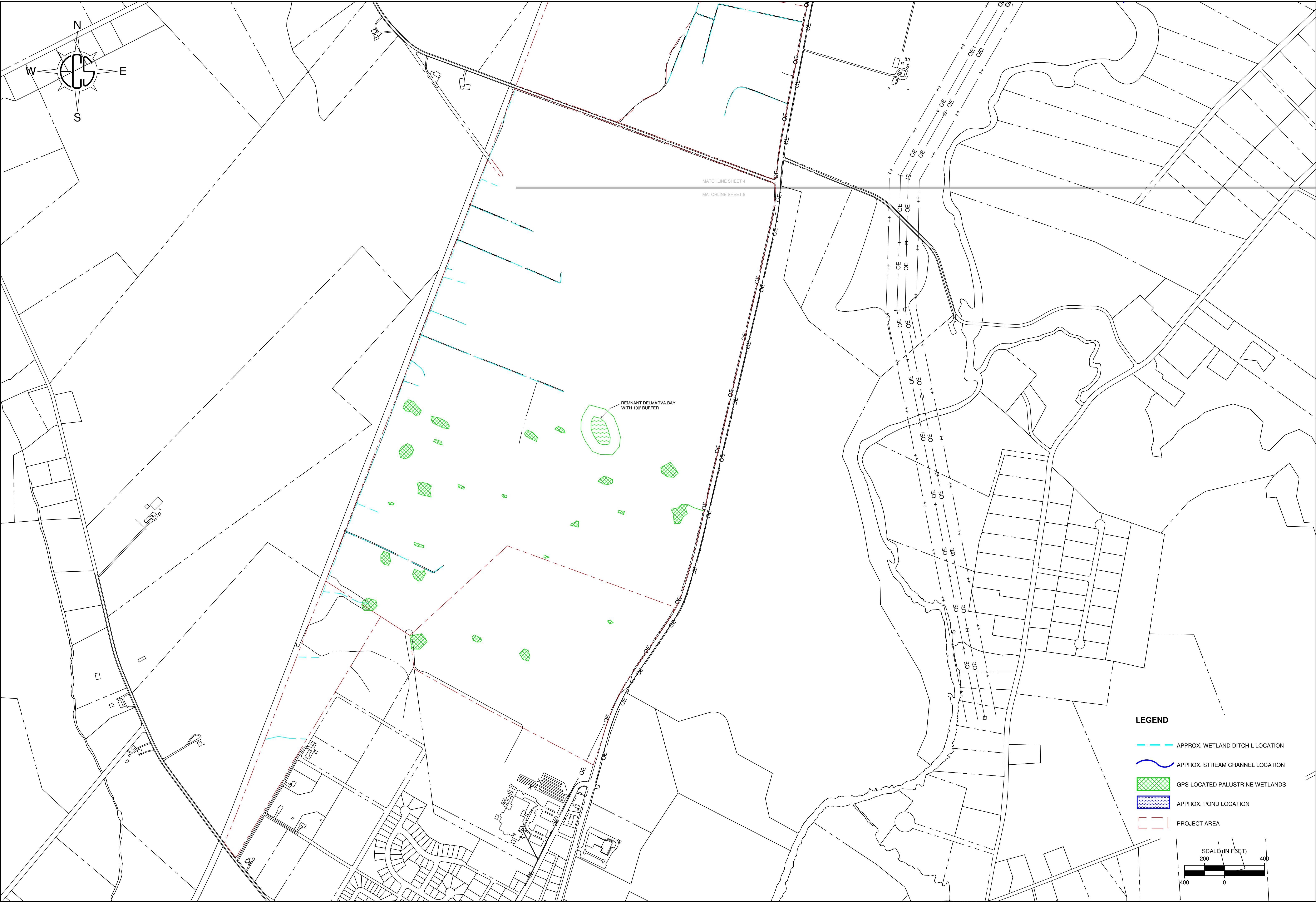
- LEGEND**
- APPROX. WETLAND DITCH LOCATION
 - APPROX. STREAM CHANNEL LOCATION
 - APPROX. PALUSTRINE WETLAND LOCATION
 - APPROX. POND LOCATION
 - PROJECT AREA



ECS - MID-ATLANTIC, LLC 14026 THUNDERBOLT PLACE SUITE 100 CHANTILLY, VA 20151 1-800-822-3489 703-771-5400 (FAX) 703-854-5527		CELEBRATING OVER 25 YEARS OF EXCELLENCE	
		"SETTING THE STANDARD FOR SERVICE"	
WATERS OF THE U.S. DETERMINATION MAP			
CHERRYWOOD PROJECT GREENSBORO AND GOLDSBORO CAROLINE COUNTY, MARYLAND			
CHERRYWOOD SOLAR I, LLC			
ECS REVISIONS			
12-20-17 AEA			
ENGINEER AMM		DRAFTING AEA	
SCALE 1" = 300'			
PROJECT NO. 47:4881			
SHEET		3 OF 5	
DATE		11-20-17	

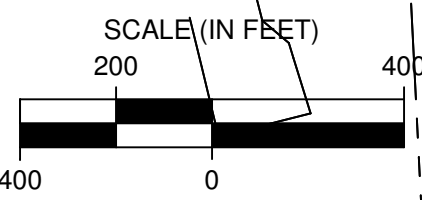
S:\1\AES2016\aes_1\project\4881\4881.dwg Cherrywood Solar Goldboro, MD\SettingCherrywood wetlands.dwg

11/20/16 4:21:39 PM



LEGEND

- APPROX. WETLAND DITCH LOCATION
- APPROX. STREAM CHANNEL LOCATION
- GPS-LOCATED PALUSTRINE WETLANDS
- APPROX. POND LOCATION
- PROJECT AREA



WATERS OF THE U.S.
DETERMINATION MAP
CHERRYWOOD SOLAR I, LLC

CHERRYWOOD PROJECT
GREENSBORO AND GOLDSBORO
CAROLINE COUNTY, MARYLAND



ECS - MID ATLANTIC, LLC
14025 THUNDERBOLT PLACE
SUITE 100
CHANTILLY, VA 20151
1-800-852-3489
(703) 471-6440
(FAX) 703-624-6527

CELEBRATING
OVER 25 YEARS
OF EXCELLENCE

"SETTING THE STANDARD FOR SERVICE"

ECS REVISIONS	
12-20-17 AEA	
ENGINEER AMM	DRAFTING AEA
SCALE 1" = 400'	
PROJECT NO. 47:4881	
SHEET 5 OF 5	
DATE 11-20-17	

APPENDIX 11

MDE Jurisdictional Nontidal Wetlands Confirmation Memo



Maryland

Department of the Environment

Larry Hogan, Governor
Boyd Rutherford, Lt. Governor

Ben Grumbles, Secretary
Horacio Tablada, Deputy Secretary

MEMORANDUM

To: Dane Bauer/Melissa Hall

From: Al Kampmeyer/Project Reviewer
Maryland Department of the Environment/Nontidal Wetlands Division

Date: January 19, 2018

Re: Cherrywood Solar Project, Goldsboro to Greensboro, Caroline County, Maryland

The Maryland Department of the Environment, Nontidal Wetlands Division has reviewed the project limits of disturbance and nontidal wetlands, wetland buffers, streams, and 100-year floodplain for the proposed Cherrywood solar facility, planned from north of Goldsboro, on Jackson Lane, then south to Greensboro. The Department is in agreement with the nontidal wetlands delineation and stream locations and has determined that the project shall have no impacts to jurisdictional areas of the State, including nontidal wetlands, 25 foot nontidal wetland buffer, streams, and 100-year nontidal floodplain, as depicted in the document titled Preliminary Waters of the U.S. Report, Cherrywood Solar Project, prepared by ECS, and dated and revised November 2017. Please be advised the streams have not been designated intermittent or perennial, only as regulated waterways. These waterways also have nontidal wetlands in or along the streams so there are as depicted a wetlands buffer to these waterways as well. If this project does not disturb nontidal wetlands, wetland buffers, streams, or 100-year nontidal floodplain then no authorization from this office is necessary. It is our desire to see that these types of projects can take place without sacrificing any wetland and waterway functions that might exist on potential sites within the region. The Department is pleased that these specific projects have been designed to avoid such wetland losses. If I can be of further assistance, please feel free to contact me at alan.kampmeyer@maryland.gov or at 410-713-3685.

APPENDIX 12

Forge Solar Glare Analysis Report

Site Configuration: Carmean Airport

Project site configuration details and results.



Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m²**
Analyze every **1 minute(s)**
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1
Axis tracking: Single-axis rotation
Tracking axis orientation: 0.0 deg
Tracking axis tilt: 0.0 deg
Tracking axis panel offset: 0.0 deg
Limit tracking rotation? Yes
Maximum tracking angle: 60.0 deg
Rated power: -
Panel material: Smooth glass without AR coating
Vary reflectivity with sun position? Yes
Correlate slope error with surface type? Yes
Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 82.4 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
Threshold	38.930571	-75.893898	56.08	50.00	106.08
2-mile point	38.934395	-75.857014	41.52	618.02	659.54

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 156.79 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
Threshold	38.934310	-75.891151	55.16	50.00	105.17
2-mile point	38.907737	-75.876486	54.68	603.94	658.62

PV Array Results

PV array 1

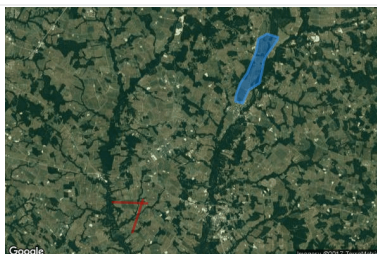
Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass : continuous, not discrete, spectrum.

Site Configuration: Gary Field Airport

Project site configuration details and results.



Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m²**
Analyze every **1 minute(s)**
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1

Axis tracking: Single-axis rotation

Tracking axis orientation: 0.0 deg

Tracking axis tilt: 0.0 deg

Tracking axis panel offset: 0.0 deg

Limit tracking rotation? Yes

Maximum tracking angle: 60.0 deg

Rated power: -

Panel material: Smooth glass without AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 271.91 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
Threshold	38.898426	-75.904713	40.80	50.00	90.80
2-mile point	38.899389	-75.941886	28.78	615.48	644.25

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 197.65 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
Threshold	38.901454	-75.909176	45.12	50.00	95.13
2-mile point	38.873902	-75.920454	31.18	617.40	648.58

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass : continuous, not discrete, spectrum.

Site Configuration: Marble Head Farm Airport

Project site configuration details and results.



Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m²**
Analyze every **1 minute(s)**
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1

Axis tracking: Single-axis rotation

Tracking axis orientation: 0.0 deg

Tracking axis tilt: 0.0 deg

Tracking axis panel offset: 0.0 deg

Limit tracking rotation? Yes

Maximum tracking angle: 60.0 deg

Rated power: -

Panel material: Smooth glass without AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1
Description:
Threshold height: 50 ft
Direction: 79.87 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
Threshold	38.989036	-75.870037	58.89	50.00	108.89
2-mile point	38.994121	-75.833376	54.45	607.89	662.34

Name: FP 2
Description:
Threshold height: 50 ft
Direction: 259.56 deg
Glide slope: 3.0 deg
Pilot view restricted? Yes
Vertical view restriction: 30.0 deg
Azimuthal view restriction: 120.0 deg

Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
Threshold	38.990370	-75.860424	59.28	50.00	109.29
2-mile point	38.985131	-75.897050	56.84	605.90	662.74

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass : continuous, not discrete, spectrum.

Site Configuration: Ridgely Airpark

Project site configuration details and results.



Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m²**
Analyze every **1 minute(s)**
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1

Axis tracking: Single-axis rotation

Tracking axis orientation: 0.0 deg

Tracking axis tilt: 0.0 deg

Tracking axis panel offset: 0.0 deg

Limit tracking rotation? Yes

Maximum tracking angle: 60.0 deg

Rated power: -

Panel material: Smooth glass without AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1 Description: Threshold height: 50 ft Direction: 109.16 deg Glide slope: 3.0 deg Pilot view restricted? Yes Vertical view restriction: 30.0 deg Azimuthal view restriction: 120.0 deg	Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
		deg	deg	ft	ft	ft
	Threshold	38.973156	-75.878878	60.42	50.00	110.42
	2-mile point	38.963667	-75.843707	51.39	612.48	663.88

Name: FP 2 Description: Threshold height: 50 ft Direction: 290.88 deg Glide slope: 3.0 deg Pilot view restricted? Yes Vertical view restriction: 30.0 deg Azimuthal view restriction: 120.0 deg	Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
		deg	deg	ft	ft	ft
	Threshold	38.966817	-75.856733	65.24	50.00	115.24
	2-mile point	38.977121	-75.891518	60.45	608.24	668.70

Name: FP 3 Description: Threshold height: 50 ft Direction: 207.93 deg Glide slope: 3.0 deg Pilot view restricted? Yes Vertical view restriction: 30.0 deg Azimuthal view restriction: 120.0 deg	Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
		deg	deg	ft	ft	ft
	Threshold	38.975825	-75.866003	59.74	50.00	109.75
	2-mile point	38.950280	-75.883443	64.19	599.01	663.20

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0
FP: FP 3	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass : continuous, not discrete, spectrum.

Site Configuration: Spiering Airport

Project site configuration details and results.



Created **Oct. 19, 2017 4:59 p.m.**
DNI **varies** and peaks at **1,000.0 W/m²**
Analyze every **1 minute(s)**
0.5 ocular transmission coefficient
0.002 ft pupil diameter
0.017 ft eye focal length
9.3 mrad sun subtended angle
Site Configuration ID: 10723.1874

Summary of Results No glare predicted!

PV name	Tilt	Orientation	"Green" Glare	"Yellow" Glare	Energy Produced
	deg	deg	min	min	kWh
PV array 1	0.0	0.0	0	0	-

Component Data

PV Array(s)

Name: PV array 1

Axis tracking: Single-axis rotation

Tracking axis orientation: 0.0 deg

Tracking axis tilt: 0.0 deg

Tracking axis panel offset: 0.0 deg

Limit tracking rotation? Yes

Maximum tracking angle: 60.0 deg

Rated power: -

Panel material: Smooth glass without AR coating

Vary reflectivity with sun position? Yes

Correlate slope error with surface type? Yes

Slope error: 6.55 mrad

Vertex	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
	deg	deg	ft	ft	ft
1	39.037853	-75.784206	52.17	0.00	52.17
2	39.042120	-75.774593	49.57	0.00	49.57
3	39.039186	-75.762577	43.79	0.00	43.79
4	39.036786	-75.763264	45.43	0.00	45.43
5	39.029052	-75.770130	44.21	0.00	44.21
6	39.023718	-75.775280	22.56	0.00	22.56
7	39.018917	-75.778027	27.96	0.00	27.96
8	39.012248	-75.779400	12.22	0.00	12.22
9	39.000243	-75.782661	19.76	0.00	19.76
10	38.994373	-75.794334	40.38	0.00	40.38
11	38.983165	-75.800858	40.75	0.00	40.75
12	38.984766	-75.809097	43.18	0.00	43.18
13	38.990103	-75.808411	41.72	0.00	41.72
14	39.000243	-75.803604	44.56	0.00	44.56
15	39.008780	-75.796051	47.04	0.00	47.04
16	39.016783	-75.791931	46.11	0.00	46.11
17	39.027452	-75.786438	51.74	0.00	51.74

Flight Path Receptor(s)

Name: FP 1 Description: Threshold height: 50 ft Direction: 68.96 deg Glide slope: 3.0 deg Pilot view restricted? Yes Vertical view restriction: 30.0 deg Azimuthal view restriction: 120.0 deg	Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
		deg	deg	ft	ft	ft
	Threshold	38.982364	-75.781116	51.71	50.00	101.71
	2-mile point	38.992744	-75.746361	51.57	603.60	655.16

Name: FP 2 Description: Threshold height: 50 ft Direction: 248.2 deg Glide slope: 3.0 deg Pilot view restricted? Yes Vertical view restriction: 30.0 deg Azimuthal view restriction: 120.0 deg	Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
		deg	deg	ft	ft	ft
	Threshold	38.983698	-75.776653	52.38	50.00	102.38
	2-mile point	38.972961	-75.811229	35.26	620.57	655.84

Name: FP 3 Description: Threshold height: 50 ft Direction: 152.24 deg Glide slope: 3.0 deg Pilot view restricted? Yes Vertical view restriction: 30.0 deg Azimuthal view restriction: 120.0 deg	Point	Latitude	Longitude	Ground elevation	Height above ground	Total elevation
		deg	deg	ft	ft	ft
	Threshold	38.984499	-75.780430	51.41	50.00	101.41
	2-mile point	38.958914	-75.763085	55.87	599.00	654.87

PV Array Results

PV array 1

Component	Green glare (min)	Yellow glare (min)	Red glare (min)
FP: FP 1	0	0	0
FP: FP 2	0	0	0
FP: FP 3	0	0	0

Assumptions

- Times associated with glare are denoted in Standard time. For Daylight Savings, add one hour.
- Glare analyses do not account for physical obstructions between reflectors and receptors. This includes buildings, tree cover and geographic obstructions.
- The glare hazard determination relies on several approximations including observer eye characteristics, angle of view, and typical blink response time. Actual values may differ.
- Hazard zone boundaries shown in the Glare Hazard plot are an approximation and visual aid. Actual ocular impact outcomes encompass : continuous, not discrete, spectrum.

APPENDIX 13

Beacon Economic Impact Estimate



December 14, 2017

Cyrus Tashakkori, President
Open Road Renewables
1105 Navasota Street, Austin, TX 78702

Dear Mr. Tashakkori,

On December 4, 2017, you asked us to prepare a preliminary economic impact estimate for the Cherrywood Solar Project in Caroline County, MD.

Based on the project parameters you provided, we understand that construction for each of the three phases of this project last twelve months, beginning with 2019 and each phase will be operational upon completion of construction. You expect the project to have a 35-year operational life.

The additional project parameters you provided (per phase) were:

1. The project would have a footprint of 1,212 acres at 6 acres per MW;
2. The capital expenditures per MW would be \$1,300,000;
3. There would be five construction jobs per MW;
4. There would be eight jobs supported per annum for operations;
5. There would be 50% State Abatement;
6. The annual personal property taxes would be \$2,626,000;
7. The annual property taxes on the land would go from \$4,513 to \$118,776;
8. The annual landowner payments would be \$1,333,200;
9. The annual operational costs would be \$8,000 per MW.

Based on these parameters and on additional research we conducted, we prepared preliminary impact estimates using Social Accounting Matrix multipliers calculated by the Minnesota IMPLAN Group. These estimates are presented on the next page.

CONSTRUCTION IMPACTS (2019 through 2022 in phases):

Output: \$656.5M direct, \$89.8M indirect, and \$111.6M induced for a total of \$857.9M.

Annual Jobs Supported: 500 direct, 49 indirect, and 72 induced for a total of 621.

Annual Fiscal Impact: \$3.1M (Excluding property taxes which are estimated in the O&M phase).

OPERATION AND MAINTENANCE IMPACTS (35 Years):

Net Output: \$311M direct and \$145M induced impact (\$269M total in 2020 dollars).

Jobs Supported: 61.5 jobs per year of operation.

Fiscal Impact including net new property taxes: \$112M (\$84M in 2020 dollars).

PAYMENT TO LANDOWNERS IMPACTS (35 Years):

Output: \$118.8M direct and \$32.8M indirect (\$269M total in 2020 dollars).

Annual Jobs Supported: 8 direct and 7 induced for a total of 15.

Please note that these preliminary estimates are not actual forecasts. These estimates are simple scenario analyses that indicate what the likely impact outcomes would be under the assumptions used. It should also be noted that these numbers are subject to change when a comprehensive economic impact assessment is undertaken using more precise project data. It is possible that such a study could yield results that are +/- 10 to 15% different than these preliminary estimates.

Please do not hesitate to contact us if you have any questions.

Sincerely,



Dr. Memo Diriker, Director

APPENDIX 14

*DNR Wildlife and Heritage
Response Letter*



Larry Hogan, Governor
Boyd Rutherford, Lt. Governor
Mark Belton, Secretary
Joanne Throwe, Deputy Secretary

November 30, 2017

Mr. Dane S. Bauer
H&B Solutions, LLC
37534 Oliver Drive
Selbyville, Delaware 19975

RE: Environmental Review for Cherrywood Solar I, LLC - Cherrywood Central Solar Project, Project No: 17011.00, Proposed 202 MW Solar Photovoltaic Power Project, along Route 313, Caroline County, Maryland.

Dear Mr. Bauer:

The Wildlife and Heritage Service has the following areas of potential concern for this proposed project, broken down by the three sections for easier reference:

Upper Section

For **Property 1** (Tax Map 11, Parcel 52), **Property 2** (Tax Map 11, Parcel 158), **Property 3** (Tax Map 11, Parcel 53), **Property 4** (Tax Map 11, Parcel 56), **Property 5** (Tax Map 11, Parcel 58), and **Property 6** (Tax Map 11, Parcel 5), the Wildlife and Heritage Service has determined that these parcels fall within the drainage area of the Crescent macrosite, which is a complex of nontidal wetlands known to support several species of plants and amphibians with rare, threatened or endangered state status, including:

<u>Scientific Name</u>	<u>Common Name</u>	<u>State Status</u>
<i>Fimbristylis perpusilla</i>	Harper's Fimbristylis	Endangered
<i>Hypericum denticulatum</i>	Coppery St. John's-wort	Threatened
<i>Eleocharis melanocarpa</i>	Black-fruit Spikerush	Endangered
<i>Hottonia inflata</i>	Featherfoil	Endangered

It is important to note that we do not have any such records documented as occurring on these specific parcels, however, any nontidal wetlands present on them could be potential habitat for such species. We would suggest that activities on these parcels be planned so that there are not adverse impacts to the surrounding hydrology or water quality.

For **Property 3** and **Property 4**, in addition to the above comments, these parcels are located within the drainage to a portion of the Upper Choptank River that is known to support rare, threatened or endangered species. In fact, there are records for a population of state-listed endangered Triangle Floater (*Alasmidonta undulata*) and a population of state rare Deciduous Holly (*Ilex decidua*) that overlap the parcel boundaries of both **Property 3** and **Property 4**. Direct impacts to the Deciduous Holly population are unlikely given that there is to be no forest disturbance. As freshwater mussels are known to be very susceptible to the effects of siltation or changes in water quality, we would encourage the applicant to adhere stringently to all appropriate best management practices for sediment and erosion control during any activities on these parcels, in order to reduce the likelihood of adverse impacts to the Triangle Floater population, and other native aquatics in the Upper Choptank.

Middle Section

For **Property 7** (Tax Map 10, Parcel 34), **Property 8** (Tax Map 11, Parcel 25), and **Property 9** (Tax Map 10, Parcel 11), the Wildlife and Heritage Service has determined that there are no official State or Federal records for listed plant or animal species within the delineated area shown on the map provided. As a result, we have no specific concerns regarding potential impacts or recommendations for protection measures at this time, for these parcels.

Lower Section

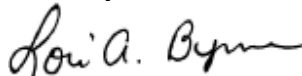
For **Property 10** (Tax Map 11, Parcel 7), **Property 11** (Tax Map 11, Parcel 51), **Property 12** (Tax Map 15, Parcel 66), and **Property 16** (Tax Map 15, Parcel 68), the Wildlife and Heritage Service has determined that these parcels are located within the drainage to a portion of the Upper Choptank River that is known to support several rare, threatened or endangered species. In addition, **Property 11** and **Property 12** are located within very close proximity to records of state-listed endangered Triangle Floater and state rare Sparkling Jewelwing (*Calopteryx dimidiata*). Both of these species have an aquatic larval stage that is very susceptible to the effects of siltation or changes in water quality. **Property 16** overlaps with a portion of the Upper Choptank River that is designated in state regulations as a Nontidal Wetland of Special State Concern. This wetland, along with its 100-foot upland buffer, is regulated as a Nontidal Wetland of Special State Concern by Maryland Department of the Environment. The species in close proximity to **Property 16**, for which the wetland is designated, include: Sparkling Jewelwing, Deciduous Holly, state rare Blackwater Bluet (*Enallagma weewa*), and state-listed endangered Creeping Burhead (*Echinodorus cordifolius*). Avoiding impacts to the regulated 100-foot buffer to this portion of the Upper Choptank River on this parcel would serve to protect these occurrences of rare, threatened and endangered species, although your project may need review by Maryland Department of the Environment for any permits needed in association with this wetland.

For the **property added** to the review request in your October 23, 2017 email (Tax Map 14, Parcel 16), the Wildlife and Heritage Service has determined that there are no official State or Federal records for listed plant or animal species within the delineated area shown on the map provided. As a result, we have no specific concerns regarding potential impacts or recommendations for protection measures at this time, for this parcel.

For the **overall project study area**, our remote analysis suggests that the forested area on this property contains Forest Interior Dwelling Bird habitat. Populations of many bird species which depend on this type of forested habitat are declining in Maryland and throughout the eastern United States. Interested landowners can contact us for further voluntary guidelines to help conserve this important habitat, although we have no concerns for this habitat if there is no disturbance to forested areas from the proposed project.

Thank you for allowing us the opportunity to review this project. If you should have any further questions regarding this information, please contact me at (410) 260-8573.

Sincerely,



Lori A. Byrne,
Environmental Review Coordinator
Wildlife and Heritage Service
MD Dept. of Natural Resources

ER# 2017.1602.cn
Cc: S. Gray, DNR

APPENDIX 15

MHT Response Letter

November 30, 2017

Mr. Dane Bauer
H&B Solutions
37534 Oliver Dr.
Selbyville, DE 19975

Re: MHT Review of Proposed Cherrywood Central Solar Project (Cherrywood Solar I, LLC)
Caroline County, Maryland

Dear Mr. Bauer:

Thank you for providing the Maryland Historical Trust (MHT) with preliminary project information and site location maps for the above-referenced undertaking. In response to your request, we are reviewing the proposed undertaking to assess potential effects on historic properties in accordance with the Maryland Historical Trust Act, §§ 5A-325 and 5A-326 of the State Finance and Procurement Article. We understand that the construction of the proposed solar facility on the 1,000-1,200-acre site will require a CPCN license from the Maryland Public Service Commission (PSC) and is therefore subject to state historic preservation law. Below are our preliminary comments and recommendations regarding potential effects on historic properties.

The Cherrywood Central Solar Project undertaking is a 202 MW solar generation facility proposed on approximately 1,000-1,200 acres located on 19 parcels between Goldsboro and Greensboro, Caroline County. To better identify potential historic properties please provide the MHT with an area of potential effects (APE) for this undertaking. The APE is defined before the identification of any historic properties and is "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties", if any such properties exist. The APE should reflect the potential visual, auditory, and physical effects to the setting of historic properties. The APE should also take into account topography and existing vegetation. Once a defensible APE is identified all resources over 50 years of age within that boundary must be identified and evaluated for listing in the National Register of Historic Places.

Archeology: Some of the parcels that are intended to be developed as part of the solar generation facility are located in areas that are archeologically sensitive -- such as the areas along the Choptank River and Oldtown Branch. While the majority of the proposed project area has not been systematically surveyed for archeological resources, MHT files indicate that six prehistoric archeological sites (18CA79, 18CA80, 18CA174, 18CA175, 18CA196, and 18CA197) have already been identified within the project area boundaries. In addition, MHT files also indicate that the sites of two early 19th century farmsteads -- CAR-22, (still extant) and CAR-23 (razed) -- are located within the project area, and aerial photographs and the 1875 atlas of Caroline County suggest that several other 19th century dwellings and/or farmsteads once stood within the project area.

Given the presence of the already-recorded prehistoric sites and the evidence of various 19th century farmsteads, it is our opinion that *some* parcels that are identified as part of the Cherrywood Central Solar project area have a moderate to high potential for containing additional archeological deposits that have not yet been identified. We are therefore recommending that Phase I archeological investigations take place prior to construction within *eight* of the proposed parcels that are outlined on the Cherrywood Solar Project map (dated October 23, 2017) to determine if any previously unidentified sites are located within the impact areas and to determine if

the known sites will be affected by the proposed undertaking. The parcels that require archeological survey work include the following:

- Parcel No. 0010-0018-0011
- Parcel No. 0011-0004-0052
- Parcel No. 0011-0004-0053
- Parcel No. 0011-0009-0056
- Parcel No. 0011-0020-0007
- Parcel No. 0011-0020-0051
- Parcel No. 0015-0001-0066
- Parcel No. 0014-0012-0008

The remaining parcels may be excluded from the Phase I investigations, as it is our opinion that they have a lower potential for containing significant archeological deposits that would be eligible for the National Register of Historic Places. The survey work must be carried out by a qualified professional archeologist and performed in accordance with the *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole 1994). Upon our review of the survey results, additional (Phase II) investigations of identified sites *may* be necessary.

Historic Built Environment: Due to the large scale of the project, there is high potential for direct or indirect effects on historic buildings and landscapes. With respect to the historic built environment, MHT should be provided with the following information, which will allow us to identify historic properties that might be affected by the undertaking and begin assessing the possible effects of the project on them as the proposed undertaking could be adversely affect the resources by changing their setting and view. The MHT has taken a cursory look at project area and adjacent properties and at a minimum the following resources must be evaluated for the National Register using the MHT's Determination of Eligibility (DOE) form:

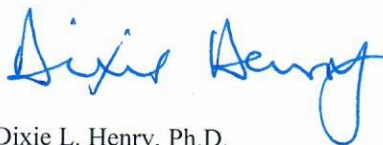
- 14267 Greensboro Road (Maryland Inventory of Historic Property No. CAR-23, Parcel No. 0014-0023-0038);
- 14697 Greensboro Road (MIHP No. CAR-22, Parcel No. 0015-0001-0066);
- 15045 Greensboro Road (MIHP No. CAR-167, Parcel No. 0011-0020-0001);
- 15642 Jackson Lane (Parcel No. 0011-0009-0056);
- 15642 Jackson Lane (Parcel No. 0011-0009-0058);
- 15833 Jackson Lane (Parcel No. 0011-0004-0053);
- Jackson Lane (MIHP No. CAR-107, Parcel No. 0011-0004-0052);
- 25970 Bridgetown Rd (Parcel No. 0010-0018-0011);
- 25802 Bridgetown Rd (Parcel No. 0010-0017-0025);
- 25799 Bridgetown Rd (Parcel No. 0010-0018-0064);
- 26047 Bridgetown Rd (Parcel No. 0010-0018-0014);
- 15551 Wharton Rd (Parcel No. 0010-0012-0007);
- 14875 Greensboro Rd (Parcel No. 0011-0020-0101);
- 14880 Greensboro Rd (Parcel No. 0011-0019-0018);
- 14558 Greensboro Rd (MIHP No. CAR-142, Parcel No. 0015-0001-0107);
- 13869 Cedar Lane (MIHP No. CAR-169, Parcel No. 0014-0017-0011);
- Any other resources over 50 years of age within the APE.

Please note that DOE forms for any farm complexes should include all associated buildings. If any property has been identified with an MIHP record but the historic structures are no longer extant, please complete MIHP Addenda form for that record and submit it with the other completed DOE forms. MHT would recommend that once you have hired a qualified consultant, they should conduct a review the APE for any additional resources over 50 years of age, not listed above, that may be need to have a DOE form completed.

DOE forms must contain sufficient description of buildings, structures, areas of land use, and the overall landscape of a property to evaluate its significance under National Register Criterion C and its historic integrity. This should include information about feature age, form, stylistic elements, methods of construction, materials, and condition. Forms must also contain sufficient historical context to evaluate a property under National Register Criteria A and B. This should include information derived from historic maps and land records; examination of the existing buildings, structures, and landscape as historical sources; and relevant information from existing reports and other secondary sources. All DOE forms must be completed by a qualified architectural historian, preservationist, or historian and be accompanied by supporting materials as described in *General Guidelines for Compliance-Generated Determinations of Eligibility* and *Standards and Guidelines for Architectural and Historical Investigations in Maryland*.

Upon our receipt of this information, we will be able to continue our review and provide informed recommendations regarding the project's potential effects on significant cultural resources. We look forward to receiving the information requested above and to further coordination as project planning proceeds. Additional information regarding the historic preservation review process and the *Standards and Guidelines* can be found on our website at <http://mht.maryland.gov>. If you have any questions or we may be of assistance, please do not hesitate to contact either Dixie Henry (regarding archeological resources) at dixie.henry@maryland.gov /410-697-9553 or Natalie Loukianoff (regarding historic buildings and landscapes) at natalie.loukianoff@maryland.gov /410-697-9587. Thank you for providing us with this opportunity to comment.

Sincerely,



Dixie L. Henry, Ph.D.
Preservation Officer
Maryland Historical Trust

DLH/NSL/201705810

cc: Susan Gray (DNR)
Gail Owings (Stories of the Chesapeake Heritage Area)