
**Staff Analysis of Proposed Amendment to the
Dane County Water Quality Plan,
Revising the Cottage Grove Urban Service Area Boundary and
Environmental Corridors in the Town of Cottage Grove**

1) Existing Conditions

a) Land Use

Surrounding Land Uses for the Amendment Areas Include:

“Shady Grove”-The northern edge of this amendment area is contiguous to the sewer service area (SSA).

- North—Agricultural, Institutional (school)
- South—Agricultural, Single-family residential,
- West—Agricultural, Woodland, Single-family residential
- East—Single-family residential

“Wilden-Olsen”-The northern and eastern edges of this amendment area are contiguous to the SSA.

- North— Single-family residential
- South—Agricultural, Woodland, Single-family residential
- West—Agricultural, Woodland
- East—Agricultural, Woodland, Single-family residential

“Drumlin Grove”-The southern edge of this amendment area is contiguous to the SSA.

- North—Agricultural, Open land, Single-family residential
- South—Agricultural, Woodland, Single-family residential, Multi-family residential
- West—Single-family residential, Open land
- East—Mineral extraction, Open land

“School Grounds”- Existing development (coffee shop and art gallery). The southern and eastern edges of this amendment area are contiguous to the SSA.

- North—Open land, Single-family residential
- South—Agricultural, Open land,
- West—Open land, Single-family residential, Woodland
- East—Commercial

Land Use	Existing (Acres)	Proposed (Acres)	Env. Corridor (Acres)
Agriculture	69.1		
Commercial	0.6	0.7	
Open Land	29.8		
Recreation	0.0		49.7
Residential	11.3	72.0	2.9
Transportation, Communications and Utilities	4.6	24.5	0.0
Water	1.2		
Woodlands	33.4		
Misc			0.3
TOTAL	150.1	97.2	52.9

b) Cultural and Historic Sites

The Wisconsin Historical Society has been contacted regarding the presence of any known archaeological sites or cemeteries within the amendment areas. Their April 14, 2017 review letter recommends an archaeological survey of the Drumlin Grove area.

c) Natural Resources

The proposed Drumlin Grove, Shady Grove, and Widen Olsen amendment areas are located in the Door Creek subwatershed (see Map 5). Door Creek flows into Lake Kegonsa and the Yahara River approximately eight miles to the south. The School Grounds amendment area drains to Koshkonong Creek, located approximately 1.5 mile to the east.

Two mapped, unnamed, intermittent tributaries traverse the northwest and southeast corners of the Shady Grove area to join Door Creek approximately one-half mile to the southwest (see Map 1A). There is a wooded area located in the southwestern quarter of the Shady Grove area.

An unnamed, perennial (ditched) tributary is located along the northwestern half of the Widen Olson area draining much of the Village of Cottage Grove from the north and discharging to Door Creek about one-half mile to the west. Approximately 12.5 acres of wetland and the edge of the 100-year floodplain is also located here (see Map 1B). The site includes an area of woodlands in this area, as well as along the drumlin ridgeline traversing the middle of the Widen Olsen amendment northeast to southwest. The Widen Olsen area also contains two small kettle ponds.

Due to the presence of these natural resources, part of the northwest quarter of the Widen Olsen area is identified in the Dane County Parks and Open Space Plan as part of the Door Creek Natural Resource Area. A Natural Resource Area consists of land that is specifically identified for the protection of a valuable natural environment and/or greenbelt corridor through a public process. This can include habitat protection and open space preservation. However, Natural Resource Area boundaries have no bearing on any zoning or land use decisions and participation by private landowners or local units of government to carry out any outlined resource protection initiatives is on a voluntary basis.

Door Creek

Door Creek begins as a small stream in the southeast corner of the Town of Burke and flows generally 14 miles south before emptying into Lake Kegonsa. Door Creek and its tributaries drain nearly 30 square miles of land in the drumlin-marsh area of eastern Dane County. Much of Door Creek has been straightened and ditched to facilitate agricultural drainage. It is a relatively sluggish stream subject to low flows and high temperatures. Soil loss in the watershed from cropland erosion is high and the stream bottom is covered with silt. This sedimentation decreases the amount of adequate aquatic habitat, increases the turbidity of the water, and affects the creek's temperature.

From its mouth at Lake Kegonsa upstream to its headwaters north of Interstate Highway 94, the DNR's current designated biological use of Door Creek is as a Limited Forage Fishery (this is the classification used to determine water quality criteria and effluent limits under NR 102 and NR 104). In 1982, the Village of Cottage Grove discontinued its wastewater discharge to Door Creek, sending it to the Madison Metropolitan Sewerage District Wastewater Treatment Facility where it is treated and subsequently discharged to Badfish Creek. The current biological use of Door Creek is as warmwater forage fishery and the attainable use is as a warmwater sport fishery. In 2002 a DNR aquatic biologist noted that water quality improvements have been documented and recommended that the stream should be upgraded to a warmwater forage fishery or warmwater sport fishery.

Since April 2012, all of Door Creek has been included on the state 303d list of impaired waters for total phosphorus from unknown sources of urban or rural nonpoint source pollution. While the DNR's 2016 assessments showed continued impairment by phosphorus the available biological data did not indicate impairment. A Total Maximum Daily Load (TMDL) for phosphorus has been established for this segment of Door Creek associated with the greater Rock River TMDL project.

In 2015 Dane County selected the Door Creek watershed for focus as a part of its larger scale work in the Yahara Watershed, because it contributes the second-highest phosphorus loading from agricultural land. The plan calls for working with agricultural landowners over the next ten years to install management practices (e.g. nutrient management planning, crop rotations, cover crops) and structural practices (e.g. grassed waterways, terraces, manure storage, barnyard runoff controls).

Koshkonong Creek

The proposed 1.2 acre School Grounds amendment area is located in the 130 square mile Koshkonong Creek watershed, which supports an extensive (49 mile long) warmwater sport fishery before emptying into Lake Koshkonong. The proposed amendment area is small compared to the overall contributing watershed and is located over one mile from Koshkonong Creek. There are also no woodlands, wetlands, hydric soils, or floodplains within the School Grounds amendment area. The parcel is occupied by a historic school house that is being reused as a coffee shop and art gallery. The current use will not change based on the status of the proposed urban service area (USA).

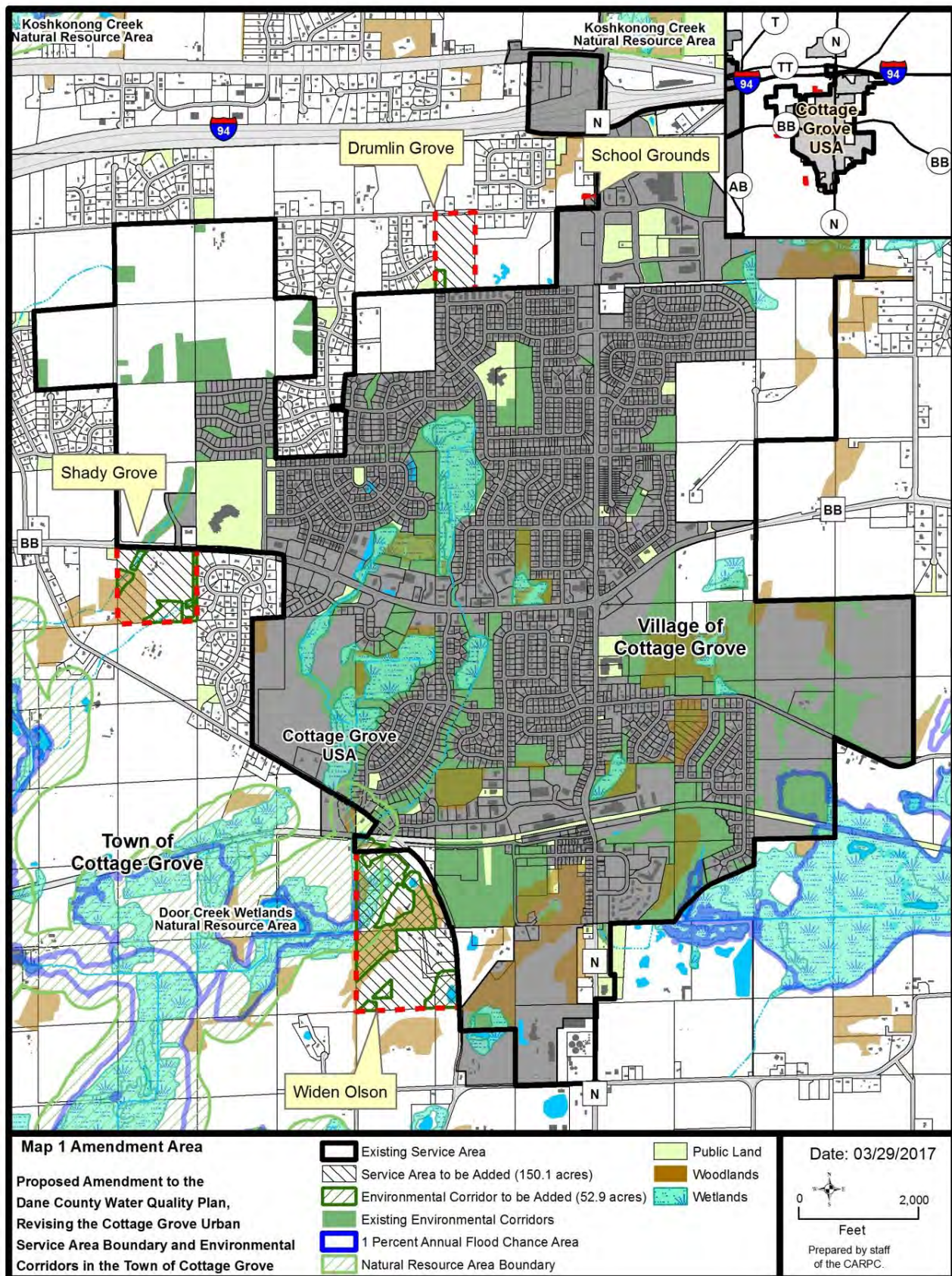
Wetlands

A wetland delineation of the northern part of the Widen Olsen site was conducted by Stantec in August 2016. The resulting wetland delineation map and report was provided with the amendment application. According to the report, a 12.45 acre wetland is located in the northwest corner of the Widen Olsen amendment area. It is a complex of primarily forested wetland with smaller components of wet meadow and farmed wetland that occupies a relatively flat basin. The wetland is surrounded by cultivated fields, except for an area of upland forest on the east. The wetland is directly adjacent to a perennial waterway, which is a tributary to Door Creek beyond the amendment area limits. The waterway has been ditched and straightened, presumably to enhance drainage of the surrounding agricultural fields.

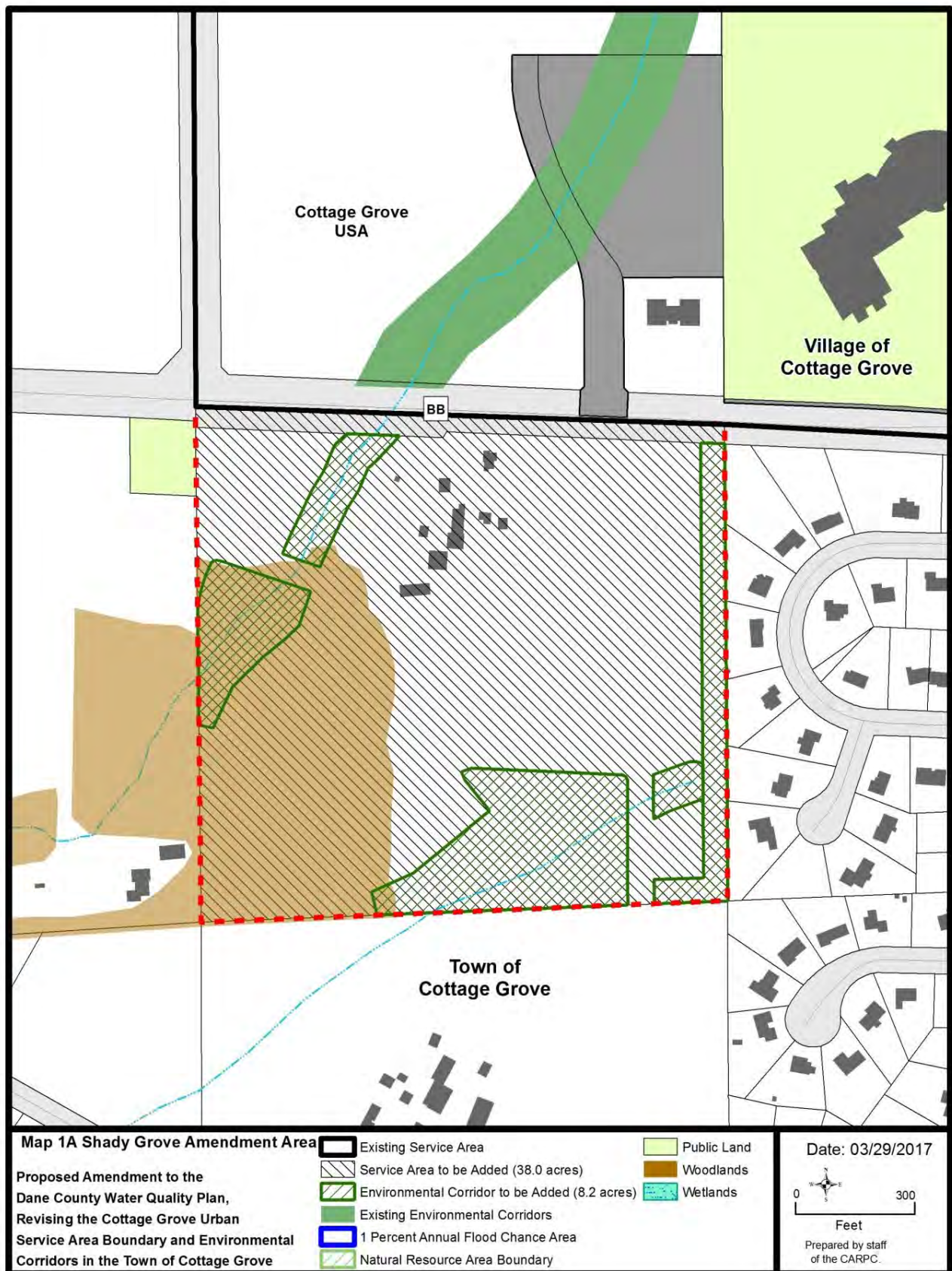
Another 0.4 acre excavated pond constructed in 2004-05 is located in the northeast corner of the Widen Olsen amendment area. It includes a small area of shallow marsh vegetation along the margins with the remaining portions consisting of forested wetland. The wetland appears to be isolated from other surface waters under typical conditions. An outlet exists, via a culvert under the driveway, which may allow ephemeral outflow.

According to the report, the wetlands identified within the amendment area are dominated by invasive plant species, specifically common buckthorn and reed canary grass.

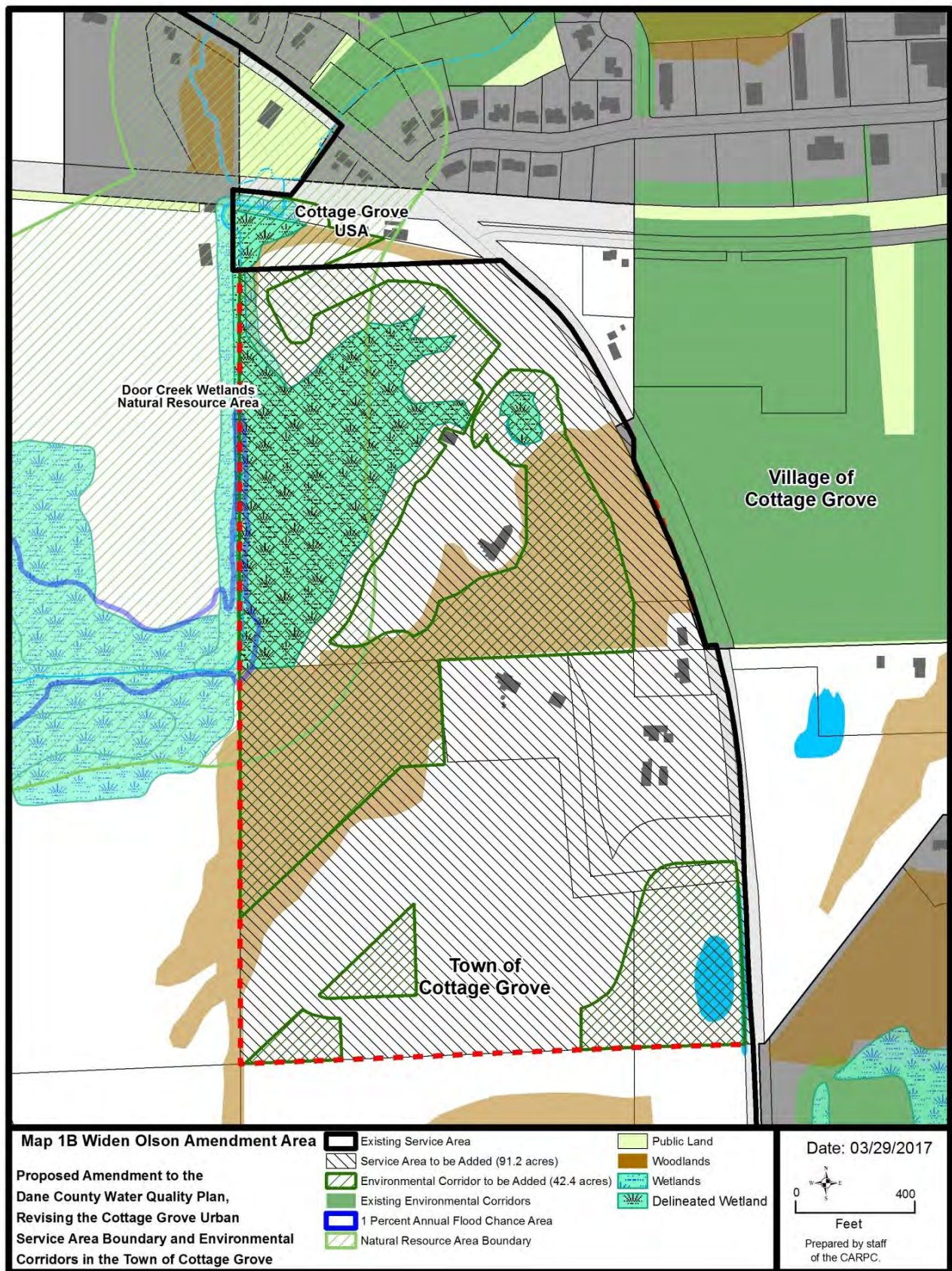
Map 1 - Amendment Area – Overview



Map 1A – Amendment Area – Shady Grove



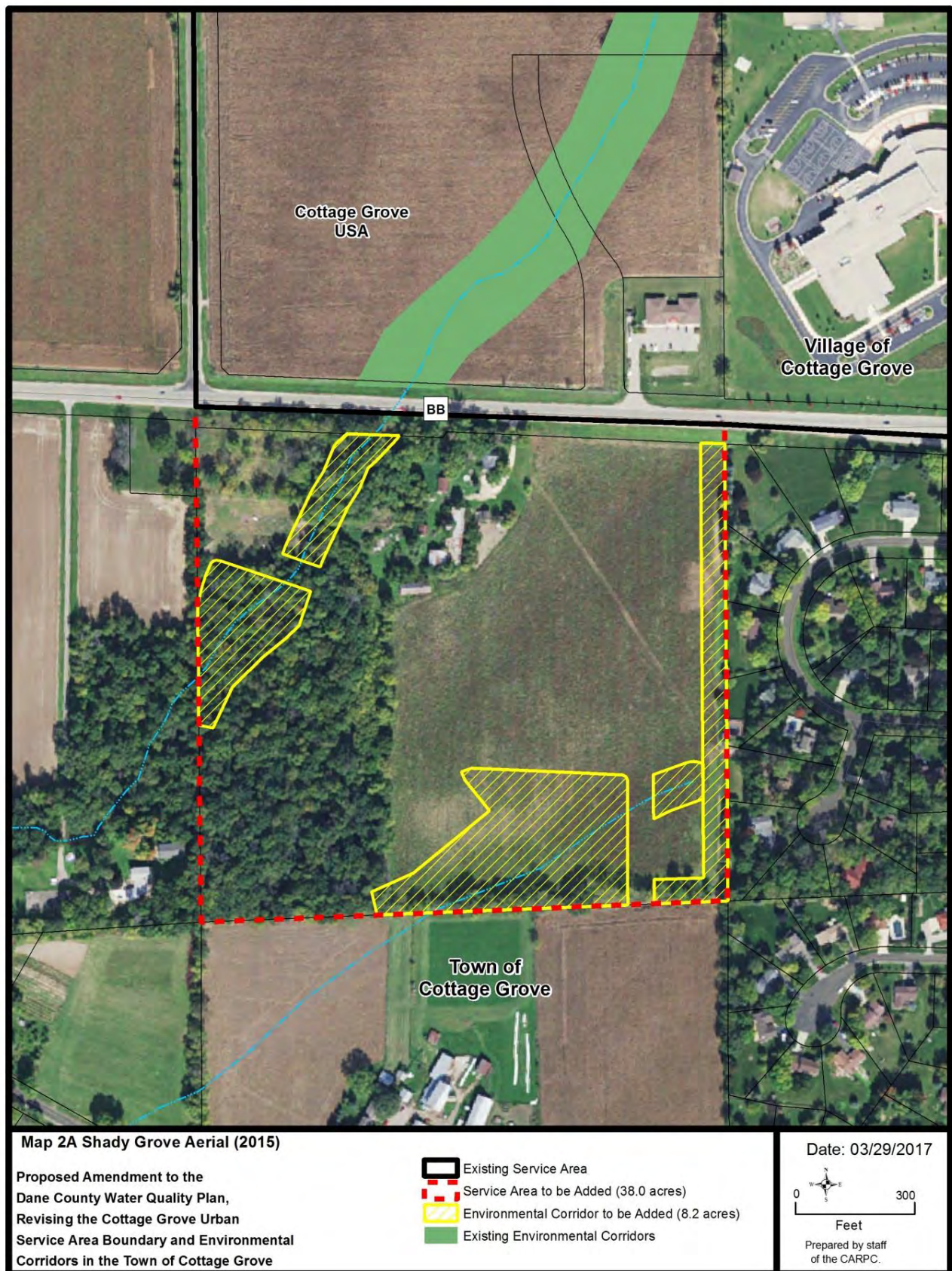
Map 1B – Amendment Area – Widen Olson



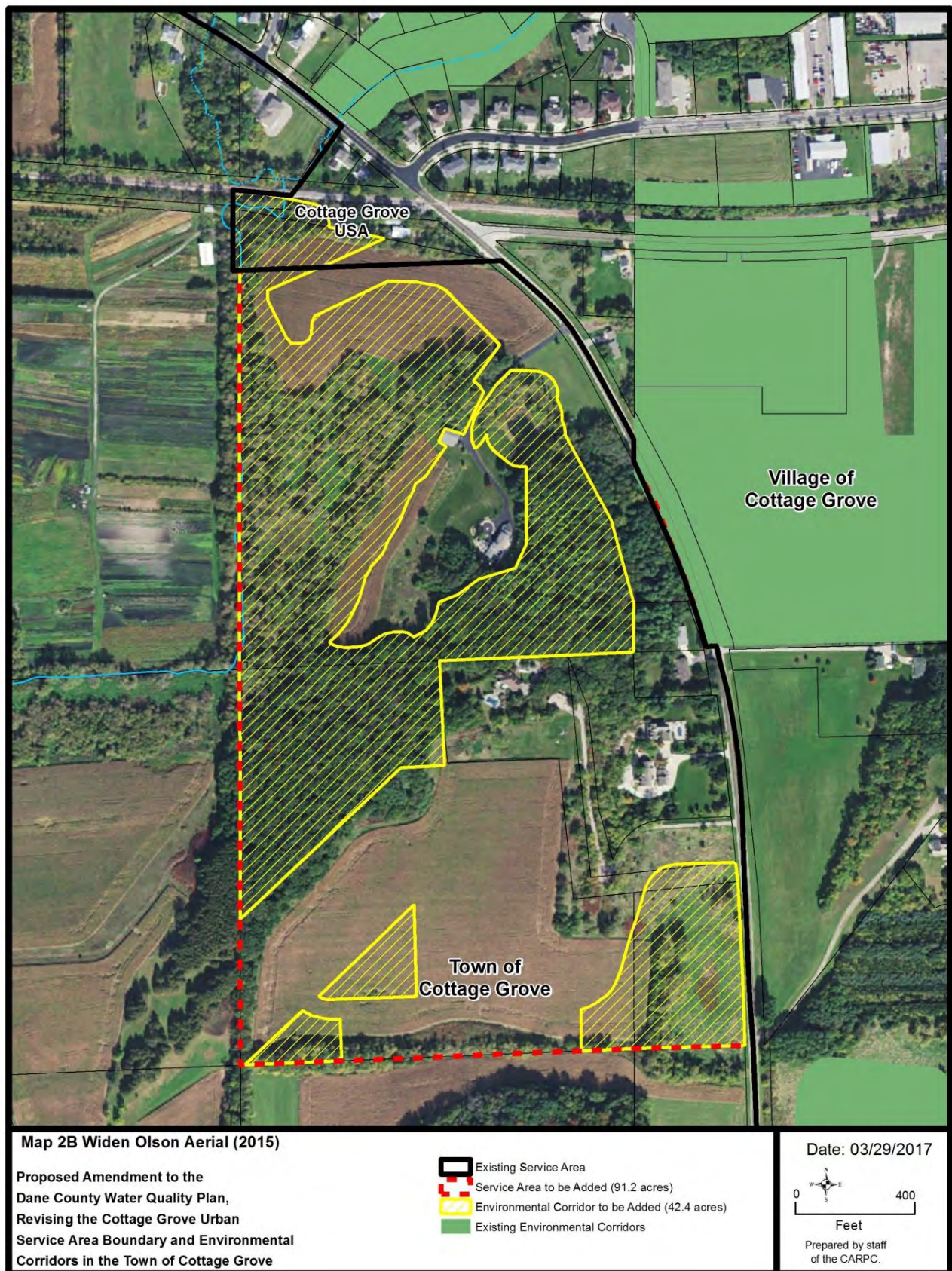
Map 1C – Amendment Area – Drumlin Grove



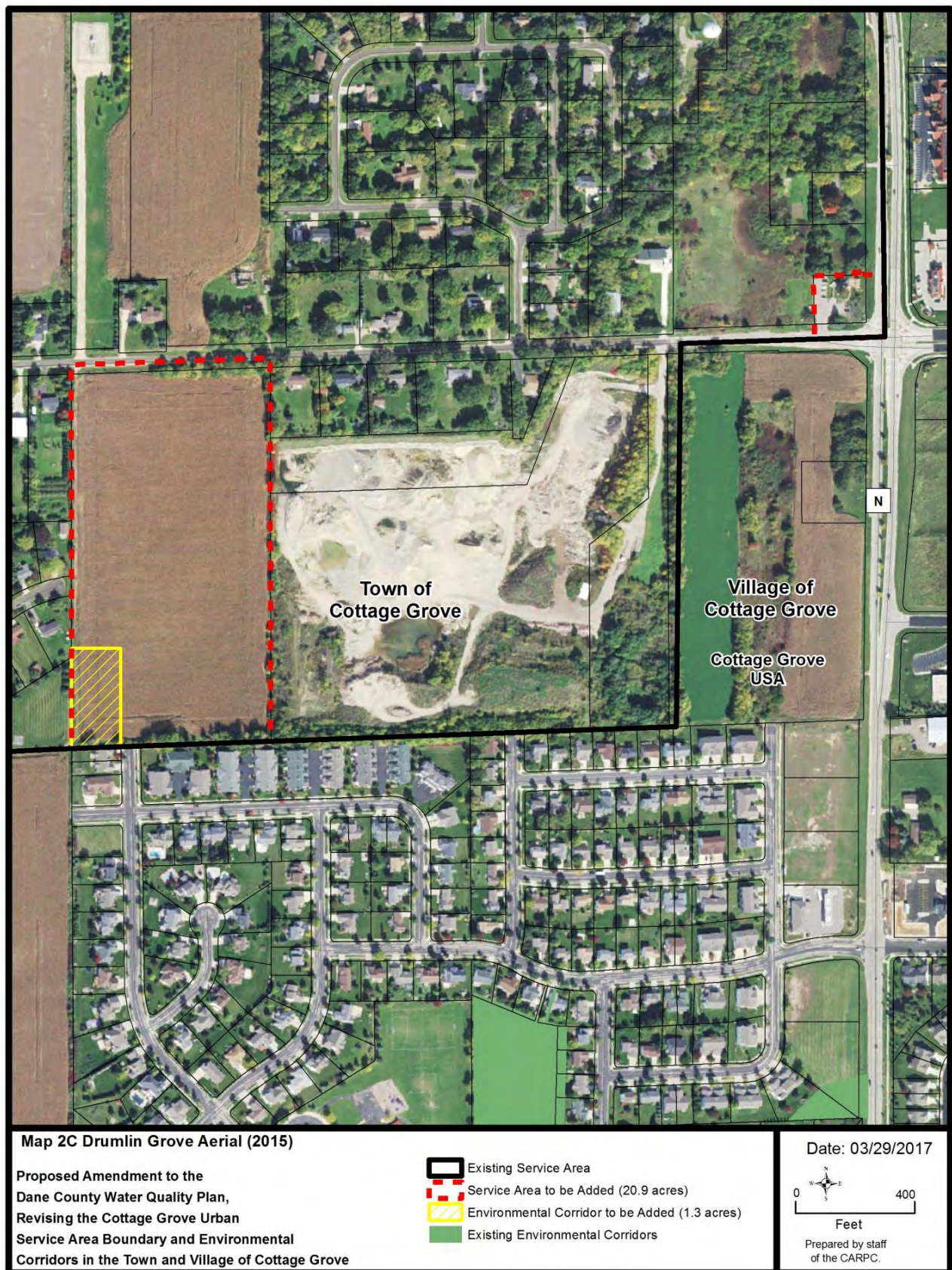
Map 2A – Aerial – Shady Grove



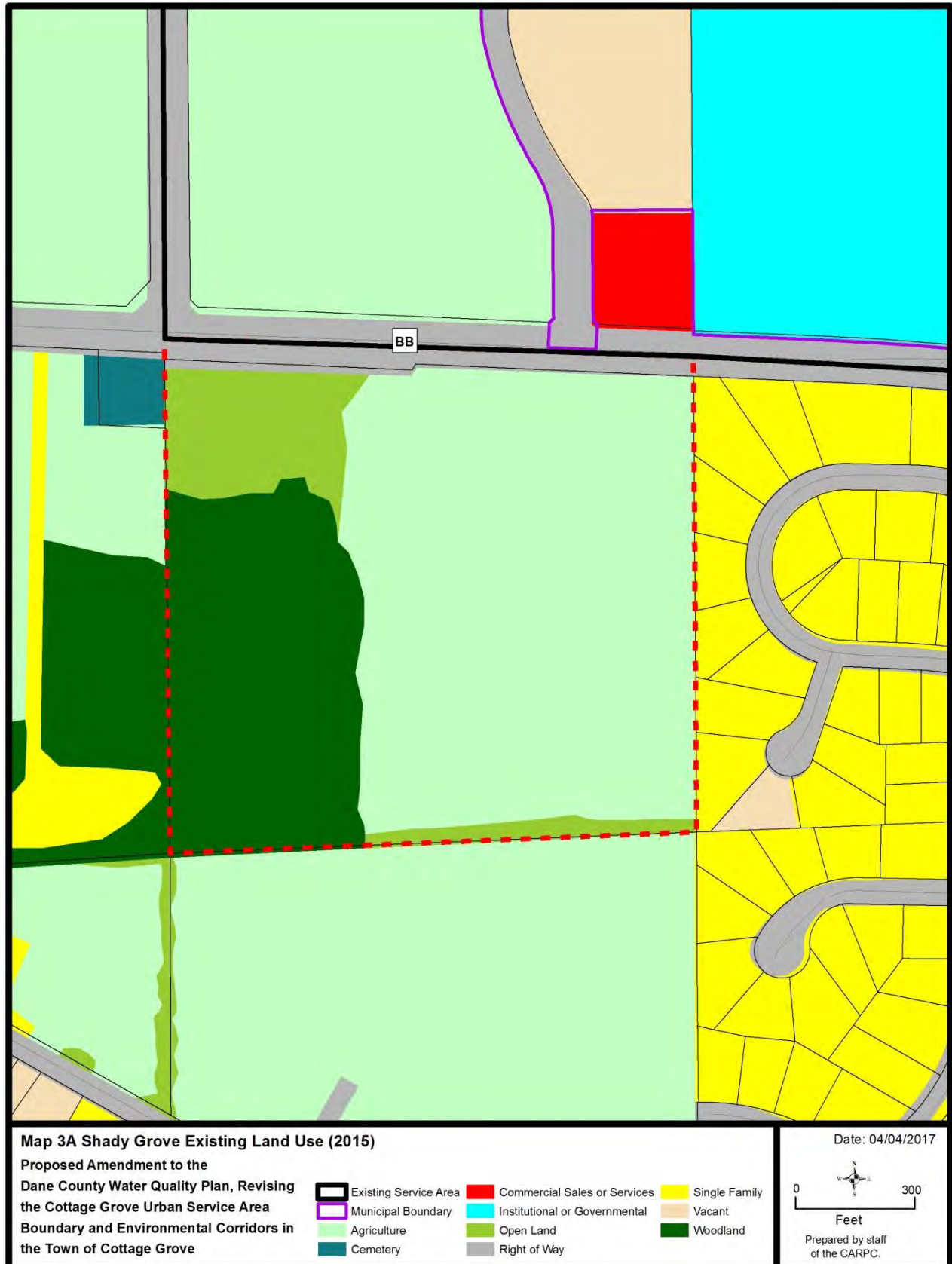
Map 2B – Aerial – Widen Olson



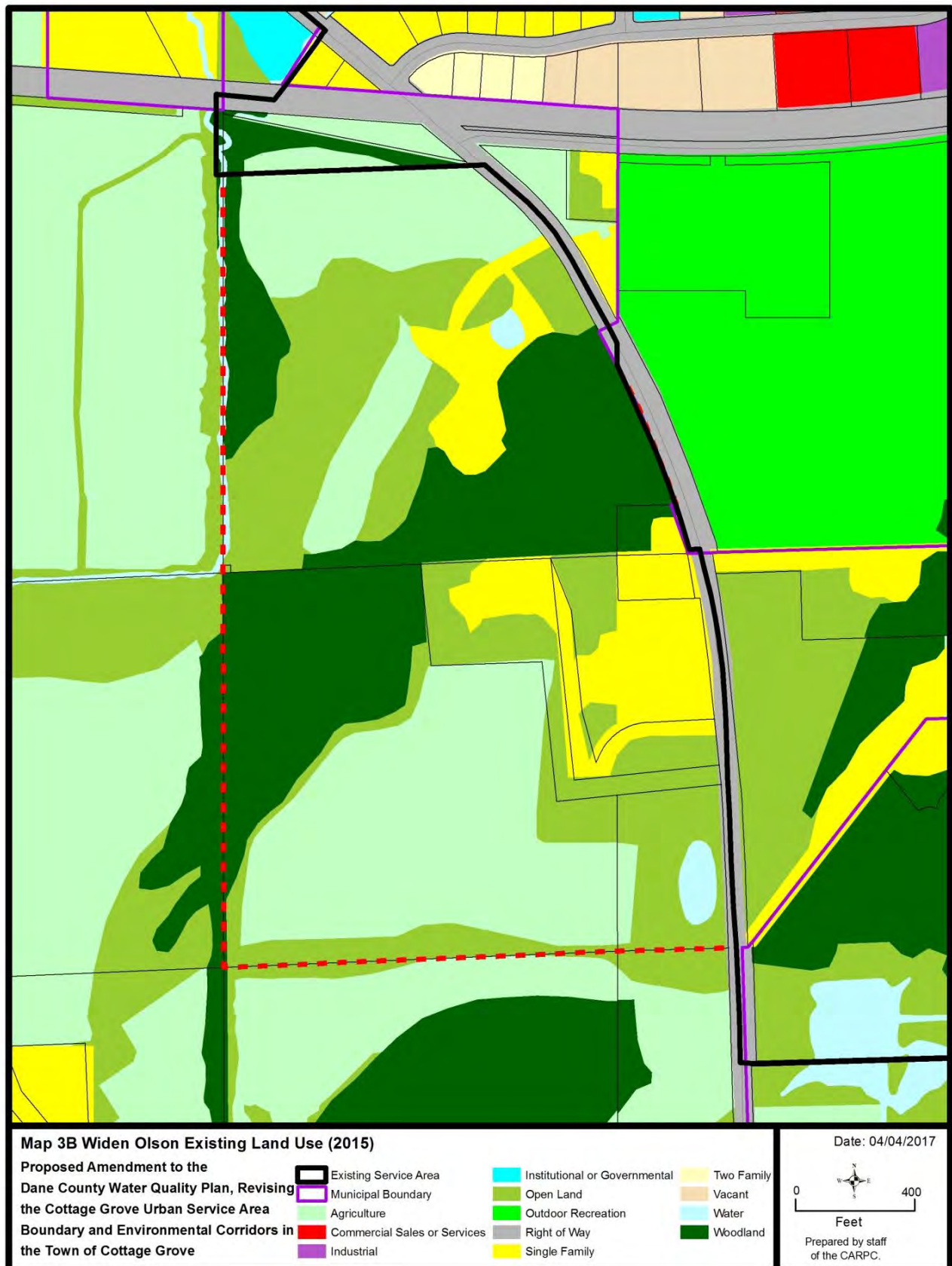
Map 2C – Aerial – Drumlin Grove



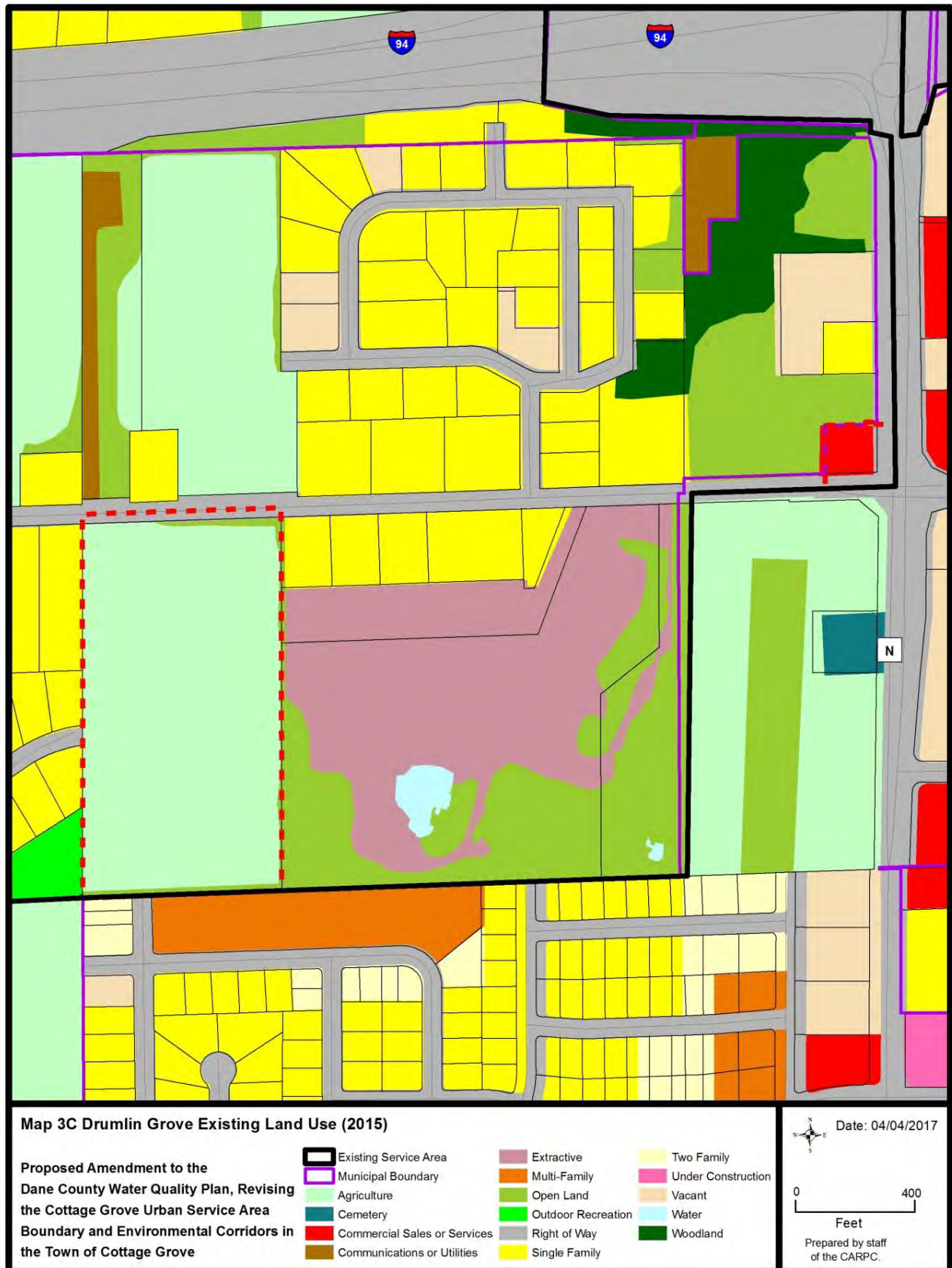
Map 3A – Existing Land Use – Shady Grove



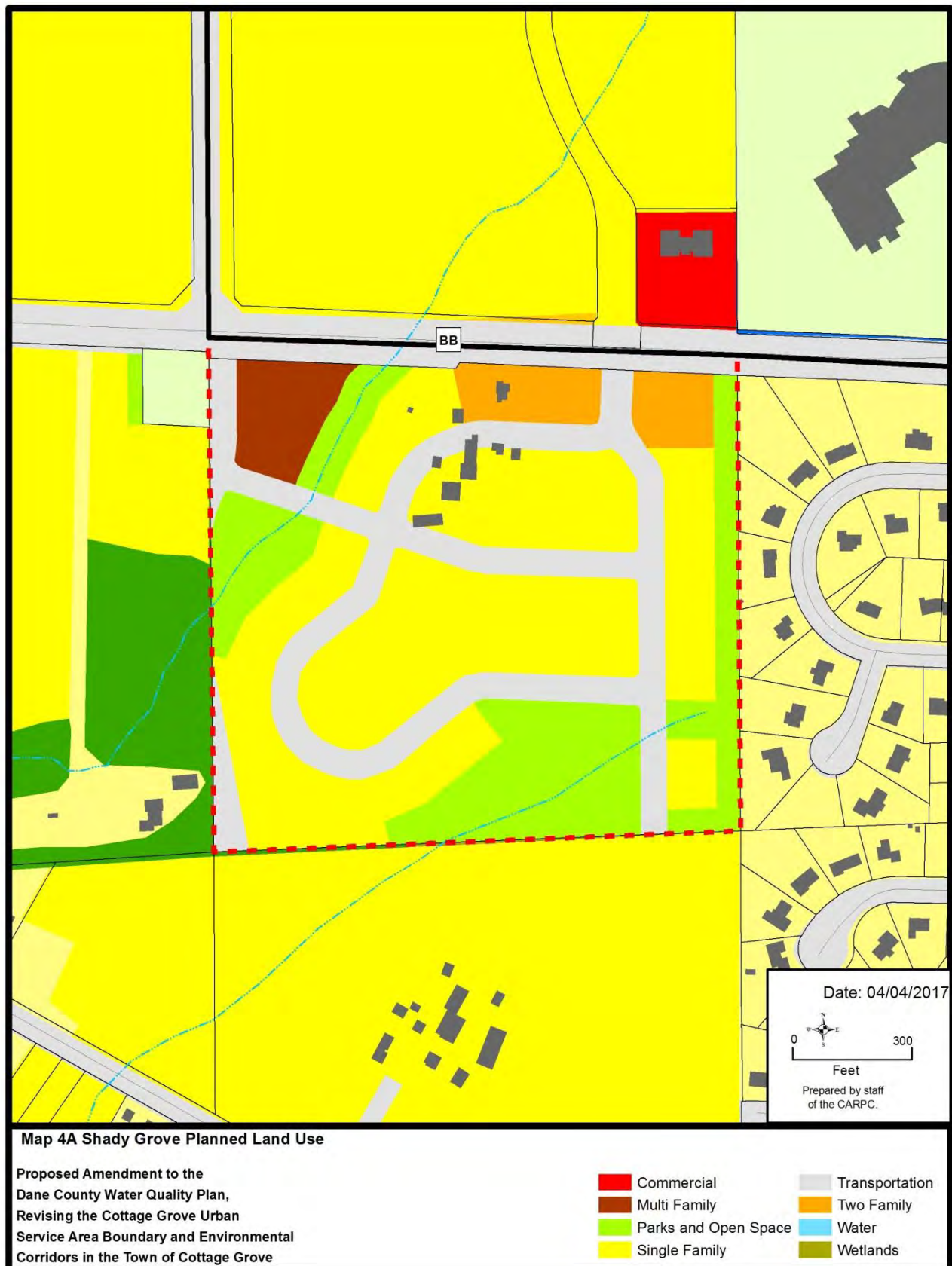
Map 3B – Existing Land Use – Widen Olson



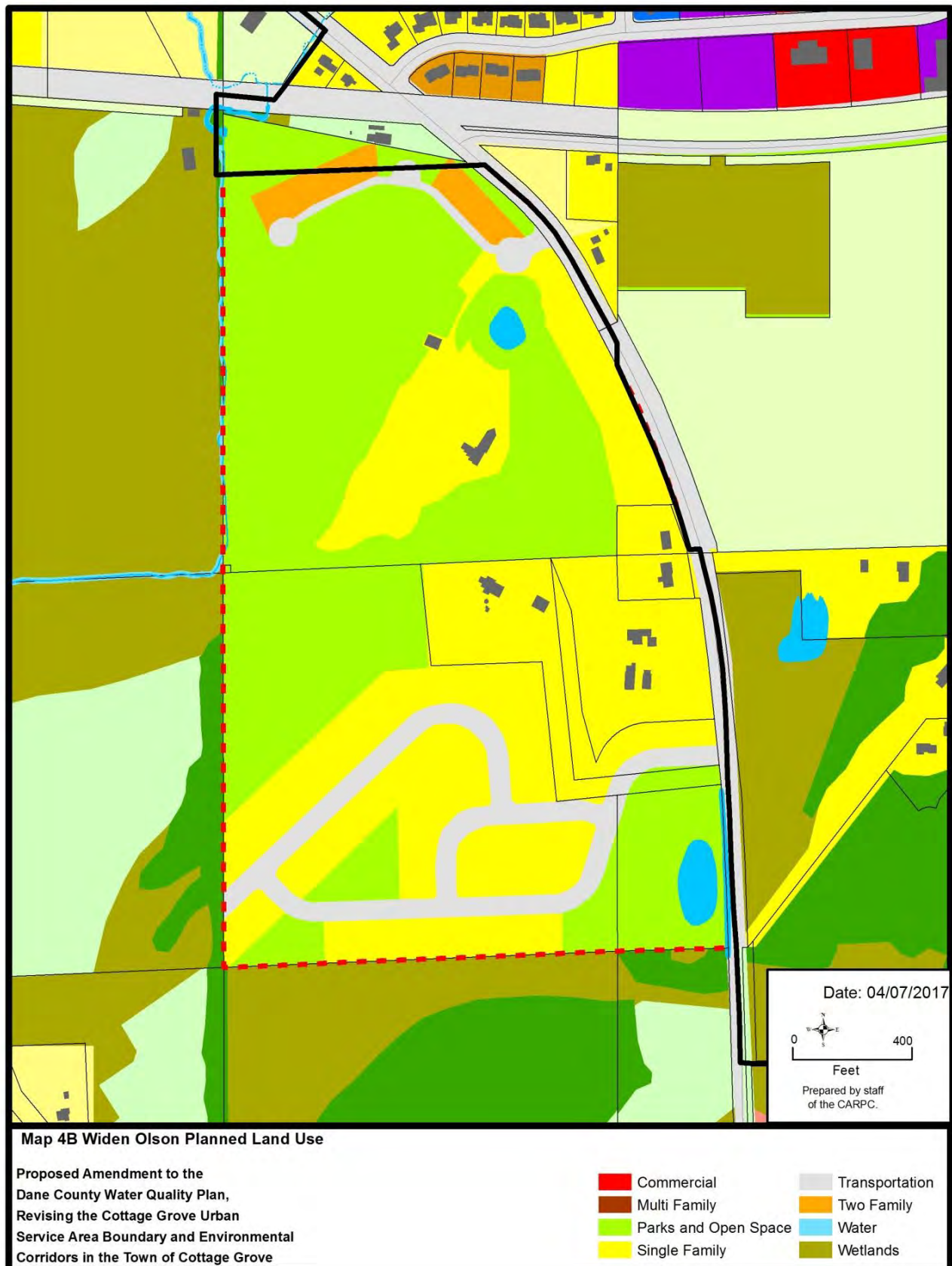
Map 3C – Existing Land Use – Drumlin Grove



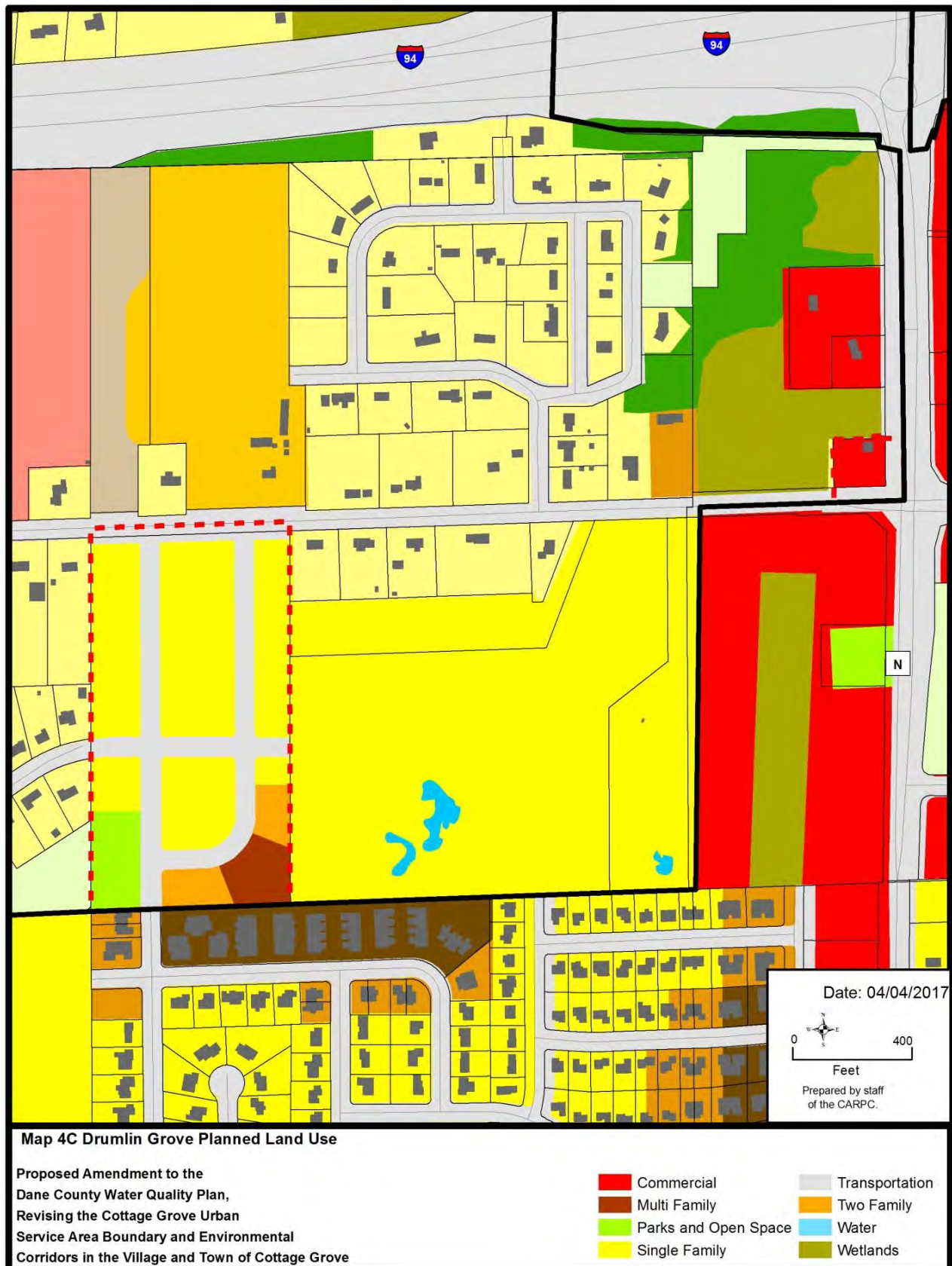
Map 4A – Proposed Land Use – Shady Grove



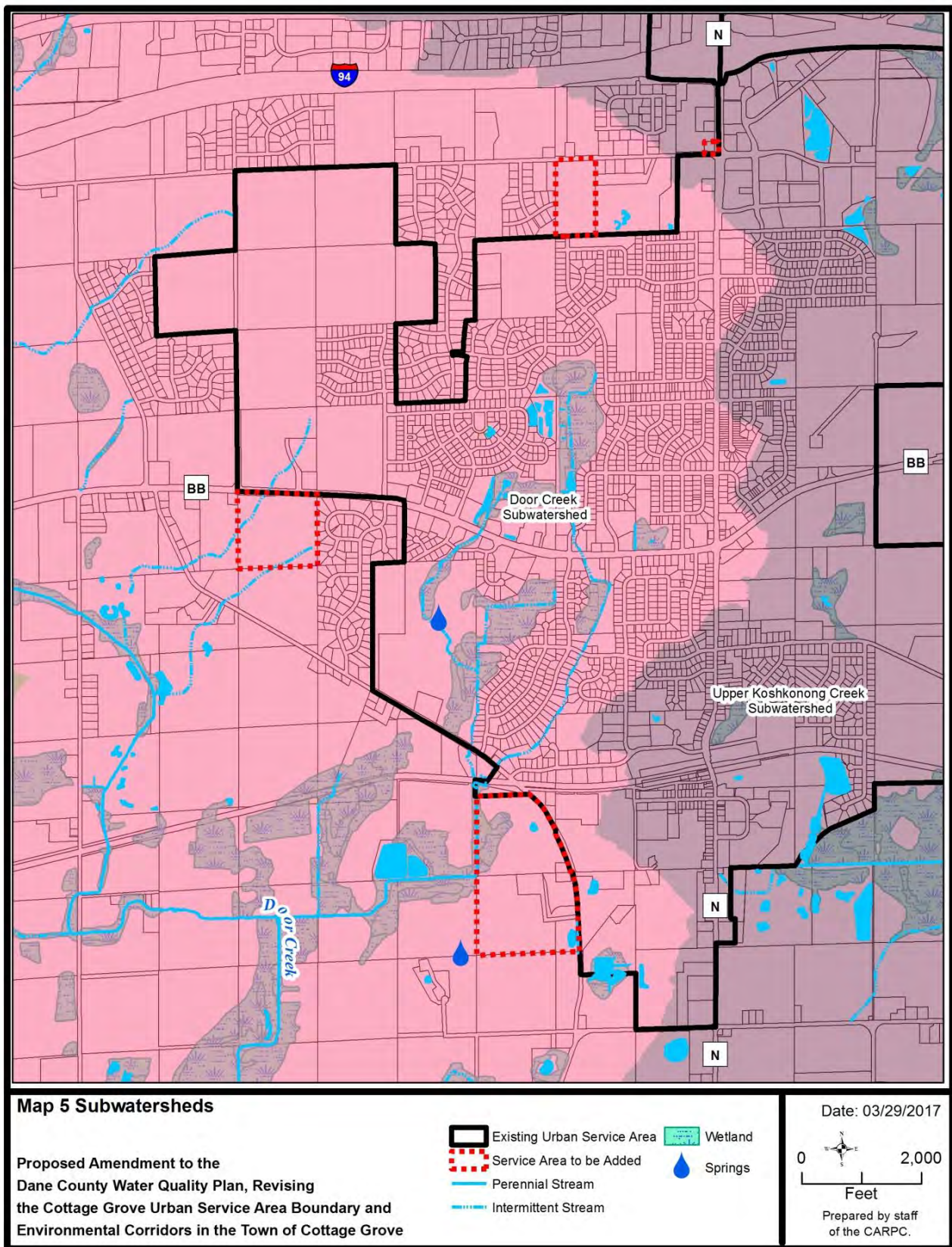
Map 4B – Proposed Land Use – Widen Olson



Map 4C – Proposed Land Use – Drumlin Grove



Map 5 – Subwatersheds



Groundwater

Groundwater modeling, using the regional groundwater model developed by the Wisconsin Geological and Natural History Survey (WGNHS), shows that baseflow in Door Creek near Cottage Grove has decreased from 5.01 cfs during predevelopment conditions (no water well pumping) to 3.33 cfs in 2010 due to the cumulative effects of well water withdrawals in the groundwatershed, which includes Madison.

In 2012, the WGNHS published a report estimating the existing groundwater recharge rates in Dane County based on the soil water balance method. The study estimates the existing groundwater recharge rate in Shady Grove amendment area to be about 9.5 inches per year, in the Widen Olson amendment area to be about 9.5 inches per year, and in the Drumlin Grove amendment main area to be about 9.3 inches per year.

Endangered Resources

The WDNR Bureau of Endangered Resources maintains a database representing the known occurrences of rare species and natural communities that have been recorded in the Wisconsin Natural Heritage Inventory. A screening review of this database conducted by CARPC staff did not identify any Threatened, Endangered, or species of Special Concern that have the potential to occur in the proposed amendment areas.

Soils and Geology

The amendment area is located in the Dane-Jefferson Drumlins and Lakes. The Land Type Associations of Wisconsin classifies the surficial geology of this area as an undulating complex of till plains with drumlins, outwash plains, lake plains and muck deposits. Surface elevations in Shady Grove amendment area range from 920 feet to 940 feet. The area includes some minor areas with steep slopes (> 12%) adjacent to an intermittent stream (see Map 6A). Surface elevations in the Widen Olson amendment area range from 860 feet to 970 feet. There are wide-spread areas with non-riparian steep slopes (see Map 6B). Surface elevations in the Drumlin Grove amendment area range from 940 feet to 990 feet. There are no steep slopes in the Drumlin Grove amendment area (see Map 6C).

According to the Natural Resource Conservation Service (NRCS) Soil Survey of Dane County, soils in the Shady Grove and Widen Olson amendment areas are primarily in the Dodge-St. Charles-McHenry association. These soils are moderately well drained and well drained, deep silt loams. Soils in the Drumlin Grove amendment area are in the Plano – Ringwood – Griswold association. These soils are moderately well drained and well drained, deep silt loams and loams. Table 2 shows detailed classification for soils in the amendment areas (see Maps 7A, 7B, and 7C). Table 3 shows important soil characteristics for the amendment areas (see Maps 7A, 7B, and 7C).

There are hydric soils (the Ho, Mc, SaA, and Wa soil map units) within the Widen Olson amendment area. Their mapped location is generally consistent with those areas that have been delineated as wetlands.

The Batavia¹, Plano¹, St. Charles¹, and Virgil, soils (the BbA, PnB, ScB, ScC2, and VwA, map units) are not hydric, but can have a seasonal (April to June) zone of water saturation within 5 feet of the ground surface. These soils are classified as well drained except for the Virgil soils which are classified as somewhat poorly drained. The poorly drained soils can have limited suitability for buildings with basements due to their seasonal high water table (zone of soil saturation), which can cause problems with groundwater induced flooding (see Map 8). These sites all have the potential for some areas where a seasonal high water table within 5 feet of the surface would limit infiltration within these areas to roof runoff or stormwater management practices using engineered soil with at least 10% fines.

¹ This is a recent change in classification by the NRCS for these three soils types. They were not previously identified as having a seasonal high water table within 5 feet of the surface.

According to WGNHS mapping, the bedrock in the Shady Grove amendment area is in the Ancell association. The bedrock in the Widen Olson amendment area mostly is in the Ancell association with a small portion in the southwest in the Trempealeau association. The bedrock in the Drumlin Grove amendment area is split between both the Sinnipee and Ancell association. Ancell Group bedrock, which is sandstone, siltstone, and/or shale, consists of two formations, the Glenwood and the underlying St. Peter, which were combined as one mapping unit. Sinnipee Group, which is dolomite with some limestone and shale, consists of three formations including the Galena, Decorah and Platteville Formations. Trempealeau Group, which is Quartz sandstone, dolomitic siltstone, silty dolomite, and sandy dolomite, consists of two formations, the Jordan and the underlying St. Lawrence, which were combined as one mapping unit. Thickness is about 75 feet, where not eroded. Based on WGNHS mapping of bedrock elevation, the depth to bedrock within the Shady Grove amendment area is 0 to 40 feet., Within the Widen Olson amendment area the depth to bedrock is 85 to 180 feet. Within the Drumlin Grove amendment the depth to bedrock is 5 to 35 feet.

As is common throughout much of the upper Midwest, karst features such as enlarged bedrock fractures are prevalent in the local dolomite uplands. Karst features such as vertical fractures and conduits provide primary pathways for groundwater movement and can dramatically increase groundwater susceptibility when present. The location of karst features are difficult to predict, and the thickness and type of the overlying soil greatly affects how much water drains into them. Where clay soils are thick, infiltration rates are likely to be very low. Where bedrock fractures are near the surface, however, infiltration rates can be very high, which can lead to potential groundwater contamination if adequate protection measures are not put in place. Based on the WGNHS Karst Potential map, the northern two-thirds of the main Drumlin Grove amendment area is within an area where the depth to bedrock over potential karst units is 8 to 33 feet. No karst features are present within the Shady Grove or Widen Olson amendment areas.

**Table 2A Shady Grove
Soils Classification**

Soil	% of Area	General Characteristics
<i>St. Charles Silt Loam; ScB</i>	54.3	Deep, well drained, sloping soils to moderately steep soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due to slopes, shrink/swell potential and low bearing capacity.
<i>Kidder Loam; KdD2</i>	15.0	Deep, well drained, gently sloping to very steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a very severe hazard of erosion and are moderately droughty. Poses severe limitations for development due to steep slopes.
<i>Dodge Silt Loam; DnB</i>	14.4	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due slope and shrink/swell potential.
<i>Plano Silt Loam; PnB</i>	11.8	Deep, well drained and moderately well drained, nearly level to sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due to low bearing capacity.
<i>Ringwood Silt Loam; RnB</i>	3.9	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses no limitations for development due to low bearing capacity.
<i>McHenry Silt Loam; MdC2</i>	0.5	Deep, well drained, gently sloping to moderately steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses slight to moderate limitations for development due to slopes, shrink/swell potential and low bearing capacity.

Source: Soil Survey Geographic data for Dane County developed by the USDA NRCS

**Table 2B Widen Olson
Soils Classification**

Soil	% of Area	General Characteristics
<i>Kidder Loam; KrE2</i>	19.1	Deep, well drained, gently sloping to very steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, a very severe hazard of erosion, and are moderately droughty. Poses severe limitations for development due to steep slopes shrink/swell potential and low bearing capacity.
<i>Dodge Silt Loam; DnB</i>	19.0	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due slope and shrink/swell potential.
<i>McHenry Silt Loam; MdC2</i>	15.0	Deep, well drained, gently sloping to moderately steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses slight to moderate limitations for development due to slopes, shrink/swell potential and low bearing capacity.
<i>Sable Silty Clay Loam; SaA</i>	13.0	Deep, nearly level and gently sloping, poorly drained soils on low benches in stream valleys. Soils have high fertility, moderate permeability, and a low hazard of erosion. Poses severe to very severe limitations for development due to low bearing capacity, moderate shear strength and compressibility, flooding, depth to saturated zone and shrink/swell potential.
<i>Wacousta Silty Clay; Wa</i>	9.3	Deep, poorly drained, nearly level soils on low benches in old lake basins. Soils have low fertility, moderately slow permeability, and no hazard of erosion. Poses severe limitations for development due to ponding and depth to saturated zone.
<i>Kidder Loam; KdC2</i>	8.8	Deep, well drained, gently sloping to very steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a severe hazard of erosion. Poses moderate limitations for development due to steep slopes.
<i>Batavia Silt Loam; BbA</i>	6.8	Deep, well drained, nearly level to sloping soils on high benches. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due to shrink/swell potential.
<i>Virgil Silt Loam; VwA</i>	3.1	Deep, nearly level and gently sloping, somewhat poorly drained soils on low benches on uplands and in stream valleys. Soils have high fertility, moderate permeability and a slight hazard of erosion. Poses severe to very severe limitations for development due to low bearing capacity, depth to saturated zone and shrink/swell potential.
<i>St. Charles Silt Loam; ScC2</i>	2.2	Deep, well drained, sloping soils to moderately steep soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate to severe limitations for development due to steep slopes, shrink/swell potential and low bearing capacity.
<i>Marshan Silt Loam; Mc</i>	1.9	Moderately deep, poorly drained, nearly level soils on low benches in major stream valleys. Soils have medium fertility, moderate subsoil permeability and rapid substratum permeability. Poses severe limitation for development due to seasonal high water table, subject to ponding, moderate bearing capacity, and is subject to liquefaction and piping.
<i>Kegonsa Silt Loam; KeB</i>	1.5	Moderately deep, well drained, nearly level and gently sloping soils on benches on outwash plains. Soils have medium fertility, moderate permeability, and a moderate hazard of erosion. Poses no limitations for development.
<i>Kidder Loam; KdD2</i>	0.2	Deep, well drained, gently sloping to very steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a very severe hazard of erosion and are moderately droughty. Poses severe limitations for development due to steep slopes.
<i>Houghton Muck; Ho</i>	0.1	Deep, very poorly drained, nearly level soils on low benches and bottoms in stream valleys. Soils have medium fertility and moderately rapid permeability. Poses severe to very severe limitations for development due to seasonal high water table, moderate bearing capacity and frost heave potential.

Source: Soil Survey Geographic data for Dane County developed by the USDA NRCS

**Table 2C Drumlin Grove
Soils Classification**

Soil	% of Area	General Characteristics
<i>Plano Silt Loam; PnB</i>	61.5	Deep, well drained and moderately well drained, nearly level to sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due to low bearing capacity.
<i>Ringwood Silt Loam; RnB</i>	32.7	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses no limitations for development due to low bearing capacity.
<i>Plano Silt Loam; PoA</i>	5.8	Deep, well drained and moderately well drained, nearly level to sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due low bearing capacity and erodibility.

Source: Soil Survey Geographic data for Dane County developed by the USDA NRCS

**Table 3A Shady Grove
Soils Characteristics**

Characteristic	Soil Map Symbols (see Map 7)	% of Area
Prime Agricultural Soils	DnB, PnB, RnB, ScB	84.5
Hydric Soils (Indicates Potential / Restorable Wetlands)	None	0.0
Soils with Seasonal High Water Table (< 5')	PnB, ScB	66.1
Soils Associated with Steep Slopes (> 12%)	KdD2	15.0
Soils Associated with Shallow Bedrock (< 5')	None	0.0
Poorly Drained Soils	None	0.0
Best Potential for High Rates of Infiltration in Subsoils	KdD2, MdC2, PnB, RnB, ScB	85.6

Source: Soil Survey Geographic data for Dane County developed by the USDA NRCS

**Table 3B Widen Olson
Soils Characteristics**

Characteristic	Soil Map Symbols (see Map 7)	% of Area
Prime Agricultural Soils	BbA, DnB, KeB, VwA	30.4
Hydric Soils (Indicates Potential / Restorable Wetlands)	Ho, Mc, SaA, Wa	24.3
Soils with Seasonal High Water Table (< 5')	BbA, Ho, Mc, SaA, ScC2, VwA, Wa	36.3
Soils Associated with Steep Slopes (> 12%)	KdD2, KrE2	19.3
Soils Associated with Shallow Bedrock (< 5')	None	0.0
Poorly Drained Soils	Ho, Mc, SaA, VwA, Wa	27.3
Best Potential for High Rates of Infiltration in Subsoils	BbA, KdC2, KdD2, KeB, KrE2, MdC2, ScC2	53.7

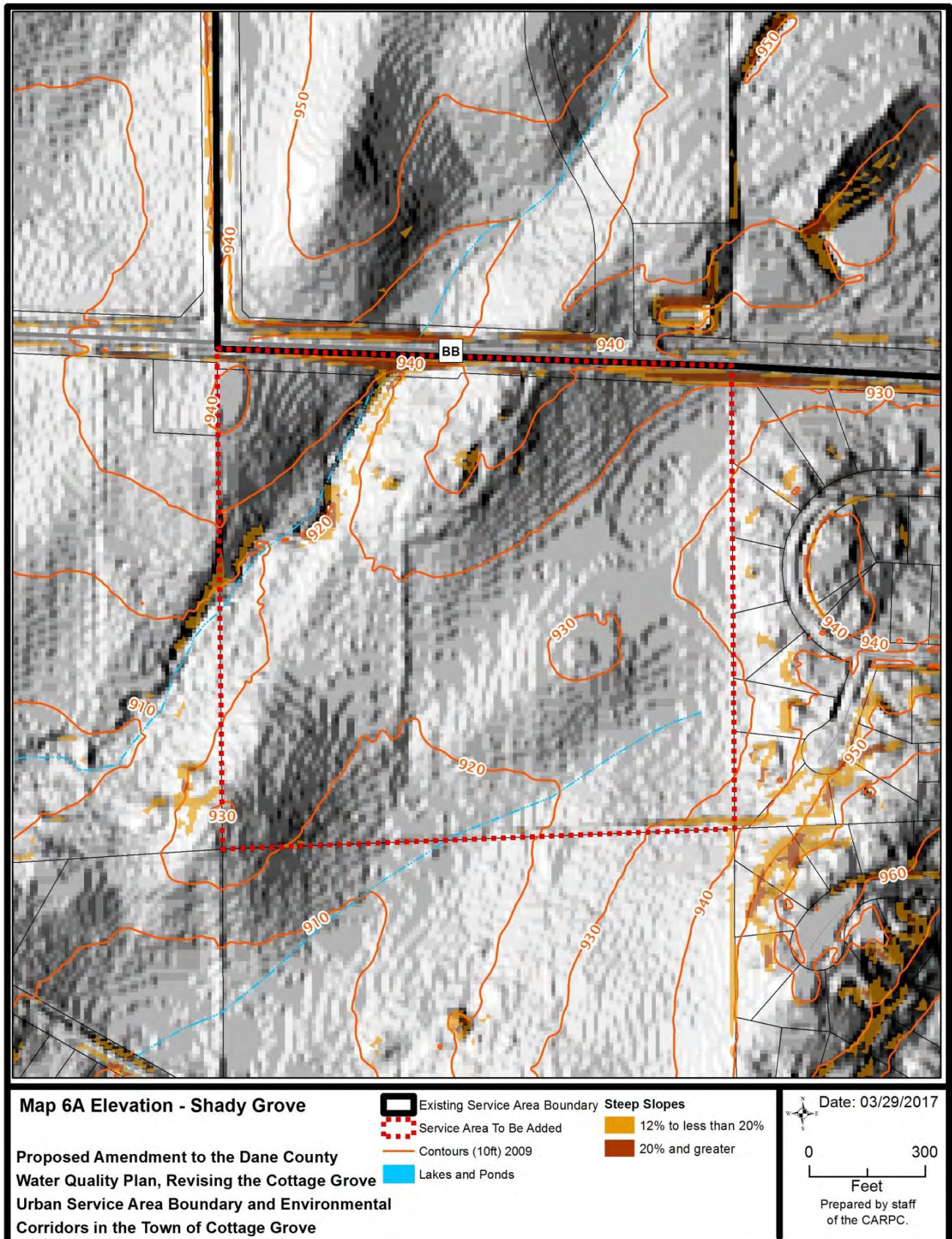
Source: Soil Survey Geographic data for Dane County developed by the USDA NRCS

**Table 3C Drumlin Grove
Soils Characteristics**

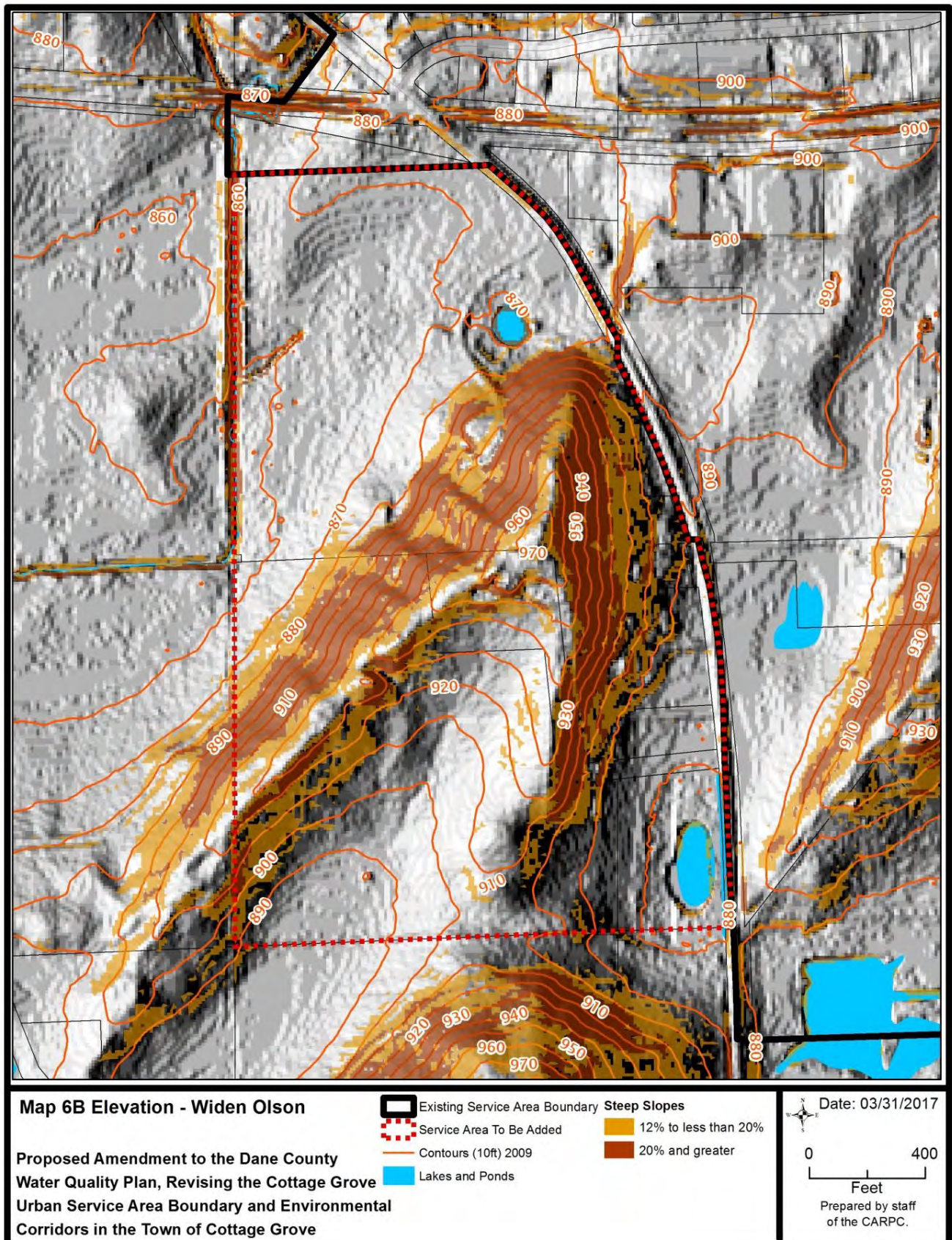
Characteristic	Soil Map Symbols (see Map 7)	% of Area
Prime Agricultural Soils	PnB, PoA, RnB	100.0
Hydric Soils (Indicates Potential / Restorable Wetlands)	None	0.0
Soils with Seasonal High Water Table (< 5')	PnB	61.5
Soils Associated with Steep Slopes (> 12%)	None	0.0
Soils Associated with Shallow Bedrock (< 5')	None	0.0
Poorly Drained Soils	None	0.0
Best Potential for High Rates of Infiltration in Subsoils	PnB, PoA, RnB	100.0

Source: Soil Survey Geographic data for Dane County developed by the USDA NRCS

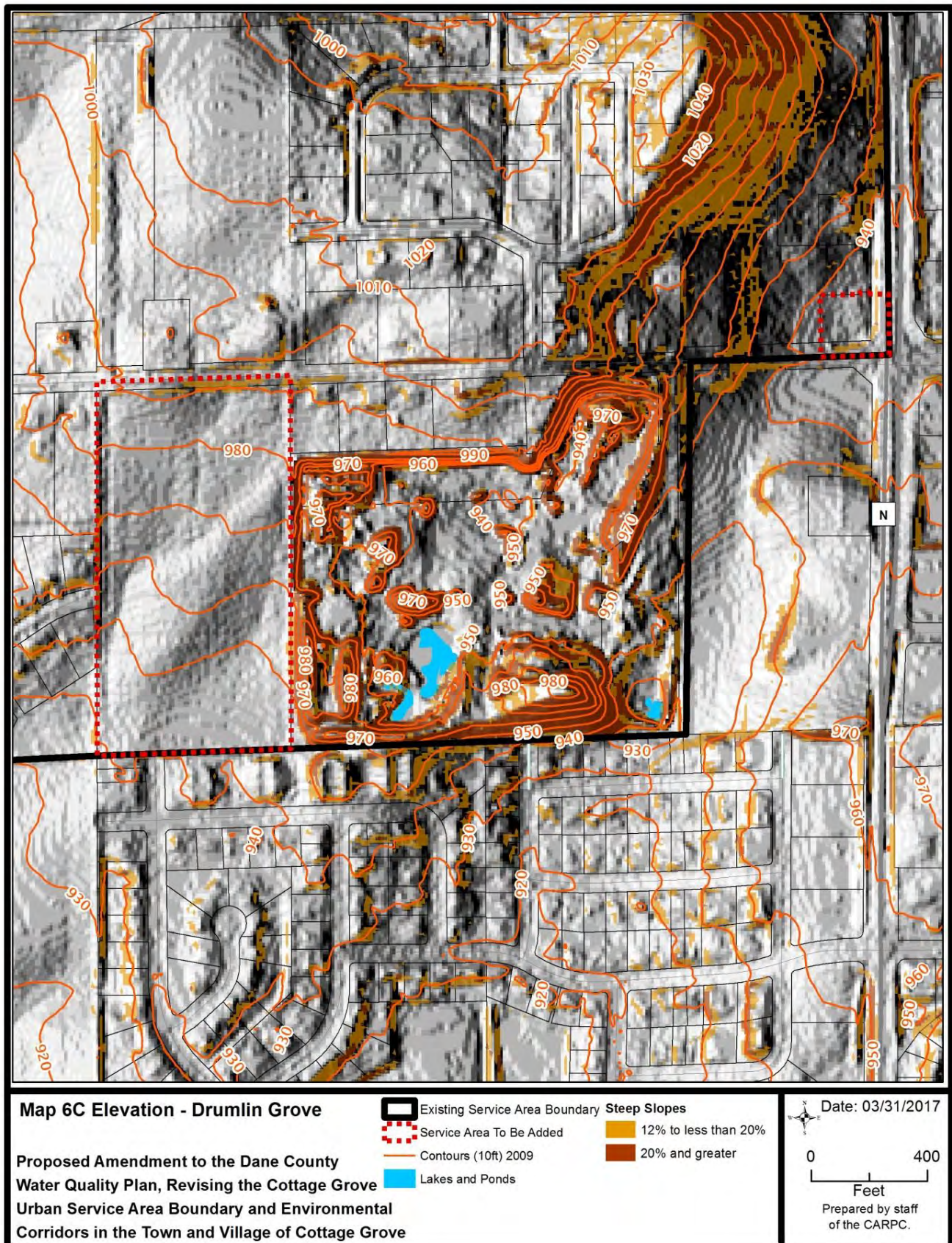
Map 6A – Elevations- Shady Grove



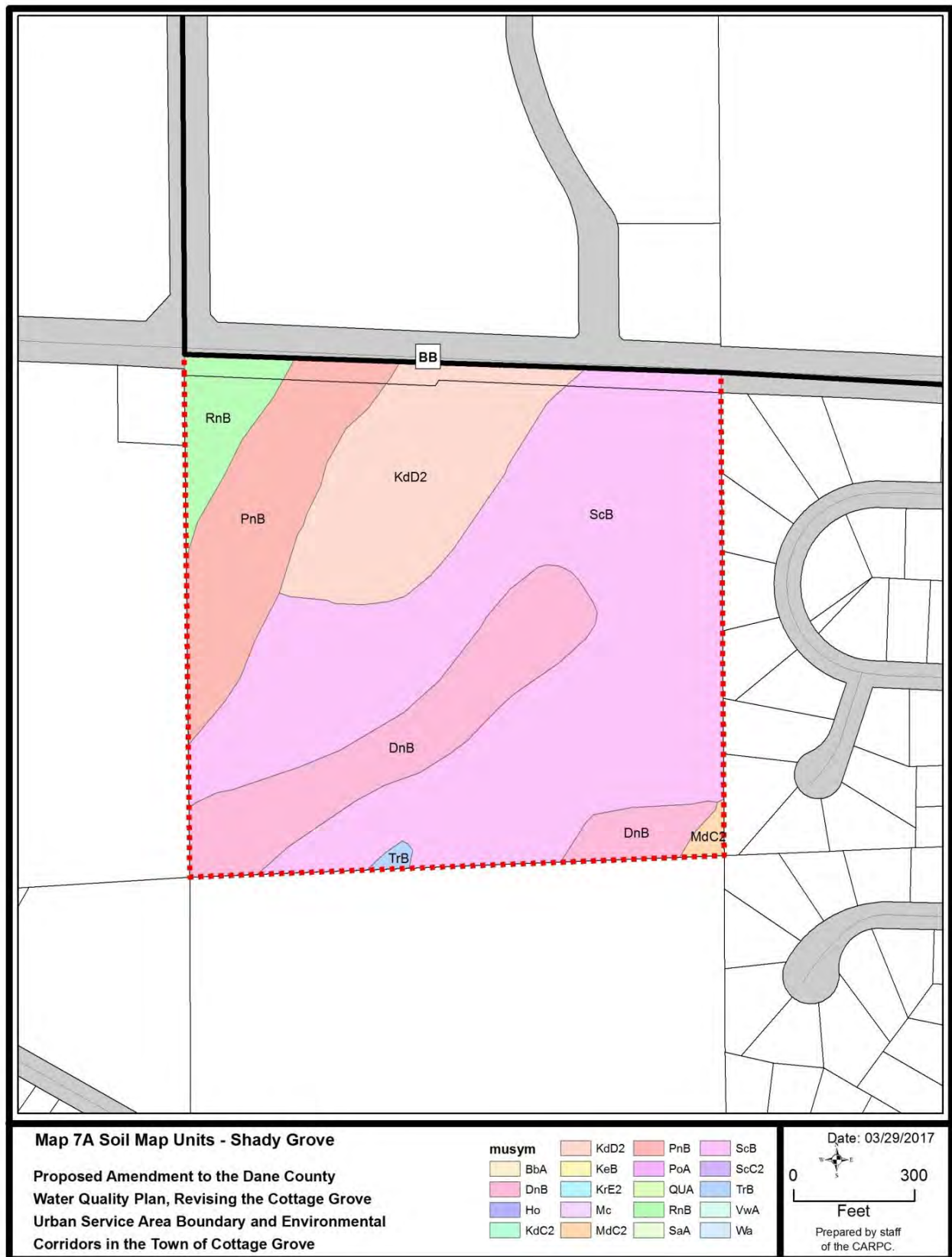
Map 6B – Elevations – Widen Olson



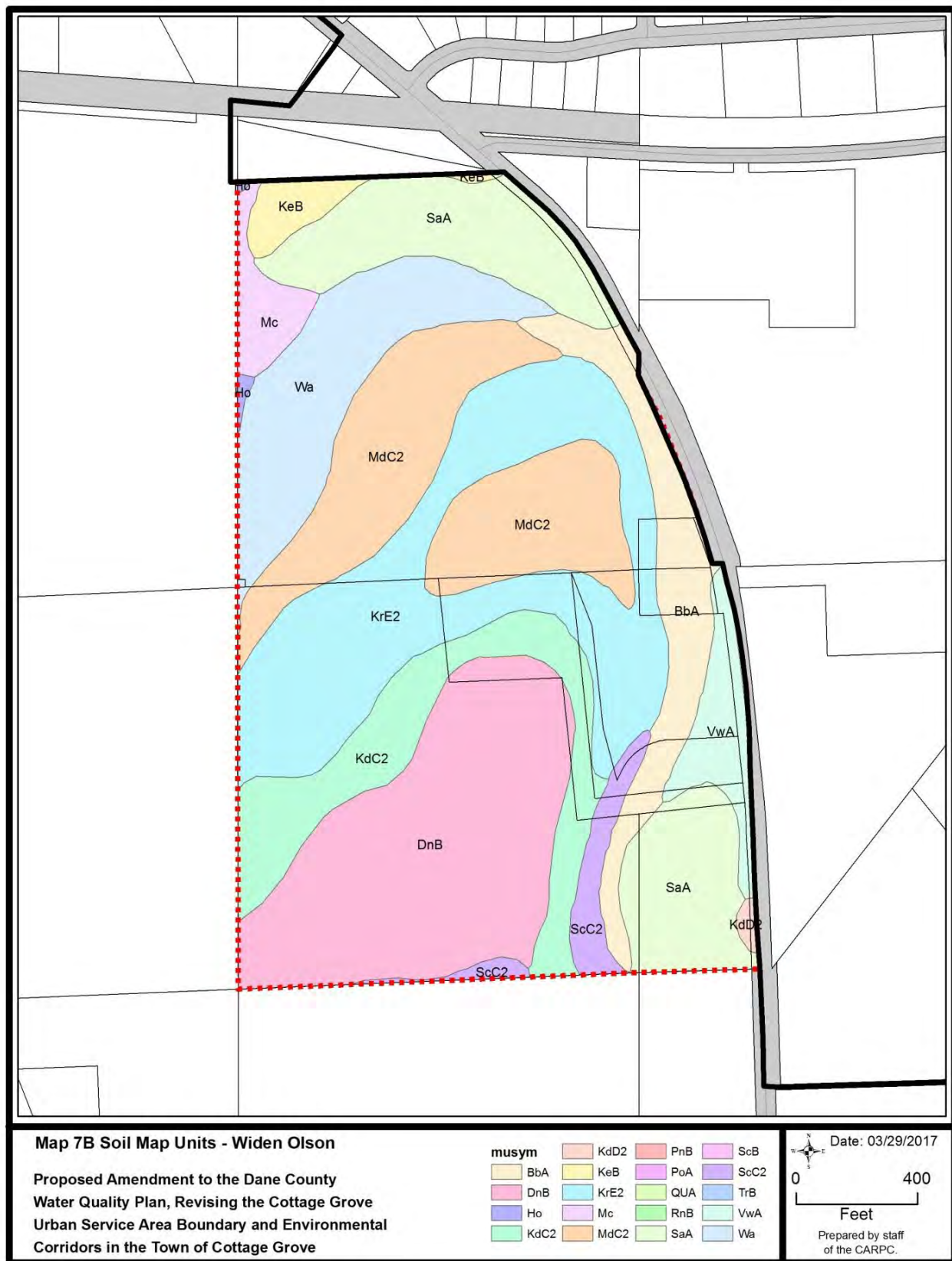
Map 6C – Elevations – Drumlin Grove



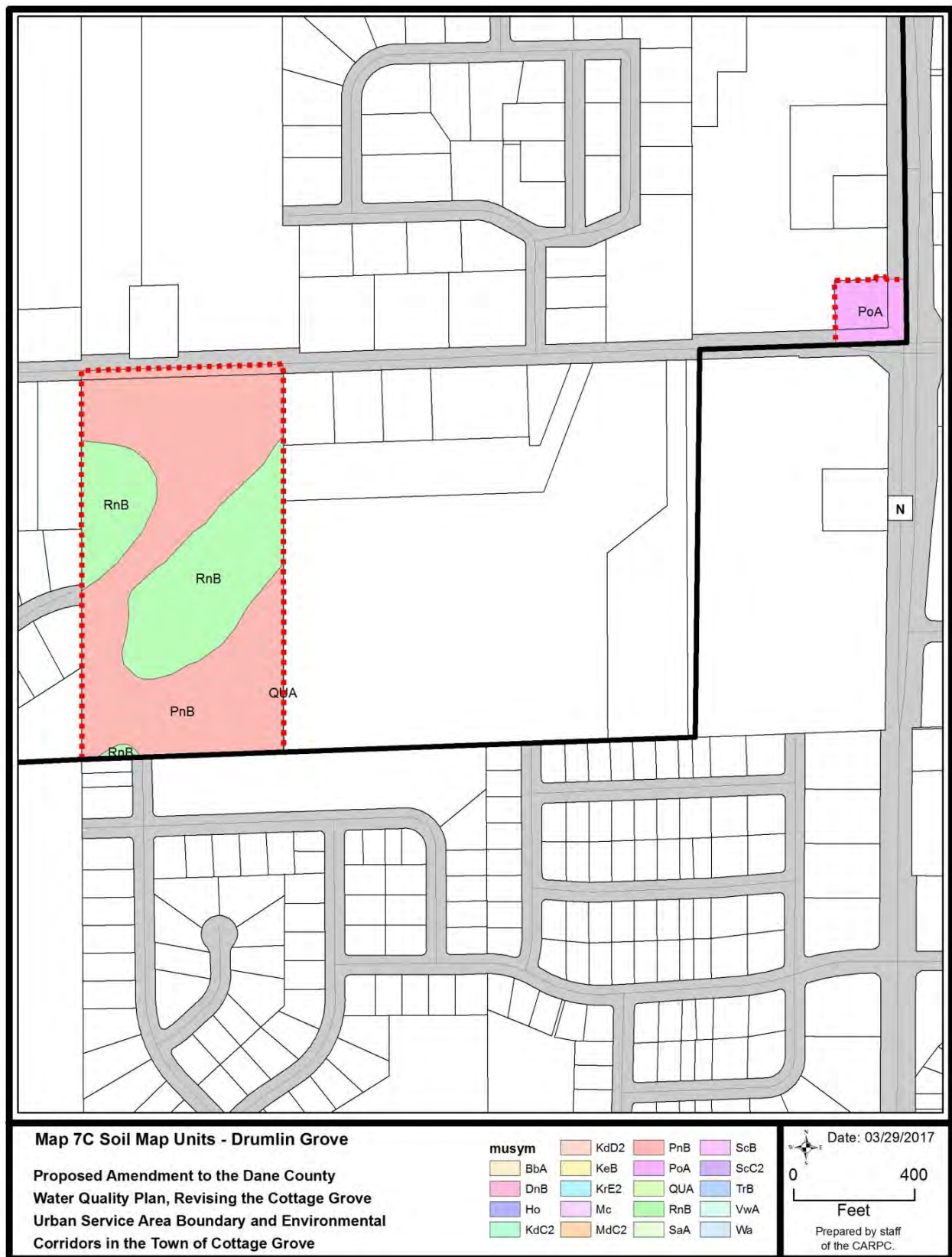
Map 7A – Soil Type - Shady Grove



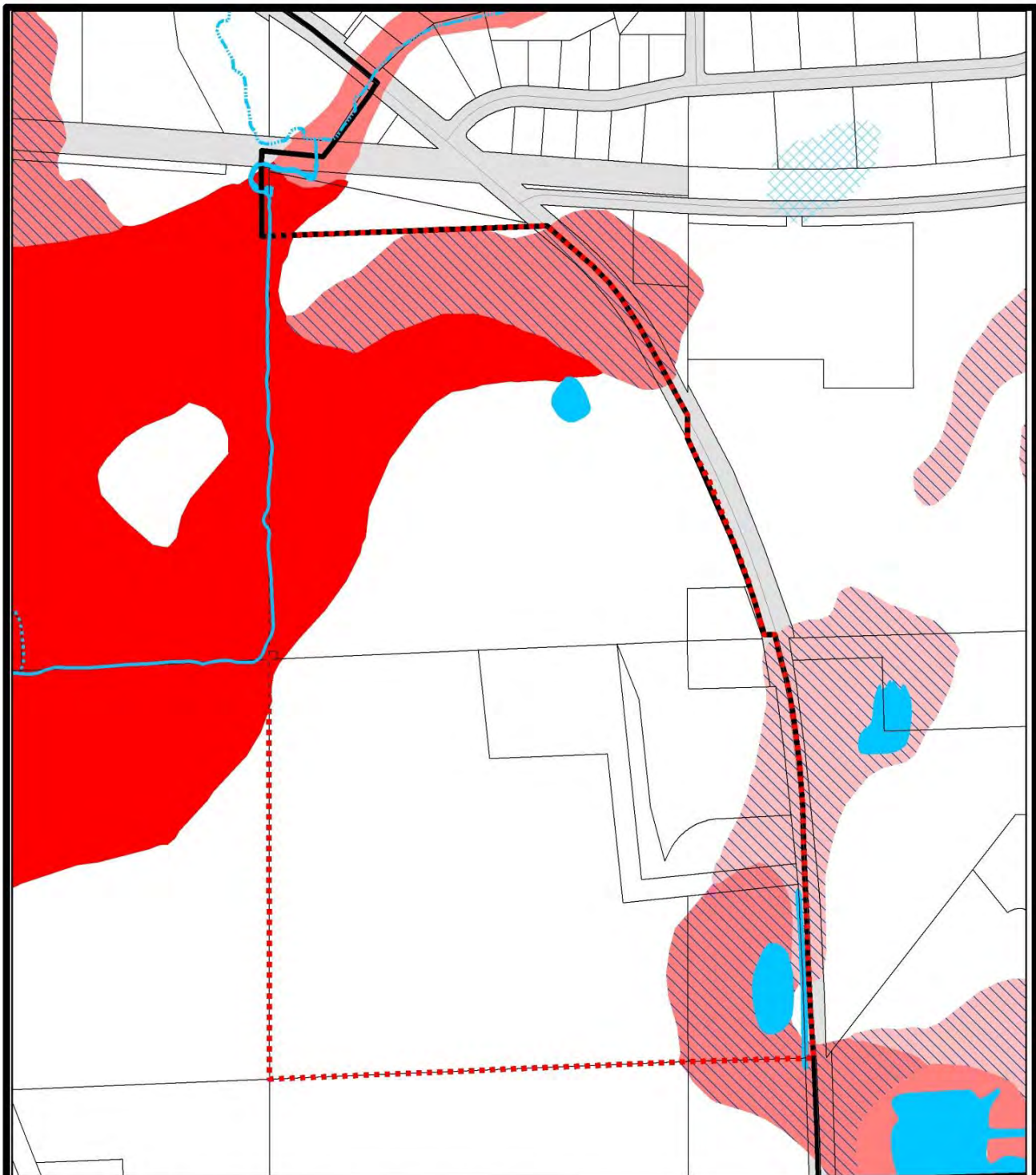
Map 7B – Soil Type – Widen Olson



Map 7C – Soil Type – Drumlin Grove



Map 8 – Potential Seasonal High Groundwater – Widen Olson



Map 8 Potential Seasonal High Groundwater - Widen Olson

Proposed Amendment to the
Dane County Water Quality Plan, Revising
the Cottage Grove Urban Service Area Boundary and
Environmental Corridors in the Town of Cottage Grove



Date: 04/07/2017

0 400

Feet

Prepared by staff
of the CARPC.

2) Proposed Urban Services

a) Parks and Open Space

The proposed amendment includes a total of 56.8 acres for stormwater management or other open space. While none of this area is designated as park, the Village requires developers to meet with the Village Parks and Recreation Commission during the platting process and dedicate 0.067 acres per housing unit for park land or pay a fee in lieu of dedication. Some lots currently shown for development may be dedicated for park land during the platting process.

b) Public Water System

In 2014, the Village of Cottage Grove Water Utility completed construction of a new 400,000 gallon water tower on the north side of the Village near the CTH N and I-94 interchange. The new tower improved water pressure on the Village's north side and provides the pressure necessary to serve the proposed USA expansion area. The Village recently secured funding through the State of Wisconsin's 'Safe Drinking Water Loan' program that enabled the Village to install a 16-inch water main from the new tower to the west along Gaston Road. The new main was constructed in 2016 to create a loop in the water system, greatly improving the system's redundancy. The new main will serve the proposed USA expansion area and areas already in the USA, and could serve Town of Cottage Grove residents in the area who have a need or desire to receive municipal water. This main is part of the high pressure zone that will also be connected at the pressure reducing valve vault in the Westlawn 4th Addition Plat with a 12-inch main, facilitating the development of portions of this plat. Service within the proposed development will be provided by 8-inch mains that will follow the proposed streets.

The Village water utility provides municipal water through three high capacity wells. Well #2 (750 gpm) is 550 feet deep, well #3 (1,100 gpm) is 530 feet deep, and well #4 (1,000 gpm) is 675 feet deep. Well #4 can be upgraded to provide 1,500 gallons per minute. The Village has also acquired a future well site for Well #5 which will be constructed following phase two of the Coyle Highlands Neighborhood development south of CTH BB, west of CTH N. The current average demand is 478,000 gpd. The Village estimates that the average daily pumped water demand for the combined amendment areas will be 44,810 gpd. This estimate is reasonably conservative based on water utility's annual reports provided to the Public Service Commission.

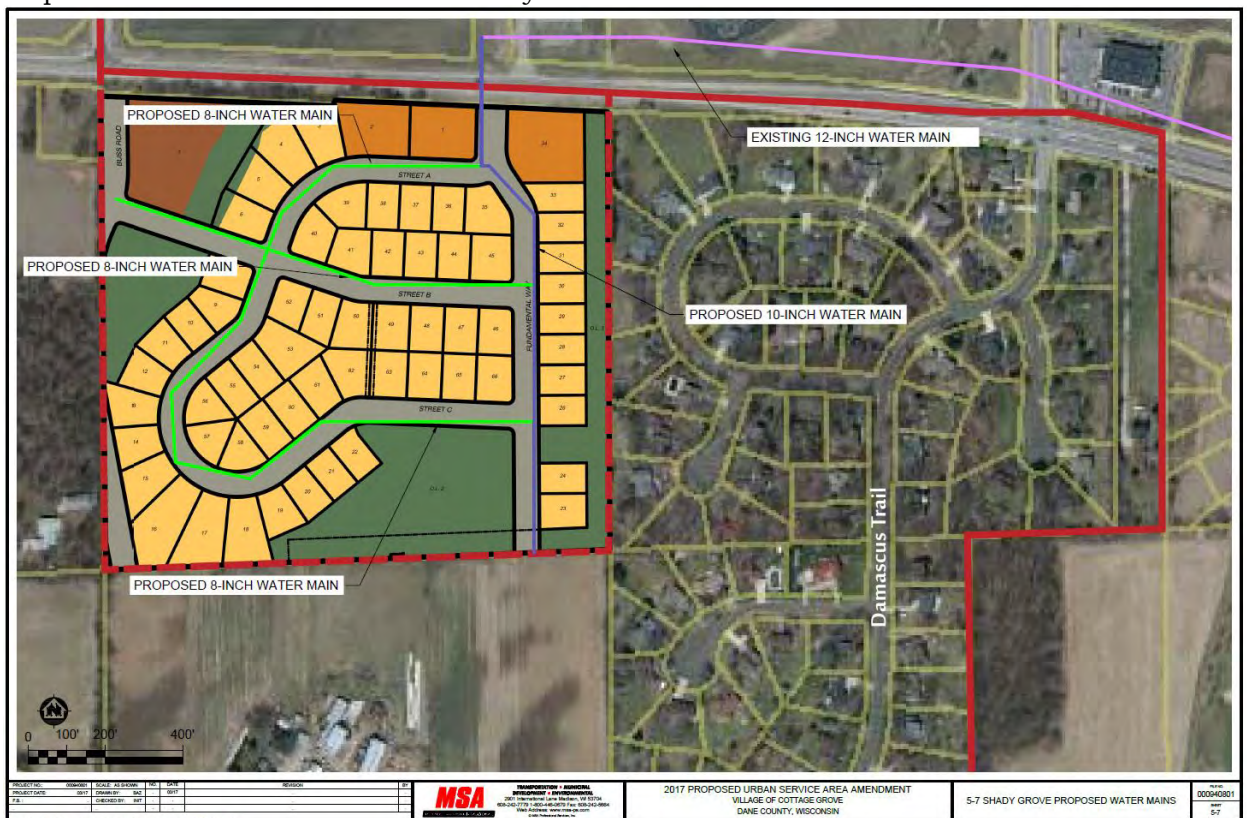
The Shady Grove amendment area will be served by a 10-inch water main extension from an existing 12-inch water main located along West Cottage Grove Road. The Widen Olson amendment area will be served by a 10-inch water main extension from an existing 16-inch water main located along Vilas Road. The Drumlin Grove amendment area will be served by an 8-inch and a 10-inch water main extension from an existing 16-inch water main along Gaston Road, which is within the Village High Pressure Zone. An extension of the existing 10-inch water main along North Parkview Street is also proposed with a valved connection that will remain closed as this connection is within the Village Low Pressure Zone. The School Grounds amendment area will be served by the existing 16-inch water main along Gaston Road near the intersection of County Highway N.

In January 2012, MSA published the 'Water System Evaluation Report' to "evaluate the adequacy of the Cottage Grove municipal water system source (well) capacity and storage capacity, and the ability of the water system to serve additional (new) development at higher elevations to the north and west." According to MSA, "the report concludes that the current well capacity is adequate for the existing and projected future (20-year) peak day demands."

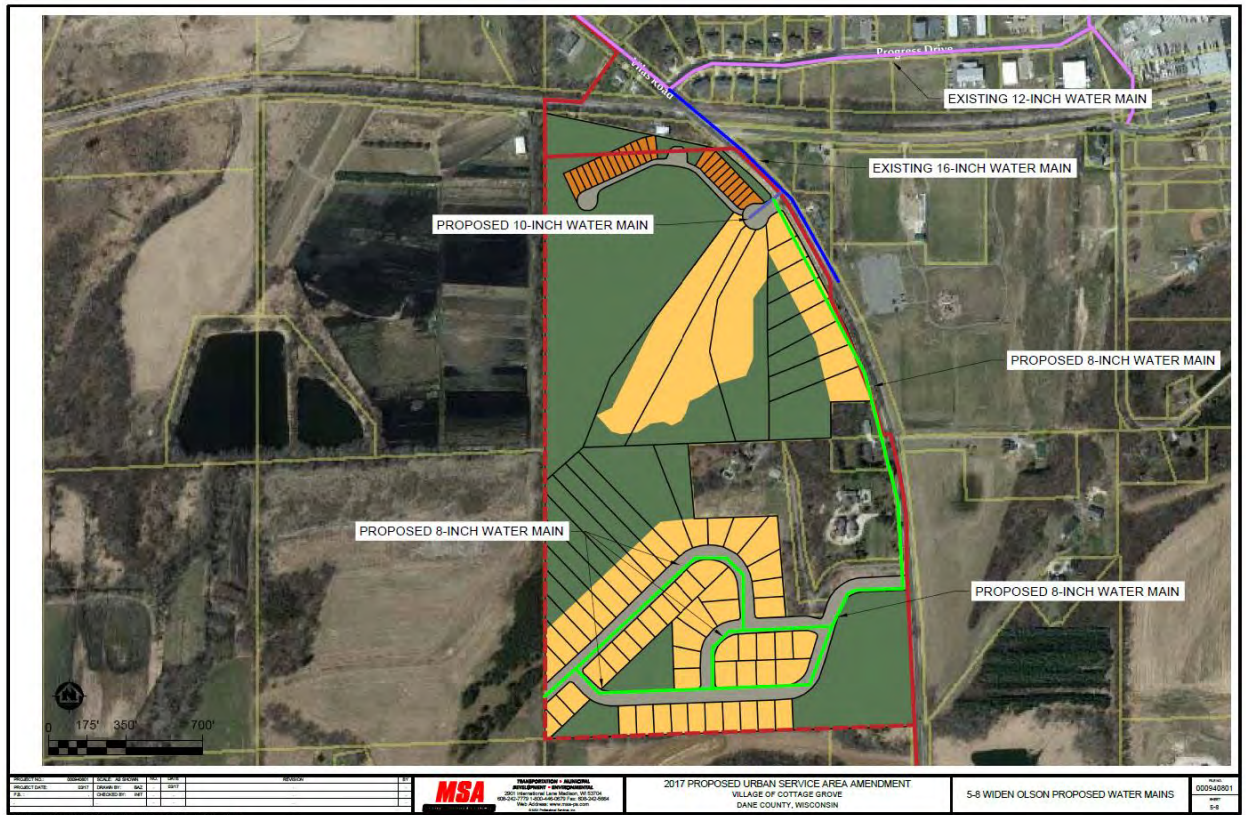
The report recommended water system improvements to accommodate existing and future water demands including a new 400,000-gallon elevated storage reservoir, which is was completed in 2014. Other improvements include modifications to Well #4 so that the well can pump to the higher reservoir elevation; a pressure reducing valve station adjacent to Well #4 to allow water from the upper zone to be utilized in the lower zone; refurbishment of the existing 479,000-gallon water storage reservoir (standpipe); and demolition of the existing 40,000-gallon storage reservoir. The Capital Utility Plan prepared by the Village Department of Public Works and MSA Professional Services also proposes a number of potential improvements to the water distribution system over the next 25 years.

Water losses in the Village's distribution system have been steady since 2011, with a level of 2% of net water supplied in 2016. The Wisconsin Administrative Code PSC 185.85(4)(b) requires a utility with more than 1,000 customers to submit a water loss control plan to the Public Service Commission if the utility reports its percentage of water losses exceed 15%.

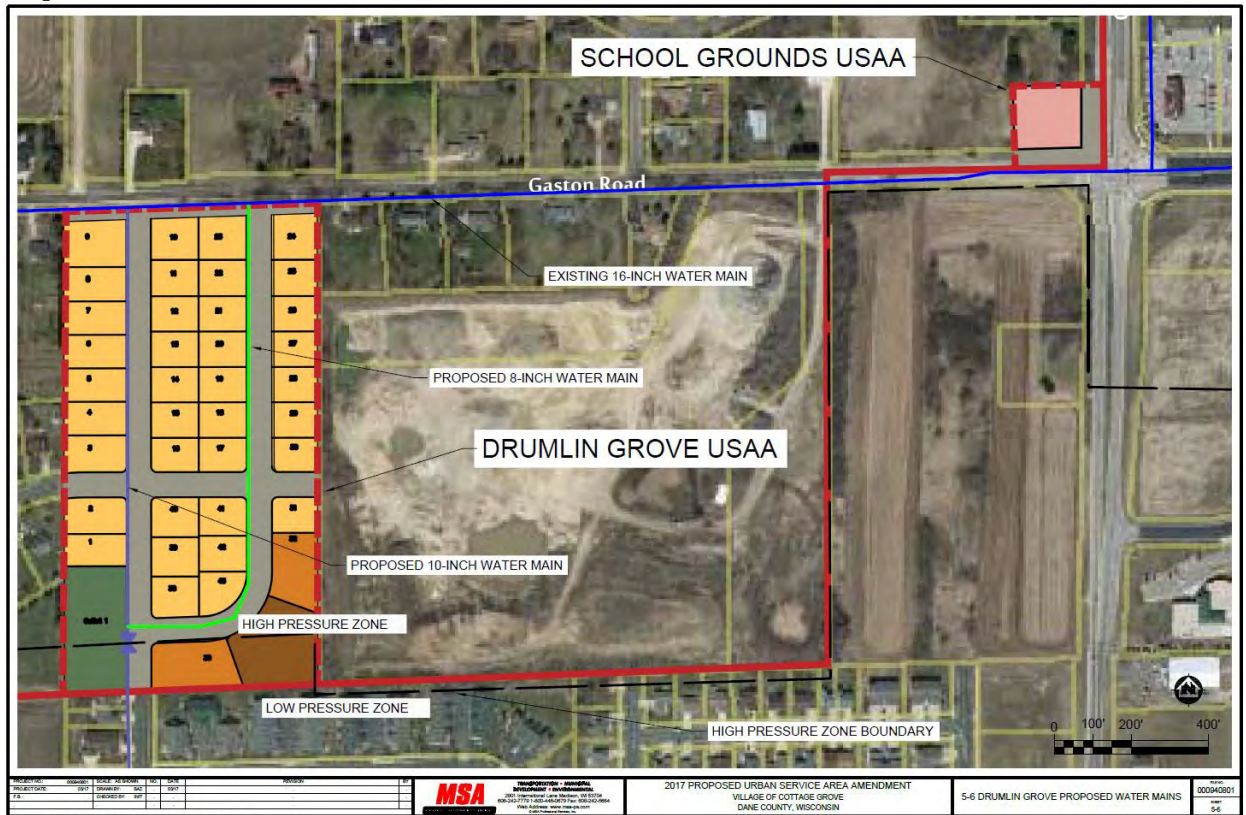
Map 9A – Planned Water Service – Shady Grove



Map 9B – Planned Water Service – Widen Olson



Map 9C – Planned Water Service – Drumlin Grove



c) Wastewater

Sanitary sewer service will be provided to the proposed amendment areas by connection to the Village's existing sanitary sewer collection system. The Village has a network of 10-inch through 18-inch interceptor sewers that will convey the wastewater from the proposed service areas through the Village to the Vilas Road Pump Station, where it will be pumped to the MMSD Far East Interceptor – Cottage Grove Extension. The Shady Grove amendment area will be served by a 10-inch gravity sanitary sewer main extension from an existing 12-inch gravity sanitary sewer located along West Cottage Grove Road. The Widen Olson amendment area will be served by an 8-inch gravity sanitary sewer main extension from an existing 15-inch gravity sanitary sewer located along Vilas Road. The Drumlin Grove amendment area will be served by a 10-inch gravity sanitary sewer main extension of the existing 10-inch gravity sanitary sewer located along North Parkview Street. The School Grounds amendment area will be served by the existing 12-inch sanitary sewer along County Highway N and Gaston Road.

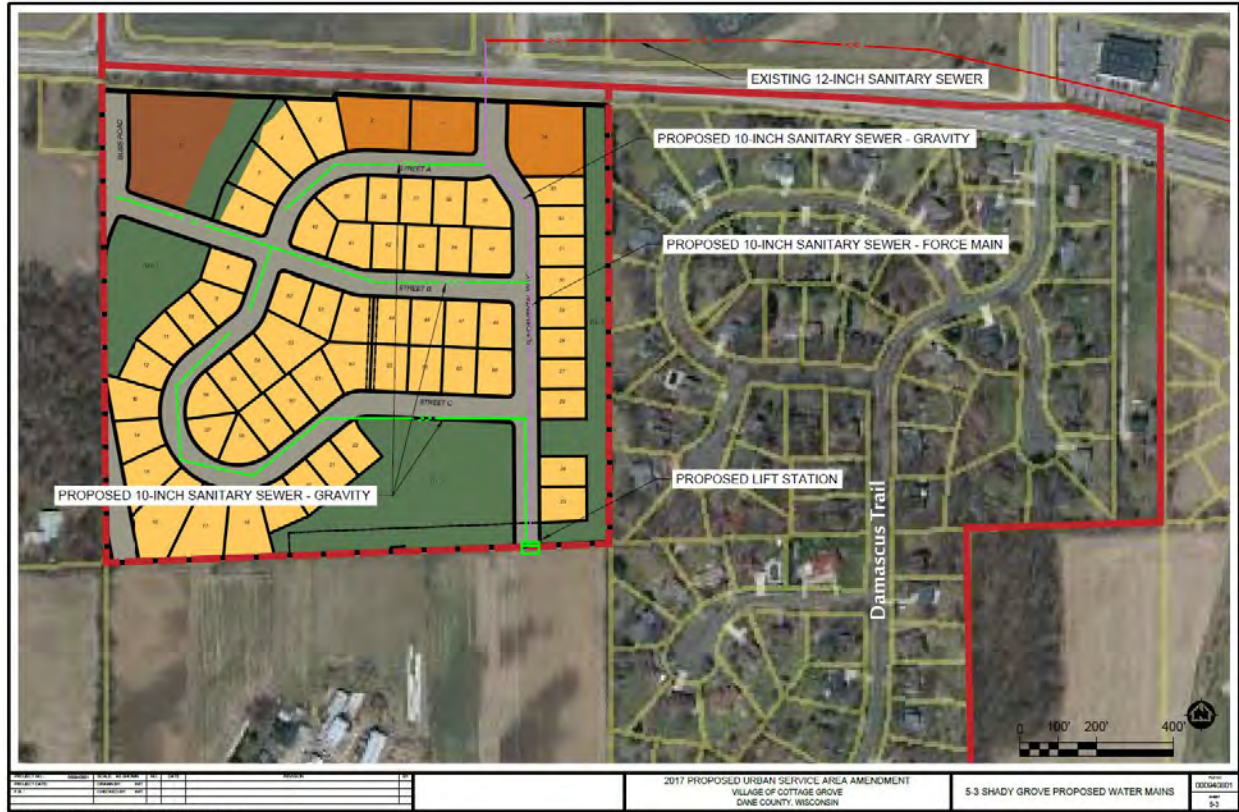
The Village estimates that the amendment areas combined will generate an average of 59,040 gallons of wastewater per day (gpd), including infiltration and inflow. Utilizing a peaking factor of 4, it is estimated that the amendment area would generate a peak flow of 166 gpm. The estimate is consistent with historical wastewater generation rates in the Village. The Village has determined that there is available capacity in their existing sanitary sewer collection system for the proposed amendment area.

In 2014, the Village Department of Public Works, in collaboration with MSA Professional Services, prepared a Capital Utility Plan which outlined specific utility projects that are expected to be needed within the next 25 years. A recent study of the Village wastewater system has determined the existing peak wastewater flow rates in the various interceptor sewers. The addition of the proposed service areas will not result in any of the interceptors or the lift station being over capacity.

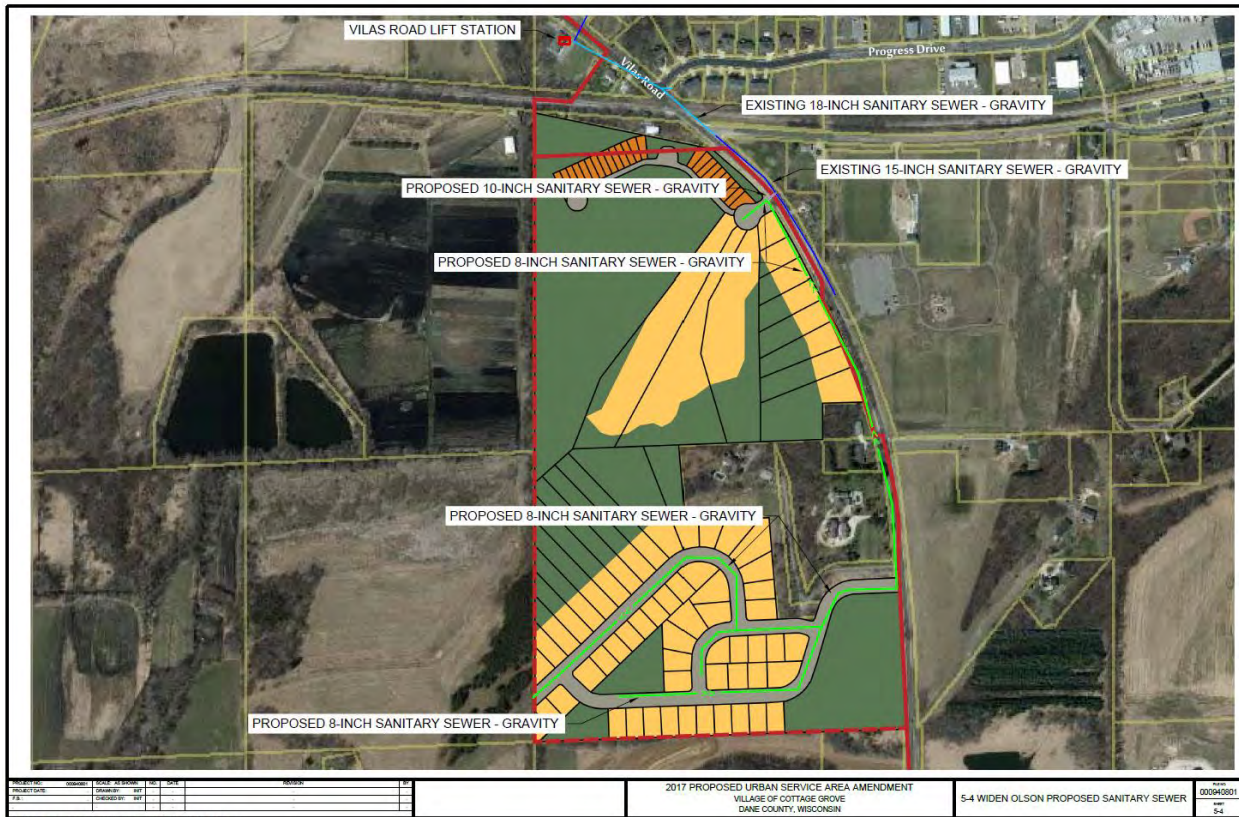
WWTF

The Madison Metropolitan Sewerage District (MMSD) will provide wastewater treatment for the amendment area. MMSD's new 66 million gallons per day (mgd) Pumping Station #18, completed in March 2015, serves this area. The Nine Springs Treatment Facility has a design capacity of 50 mgd and received an average of 38.27 mgd in 2015, including infiltration and inflow. It is expected to reach 90% of current hydraulic design capacity around 2026 based on current projected growth rate assumptions. The MMSD has completed a long-range plan that evaluated various options for expanded treatment capacity to serve its current and future service area. For the 20-year planning period, service to this area is expected to remain through current interceptor routes with expanded capacity of the system as the need is foreseen. MMSD has not had any issues meeting its WPDES permit limits for the quality of effluent discharged to Badfish Creek according to their 2015 Compliance Maintenance Annual Report.

Map 10A – Planned Sanitary Sewer Service - Shady Grove



Map 10B – Planned Sanitary Sewer Service - Widen Olson



Map 10C – Planned Sanitary Sewer Service - Drumlin Grove

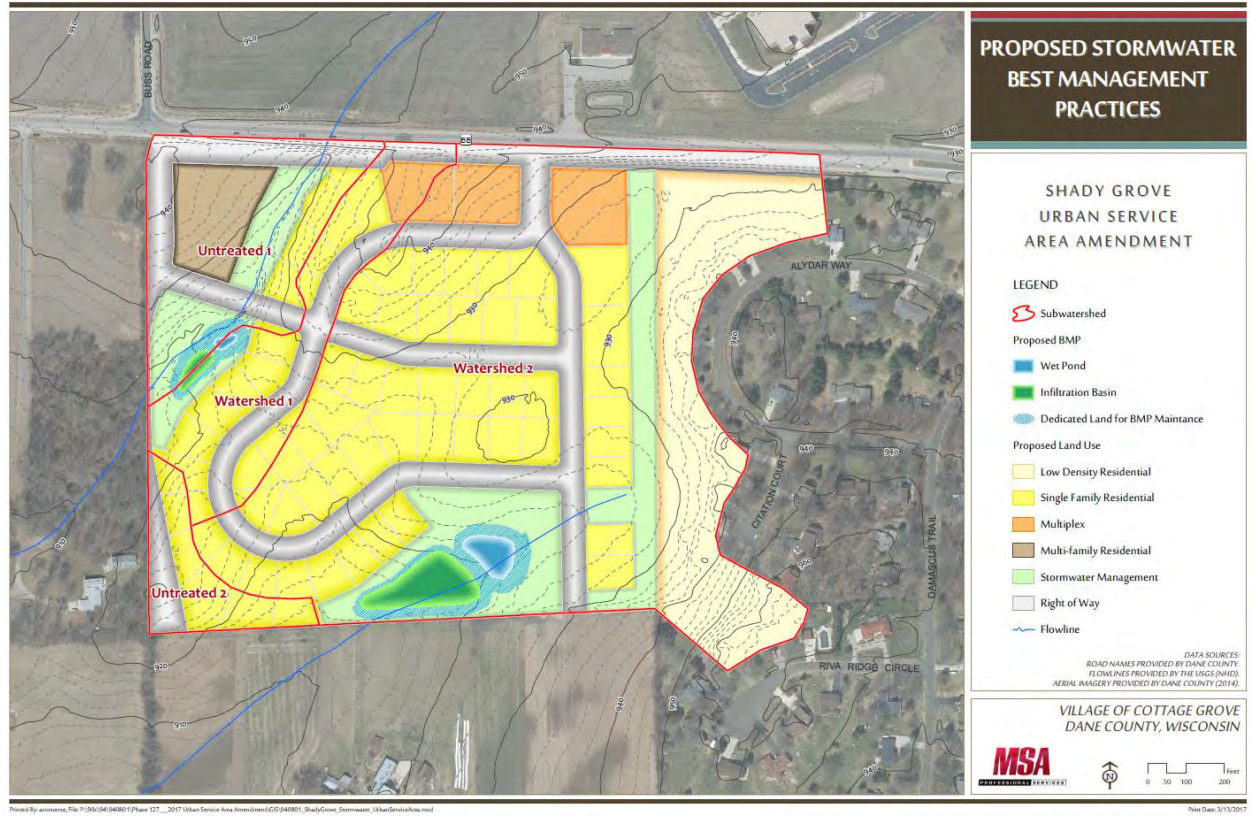


d) **Stormwater Management System**

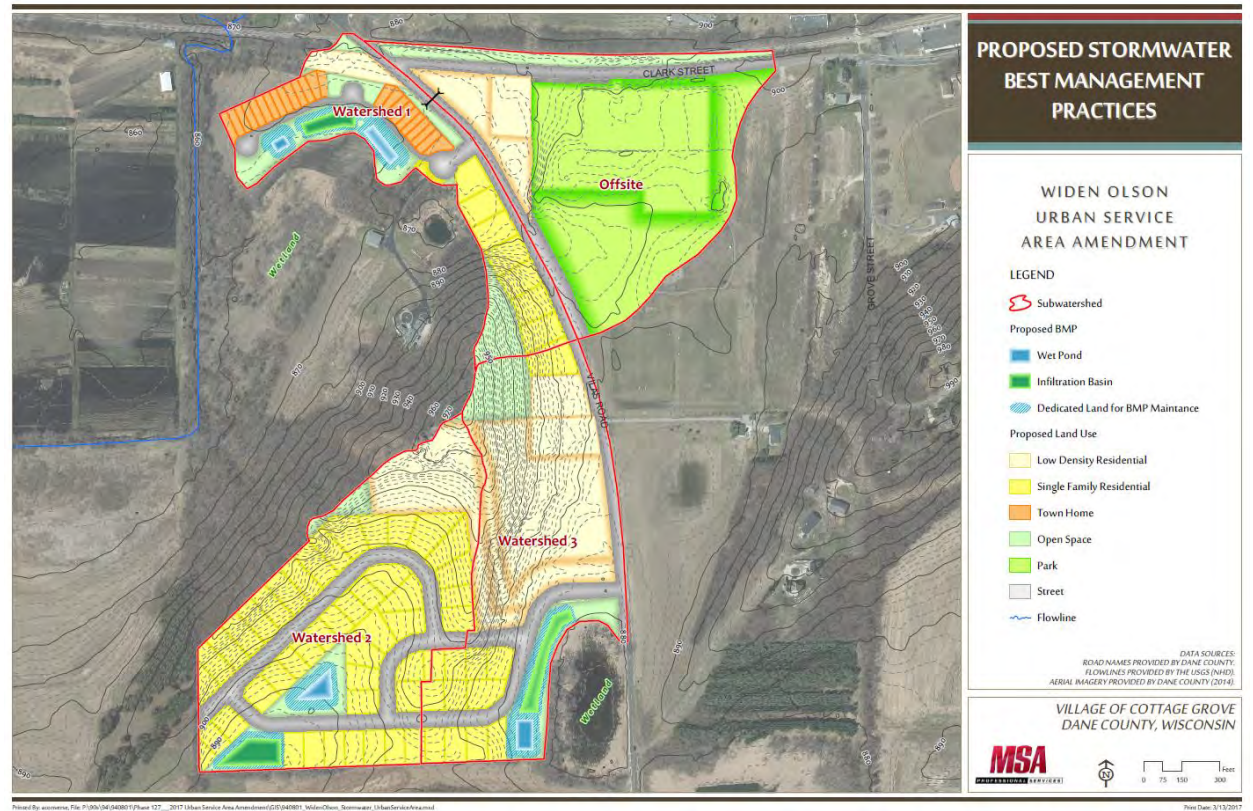
The preliminary stormwater management plan for the amendment areas a system of twelve stormwater management facilities. These facilities will generally be configured as two-cell systems. The first cell in each system will consist of a wet detention basin which will provide water quality treatment (80% TSS reduction) followed by an infiltration basin which will provide for 90% of the predevelopment annual stay-on. It is anticipated that infiltration performance will further reduce TSS (and other pollutants such as Total Phosphorus) from stormwater discharges. Collectively, the two-cell systems will provide peak discharge rate control; each basin has been sized to accommodate four-feet of water storage above normal conditions to account for 100-yr rainfall runoff volume. It is anticipated that the Shady Grove amendment area will have one pair of facilities (wet pond and infiltration basin) near the midpoint of the west and south edges of the site area. The Widen Olson amendment area will have two pairs of facilities at the southwest and southeast corners along with an infiltration basin with two contributing wet ponds at the northeast corner of the site area. The Drumlin Grove amendment area proposes to have one pair of facilities at the southwest corner of the site area. The stormwater facilities are proposed to be owned and maintained by the Village of Cottage Grove.

The conceptual stormwater management plan for the Shady Grove amendment area includes two untreated sub-watersheds. The proposed multi-family development will be served by an on-site water best management practice for water quality. The regional stormwater facilities will be designed to provide compensatory peak rate and infiltration/volume control. Dane County and NR 151 stormwater management standards allow for some areas of direct runoff without stormwater management practices if necessary provided that other areas are over treated to provide the required water quality, peak rate, and volume control for the site overall. This will be fully reviewed when the final stormwater management plan is submitted.

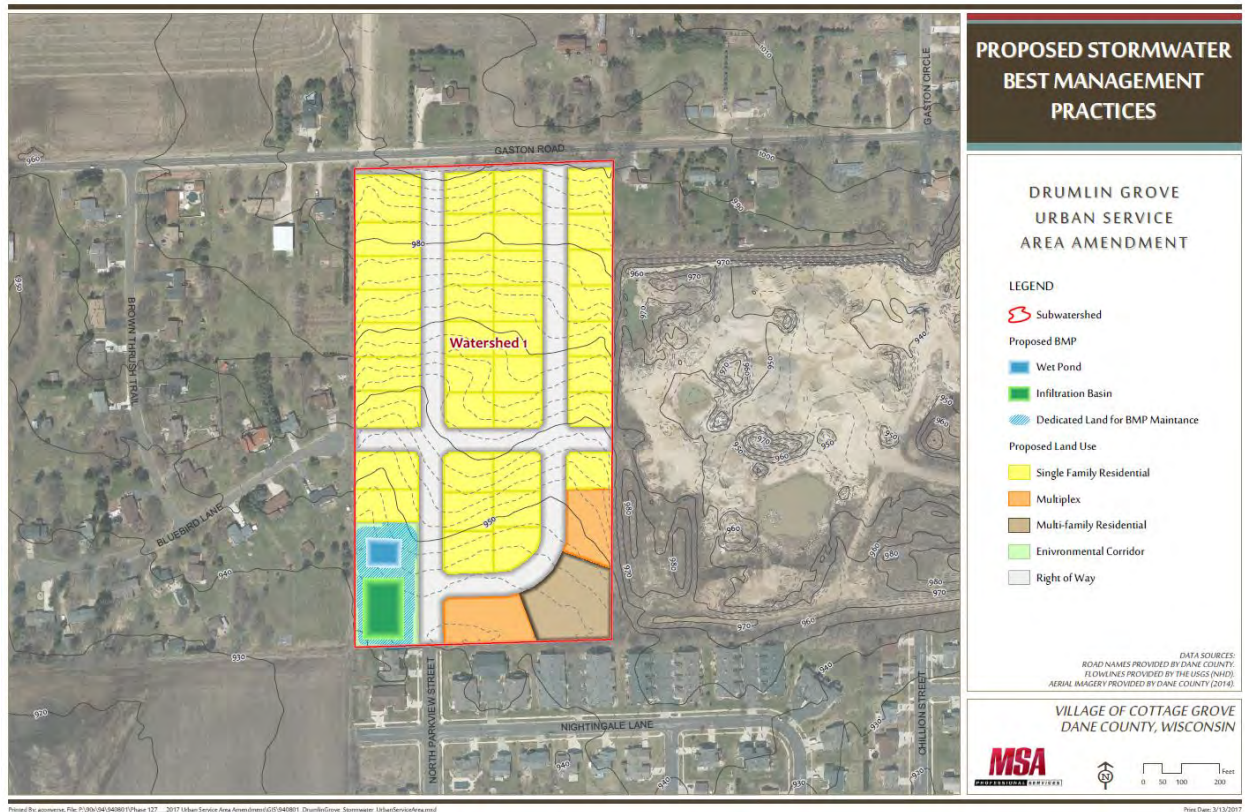
Map 11A – Proposed Stormwater Management System- Shady Grove



Map 11B – Proposed Stormwater Management System- Widen Olson



Map 11C – Proposed Stormwater Management System- Drumlin Grove



Performance Standards

The Village of Cottage Grove proposes stormwater management performance measures to meet or exceed standards required by the State of Wisconsin (NR 151), Dane County (Chapter 14), and Village of Cottage Grove (Chapter 163) stormwater regulations, as follows:

1. Require post-construction sediment control (reduce total suspended solids leaving the site by at least 80%, with a minimum of 60% of that control occurring in a pre-treatment facility prior to infiltration) for the 1-year, 24-hour design storm. This is consistent with the standards currently required by Dane County and the State of Wisconsin.
2. Require post-construction peak runoff rate control for the 1-, 2-, 10-, and 100-year, 24-hour design storms to “pre-development” peak runoff rates. This is consistent with the standards currently required by Dane County.
3. Require post-development stay-on volume of at least 90% of pre-development stay-on volume. This is consistent with the standards currently required by Dane County.
4. Maintain pre-development groundwater annual recharge rate of 9.5 inches per year for the Shady Grove and Widen Olson amendment areas and 9.3 inches per year for the Drumlin Grove amendment area as estimated by the WGNHS.

e) Environmental Corridors

The proposed amendment area includes mapped intermittent streams, delineated wetlands, and floodplains unsuitable for development because of physical or environmental constraints requiring preservation in environmental corridors. These areas have been designated in environmental corridors in accordance with the policies and criteria of the *Dane County Water Quality Plan*. The environmental corridors in the Widen Olson area also include steep slope areas on a drumlin that crosses the property and associated woodlands. Proposed open space and stormwater management areas have also been included in environmental corridors. In total, 52.9 acres of the amendment area have been included in environmental corridors, including most of the area identified as part of the Door Creek Natural Resource Area.

3) Impacts and Effects of Proposal

a) Meeting Projected Demand

Population increase by 2040 within the Cottage Grove SSA is an estimated 3,300 additional people. The Village of Cottage Grove is home to approximately 6,635 people, according to the Wisconsin Department of Administration population estimates for 2016. An estimated 1,400 additional households are projected from 2010 to 2040 within the Village. The requested amendment would add 229 additional housing units. The 2016 amendment request from the Village added an estimated 540 new units. Additionally, the Village has added around 200 new units of infill development in the past few years. These factors suggest that Cottage Grove may be growing faster than expected.

The SSA request totals 80 acres of “developable” land (i.e. unbuilt, non-environmental corridor land). Including its current request, Cottage Grove has requested the addition of roughly 275 acres to its SSA, which staff compares to the 2010-2040 projection. Additional projected land demand to 2040 was estimated at roughly 710 acres. “Undeveloped acreage” in the Cottage Grove SSA totaled approximately 750 acres at the time of the 2010 Land Use Inventory.² However, there are a number of factors at play in determining the need for this amendment:

- One of the four amendment proposals (“School Grounds” – 1.1 acres) does not contribute to the future demand calculation since it is already built.
- Approximately 15 acres of existing development (predominantly residential) exist within the remaining three development areas.
- Village staff recently met with Monona Grove School District staff. The school district expects to add an elementary school in the Village in the next few years. They are currently seeking property on the west side of the Village. They anticipate purchasing as much as 80 acres to accommodate the new school and a variety of athletic fields to be used by the entire district. This purchase would cause up to 80 acres of residential land within the existing USA to be converted to an institutional use. The lands proposed to be added by the currently proposed amendment would offset that loss within the existing USA.

b) Phasing

The four amendment areas are, individually, too small to necessitate a development phasing plan. However, Village staff anticipate build-out of all the areas in under 10 years.

² It should be noted that all “undeveloped” acreage is not necessarily “developable.” More importantly, not all acres of developable land are equal. Meaning, not all acres of land are suitable for all kinds of development. Much of the acreage included in the designation of “developable” does not exclude environmental corridor land as they would exist were the site developed. Many of these areas were included in the SSAs prior to the creation of the designation “Environmental Corridors.” Another caveat is that the category of “undeveloped” lands also includes areas, like woodland or other open spaces, which may never be built upon because it is impractical, the community chooses to leave the area undeveloped, or the land owner never decides to develop the area.

b) Surface Water Impacts

Development typically creates impervious surfaces (i.e., streets, parking areas, and roofs) and has the potential to alter the natural drainage system (e.g., natural swales are replaced by storm sewers) resulting in increased stormwater runoff rates and volumes, as well as reduced infiltration. Development can also cause substantial short-term soil erosion and off-site siltation from construction activities. Scientific research has well documented that without effective mitigation measures, the potential impacts of development on receiving water bodies can include the following:

- Flashier stream flows (i.e., sudden higher peaks)
- Increased frequency and duration of bankfull flows
- Reduced groundwater recharge and stream base flow
- Greater fluctuations in water levels in wetlands
- Increased frequency, level (i.e., elevation), and duration of flooding
- Additional nutrients and urban contaminants entering the receiving water bodies
- Geomorphic changes in receiving streams and wetlands

Natural drainage systems attempt to adapt to the dominant flow conditions. In the absence of mitigation measures, the frequency of bank-full events often increases with urbanization, and the stream attempts to enlarge its cross section to reach a new equilibrium with the increased channel forming flows. Higher flow velocities and volumes increase the erosive force in a channel, which alters streambed and bank stability. This can result in channel incision, bank undercutting, increased bank erosion, and increased sediment transport. The results are often wider, straighter, sediment laden streams, greater water level fluctuations, loss of riparian cover, and degradation of shoreland and aquatic habitat.

If left unmanaged, these changes in hydrology combined with increased urban pollutant loading, can have a dramatic effect on the aquatic ecosystem of streams. It is important to realize that flow is a major determinant of the physical habitat in a stream, which in turn determines the biotic composition of stream communities. A growing body of literature documents that channel geomorphology, habitat structure, and complexity are determined by prevailing flow conditions, which in turn determine the biota that can inhabit the area. This is true for the fish as well as the aquatic insects upon which they feed. Studies of streams affected by urbanization have shown that fish populations either disappear or become dominated by rough fish that can tolerate the associated lower water quality levels.

The Village proposes to mitigate the urban non-point source impacts of the proposed development by implementing various stormwater best management practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, and groundwater recharge. This will reduce the likely impacts of the proposed development on the receiving waters.

c) Groundwater Impacts

Without effective mitigation practices, as natural areas are converted to urban development the ground/surface water balance in streams and wetlands shifts from a groundwater-dominated system to one dominated more and more by surface water runoff, with subsequent reductions in stream quality and transitions to more tolerant biological communities.

Groundwater modeling indicates that the cumulative effects of year 2010 well water withdrawals have resulted in a 1.68 cfs decline in baseflow in Door Creek downstream from the Village compared to the pre-development (no pumping) base flow of 5.01 cfs (see Map 12 and Table 4). According to the modeling, an additional 0.44 cfs decline is anticipated by the year 2040, reducing the baseflow to 2.89 cfs. Significant change in the fish community status from current conditions is not expected to occur as a result of the projected reduction in baseflow in the in the downstream portion of Door Creek

according to the 2014 WDNR report, *Ecological Limits of Hydrologic Alteration in Dane County Streams*.

Table 4. All Municipal Wells Modeled baseflow results due to current and anticipated future well water withdrawals (cfs)			
Stream	Pre-Development	2010	2040
Door Creek	5.01	3.33	2.89

The loss of baseflow from the cumulative effects of water well pumping is a regional issue, beyond the boundaries of a single USA Amendment or even a single municipality. This is illustrated by the comparatively lower baseflow reductions due to Village of Cottage Grove municipal well water withdrawals only, shown in Table 5. This issue is discussed along with potential management options in the recently updated *Dane County Groundwater Protection Planning Framework* (Technical Appendix G of the Water Quality Plan).

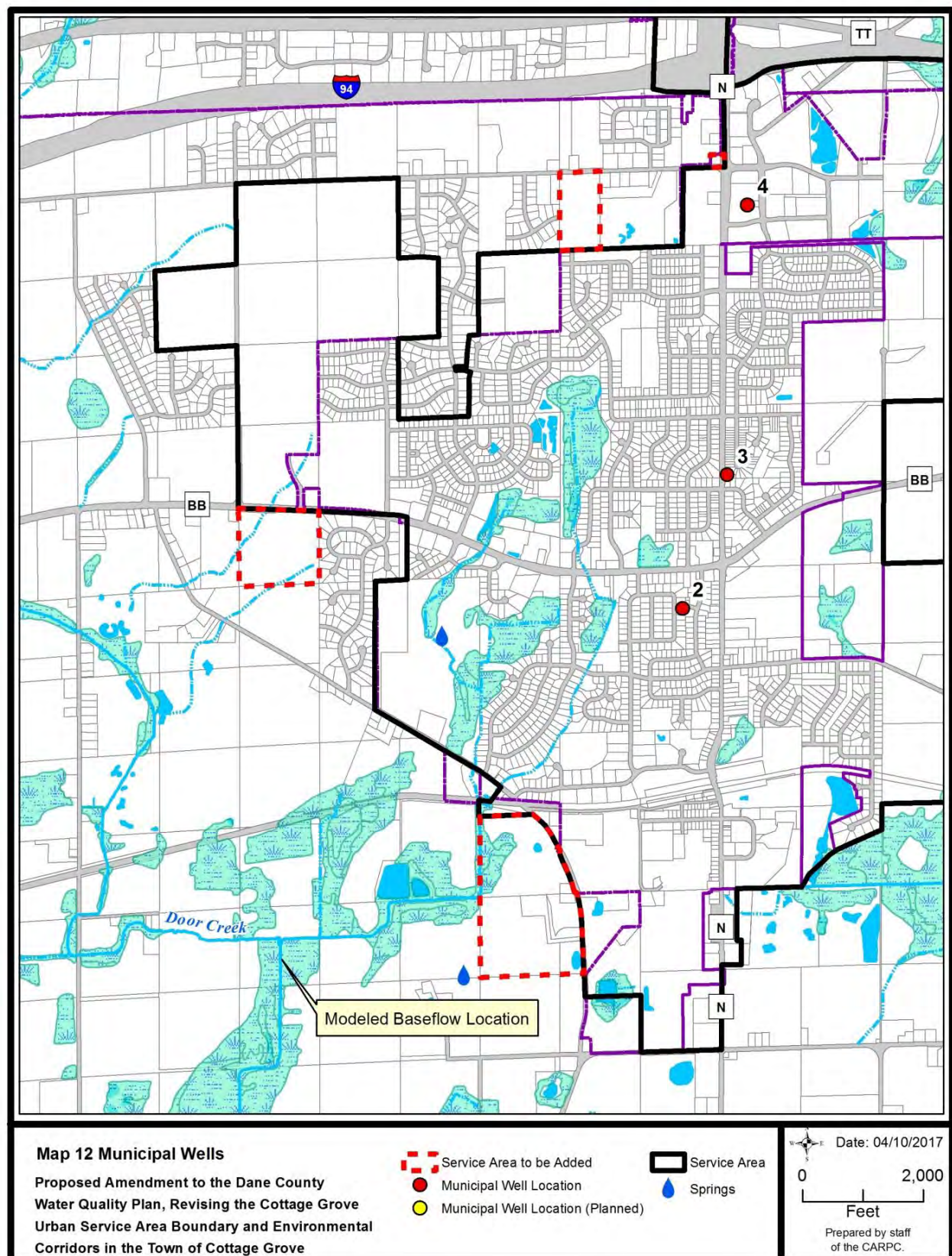
Table 5. Village of Cottage Grove Only Modeled baseflow results due to current and anticipated future municipal well water withdrawals (cfs)			
Stream	Pre- Development	2010	2040
Door Creek	5.01	4.86	4.77

Maintaining pre-development groundwater recharge also helps to maintain baseflow and mitigate this impact. The Village of Cottage Grove proposes to maintain the pre-development annual recharge rate (estimated as 9.3 to 9.5 inches per year for this area according to the WGNHS study). Experience has shown that this criterion is generally met when pre-development runoff volume is maintained for the development area through infiltration measures.

4) Comments Received and Unresolved Issues

The Village of Cottage Grove sent notification of the proposed amendment to the Town of Cottage Grove requesting feedback on the request. As of the time of posting of this staff analysis, no other public comment related to this amendment request has been received.

Map 12 – Municipal Wells and Modeled Baseflow Location



5) Conclusions and Staff Water Quality Recommendations

There is sufficient wastewater collection and treatment plant system capacity to serve the proposed amendment area.

The Village proposes to mitigate the urban non-point source impacts of the proposed development by implementing various stormwater best management practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, and groundwater recharge. This will reduce the likely urban nonpoint runoff impacts of the proposed development on the receiving waters. Staff recommends siting stormwater infiltration facilities in those areas where the soils are most suitable for infiltration.

The Widen Olson amendment area includes some mapped hydric soils and poorly drained soils in areas with seasonal high groundwater tables. These soils can have limited suitability for buildings with basements due to their seasonal high water table (zone of soil saturation), which can cause problems with groundwater induced flooding. Regional Planning Commission staff recommends that on-site soils investigations in accordance with SPS 385.60 be conducted in areas with these soil classifications to determine the actual extent of seasonal high groundwater in the amendment areas and identify potential problem areas. It is further recommended that the Village consider requiring that the lowest level of any structure be built at a minimum of one foot above the seasonal high groundwater table and have this restriction recorded on the plat. This type of restriction is being used in several counties in Wisconsin and will reduce the potential for basement flooding.

Based on the WGNHS Karst Potential map the northern two-thirds of the main Drumlin Grove amendment area is within an area where the depth to bedrock over potential karst units is 8 to 33 feet. Regional Planning Commission staff recommends the collection of site-specific data for an accurate assessment of karst potential in this area. If karst features are found, adequate protection measures must be taken to address the potential for groundwater contamination.

a) Conditions

CARPC staff suggests that the Commission recommend this amendment to the *Dane County Water Quality Plan* to WDNR for approval, based on the Village of Cottage Grove's submitted proposal and conditioned on the Village's commitment to pursuing the following:

1. Submit a detailed stormwater management plan for CARPC staff review and approval (in conjunction with DCL&WCD staff) prior to any land disturbing activities in the amendment area. The stormwater management plan shall include the following:
 - a. Install stormwater and erosion control practices prior to other land disturbing activities. Protect infiltration practices from compaction and sedimentation during land disturbing activities.
 - b. Control peak rates of runoff for the 1-, 2-, 10-, and 100-year 24-hour design storms to pre-development levels, in accordance with the Dane County Stormwater Ordinance.
 - c. Maintain the post development stay-on volume to at least 90% of the pre-development stay-on volume for the one-year average annual rainfall period, in accordance with the Dane County Stormwater Ordinance.
 - d. Maintain pre-development groundwater recharge rates from the Wisconsin Geological and Natural History Survey's 2012 report, *Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model* (ranging from an average of 9.3 to 9.5 in./yr. for the amendment areas) or by a site specific analysis.

- e. Provide at least 80% sediment control for the amendment area based on the average annual rainfall record, with a minimum of 60% of that control occurring in a pre-treatment facility prior to infiltration, in accordance with the Dane County Stormwater Ordinance.
 - f. Coordinate stormwater discharge locations to the Town of Cottage Grove with the Town Engineer.
2. Stormwater management facilities shall be placed in public outlots whenever feasible and designated as environmental corridor. Easements and perpetual legal maintenance agreements with the Village, to allow the Village to maintain stormwater management facilities if owners fail to do so, shall be provided for any facilities located on private property.
 3. Delineate environmental corridors to include wetlands, 75-foot wetland buffers, 100-year floodplains, streams and shoreland buffers, associated steep wooded slopes, and stormwater management areas to meet *Dane County Water Quality Plan* criteria for the delineation of environmental corridors. Submit plats showing environmental corridors for CARPC staff review and approval prior to recording. Any environmental corridor on private property shall be protected by deed restrictions and neighborhood covenants.

b) Recommendations

It is also recommended that the Village of Cottage Grove consider pursuing the following measures:

1. Conduct on-site soils investigations in areas with mapped hydric soils and with poorly drained soils and seasonal high groundwater tables in the Widen Olson amendment area to determine the actual extent of seasonal high groundwater and identify potential problem areas. The Village should consider requiring that the lowest level of any structure be built at a minimum of one foot above the seasonal high groundwater table and have this restriction recorded on the plat to reduce the potential for basement flooding.
2. Based on the WGNHS Karst Potential map the northern two-thirds of the main Drumlin Grove amendment area is within an area where the depth to bedrock over potential karst units is 8 to 33 feet. Regional Planning Commission staff recommends the collection of site-specific data for an accurate assessment karst potential in this area. If karst features are found, adequate protection measures must be taken to address the potential for groundwater contamination.
3. Require an archaeological survey be performed by a qualified archaeologist for the Drumlin Grove amendment area as recommended by the Wisconsin Historical Society (see attached letter).
4. Develop and implement a wetland restoration plan for the wetlands on the site to improve habitat and create a natural amenity for the development and the community.
5. Amend the Village's stormwater ordinance to require maintaining 100% of the pre-development stay-on volume for the one-year average annual rainfall period, as a means of contributing to a reduced potential for downstream flooding. This standard has been adopted in the Village of Cross Plains, Village of DeForest, and Town of Westport and is being considered by a joint Technical Advisory Committee of CARPC and the Dane County Lakes and Watersheds Commission. The effectiveness of this approach will ultimately depend on the collaboration of other municipalities within the watershed to adopt the same standard.



14 April 2017

Mr. Sean Higgins
Capital Area Regional Planning Commission
City-County Building, Room 362
210 Martin Luther King Jr. Boulevard
Madison, WI 53703-2558

RE: Proposed Amendment to the Dane County Water Quality Plan, Revising the Cottage Grove Urban Service Area Boundary and Environmental Corridors in the Town of Cottage Grove, Dane County, Wisconsin

Dear Mr. Higgins:

Drumlin Grove Area -- Two previously recorded archaeological sites have been recorded adjacent to the parcel. The Gaston site (DA-61) is a campsite and Gaston Mound Group site (Da-927) is a mound group. Considering the presence of the American Indian campsites/village and a mound group in the vicinity, and the nature of those reports, we recommend that an archaeological survey of the parcel be completed by a qualified archaeologist. When the archaeological field investigation is completed, please send two copies of the report to our office.

Widen Olson Area -- Considering the lay-of-the-land, and the current use of the area, our recommendation is that no archaeological survey needs to be conducted.

Shady Grove Area -- The Salem Church Cemetery (BDA-33) is located just outside of the northeast corner of this parcel. No additional investigations are necessary.

Under Wisconsin law, Native American burial mounds, unmarked burials, and all marked and unmarked cemeteries are protected from intentional disturbance. If anyone suspects that a Native American burial mound or an unmarked or marked burial is present in an area, the Wisconsin Historical Society should be notified.

If human bone is unearthed during any phase of a project, **all work must cease**, and the **local authorities must be contacted**. The police or sheriff will determine if the burial is a criminal matter or if it should be referred to the Wisconsin Historical Society at 1-800-342-7834 to be in compliance with Wis. Stat. § 157.70 which provides for the protection of all human burial sites. If we are contacted, **work cannot resume until the Wisconsin Historical Society gives permission**. If you have any questions concerning the law, please contact the Wisconsin Historical Society at 1-800-342-7834.

If you have any questions, or if you need additional information, please feel free to contact me.

Sincerely;

John H. Broihahn
State Archaeologist
State Archaeology and Maritime Preservation
608-264-6496, john.broihahn@wisconsinhistory.org

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