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

1) Existing Conditions**a) Land Use**

The requested amendment area is located along the western boundary of Waunakee in the Town of Westport (see Map 1). The 125 acre site is contiguous to the Waunakee Urban Service Area for approximately half of the site's perimeter. The site is connected to the existing Service Area to the northwest, north, and east. The area is located west of Highway Q and south of Woodland Drive.

Surrounding Land Uses Include:

- North: Single-family residential, Commercial (Construction Services)
- South: Agriculture
- West: Institutional (school), Agriculture, Open Space
- East: Commercial (Medical), Institutional (church), Residential (in development), Open Space, Agriculture

Existing Land Use	Acres
Agriculture	101.0
Institutional/Governmental	8.5
Open Land	8.5
Commercial	3.6
Residential	3.2
TOTAL	124.8

Proposed Land Use	Proposed Acres	Env. Corridor Acres
Community Residential	42.4	
Right of Way	22.7	
Parks and Stormwater Management	20.4	20.4
Institutional	10.5	
Wetland	8.9	8.9
Single Family Residential	7.6	3.5
Commercial	6.7	
Mixed Use	5.6	
TOTAL	124.8	32.8
NET DEVELOPABLE¹	92.0	

¹ Net Developable = Total acreage – existing right-of-way – environmental corridor

The Village of Waunakee Plan Commission, Village of Waunakee Board, Waunakee/Westport Joint Planning Commission, and Town of Westport have all adopted resolutions finding the requested amendment consistent with their adopted plans and recommending submission of the application to CARPC. The site is identified for future development by the [2017 Waunakee/Westport Joint Comprehensive Plan](#). The site is also identified as a development area in the [2013 North Mendota FUDA Study](#) as a part of its “Conceptual 2035 Land Uses” map.

b) Cultural and Historic Sites

The Wisconsin Historical Society (WHS) has been contacted regarding the presence of any known archaeological sites or cemeteries within the amendment area. They have identified two previously recorded sites within the amendment area: a “lost” cemetery and a site containing pre-contact materials, likely a Native American campsite or village. Their November 3, 2017 review letter recommends an archaeological survey of the amendment area.

c) Natural Resources

The proposed amendment area is primarily located in the Dorn Creek subwatershed of the Sixmile and Pheasant Branch Creek Watershed of the Lower Rock River Basin (see Map 5). This area was included in the [2012 North Mendota FUDA Environmental Conditions Report](#). Wastewater from the Village of Waunakee is treated at the Madison Metropolitan Sewerage District Wastewater Treatment Facility. The treated effluent is discharged to Badfish Creek and bypasses the Yahara Chain of Lakes before entering the Yahara River. There are wetlands and hydric soils, but no waterbodies or floodplains, located within the amendment area.

Due to the presence of these natural resources, the northwest corner of the amendment area is identified in the Dane County Parks and Open Space Plan as part of the North Mendota 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. The area designated as environmental corridors is generally consistent with, though not as large as, the natural resource area boundary in the Dane County Parks and Open Space Plan. The North Mendota Natural Resource Area boundary was adopted in 2010 and encompasses 4,602 acres. Established to provide wildlife habitat and to protect water quality for surface water flowing into the Yahara lakes, the boundary extends south of the amendment area along Dorn Creek to the shore of Lake Mendota. Conservation easements can be purchased to protect land within the area.

Dorn Creek

Approximately 85% of the proposed amendment area is within the Dorn Creek Watershed. This stream has previously been called Spring Creek. This creek of 6.46 miles flows through agricultural lands and ends in Governor Nelson State Park where it combines with Six Mile Creek and subsequently flows into Lake Mendota. The watershed covers 12.7 square miles and includes a few springs that contribute to the creek’s base flow. The creek is approximately 0.4 miles southwest of the proposed amendment area boundary. Wetlands within the proposed amendment area are part of a larger wetland complex that is hydrologically connected to the creek. The upstream portion (from mile 1 to 6.46) of Dorn Creek is declared impaired by the Wisconsin Department of Natural Resources (DNR) for elevated water temperature and recreational restrictions due to pathogens. These impairments stem from E.coli, Total Phosphorus, and Sediment/Total Suspended Solids. The DNR does not have any chloride monitoring data for Dorn Creek. The United States

Geological Survey (USGS) baseflow monitoring indicated chloride levels of 32 mg/L in 2015-2016. Chronic and acute toxicity levels are 395 mg/L and 797 mg/L, respectively. The creek is considered to have cool-cold headwater, macroinvertebrate, and cool-warm headwater natural communities.

Six Mile Creek

Approximately 15% of the proposed amendment area is within the Six Mile Creek watershed. Six Mile Creek is 12.08 miles long and flows through the Village of Waunakee, ultimately draining into Lake Mendota. The 43 square mile watershed encompasses predominately agricultural lands and the growing community of Waunakee. The creek is listed as an Exceptional Resource Water by the DNR. The creek provides spawning areas for Lake Mendota's fish and offers a warm water sport fishery. The lower reach of the creek (from mile 0 to 8.5) is impaired for Total Phosphorus. There is a DNR monitoring station on Six Mile Creek at the Mill Road Bridge. Limited chloride monitoring results from that station indicated that chloride levels averaged 97 mg/L in 2011. USGS baseflow monitoring indicated chloride levels of 43 mg/L in 2015-2016. Six Mile Creek has cool-cold and cool-warm main stem natural communities.

Wetlands

The WDNR's wetland inventory shows an 8.9 acre emergent/wet meadow within the proposed amendment area. Aerial images show that much of the wetland area has been farmed in dry years. The wetland extends half a mile southwest from the amendment area until it meets Dorn Creek. The larger wetland complex totals 127 acres (including the portion within the amendment area) and is a mix of forested, shrub, and emergent/wet meadow habitats. Some of the wetland area has historically been grazed or cultivated in dry years. The wetland is predominantly surrounded by agricultural land. The wetland has been classified as a combination of "Group V" and "Not Inventoried" wetland in the [2008 Dane County Wetlands Resource Management Guide](#) (with Group I wetlands being the highest quality and Group V wetlands being the most degraded). A wetland delineation and assessment will be required to determine the actual extents and condition of the wetland within the proposed amendment area.

Springs

Springs represent groundwater discharge visible to the casual observer. The Wisconsin Geological and Natural History Survey (WGNHS) maintains an inventory of springs in Dane County and throughout the state. There are no known springs in the proposed amendment area. The Dorn Creek watershed has four springs and Six Mile Creek's watershed has two springs, all on private agricultural land (see Map 5). The closest spring to the Woodland West area is 0.7 miles southwest on the southern side of Meffert Road. This unnamed spring (WGNHS ID 130211) has a maximum flow of 0.33 cubic feet per second (cfs). Another smaller spring (WGNHS 130190), located about half a mile west of 130211, has a maximum flow of 0.018 cfs. Dorn Creek's other two springs (WGNHS 130189 and 130210) are approximately 1.7 miles south of the amendment area and have respective maximum flows of 0.002 cfs and 0.13 cfs. The two springs that contribute to Six Mile Creek are small. One (WGNHS 130212) is two miles northeast of Woodland West and has a maximum flow of 0.002 cfs. The other (WGNHS 130192) is 3.5 miles to the northwest and has a maximum flow of 0.01 cfs. Groundwater discharge generally occurs along the entire length of perennial streams and is the source of stream baseflow. The regional groundwater model has been used to evaluate the possible effects of current and future municipal groundwater well withdrawals on these stream systems.

Groundwater

Groundwater modeling, using the [2016 Groundwater Flow Model for Dane County](#) developed by the WGNHS, shows that baseflow in Sixmile Creek (see Map 12 and Table 4) has decreased from 13.3 cfs during pre-development conditions (no well pumping) to 11.3 cfs in 2010. These reductions are due to the cumulative effects of well water withdrawals from multiple municipalities in the groundwatershed.

In 2012, the WGNHS published a report, [Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model](#), estimating the existing groundwater recharge rates in Dane County based on the soil water balance method. The study estimates that the existing groundwater recharge rate in the amendment area ranges from 9 to 10 inches per year.

Endangered Resources

The DNR Bureau of Endangered Resources maintains a database representing the known occurrences of rare plants, animals, and natural communities that have been recorded in the [Wisconsin Natural Heritage Inventory](#). A screening review of this database conducted by Regional Planning Commission staff for species designated as endangered, threatened, or of special concern identified a species of special concern (frog) within a one-mile radius of the amendment area. It is recommended that the Village request a complete Endangered Resources Review by the DNR for potential impacts to endangered resources like rare plants, animals and natural communities in the amendment area.

Soils and Geology

The amendment area is located within the Waunakee Moraines. The Land Type Associations of Wisconsin classifies the surficial geology of this area as rolling till plain and irregular drumlins with scattered bedrock knolls, lake plains, and outwash plains. Soils are predominantly well drained silt and loam over calcareous sandy loam till or bedrock.

Surface elevations in the amendment area range from around 910 feet to 980 feet. The amendment area includes areas of steep (> 12%) slopes with some isolated areas of very steep (>20%) slopes associated with the ridges in the northwest and central areas of the site (see Map 6). There are no steep slopes adjacent to riparian areas.

According to the Natural Resource Conservation Service (NRCS) Soil Survey of Dane County, the soils are primarily in the Plano – Ringwood – Griswold association. These soils are moderately well drained and well drained, deep silt loams and loams. The Table 2 shows detailed classification for soils in the amendment area (see Map 7). Table 3 shows important soil characteristics for the amendment area (see Map 7).

There are hydric soils (the Ev, Os, and Wa soil map units) within the amendment area (see Map 7). Their mapped location is generally consistent with, but more expansive than the mapped wetland. Hydric soils are good indicators of existing and former (drained) wetlands. Hydric soils may have the potential for wetland restoration. A wetland delineation will be required to determine the actual extents of the wetland within the proposed amendment area.

According to the [Soil Survey Geographic data for Dane County developed by the USDA Natural Resources Conservation Service](#), the Elburn, Plano, St. Charles and Troxel soils (the EfB, PnB, PnC2, ScB and TrB map units) are not hydric, but they can have a seasonal (April to June) zone of water saturation within 5 feet of the ground surface. All these soils except the Elburn (EfB) are classified as either well drained or moderately well drained. Soils with seasonal high water tables that are also classified as well drained or moderately well drained generally do not pose limitations for buildings with basements.

The Elburn soils are poorly drained and may 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. These areas are well suited for park and open space areas. If these areas are developed, on-site soils investigations are recommended to determine the actual extent of seasonal high groundwater areas. Restrictions are recommended in confirmed problem areas to establish the lowest allowable level of any structure so that it is situated well above the high water table to reduce the potential for groundwater induced flooding.

Table 2
Soils Classification

Soil	% of Area	General Characteristics
<i>Plano Silt Loam; PnB</i>	22.1	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>Griswold Loam; GwD2</i>	20.3	Deep, well-drained gently sloping to moderately steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a severe hazard of erosion. Poses severe limitations for development due to slope, bearing capacity, shrink/swell potential and erodibility.
<i>Ringwood Silt Loam; RnC2</i>	19.7	Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due to slope, low bearing capacity, shrink/swell potential, and erodibility.
<i>Plano Silt Loam; PnC2</i>	13.8	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>Orion Silt Loam; Os</i>	7.2	Deep, somewhat poorly drained, nearly level soils on flood plains and narrow stream bottoms. Soils have high fertility, moderate permeability, and a severe hazard of erosion. Poses very severe limitations for development due to flooding, seasonal high water table, moderate shrink/swell potential, and very low bearing capacity.
<i>Wacousta Silty Clay; Wa</i>	3.7	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>Elburn Silt Loam; EfB</i>	3.4	Deep, somewhat poorly drained, nearly level and gently sloping soils in glaciated stream valleys. Soils have high fertility, moderately slow permeability, and a moderate hazard of erosion. Poses moderate to severe limitations for development due to seasonal high water table, frost heave potential and low bearing capacity.
<i>Plano Silt Loam; PoC2</i>	2.6	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 steep slope, erodibility, and low bearing capacity.
<i>Griswold Loam; GwC</i>	2.5	Deep, well-drained gently sloping to moderate steep soils on glaciated uplands. Soils have medium fertility, moderate permeability, and a severe hazard of erosion. Poses moderate limitations for development due to bearing capacity and shrink/swell potential.
<i>Kidder Loam; KrE2</i>	1.6	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>Troxel Silt Loam; TrB</i>	1.4	Deep, well drained and moderately well drained, gently sloping soils in draws, on fans, and in drainageways. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses moderate limitations for development due to shrink/swell potential and depth to saturated zone.
<i>Edmund Silt Loam; EdC2</i>	0.6	Shallow, well drained, gently sloping to moderately steep soils on uplands. Soils have low fertility, moderately slow permeability, and a very severe hazard of erosion. Poses severe limitations for development due to steep slopes, depth to hard bedrock, and shrink/swell potential.
<i>Elvers Silt Loam; Ev</i>	0.6	Moderately deep, poorly drained, nearly level soils on low benches and bottoms in stream valleys. Soils have medium fertility and moderately slow permeability. Poses very severe limitations for development due to very low bearing capacity, seasonal high water table, frost heave potential, shrink/swell potential and is subject to frequent flooding.
<i>St. Charles Silt Loam; ScB</i>	0.5	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.

Source: Soil Survey Geographic data for Dane County developed by the USDA Natural Resources Conservation Service

Table 3
Soils Characteristics

Characteristic	Soil Map Symbols (see Map 7)	% of Area
<i>Prime Agricultural Soils</i>	<i>EfB, PnB, ScB, TrB</i>	27.4
<i>Hydric Soils (Indicates Potential / Restorable Wetlands)</i>	<i>Ev, Os, Wa</i>	11.5
<i>Soils with Seasonal High Water Table (< 5')</i>	<i>EfB, Ev, Os, PnB, PnC2, ScB, TrB, Wa</i>	52.7
<i>Soils Associated with Steep Slopes (> 12%)</i>	<i>GwD2, KrE2</i>	21.9
<i>Soils Associated with Shallow Bedrock (< 5')</i>	<i>EdC2</i>	0.6
<i>Poorly Drained Soils</i>	<i>EfB, Ev, Os, Wa</i>	14.9
<i>Best Potential for High Rates of Infiltration in Subsoils</i>	<i>KrE2, PnB, PnC2, PoC2, RnC2, ScB, TrB</i>	61.7

Source: Soil Survey Geographic data for Dane County developed by the USDA Natural Resources Conservation Service

According to WGNHS data, the majority of bedrock within the amendment area is in the Tunnel City Group, which is medium to very fine-grained quartz sandstone and locally very glauconitic. It consists of two formations including the Lone Rock and Mazomanie Formations. The bedrock thickness is up to 150 feet. The bedrock under a small portion of the northeast corner of the amendment area is in the Trempealeau Group, which is quartz sandstone, dolomitic siltstone, silty dolomite, and sandy dolomite, consisting of two formations, the Jordan and the underlying St. Lawrence Formations, which were combined as one mapping unit. The bedrock thickness is about 75 feet, where not eroded. According to WGNHS data, the depth to bedrock ranges from less than 10 feet in the north to greater than 100 feet in the southwest of the amendment area (see Map 8). The depth to bedrock in the majority of the amendment area is 50 to 100 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. However, where bedrock fractures are near the surface infiltration rates can be very high. Based on the WGNHS karst potential data, a majority of the amendment area has no potential for karst features (see Map 8). A small portion of the northeast corner of the amendment area has bedrock with potential karst units, with a depth from surface ranging from 20 to 80 feet. The DNR Conservation Practice Standard 1002 - Site Evaluation for Stormwater Infiltration requires field verification for areas of the development site considered suitable for infiltration. This includes a site assessment for karst features in this area.

There is no minimum separation distance for roofs draining to surface infiltration practices. However, the Dane County ordinance requires infiltration practices to be located so that the separation distance between the bottom of the infiltration system and the elevation of seasonal high groundwater or the top of bedrock is at least 5 feet for residential arterial roads and 3 feet for other impervious surfaces. Area immediately adjacent to the existing

wetland has the potential to experience a seasonal high water table between zero and 3 feet, which would limit infiltration within these areas to roof runoff only. A majority of the topographic low points and valleys of the amendment area have the potential to experience a seasonal high water table between three and five feet of the surface, which will require care when siting infiltration practices so as to not impact groundwater quality.

2) Proposed Urban Services

a) Parks and Open Space

The development plan includes a 2 acre park as well as an additional 30.8 acres of park and open space encompassing the wetland and stormwater management areas. The plan also includes a linear park / trail along the ridge line of the development (see Map 11)

b) Public Water System

The Waunakee Water and Light Commission operates five high capacity wells with a combined capacity to deliver 7,236,000 gallons per day (gpd), or 5,025 gallons per minute (gpm) (see Map 12). The well names and respective peak pumping capacities follow: Well HO680 (505 feet deep) 625 gpm, Well BF562 (420 feet deep) 1,100 gpm, Well BF563 (600 feet deep) 1,100 gpm, Well MO502 (700 feet deep) 1,200 gpm, and Well WK858 (752 feet deep) 1,000 gpm. The Village's water system currently has 1,350,000 gallons of storage provided by four above ground storage tanks and one below ground reservoir with a maximum serviceable water elevation of 960 feet. The Village's average municipal water demand is 1,600,000 gpd with a peak demand of 4,861 gpm.

Water will be provided to the amendment area by way of a 12-inch water main connection to an existing main near the intersection of County Highway Q and Water Wheel Drive and a 10-inch connection near the intersection of County Highway Q and Peaceful Valley Parkway (see Map 10). The estimated average daily water demand for the amendment area will be 207,000 gpd based on 209 existing and new residential units, 400 multi-family units, 10.51 acres of institutional land use and 17.7 acres of commercial land use. The peak demand for the amendment area is estimated to be 719 gpm using the Village's conservative peaking factor of 5. The combined peak demand for the existing Village demand and the amendment area will be 5580 gpm. This estimate is reasonable based on building use and the water utility's annual reports to the Public Service Commission.

Water losses in the Village's distribution system have been steadily increasing since 2012, reaching a level of 18% of net water supplied in 2016. The Wisconsin Administrative Code [PSC 185.85\(4\)\(b\)](#) requires a utility with more than 1,000 customer to submit a water loss control plan to the Public Service Commission if the utility reports its percentage of water losses exceed 15%. It is recommended that the Village develop and implement a water loss control plan.

c) Wastewater

Sanitary sewer service will be provided to the amendment area by two main extensions from the east. The sewer extension that will serve the northeastern portion of the amendment area will connect to an existing 8-inch sewer west of County Highway Q, across from the existing Church. The second extension, serving the southwestern portion of the amendment area, will connect to an existing 15-inch sewer west of the intersection of County Highway Q and Water Wheel Drive (see Map 9). Both extensions will drain to the Village's Blue Ridge Pumping Station. The Village has a back-up generator on site to insure continued operation of the pumping station in the event of a power failure.

The Village estimates that the combined amendment area will generate an average of 107,000 gpd. Using a peaking factor of 4.0, it is estimated that the amendment area will generate a peak flow of 281 gpm. The estimate is consistent with historical wastewater

generation rates in the Village. The Village estimates that the current average flow, prior to the addition of the amendment area, at the Blue Ridge Pumping Station is 238 gpm. The average daily flow is not currently monitored at the pumping station or downstream interceptor. The pumping station has a current capacity of 450 gpm and is capable of being upgraded to a capacity of 900 gpm in the future. Based on existing estimated flows, forecasted flows generated by the entire built-out development flowing to the pump station will increase to 521 gpm, above the current capacity but less than the maximum capacity. The downstream 12-inch interceptor pipe has sufficient capacity to accommodate a peak flow of 715 gpm. Based on existing estimated flows, forecasted flows generated by the entire built-out development flowing to the interceptor pipe will increase to 873 gpm, above the current capacity. The interceptor will not need to be improved until the time when the pump station is upgraded to a capacity above 715 gpm,. It is recommended that the Village begin monitoring system performance entering and exiting the pump station in order to determine when additional capacity will be needed in the sanitary system.

Waste Water Treatment Facility

MMSD will provide wastewater treatment for the amendment area. MMSD Pumping Station 14 serves this area. Results indicate the average daily and estimated peak flows are below the interceptor capacity. The Nine Springs Treatment Facility has a design capacity of 50 million gallons per day (mgd) and received an average of 40.7 mgd in 2015, including infiltration and inflow. It is expected to reach 90 percent of current hydraulic design capacity around 2026 based on current projected growth rate assumptions. 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.

d) Stormwater Management System

The preliminary stormwater management plan for the amendment area includes depressed boulevard road profiles with integrated bioretention along with a conventional wet pond and infiltration basin at the low point of the landscape. The swale-based road profile replaces a traditional curb-and-gutter section in a large portion of the development area and provides water quality and quantity treatment where a traditional inlet and piped conveyance system does not. These facilities will generally be strategically located to adequately provide water quality treatment and pretreatment, or 80% TSS reduction, followed by volume reduction facilities. In the joint planning area, the Village of Waunakee follows the Town of Westport stormwater ordinance which requires infiltration of 100% of the increased post-development runoff volume, when compared to the predevelopment volume, resulting from the 100-year, 24-hour design storm. It is anticipated that infiltration performance will further reduce TSS (and other pollutants such as Total Phosphorus) from stormwater discharges as well as reduce runoff temperature. While infiltrating the increased volume of runoff between the pre- and post-developed site provides more volume control than the County requirement to match 90% of the predevelopment average annual stay-on, it provides less volume control than maintaining 100% of the predevelopment average annual stay-on. Collectively, the stormwater facilities will provide peak discharge rate control to account for storms up to and including the 100-year rainfall event. The stormwater facilities will be owned and maintained by the Village of Waunakee.

A majority of the topographic low points and valleys of the amendment area have the potential to experience a seasonal high water table between three and five feet of the surface, which will require care when siting infiltration practices so as to not impact groundwater quality. The DNR Conservation Practice Standard 1002 - Site Evaluation for Stormwater Infiltration requires field verification for areas of the development site considered suitable for infiltration. This includes a site assessment for karst features on the site to locate infiltration facilities appropriately so that performance can be maximized while

protecting groundwater resources. The Village's plan to incorporate bioretention higher in the landscape is advantageous should limiting conditions be found at the proposed stormwater management facilities locations along the south edge of the site.

Performance Standards

The Village of Waunakee proposes stormwater management performance measures to meet or exceed standards required by the State of Wisconsin (NR 151), Dane County (Chapter 14), Village of Waunakee (Chapter 109), and Town of Westport (Section 10-2) 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 retention pond prior to infiltration) for the 1-year, 24-hour design storm. This is consistent with the standards currently required by Dane County.
- 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 range of design storms currently required by Dane County.
- 3) Require infiltration of 100% of the increased post-development runoff volume, when compared to the predevelopment volume, resulting from the 100-year, 24-hour design storm. This is more protective than the stay-on standard for new development currently required by Dane County regulations.
- 4) Maintain pre-development groundwater annual recharge rate of 9 to 10 inches per year for this area as estimated by the Wisconsin Geological and Natural History Survey in a 2012 report titled "Groundwater Recharge in Dane County, Wisconsin Estimated by a GIS-Based Water Balance Model." This is consistent with the standards currently required by Dane County.

e) *Environmental Corridors*

The Village has worked with Regional Planning Commission staff prior to submitting this application to establish environmental corridors that meet the adopted policies and criteria of the *Dane County Water Quality Plan*. The environmental corridor includes the wetland as currently mapped with a buffer of at least 75 feet. A total of 32.8 acres of environmental corridors are proposed for environmentally sensitive areas (wetland), stormwater management areas, and parks and open space.

3) Impacts and Effects of Proposal

a) *Meeting Projected Demand*

Current projections suggest that an additional 5,300 residents and 2,300 housing units can be expected in the Waunakee Sewer Service Area between 2010 and 2040. Land demand projections in 2010 estimated that a total of 990 additional acres would be needed by 2040. Department of Administration (DOA) population estimates for 2017 indicate that 13,535 residents call Waunakee home. This estimate puts population growth roughly on track with, or perhaps slightly ahead of, projections. The 2015 American Community Survey 5-Year Estimate placed the total number of households at 4,768 (+/- 170), surpassing the DOA projection for 2015 (4,663 households) by 105 housing units.

b) *Phasing*

The amendment area will develop in three, ten-year phases. Development will begin with single-family construction in the central and northern areas. Phase two will continue single-family development to the west and southwest, completing the "ring-road." Phase three will consist of multi-family and mixed-use development to the northeast. The majority

of the phase three area is already within the Waunakee Urban Service Area. The amendment will add 415 housing units. The first and second phases will contribute 190 single-family units and phase three will contribute 225 multi-family units.

c) *Surface Water Impacts*

Development creates impervious surfaces (i.e., streets, parking areas, and roofs) and typically alters the natural drainage system (e.g., natural swales are replaced by storm sewers). Without structural best management practices (i.e., detention basins and infiltration basins) this would result in increased stormwater runoff rates and volumes, as well as reduced infiltration. Without structural best management practices for erosion control, development would 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.

Since 2002, there have been stormwater management standards in effect at the state, county, and local level to require stormwater management and erosion control plans and structural best management practices to address the impacts of development on water quality, runoff volumes, peak flows, water temperature, and groundwater recharge.

The Village proposes to mitigate the urban nonpoint source impacts of the proposed development by requiring the implementation of various stormwater best management practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, water temperature, and groundwater recharge. This will address the potential impacts of the proposed development on the receiving waters. To its credit, the Village of Waunakee has adopted the Town of Westport's more stringent stormwater management requirement which requires infiltration of 100% of the difference between the post-development runoff volume and the predevelopment volume for the 100-year, 24-hour design storm.

The Village and developer have tried growing and harvesting hay (alfalfa, smooth bromegrass, and orchardgrass) in the buffer areas of environmental corridors in other parts of the Village as a means of phosphorus removal from the watershed. Research would be beneficial to quantify the effectiveness of this approach.

d) 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 from all municipalities have resulted in a 2 cfs decline in baseflow in Sixmile Creek (see Map 12 and Table 4) compared to the pre-development (no pumping) baseflow of 13.3 cfs. An additional 0.7 cfs decline is anticipated by the year 2040, according to modeling, reducing the baseflow to 10.6 cfs. According to the 2014 DNR report [*Ecological Limits of Hydrologic Alteration in Dane County Streams*](#), no significant change in the fish community status from 2010 conditions is expected to occur as a result of the projected 2040 reduction in baseflow in Sixmile Creek.

The loss of baseflow from the cumulative effects of well water pumping is a regional issue, beyond the boundaries of a single Urban Service Area Amendment or even a single municipality. 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).

Maintaining pre-development groundwater recharge helps to maintain baseflow and mitigate this impact. The Village of Waunakee proposes to maintain the pre-development annual recharge rate (estimated as 9 to 10 inches per year for this area according to the WGNHS study). Experience has shown that this criterion is generally met when 90% of pre-development runoff volume is maintained for the development area through infiltration measures, the Village goes beyond this by requiring infiltration of 100% of the difference between the post-development runoff volume and the predevelopment volume for the 100-year, 24-hour design storm.

Table 4 Modeled Baseflow Results Due to Current and Anticipated Future Municipal Well Water Withdrawals (All Municipal Wells)			
Stream	No Pumping	2010	2040
<i>Sixmile Creek</i>	<i>13.3 cfs</i>	<i>11.3 cfs</i>	<i>10.6 cfs</i>

4) Comments Received and Unresolved Issues

A public hearing was held on the proposed amendment at the November 9, 2017 meeting of the Capital Area Regional Planning Commission. Representatives of the Village of Waunakee and Town of Westport spoke in favor of the amendment. There was no public comment registered in opposition to the proposed amendment. Key questions from Commissioners at the public hearing were related to the health of the wetlands in the existing development to the east, the ability to operate the pumping station in the event of a power failure, and the linear park / trail along the ridge line of the amendment area.

5) Conclusions and Staff Water Quality Recommendations

There is sufficient existing treatment plant system capacity at MMSD to serve the proposed amendment area. There is also sufficient existing wastewater collection system capacity to serve the proposed amendment area. Monitoring of the Blue Ridge Pumping Station will be needed to plan for future capacity improvements.

Since 2002, there have been stormwater management standards in effect at the state, county, and local level to require stormwater management and erosion control plans and structural best management practices to address the impacts of development on water quality, runoff volumes, peak flows, water temperature, and groundwater recharge.

The Village proposes to mitigate the urban nonpoint source impacts of the proposed development by requiring the implementation of stormwater best management practices that are designed and constructed to meet or exceed current standards for pollutant reduction, runoff volumes, peak flows, water temperature, and groundwater recharge. This will address the potential impacts of the proposed development on the receiving waters. To its credit, in the joint planning area with the Town of Westport, the Village of Waunakee has voluntarily adopted a more stringent stormwater management which requires infiltration of 100% of the difference between the post-development runoff volume and the predevelopment volume for the 100-year, 24-hour design storm.

Wetlands are hydrologically connected to our surface and groundwater and provide many ecosystem services that result in valuable public benefits. They absorb snowmelt and rain providing flood storage and reducing downstream flood damages. They recharge our groundwater, which is the source of municipal water supplies in our region, as well as the source of stream base flows of cool waters that fish depend on. Wetlands improve water quality by slowing the flow of water and reducing erosion. They also supply critical habitat for variety of plants, animals, and birds. The development and implementation of a wetland restoration plan for the wetland on the site would improve the ecosystem service provided by the wetland and create a natural amenity for the development and the community.

It is the Regional Planning Commission staff's opinion that the proposed amendment is consistent with water quality standards under Wis. Stat. § 281.15, with the conditions of approval identified below. Additional actions have also been recommended below to further improve water quality and environmental resource management.

a) Conditions

Regional Planning Commission staff recommends approval of this amendment, based on the land uses and services proposed, and conditioned on the continued commitment of the Village of Waunakee to pursue the following:

1. Submit a detailed stormwater management plan for Regional Planning Commission 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. Provide at least 80% sediment control for the amendment area based on the 1-year, 24-hour design storm, with a minimum of 60% of that control occurring prior to infiltration, in accordance with the Dane County Stormwater Ordinance.
 - d. 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.
 - e. Infiltrate 100% of the increased post-development runoff volume from the 100-year, 24-hour design storm in accordance with the Town of Westport Stormwater Ordinance.
 - f. 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* (a range of 9 to 10 inches/year for the amendment area) or by a site specific analysis, in accordance with the Dane County Stormwater Ordinance.
2. Conduct a field verification for areas of the development site considered suitable for infiltration including a site assessment for karst features as required by the Wisconsin Department of Natural Resources Conservation Practice Standard 1002 - Site Evaluation for Stormwater Infiltration.
 3. 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.
 4. Conduct a wetland delineation and assessment report using the Wisconsin Wetland Rapid Assessment Methodology for wetland condition and function and the Floristic Quality Assessment for plant community condition. Submit the report for Regional Planning Commission staff and DNR review.
 5. Delineate environmental corridors to include the wetlands, associated buffers, and stormwater management areas to meet *Dane County Water Quality Plan* criteria for the delineation of environmental corridors. Submit plats showing environmental corridors for Regional Planning Commission staff review and approval prior to recording. Any environmental corridor on private property shall be protected by deed restrictions and neighborhood covenants.
 6. Conduct flow monitoring of the Blue Ridge Pumping Station and downstream sanitary sewer to develop a capital improvement plan for additional capacity as needed.

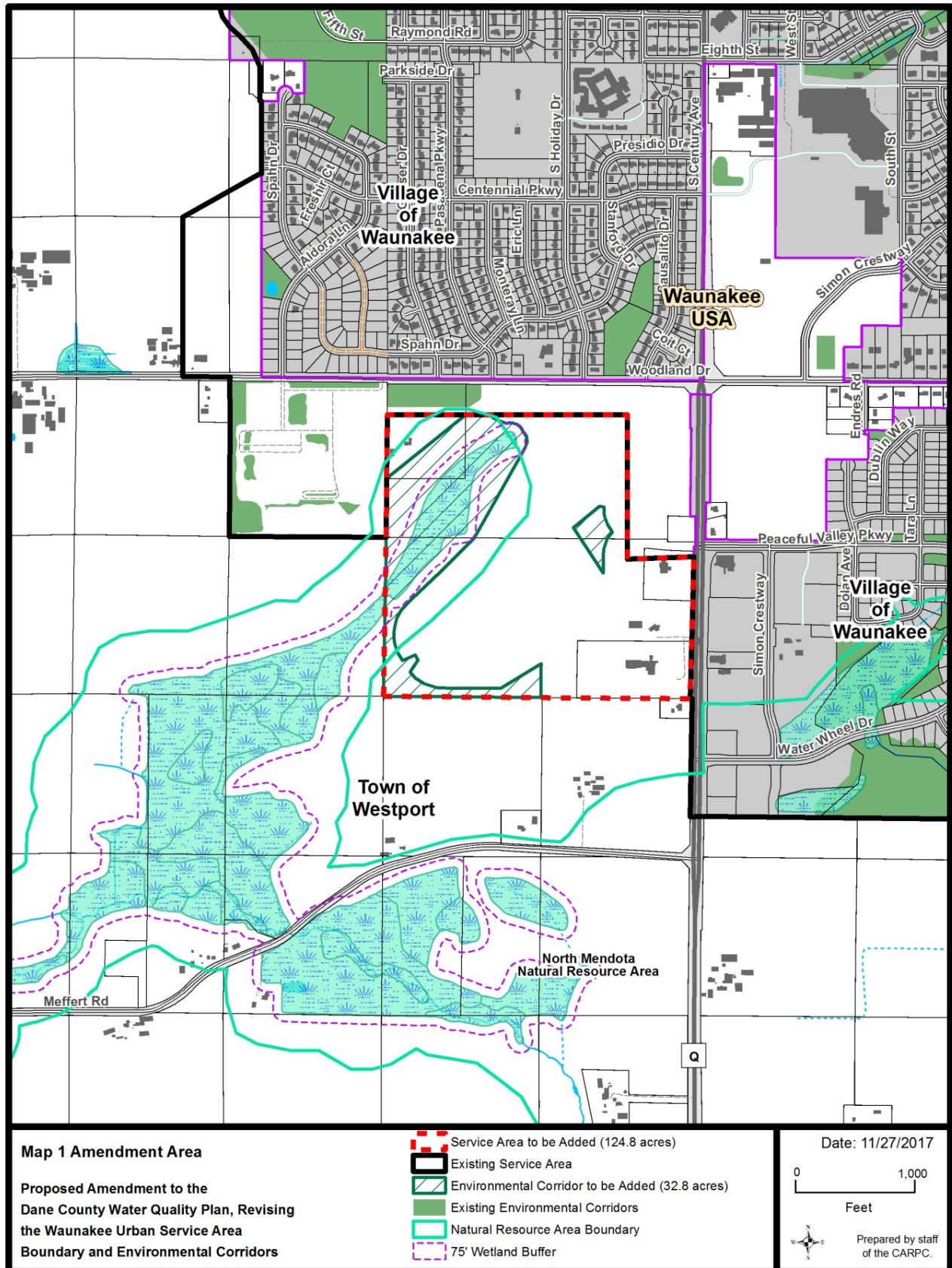
b) Recommendations

It is also recommended that the Village of Waunakee pursue the following:

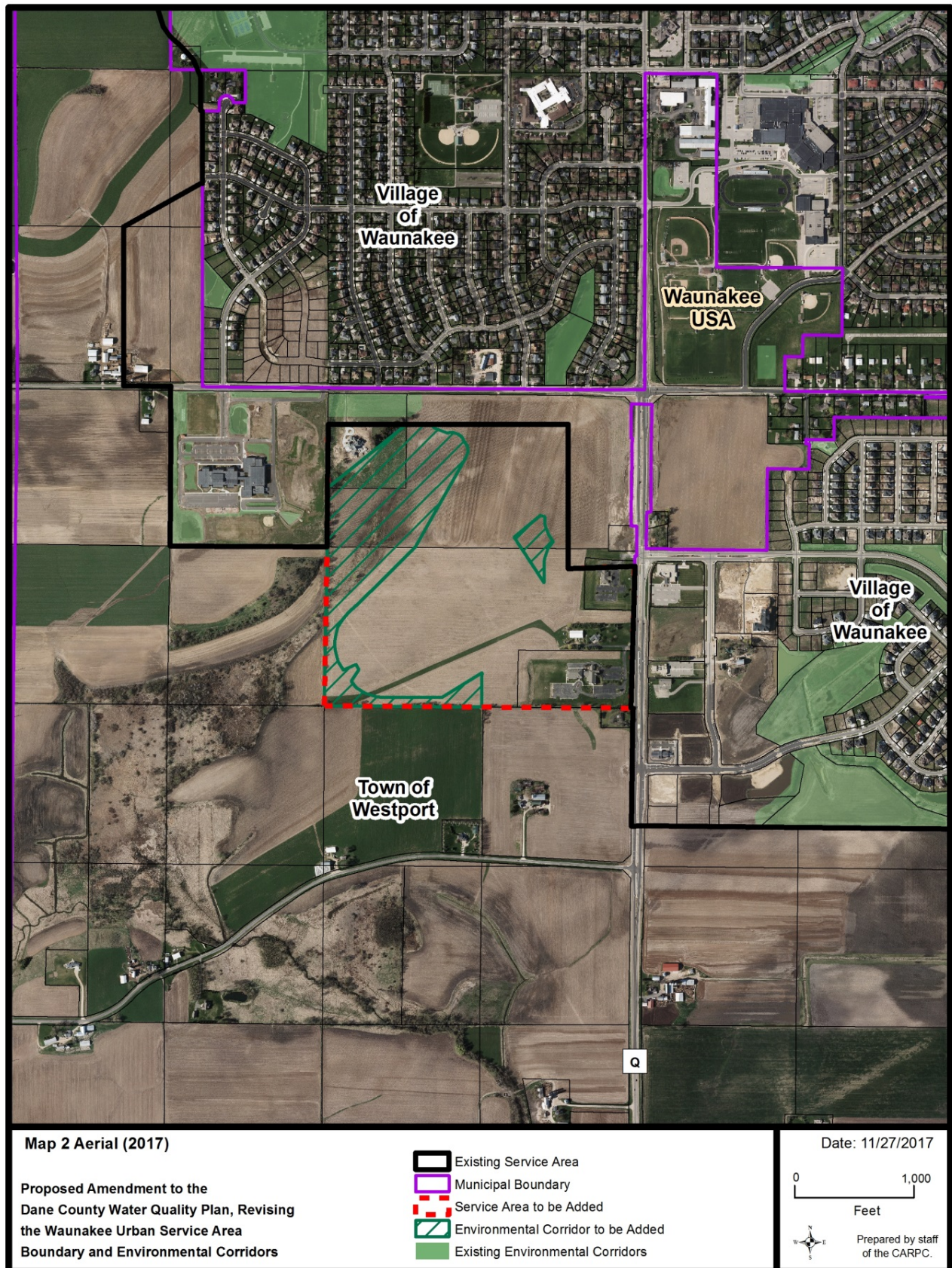
1. Require an archaeological survey be performed by a qualified archaeologist for the amendment area as recommended by the Wisconsin Historical Society (see attached letter) and take necessary protection measures if artifacts are found.
2. Request a formal Endangered Resources Review by the WDNR or one of their certified reviewers for potential impacts to endangered resources like rare plants, animals and natural communities and take necessary habitat protection measures if species are found.
3. Encourage the responsible use of deicers as part of the [WI Salt Wise Partnership](#).

4. Develop and implement a wetland restoration plan for the wetland on the site to improve the ecosystem service provided by the wetland and create a natural amenity for the development and the community.
5. Develop and implement a water loss control plan as required by PSC 185.85(4)(b)
6. Work with Regional Planning Commission staff to develop a long term water supply plan for the Village using the regional groundwater model.
7. Collaborate with the Town of Westport, Dane County, CARPC, and other stakeholders to develop a natural resource management plan for the North Mendota Natural Resource Area.
8. Consider using mowed vegetation, mulch, or permeable pavement for the ridge trail surface where appropriate based on site conditions and planned uses.
9. Participate in the [Green Tier Clear Waters Initiative](#), which aims to reduce the sediment and nutrient delivery to Dane County's lakes and streams from construction activities, beyond the current state and local requirements.

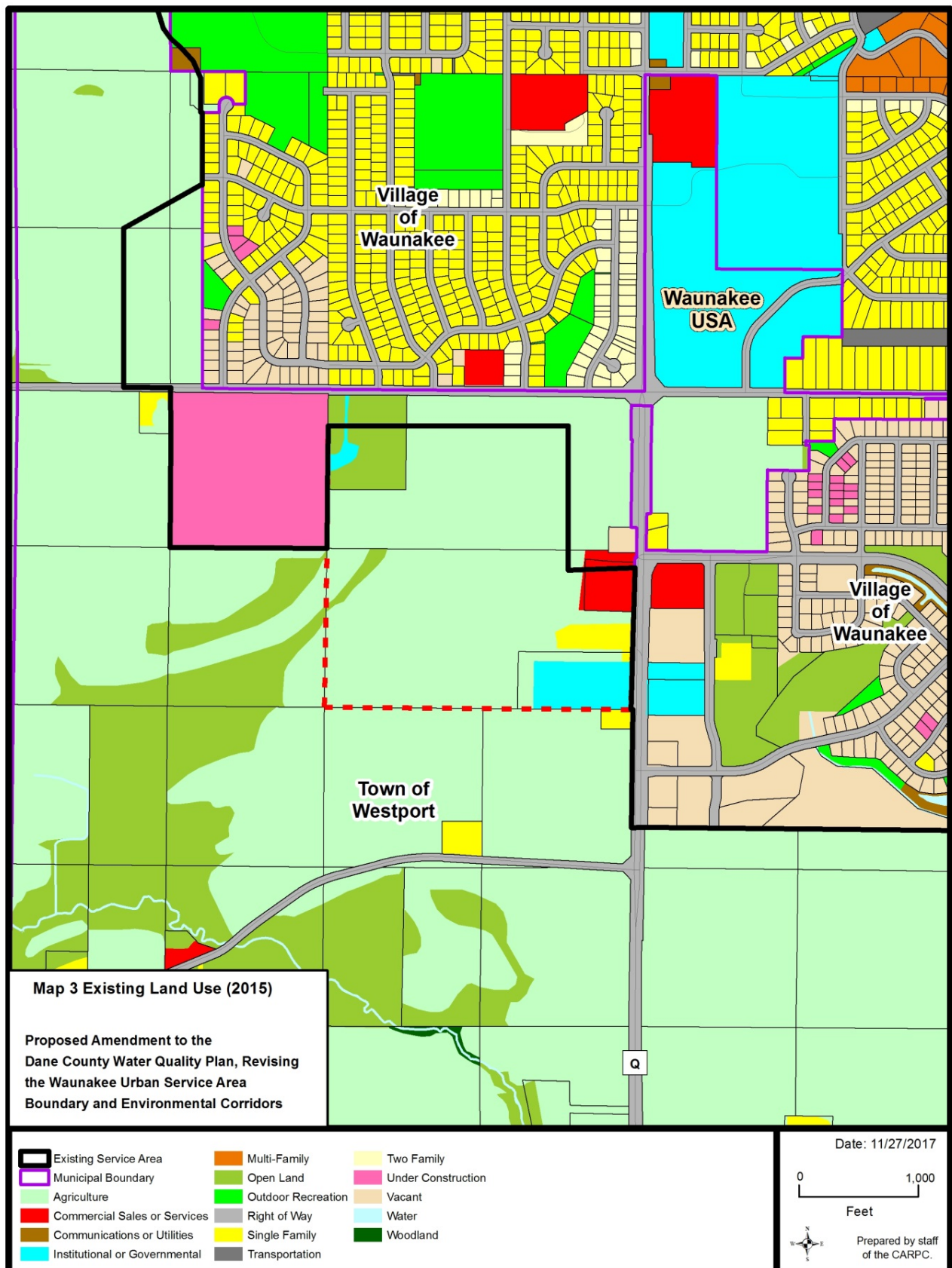
Map 1 - Amendment Area



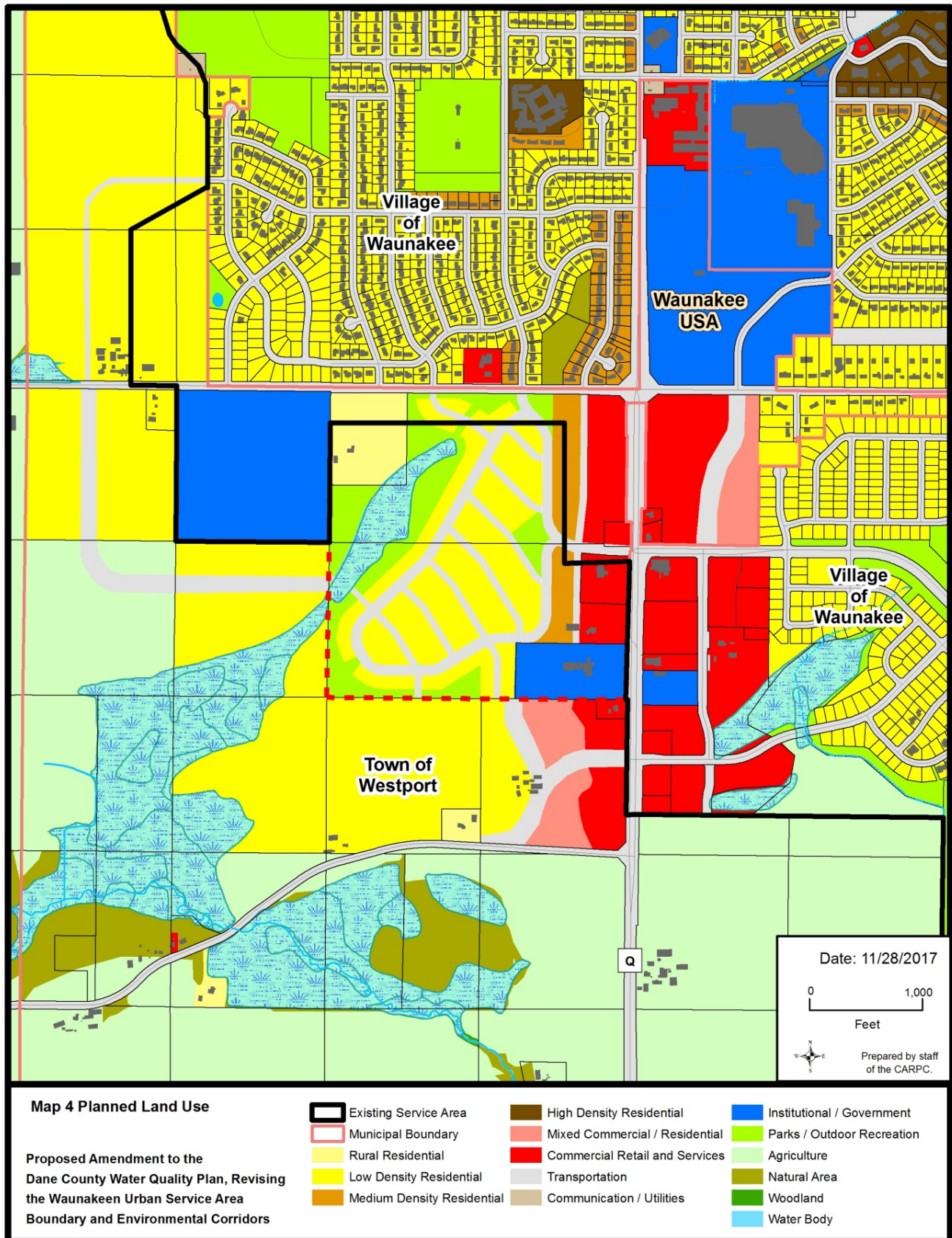
Map 2 – Aerial



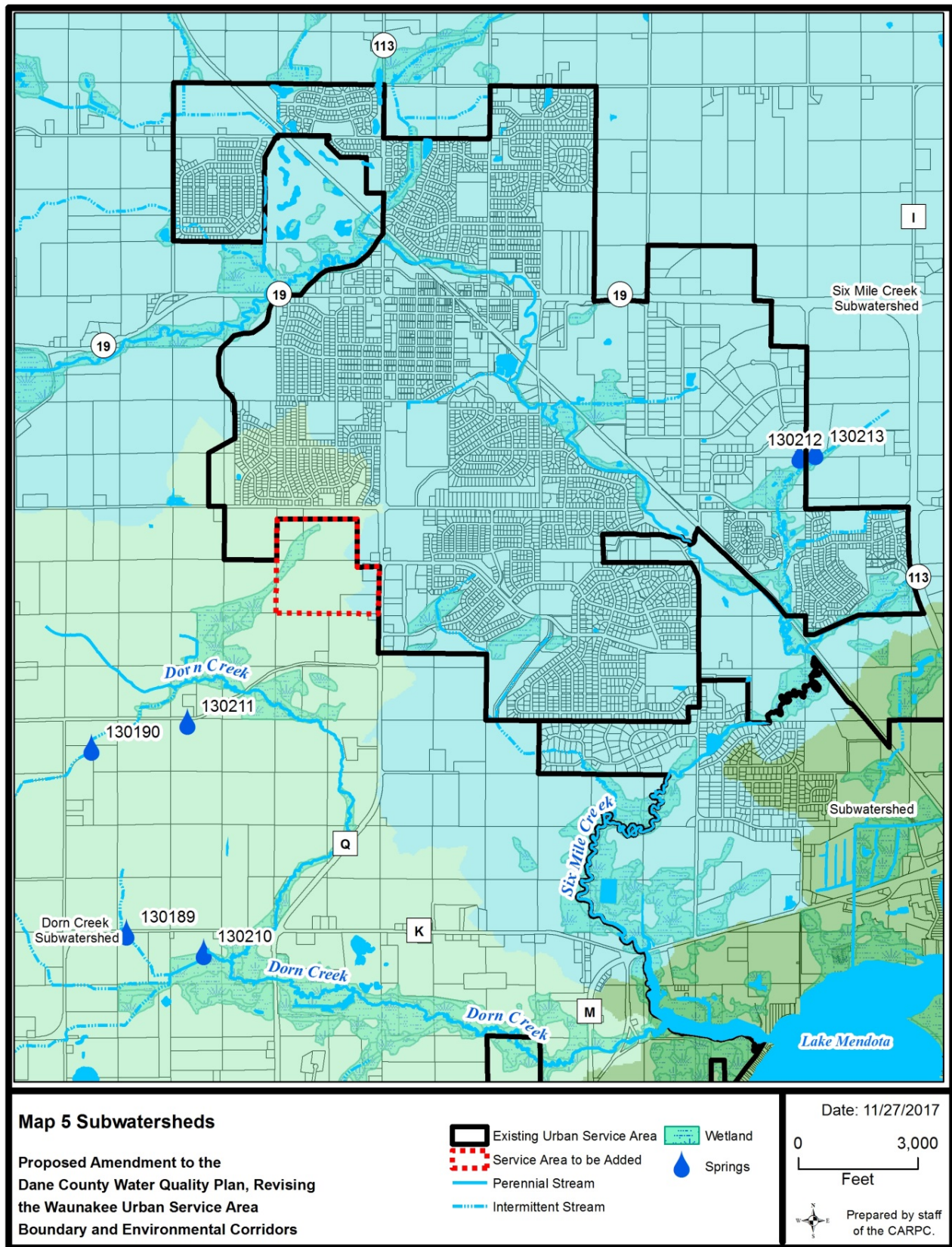
Map 3 – Existing Land Use



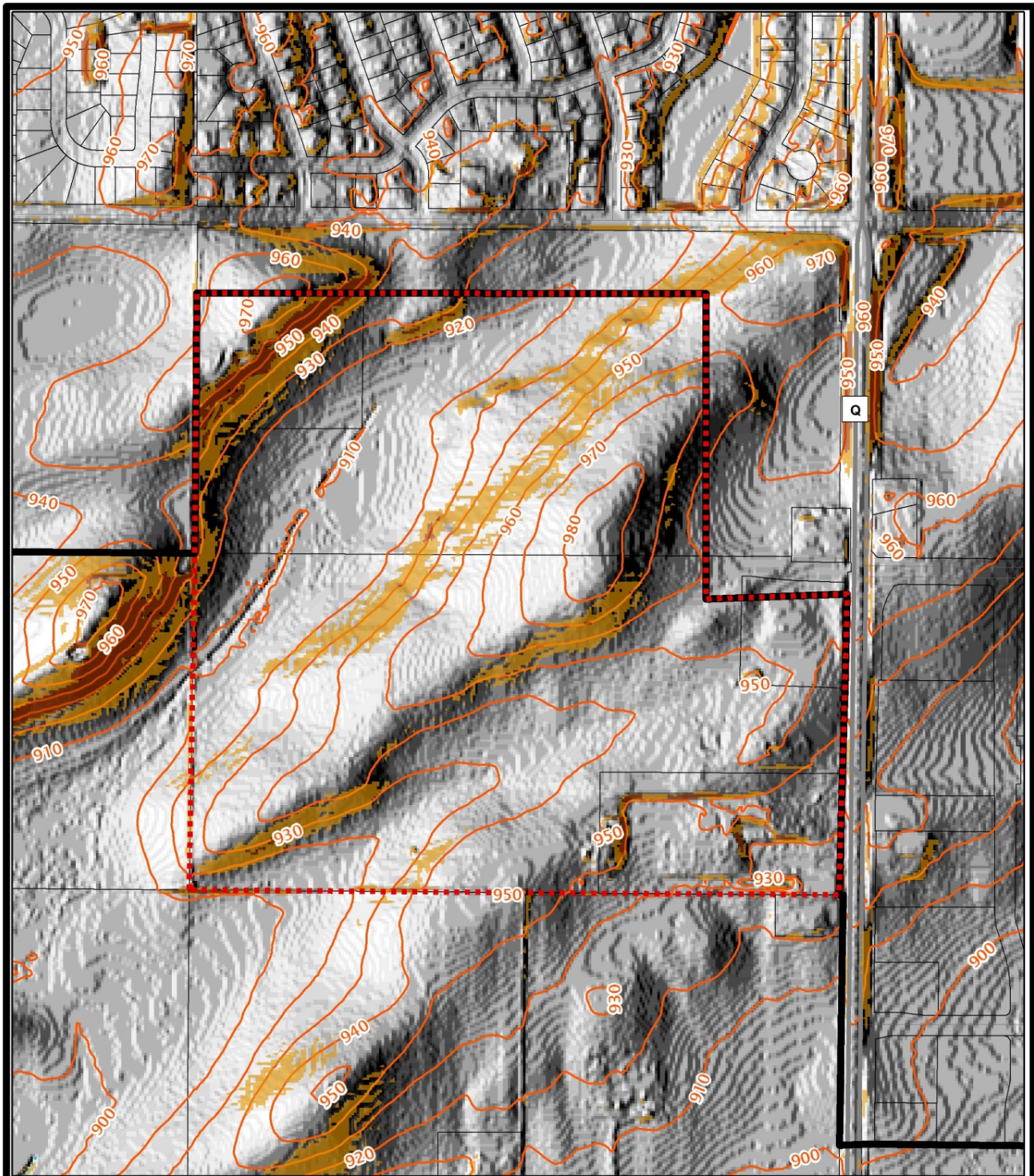
Map 4 – Planned Land Use



Map 5 - Subwatersheds



Map 6 - Elevations



Map 6 Elevation

**Proposed Amendment to the
Dane County Water Quality Plan, Revising
the Waunakee Urban Service Area
Boundary and Environmental Corridors**

- | | |
|--|---|
|  Existing Service Area Boundary | Steep Slopes |
|  Service Area To Be Added |  12% to less than 20% |
|  Contours (10ft) 2009 |  20% and greater |
|  Lakes and Ponds | |

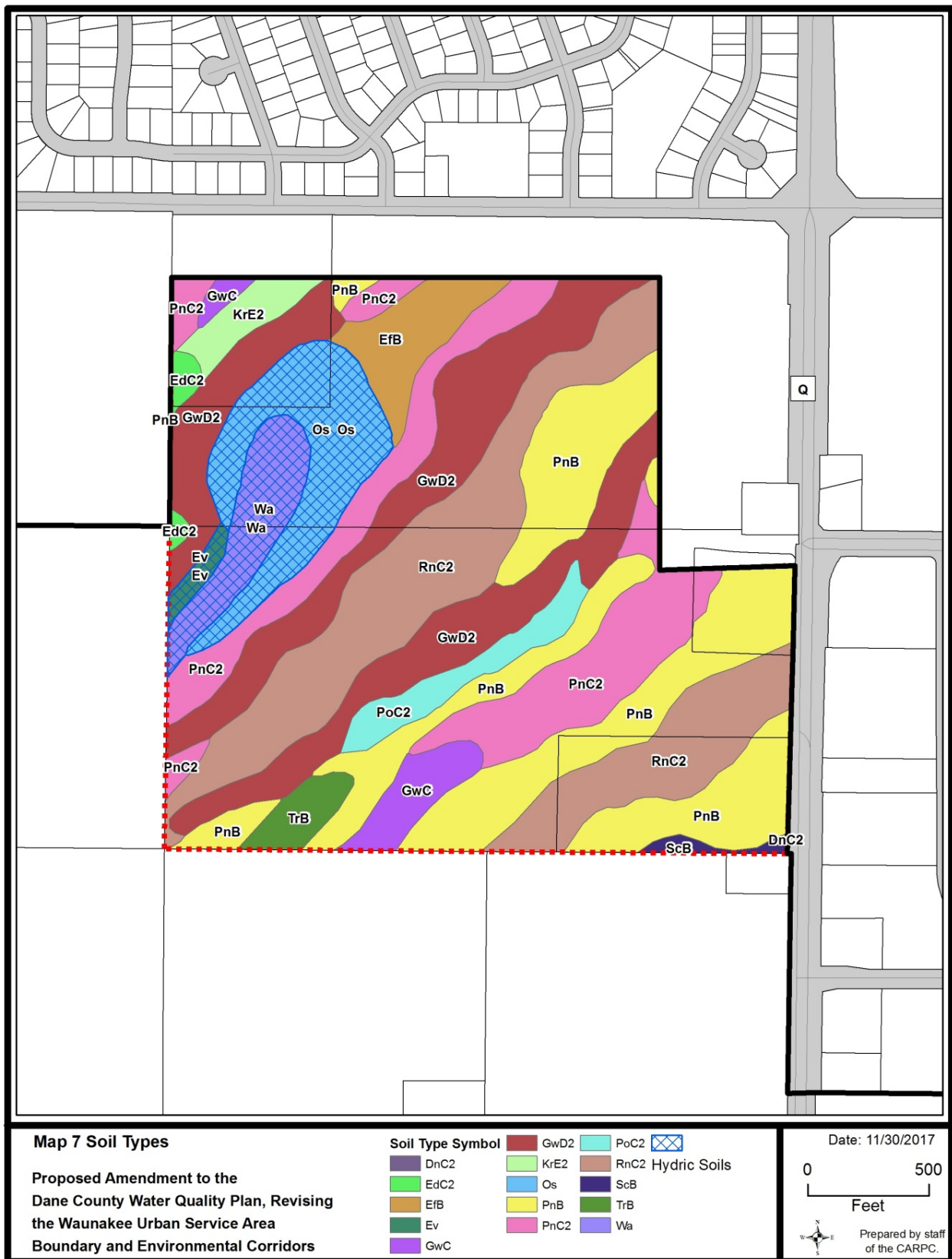
Date: 11/27/2017

0 500
Feet

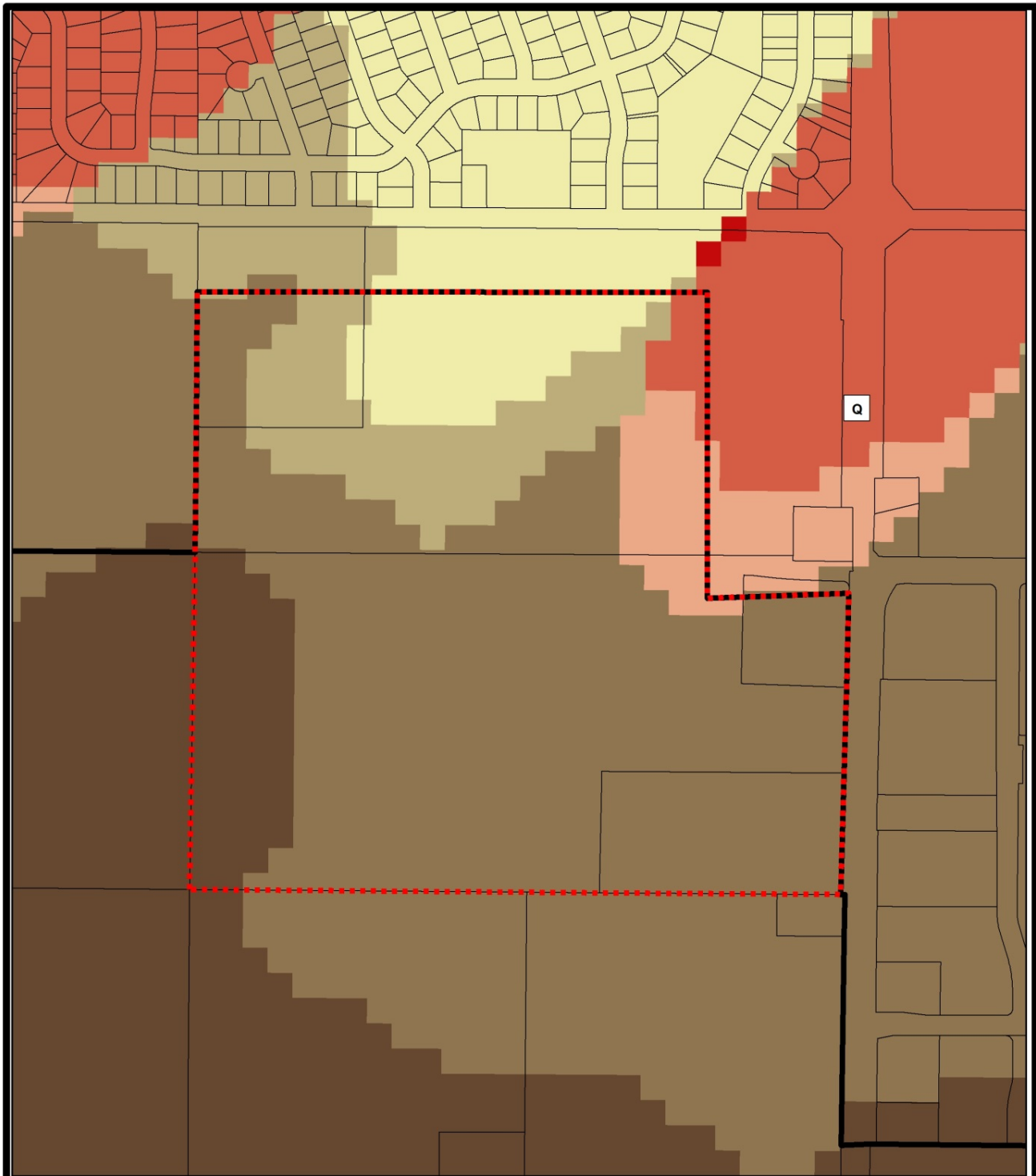


Prepared by staff
of the CARPC.

Map 7 - Soil Type



Map 8 – WGNHS Bedrock Depth and Potential Karst Features



Map 8 WGNHS Bedrock Depth and Potential Karst Features

Proposed Amendment to the
Dane County Water Quality Plan, Revising
the Waunakee Urban Service Area
Boundary and Environmental Corridors

Depth to Bedrock (ft) Potential Karst Units (ft)

0 - 10
10 - 50
50 - 100
100 - 400

0 - 10
10 - 50
50 - 100
100 - 400

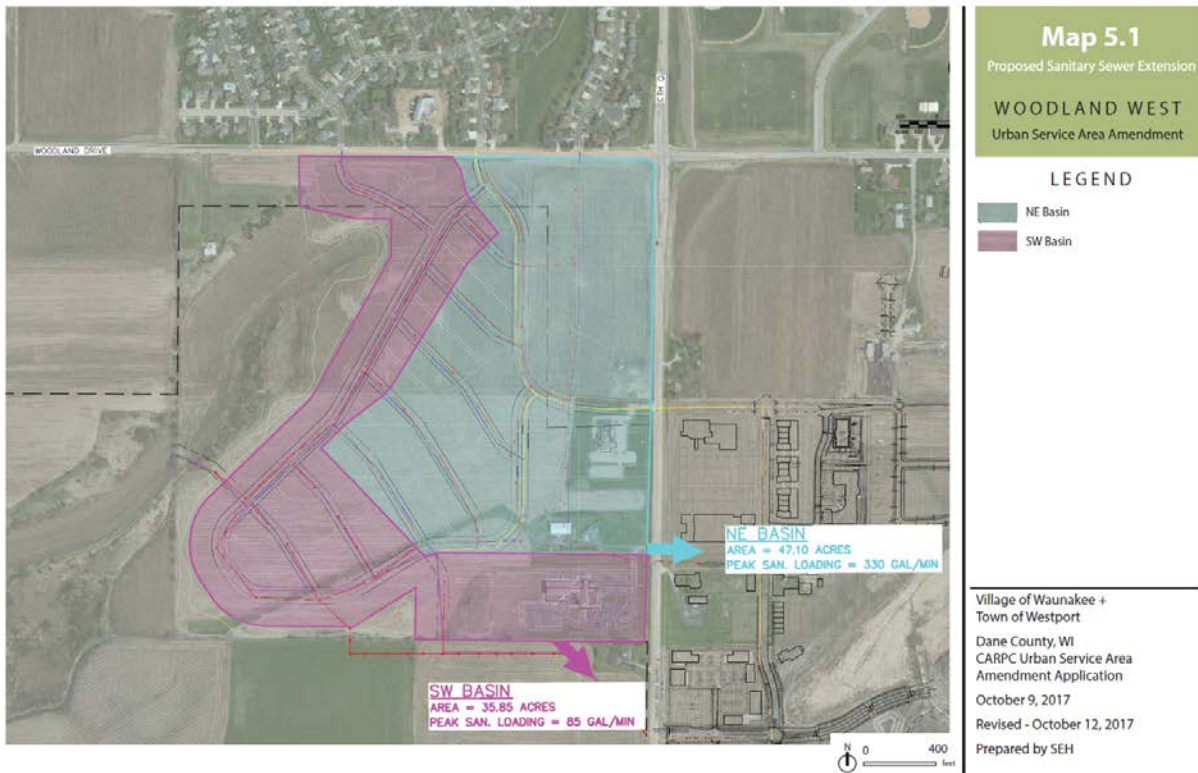
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Feet

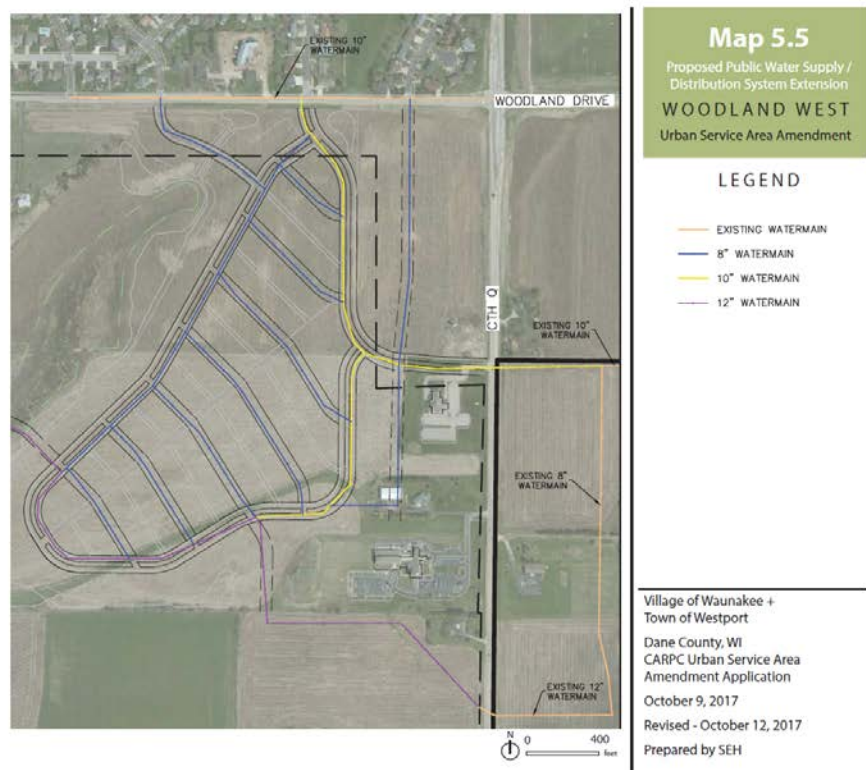


Prepared by staff
of the CARPC.

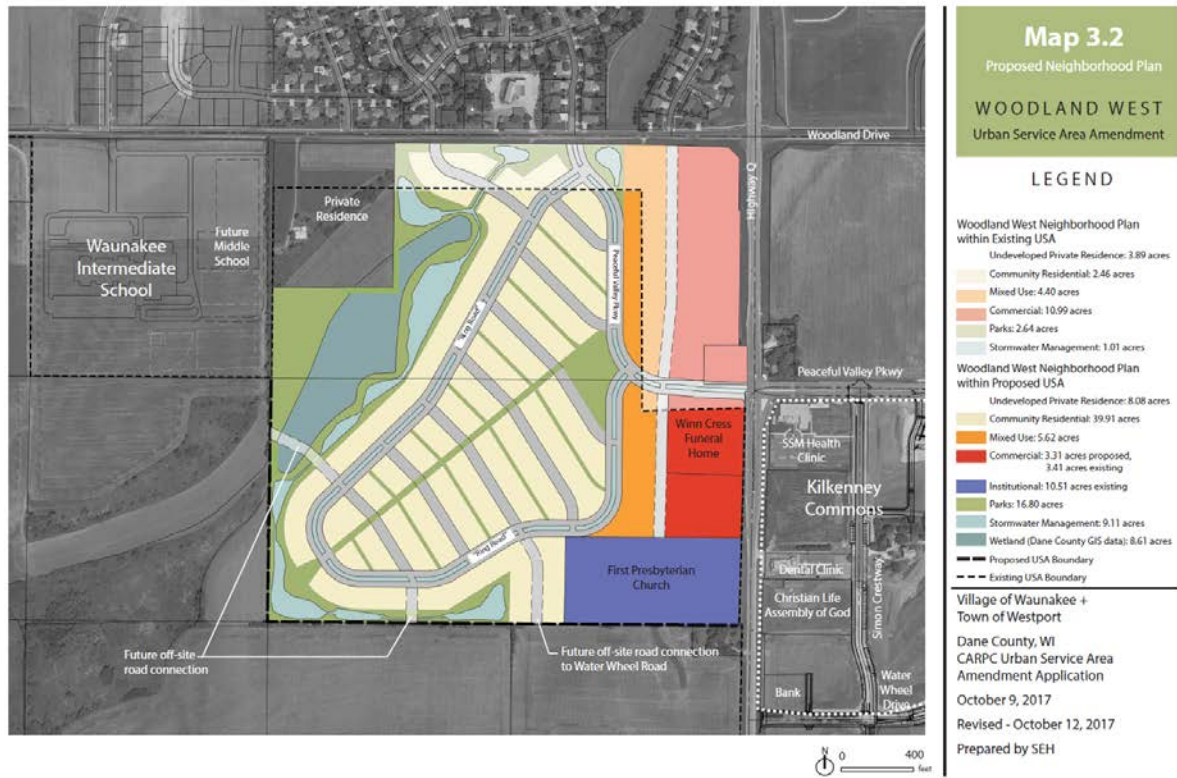
Map 9 – Planned Sanitary Sewer Service



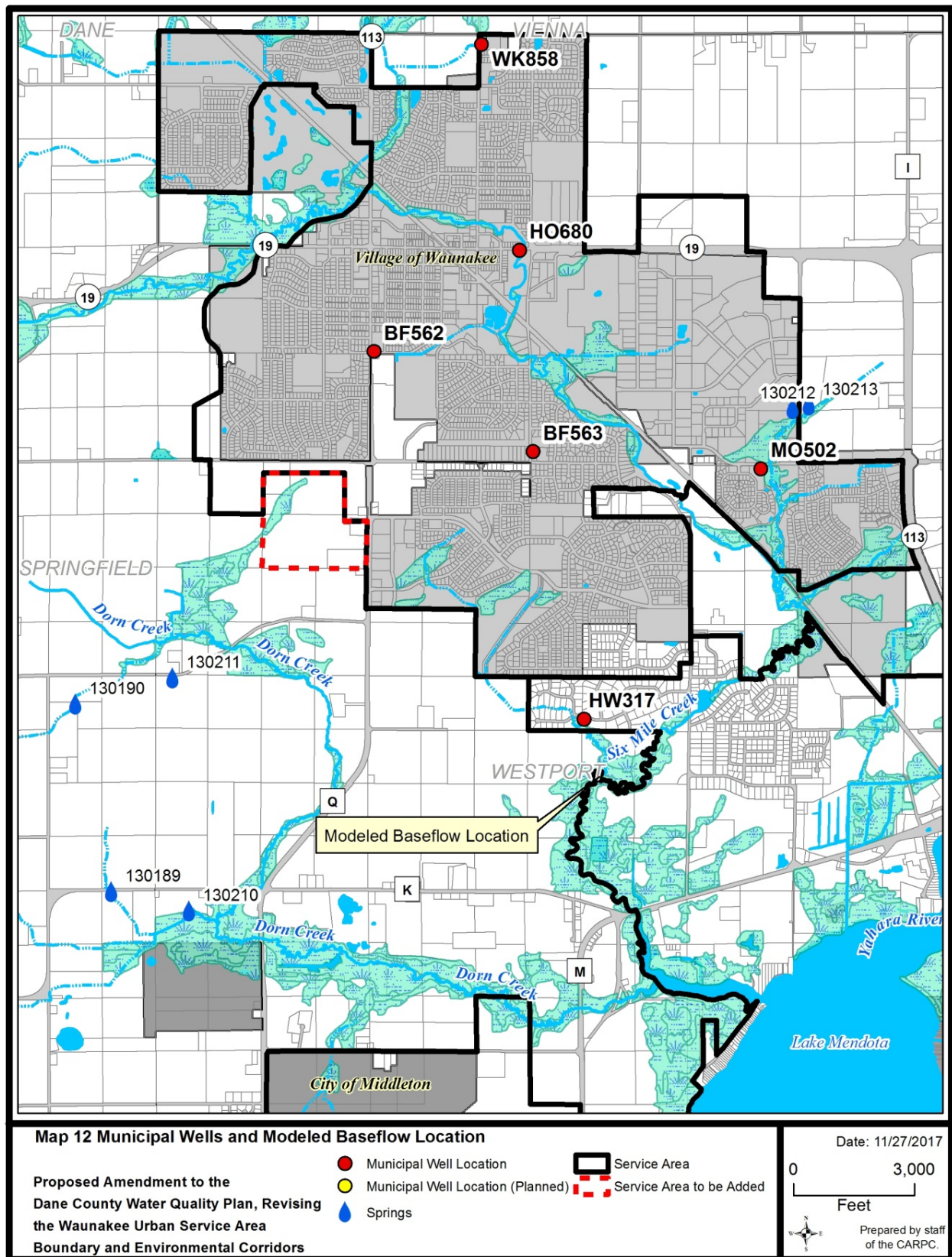
Map 10 – Planned Water Service



Map 11 – Proposed Stormwater Management System



Map 12 – Municipal Wells and Modeled Baseflow Locations





3 November 2017

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

WISCONSIN
HISTORICAL
SOCIETY

RE: Proposed Amendment to the Dane County Water Quality Plan, Revising the Waunakee Urban Service Area Boundary and Environmental Corridors in the Town of Westport-Wauakee_Woodland West, Dane County, Wisconsin

Dear Mr. Higgins:

Two previously recorded archaeological sites have been recorded in this parcel:

Lost Waunakee Cemetery DA-1300/BDA-0457

A map of 'Indian Antiquities and Historical Sites' prepared by the Dane County Planning Department depicts a cemetery in northeast corner of this location. The source of the information used for this notation is not listed on the map and supporting archival background information could not be found. According to research in 2003, portions of the supposed cemetery have been buried in fill related to construction of the intersection of CTH 'Q' and Woodland Drive. Additional field research in 2016, and interviews with long-term residents and local historians, failed to unearth evidence of a cemetery at this location. However, many early cemeteries are now "lost." They are not documented in the historic record and are no longer visible on the land.

Schunk and Eugel (DA-375)

This site was originally reported in 1930 and later reports indicate that pre-contact materials have been recovered from the parcel.

Considering the reported presence of the cemetery, and American Indian campsites/village, we recommend that an archaeological survey of the parcel be completed by a qualified archaeologist. The investigation should be sufficient to determine if the reported cemetery is indeed present on the parcel. This may entail stripping a sizeable section of the reported cemetery location. When the archaeological field investigation is completed, please send two copies of the report to our office.

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