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

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## **History of the Amendments to the Waunakee Urban Service Area**

The Waunakee Urban Service Area was established in 1971 with the adoption of the first sewer service plan. The boundaries of the Waunakee Urban Service Area were cleaned up in 1977 and Environmental Corridors delineated in 1984/1985. The first amendment occurred in 1988. There have been 15 amendments to this service area since its creation totaling 1,489 acres of developable land and 662 acres of Environmental Corridor. The most recent amendment of the service area by the Village was recommended by the Commission and approved by the WDNR in 2021, adding roughly 20 acres adjacent the Waunakee Business Park (DNR Project Number DC-0211).

## **Existing Conditions**

### ***Land Use***

The Village of Waunakee is requesting amendment to the Waunakee USA. The amendment area is northeast of the intersection of East Main Street (State Highway 19 and 113) and North Division Street. It is bounded to the east by Schumacher Road and Schumacher Farm County Park. The amendment is a continuation of the Heritage Hills Neighborhood identified in the Village Comprehensive Plan and is included in the Urban Footprint mapping of the Regional Development Framework's 2035 and 2050 growth scenarios. Planned future land use for the area is a mixture of residential, park, and open space.

Surrounding Planned Land Uses Include:

- North: Community Residential
- West: Planned Mixed Residential (Heritage Hills)
- South: Business Park
- East: Farmland, County Park

**Table 1  
Existing and Planned Land Use**

<b>Land Use Category</b>	<b>Existing Land Use Acres (see Map 3)</b>	<b>Proposed Land Use Acres (see Map 4)</b>
Agriculture	73.7	
Mixed Commercial/Residential		3.2
Parks / Open Space		19.8
Residential, Low-Density	2.6	37.0
Rights-of-Way/Transportation	6.8	23.1
<b>Total</b>	<b>83.1</b>	<b>83.1</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. The Waunakee Urban Service Area amendment is not in proximity to landscape features that are typical indicators of American Indian settlement, and the parcel has been subjected to significant ground disturbance. WHS is not recommending a survey at this time. (Attachment 1).

## ***Natural Resources***

The proposed amendment area is in the Sixmile Creek watershed (HUC 070900020602; Map 5). A 1.59 acre wetland was delineated in the amendment area. No floodplains occur in the amendment area.

Wastewater from the amendment area will be treated at the Madison Metropolitan Sewerage District (MMSD) Wastewater Treatment Facility. The treated effluent is discharged to Badfish Creek and Badger Mill Creek, bypassing the Yahara chain of lakes.

### Wetlands

DNR's Wisconsin Wetland Inventory (WWI) shows one wetland within the amendment area that was considered too small to delineate for the inventory.

A wetland delineation ([link to report](#)) was conducted within the amendment area by Heartland Ecological Group, Inc., a DNR-qualified assured delineator in August 2019. The site investigation and field delineation determined there was one farmed wet meadow totaling 1.59 acres (Map 11). This wetland has a possible surface water connection via a culvert underneath State Highway 113. The dominant vegetation was barnyard grass (*Echinochloa crus-galli*) and pinkweed (*Persicaria pensylvanica*). The delineator classified the wetland as "less susceptible" to stormwater runoff under NR 151. This wetland with a minimum 75' buffer is required to be designated as environmental corridor per the adopted policies and criteria for environmental corridors ([link to document](#)).

The wetland inventory also shows emergent / wet meadow and forested wetlands downstream of the amendment area (Map 5).

### Sixmile Creek

The proposed amendment area is within the Sixmile Creek watershed. Sixmile 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 Sixmile Creek at the Division Street and Knightsbridge Rd ([Station ID 10040382](#)). Summer/fall 2021 monitoring indicated field measurements of dissolved oxygen of 9 to 12.5 mg/L, an average transparency of 120 cm, and a macroinvertebrate index scores of 2.18 to 2.5. Further downstream there is another DNR monitoring station at the Mill Road Bridge ([Station ID 130063](#)). Limited chloride monitoring results from that station indicated that chloride levels averaged 97 mg/L in 2011. There are no active USGS baseflow monitoring stations downstream of the amendment area. Sixmile Creek has cool-cold and cool-warm main stem natural communities.

### Springs

The Wisconsin Geological and Natural History Survey (WGNHS) maintains an inventory of springs in Dane County, and throughout the state. From 2014 and 2017, the WGNS surveyed springs statewide that were expected to have flow rates at least 0.25 cubic feet per second (cfs). There are no known springs in or near the proposed amendment area from that survey.

### Groundwater

Groundwater modeling, using the 2016 Groundwater Flow Model for Dane County developed by the WGNHS ([link to website](#)), shows that baseflow in Sixmile Creek at Mill Road (see location on Map 5) has decreased from 9.1 cfs during pre-development conditions (no well pumping) to 7.6 cfs in 2010 (Table 4). This decrease is due to the combined impacts of high capacity well groundwater withdrawals contributing to reduced stream baseflow. For example, Waunakee wells withdraw groundwater that would otherwise flow downgradient towards the Sixmile Creek system. By 2040 at the same locations, flow is modeled to decrease to 7.1 cfs. This decrease is due to increased pumping to serve a growing population.

In 2012, the WGNHS published a report, *Groundwater Recharge in Dane County, Wisconsin, Estimated by a GIS-Based Water-Balance Model*, ([link to report](#)) 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 proposed amendment area ranges from 9 to 10 inches per year.

### Endangered Resources

The WDNR 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 ([link to website](#)). A screening review of this database conducted by Regional Planning Commission staff for species designated as endangered, threatened, or of special concern identified one endangered insect species (Rusty Patched Bumble Bee) within a one-mile radius of the amendment area. A 1-mile buffer was considered for terrestrial and wetland species and a 2-mile buffer for aquatic species.

The amendment area is within the High Potential Zone (species likely present) for the federally endangered Rusty Patched Bumble Bee. Section 7 of the Endangered Species Act requires consultation with the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service when any action that is carried out, funded, or permitted by a federal agency may affect a federally listed endangered or threatened species. However, much of the proposed amendment area currently consists of disturbed ground and row crops and is not considered to be suitable habitat for the Rusty Patched Bumble Bee. The WDNR typically recommends that projects within the High Potential Zone include native trees, shrubs, and flowering plants; plants that bloom spring through fall; and the removal and control of invasive species in any habitat used for foraging, nesting, and overwintering. The USFWS developed a list of plants favored by Rusty Patched Bumble Bee ([link to list](#)). Implementing these conservation measures should be coordinated with the WDNR Endangered Resources Review Program, as needed.

### Soils and Geology

The amendment area is located within the Waunakee Moraines Land Type Associations of Wisconsin. The Association classifies the surficial geology of this area as rolling till plain and irregular drumlins with scattered bedrock knolls, lake plains, and outwash plains.

Surface elevations within the amendment area range from around 915 feet to 996 feet. There are some small, isolated areas of steep (> 12%) and very steep (>20%) slopes along the southern edge, primarily associated with road embankments (Map 6). These small areas of steep slopes are not riparian and do not require inclusion in environmental corridors.

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

There are no hydric soils within the amendment area (see Map 7). Hydric soils are good indicators of existing and former (drained) wetlands.

According to the Soil Survey Geographic data for Dane County developed by the USDA Natural Resources Conservation Service ([link to web soil survey](#)), the St. Charles and Huntsville soils (the ScB and HuB map units) are not hydric, but they do have a seasonal (April to June) zone of water saturation within 5 feet of the ground surface. These soils are all classified as well drained and moderately well drained and therefore do not pose a limitation for buildings with basements.

**Table 2**  
**Soils Classification**

Soil	% of Area	General Characteristics
<i>St. Charles Silt Loam; ScB</i>	39.1	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>Huntsville Silt Loam; HuB</i>	18.4	Deep, well drained and moderately well drained, nearly level and gently sloping soils in many of the valleys of larger streams and in small drainageways on uplands. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses severe limitations for development due to very low bearing capacity.
<i>Plano Silt Loam; PnB</i>	17.3	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 slight limitations for development due to shrink/swell potential and low bearing capacity.
<i>Dodge Silt Loam; DnB</i>	14.0	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 to slope and shrink/swell potential.
<i>McHenry Silt Loam; MdC2</i>	7.0	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>Griswold Loam; GwC</i>	3.7	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.

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
Prime Agricultural Soils	ScB, HuB, PnB, DnB	88.8
Hydric Soils (Indicates Potential / Restorable Wetlands)	None	0
Poorly Drained Soils with Seasonal High Water Table (< 5')	ScB, HuB	57.5
Soils Associated with Steep Slopes (> 12%)	None	0
Soils Associated with Shallow Bedrock (< 5')	None	0
Best Potential for Infiltration in Subsoils	ScB, PnB, DnB, MdC2, GwC	81.1

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

According to WGNHS data, bedrock within the northwestern two-thirds of the amendment area is in the Trempleau Group. Bedrock in the Trempealeau Group is quartz sandstone, dolomitic siltstone, silty dolomite, and sandy dolomite, consists of two formations including the Jordan

and underlying St. Lawrence Formations, which were combined as one mapping unit. Thickness is about 75 feet, where not eroded. The southeastern one-third of the amendment area is in the Tunnel City Group. Bedrock in the Tunnel City Group is medium to very fine-grained quartz sandstone, locally very glauconitic, and consists of two formations including the Lone Rock and Mazomanie Formations. Thickness is up to 150 feet. According to WGNHS data, the depth to bedrock in the amendment area ranges from less than 10 feet to 50-100 feet, with the shallowest depths being in the west-central and deepest depths being in the southeast of the amendment area (see Map 8).

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 is 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, karst features may be encountered in the northwestern quarter of the amendment area at a depth of 0 to 10 feet and in the northwestern two-thirds and southeastern corner of the amendment area at depths ranging from about 10 to 42 feet. Stormwater management practices are not proposed in areas of shallow karst potential. The Wisconsin Department of Natural Resources 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. If shallow karst features are found, adequate protection measures are required to address any potential for groundwater contamination.

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. Soil test pits are required as part of the stormwater management plan to assure that infiltration practices are sited in locations that will not adversely affect groundwater quality.

## **Proposed Urban Services**

### ***Parks and Open Space***

There is a total of approximately 19.8 acres of parks, open space, and stormwater management areas proposed in the amendment area (See Map 4).

### ***Water System***

The Waunakee Water and Light Commission provides municipal water through a public water distribution system which includes approximately 390,525 lineal feet of water main, three booster pump stations, and five high-capacity groundwater wells. Four wells pump directly into the distribution system, and one pumps into a reservoir. The active wells are at depths ranging from approximately 420 to 752 feet with a capacity of 650 to 1,200 gallons per minute (gpm). In total, the gross capacity of the municipal wells is approximately 5,050 gpm (7.27 million gallons per day, MGD). The firm capacity (with the largest well assumed to be out of service) is approximately 3,850 gpm (5.54 MGD). The Village has four elevated storage tanks and one ground-level reservoir, with a combined capacity of 1.35 million gallons.

The water distribution system comprises three pressure zones. In 2020, the Village conducted a formal assessment of the Heritage Hills development and the water supply system. The conclusions of this analysis, presented in the *Heritage Hills Water Supply Evaluation*, by Strand Associates, Inc. (hereinafter, 2020 *Water Supply Evaluation*), indicate that a portion of the Heritage Hills development could be served within the Main Pressure Zone without any

pressure boosting, while development with a ground elevation above 960' would require boosting and need to be included in the Lexington Pressure Zone. Further, it was recommended that to account for potential future development to the north and east, upgrades would be required to the Lexington Booster station, including increasing the available pump capacity of the station. Some of these upgrades have already been made, and installation of new pumps to increase the capacity to 750 gpm is expected to occur in March 2022.

According to the 2020 Annual Report to the Public Service Commission of Wisconsin ([2020 Annual Report](#)), the Village pumped an average of 939 gpm (1.35 MGD) in 2020, approximately 24% of its firm pumping capacity. In 2020, the peak daily demand (maximum amount pumped in any one day) was 1,891 gpm (2.72 MGD), which was reported to be due to extreme weather conditions. According to the Village's application, current average daily demand on the entire water system is 1,079,200 gpd (1.08 MGD) or 749 gpm; the estimated peak hourly demand is 3,750 gpm, based on a peak daily demand factor of 2.5 (ratio of maximum day to average day) and a peak hourly demand factor of 2.0 (ratio of maximum hour to maximum day). According to the 2020 *Water Supply Evaluation*, current average daily demand within the Lexington Pressure Zone is 26,160 gpd (0.026 MGD), or 18 gpm; the current estimated peak hourly demand is 91 gpm, based on a peak daily demand factor of 2.5 and a peak hourly factor of 2.0.

Water losses in the Villages' distribution system was an average of 160,110 gpd (0.16 MGD) in 2020, which accounted for 12% of the net water supplied in 2020. Approximately 97% of this was due to unreported and background leakage, with the remaining due to reported leaks. In 2020, there were 0 main breaks and 2 service break which were repaired. Water losses in the Village's distribution system was 10% in 2018 and 11% in 2019. 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 (PSC) if the utility reports its percentage of water losses exceeds 15%.

According to the Village's application, water will be provided to most of the amendment area by extension of existing 8-inch water mains from the existing portion of the Heritage Hills development, thereby extending the Lexington Pressure Zone. Water main within the existing development will also be connected to existing main within Capital Drive to provide redundancy to the entire Heritage Hills development. Water will be provided to the mixed-use area by 10-inch water main, which will be connected to existing 10-inch main along Division Street and East Main Street and will be within the Main Pressure Zone. Within the amendment area, 8-inch water main will be extended throughout, and individual service connections will be provided to each proposed lot. Water main dead-ends will correspond to proposed roadway dead-ends intended for possible future development. Refer to Map 9A for an overview of proposed water main.

The Village's application estimates the annual average daily water demand for the 250 residential units to be 50,400 gallons per day (gpd), or 35 gallons per minute (gpm). This assumes an average demand of 60 gallons per person per day (gpcd) and 3.07 persons per unit for residential land uses, which are based on the 2020 *Water Supply Evaluation*. The 2020 *Water Supply Evaluation* estimates the mixed-use area will demand approximately 2,600 gpd, or 2 gpm, based on an estimate of 800 gallons per acre per day (gpac). Altogether, the estimated peak daily demand is 132,500 gpd or 92 gpm (0.13 MGD), based on a peak daily factor of 2.5. The estimated peak hourly demand is 184 gpm, based on a peak hourly demand factor of 2.0 for all land uses. These estimates are reasonable based on typical land use demands, historical information obtained from the 2020 *Water Supply Evaluation*, and the 2020 Annual Report.

The estimated average daily water demand and peak daily demand represent an increase of approximately 4% and 6%, respectively, of the current demands on the system; however, the anticipated total demand remains well below the available firm capacity of the water supply system and the demand within the Lexington Pressure Zone is below the available capacity of the Lexington Booster Station. Therefore, it is anticipated that the existing water supply system will support the additional demand from the proposed amendment area.

## **Wastewater**

Sanitary sewer service will be provided to the proposed amendment area by connection to the Village's existing sanitary sewer collection system. Within the amendment area, the proposed lots will be served by 8-inch sanitary sewer main and individual sewer laterals. The amendment area and a portion of the existing Heritage Hills subdivision (within the existing Waunakee Urban Service Area) will gravity drain via a proposed 15-inch interceptor sewer within the amendment area to the Division Street Interceptor, an existing sanitary interceptor sewer along Main Street / Hwy 19. Refer to Map 9A for an overview of proposed sanitary sewer main. From the Village's system, wastewater will flow via the Northeast Interceptor-Waunakee Extension sewer pipe to Madison Metropolitan Sewerage District's (MMSD's) Pumping Station 14, then eventually to the Nine Springs Treatment Facility.

The proposed development within the amendment area consists of 166 single-family residential units, 84 twin-family units, and one 3.3-acre mixed-use lot contributing to wastewater flows. The Village's application estimates that the 250 residential units will generate an annual average of 66,700 gallons per day (gpd) of wastewater, or 46 gallons per minute (gpm). This assumes approximately 2.67 persons per dwelling unit and an average wastewater generation rate of 100 gpcd for residential land uses. The application did not provide specific information on the anticipated wastewater generation for the mixed-use area; however, Village zoning requirements limits the amendment area to 250 residential units, so it can be assumed any additional loading from the mixed-use area will be from non-residential sources. For this analysis, it is assumed this area will generate an average of 4,950 gpd, or 3 gpm, using 1,500 gal/acre/day as a typical generation rate. Additionally, a relatively small portion of the existing Heritage Hills neighborhood will gravity drain to the proposed sewers within the amendment area and will contribute to wastewater loading. This area which drains to the amendment area comprises approximately 45 residential units and will contribute an additional 12,000 gpd, or 8 gpm. Altogether, the anticipated average daily flow of wastewater from the amendment area is approximately 83,650 gpd, or 58 gpm. Utilizing a daily peaking factor of 4 for residential areas and 2.5 for mixed-use areas, it is estimated that the amendment area will generate a daily peak flow of 227 gpm.

The proposed 8-inch sanitary sewer mains within the amendment area are anticipated to have a minimum capacity of 332 gpm, based on a design slope of 0.40% (minimum allowable per NR 110), which will provide sufficient capacity for the anticipated daily peak flows from the amendment area. The proposed 15-inch interceptor sewer within the amendment area is anticipated to have a minimum capacity of 1,010 gpm, based on a design slope of 0.15% (minimum allowable per NR 110), which will provide sufficient capacity for the anticipated daily peak flows from the amendment area as well as provide for possible future development to the north and east within areas not currently in the urban service area.

The existing 10-inch Division Street Interceptor, which will receive flows from the amendment area, has an estimated available capacity of 170 gpm according to the 2020 *Division Street Interceptor Sewer Capacity Analysis*, prepared by Strand Associates, Inc. on behalf of the Village of Waunakee (hereinafter, 2020 *Division Street Analysis*). This is based on flow monitoring conducted in 2019 of actual flow conditions as well as the design capacity of the limiting section of sewer. As described in the Village's application, this interceptor sewer will reach capacity prior to full development of the amendment area, and improvements to the sewer capacity of the Division Street Interceptor will be needed in the future. The 2020 *Division Street Analysis* identified two primary options to increase capacity of the Division Street Interceptor, including: replacement of the 10-inch diameter sewer with an 18-inch diameter sewer, and construction of a new 15-inch diameter sewer parallel to the existing 10-inch sewer. This work could be completed concurrently with the initial construction work in the amendment area, or in the future as development occurs. The Village will need to continue to monitor the capacity of this interceptor as the area develops.



### Wastewater Treatment Facility

Madison Metropolitan Sanitary District (MMSD) will provide wastewater treatment for the amendment area. The Nine Springs wastewater treatment facility (WWTF) is located on Moorland Road, Madison, WI, and discharges treated effluent to Badfish Creek within the Badfish Creek Watershed (Lower Rock River Basin) and Badger Mill Creek within the Upper Sugar River Watershed (Sugar-Pecatonica Basin). The rated monthly design flow capacity of the facility is 56.0 MGD and the maximum daily design flow capacity is 68.6 MGD. In the year 2020, the facility received an average monthly influent hydraulic loading of 41.9 MGD (75% of the 56.0 MGD design capacity), including infiltration and inflow, according to the 2020 Compliance Maintenance Annual Report (CMAR) ([link to 2020 CMAR](#)). It is expected to reach 90% of current hydraulic design capacity around 2026 based on current projected growth rate assumptions. This already occurs on occasion, although average flows did not exceed 90% design capacity for any month in 2020. 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, treatment for this area is expected to remain at the existing wastewater treatment facility location with expanded capacity of the system as the need is foreseen.

MMSD has not had issues meeting its WPDES permit limits for the quality of effluent discharged to Badfish Creek and Badger Mill Creek, according to their 2020 CMAR. Effluent quality summarized here refers to Badfish Creek, where approximately 95% of discharge is released. Below is a summary of the major effluents reported on in the 2020 CMAR:

- The biological oxygen demand (BOD) effluent quality for 2020 was below the monthly average limit, with a monthly average of 4.3 mg/L (22% of the limit) and a maximum of 10 mg/L (53% of the limit) for the months of January and February.
- The total suspended solids (TSS) effluent quality for 2020 was well below the monthly average limit, with a monthly average of 4.5 mg/L (23% of the limit) and a maximum of 6 mg/L (30% of the limit) for the month of January.
- The ammonia (NH<sub>3</sub>) effluent quality for 2020 was below the monthly average limits (limits vary by month), with a monthly average of 0.50 mg/L (3-74% of the limit) and a maximum of 1.34 mg/L (74% of the limit) for the month of August.
- The phosphorus (P) effluent quality for 2020 was well below the monthly average limits (limits vary by month), with a monthly average of 0.36 mg/L (23-51% of the limit) and a maximum of 0.53 mg/L (35% of the limit).

The WWTF discharge to Badfish Creek is a tributary to the Rock River, and thus the WPDES permit includes phosphorus and TSS limits to comply with the Total Maximum Daily Load (TMDL) developed for the Rock River Basin to protect and improve water quality. In addition to the TMDL limits, future water quality-based effluent limits (WQBEL) have been considered in the WPDES permit. The monthly limits to comply with the TMDL for TSS are easily met by MMSD, and in some cases, the current WPDES permit limits are more stringent than the TMDL limits. The interim limit for phosphorus is a 1.0 mg/L monthly average required beginning May 2020 (previous limit was 1.5 mg/L), with a final WQBEL of 0.225 mg/L. Additionally, an interim limit of 0.6 mg/L, expressed as a six-month average (May through October and November through April) is required beginning May 2020, with a final WQBEL of 0.075 mg/L. To meet the WQBEL for phosphorous, MMSD has implemented a Watershed Adaptive Management (WAM) approach, leading a diverse group of partners called Yahara Watershed Improvement Network (Yahara WINs) in implementing phosphorus reducing practices in the Yahara Watershed ([link to Yahara WINs website](#)).

The Nine Springs WWTF does not remove chloride from influent. A 2015 study completed by AECOM determined that while possible, treatment would be cost-prohibitive, energy intensive, and involve other environmental impacts ([link to report](#)). MMSD has been granted a variance from the chronic water quality standard for chloride required by NR 105. With this variance, the WPDES permit sets interim limits for winter and summer months and requires MMSD to implement chloride source reduction measures. One such source reduction initiative which MMSD participates in is the Wisconsin Salt Wise Partnership ([link to Salt Wise website](#)).



## ***Stormwater Management System***

The Village of Waunakee stormwater management and performance standards are contained within Chapter 109 of the Village of Waunakee Code of Ordinances. The Village contracts with Strand Associates for stormwater management plan review. Dane County Code of Ordinance, Chapter 14, contains stormwater management and performance standards which set the minimum standards for all communities in Dane County. The Dane County ordinance was most recently updated in November 2021.

The stormwater management plan for the Heritage Hills development includes a western part (already within the urban service area) and an eastern part (the proposed amendment area). The stormwater management plan prepared by D'Onofrio Kottke and Associates, Inc., dated June 4, 2020, revised February 5, 2021, and was approved by the Village of Waunakee for the entire Heritage Hills development in March 2021.

The stormwater management plan for the amendment area consists of treatment within two designated stormwater treatment areas, located in the southern edge and northeastern corner of the amendment area. Refer to Map 9B for an overview of the stormwater management facilities. Each area will consist of a combination of wet detention and infiltration basin facilities. Runoff from the proposed amendment area will flow through a network of storm sewer pipes and via overland flow to the stormwater facilities for water quality treatment, volume control, and peak flow attenuation prior to discharge offsite. The proposed stormwater management facilities will be within public outlots and will ultimately be owned and maintained by the Village.

Locations of post-development stormwater discharge from the amendment area are proposed to closely match pre-development conditions. The northeastern stormwater facilities will discharge to the Schumacher Road right-of-way, flow to the south approximately 1,400 feet, then enter the wetlands located within the southeastern corner of the amendment area; the southern stormwater facilities will discharge directly to the onsite wetlands, prior to leaving the amendment area via an existing 60-inch culvert located at the low point beneath Main Street. In the event of large storms exceeding the capacity of this culvert, stormwater will overtop Main Street and continue along the same flow path. Downstream of the amendment area, the flow path is well defined, and stormwater will flow within the Village through an existing drainage channel and through an offsite wetland south of Nord Drive prior to entering Sixmile Creek approximately 2,000 feet to the southwest of the amendment area. Sixmile Creek flows approximately 3.5 miles south, meandering between the Village of Waunakee and the Town of Waunakee, prior to discharge within Lake Mendota.

In November 2021 Chapter 14 of the Dane County ordinances was updated to require peak rate control for the 200-year design storm, among other revisions. Previously approved stormwater management plans are grandfathered from meeting the new requirements and cannot legally be required to meet the new standards. However existing stormwater management plans can be voluntarily modified to be designed for the peak rate control for the 200-year event. It is recommended that the approved Stormwater Management Plan be reevaluated to see if it can be cost-effectively modified to meet the new 200-year peak rate control requirement.

### Performance Standards

The Village of Waunakee proposes stormwater management performance measures for the amendment area to meet standards required by the State of Wisconsin (NR 151), Dane County (Chapter 14), and Village of Waunakee (Chapter 109) stormwater regulations at the time of the stormwater management plan approval, 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 residential land uses and a minimum of 80% occurring prior to infiltration for commercial, industrial, and institutional land uses) for the 1-year, 24-hour design storm. This is consistent with the standards currently required by Dane County and Village of Waunakee ordinances.
2. Require post-construction peak runoff rate control for the 1-, 2-, 10-, and 100-year, 24-hour design storms (using NRCS MSE4 storm distributions) to match predevelopment peak runoff rates. This is consistent with Dane County and Village of Waunakee ordinances at the time of the stormwater management plan approval.
3. Require post-development infiltration (stay-on) volume of at least 90% of the predevelopment infiltration (stay-on) volume for the average annual rainfall series. This is consistent with the standards currently required by Dane County.
4. Maintain predevelopment groundwater annual recharge rate of 9 to 10 inches per year 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.
5. Treat the first one-half inch of runoff to provide oil and grease control using the best available technology for commercial or industrial land uses and any other uses where the potential for pollution by oil or grease, or both, exists. This is consistent with the standards currently required by Dane County and Village of Waunakee ordinances.

## **Impacts and Effects of Proposal**

### ***Environmental Corridors***

The Amendment Area includes 19.8 acres of environmental corridor (See Map 2). This includes the delineated wetland and associated buffer in accordance with the Environmental Corridor Policies and Criteria ([link to document](#)) adopted in the Dane County Water Quality Plan.

The proposed public parks, open space, and stormwater management areas within the amendment area have also been designated as environmental corridors.

### ***Meeting Projected Demand***

Interim CARPC projections (draft) for 2050 suggest that an additional 9,000 residents, 2,800 housing units, and 4,100 jobs can be expected in the Waunakee Urban Service Area over the next 30 years. Preliminary modeling in Urban Footprint for the Regional Development Framework places close to 23% of projected housing demand (637 units) in and immediately adjacent to the amendment area. Most of the projected employment is in the business park along State Highways 19 and 113.

### ***Phasing***

The requested amendment is less than 100 acres. A phasing plan is not required.

### ***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 designed to address the impacts of development on water quality, runoff volumes, peak flows, water temperature, and groundwater recharge. In 2011, county and local standards for runoff volume control were increased beyond state standards to further address the potential stormwater impacts of development. Since 2010 many communities adopted even higher standards for volume control through their own ordinances or as part of USA amendment agreements. In 2017, State statute 281.33(6)(a)(1) was changed to limit the ability of local governments to adopted higher standards for runoff volume through local ordinances. In response to climate change, the City of Madison adopted peak rate control for the 200-year storm event in their ordinance in June 2020. Dane County adopted this same peak rate control requirement as well as requirements for closed basins in November 2021, which made these requirements universal to all of the communities in Dane County.

The Village of Waunakee 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 applicable Dane County standards for pollutant reduction, runoff volumes, peak flows, water temperature, and groundwater recharge to address the potential water quality impacts of stormwater runoff from the proposed development on the receiving waters.

Regional partners are actively working to address chlorides through the Wisconsin Salt Wise Partnership. Participation in the chloride reduction trainings provided by WI Salt Wise is open to any municipality and private winter maintenance professional in the region. Village of Waunakee staff attended winter salt certification class for winter road maintenance in 2017.

### ***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. This can result in subsequent reductions in stream quality and transitions to more tolerant biological communities.

Groundwater modeling indicates that the cumulative effects of well withdrawals have resulted in a 1.5 cfs decrease in baseflow in Sixmile Creek at Mill Road (see location Map 5) from

predevelopment (no pumping) to 2010 (Table 4). An additional 0.5 cfs decline compared to 2010 conditions is anticipated for the year 2040, according to modeling, reducing the baseflow to 7.1 cfs.

<b>Table 4</b> Modeled Baseflow Results Due to Current and Anticipated Future Municipal Well Water Withdrawals (All Municipal Wells)			
<b>Stream</b>	<b>No Pumping</b>	<b>2010</b>	<b>2040</b>
<i>Sixmile Creek</i>	<i>9.1 cfs</i>	<i>7.6 cfs</i>	<i>7.1 cfs</i>

The loss of baseflow from the cumulative effects of well water pumping is a regional issue, beyond the boundaries of a single USA Amendment or even a single municipality. This issue is discussed along with potential management options in the updated *Dane County Groundwater Protection Planning Framework* ([link to report](#)). Maintaining pre-development groundwater recharge by infiltrating stormwater runoff helps to replenish groundwater, maintain baseflow, and mitigate this impact.

The model developed for the 2014 WDNR report *Ecological Limits of Hydrologic Alteration in Dane County Streams* ([link to report](#)) 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.

## Comments at the Public Hearing

A public hearing was held on the proposed amendment at the January 13, 2022, meeting of the Capital Area Regional Planning Commission. A representative of the Village of Waunakee and a consultant for the proposed development registered in favor of the amendment. There were no registrants opposed to the amendment. Several Commissioners inquired about affordable housing and walkability in the proposed development.

## 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 or planned wastewater collection system capacity to serve the proposed amendment area.

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 designed to address the impacts of development on water quality, runoff volumes, peak flows, water temperature, and groundwater recharge. In 2011, county and local standards for runoff volume control were increased beyond state standards to further address the potential stormwater impacts of development. Since 2010 many communities adopted even higher standards for volume control through their own ordinances or as part of urban service area amendment agreements. In 2017, State statute 281.33(6)(a)(1) was changed to limit the ability of local governments to adopted higher standards for runoff volume through local ordinances. In response to climate change, the City of Madison adopted peak rate control for the 200-year storm event in their ordinance in June 2020. Dane County adopted this same peak rate control requirement as well as requirements for closed basins in November 2021, which made these requirements universal to all of the communities in Dane County.

The Village of Waunakee 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 applicable Dane County standards for

pollutant reduction, runoff volumes, peak flows, water temperature, and groundwater recharge to address the potential urban nonpoint source impacts of the proposed development on the receiving waters.

It is the Regional Planning Commission staff's opinion that the proposed amendment is consistent with water quality standards under Wis. Stat. § 281.15, and the adopted Policies and Criteria for the Review of Sewer Service Area Amendments to the *Dane County Water Quality Plan*, with the applicable state and local requirements identified below. Additional actions have also been recommended below to further improve water quality and environmental resource management.

### **State and Local Requirements**

Regional Planning Commission staff recommends approval of this amendment, based on the land uses and services proposed, and in recognition of the state and local requirements for the following:

1. State and local review and approval of stormwater management plan(s) is required, including Regional Planning Commission staff review and approval as part of the sewer extension review process.
  - a. Stormwater and erosion control practices are required to be installed prior to other land disturbing activities. Infiltration practices are required to be protected from compaction and sedimentation during land disturbing activities.
  - b. Peak rates of runoff are required to be controlled for the 1-, 2-, 10-, and 100-year 24-hour design storms to "pre-development" levels, in accordance with the Village of Waunakee and Dane County Stormwater Ordinance requirements at the time of Village stormwater management plan approval.
  - c. Sediment control is required that achieves at least 80% sediment control for the amendment area based on the average annual rainfall, with a minimum of 60% of that control occurring prior to infiltration, in accordance with the Village of Waunakee and Dane County Stormwater Ordinances.
  - d. Runoff volume control is required that maintains the post development stay-on volume to at least 90% of the pre-development stay-on volume for the average annual rainfall period, in accordance with the Village of Waunakee and Dane County Stormwater Ordinances.
  - e. Oil and grease control are required that treats the first 0.5 inches of run-off using best management practices at commercial and industrial sites, in accordance with the Village of Waunakee and Dane County Stormwater Ordinances.
  - f. Maintaining 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, when required by the Village of Waunakee and Dane County Stormwater Ordinances.
2. Stormwater management facilities shall be placed in public outlots whenever feasible.
3. Environmental corridors are required to be delineated to include the wetland, required buffers, parks, and stormwater management areas to meet the Environmental Corridor Policies and Criteria adopted in the *Dane County Water Quality Plan*.

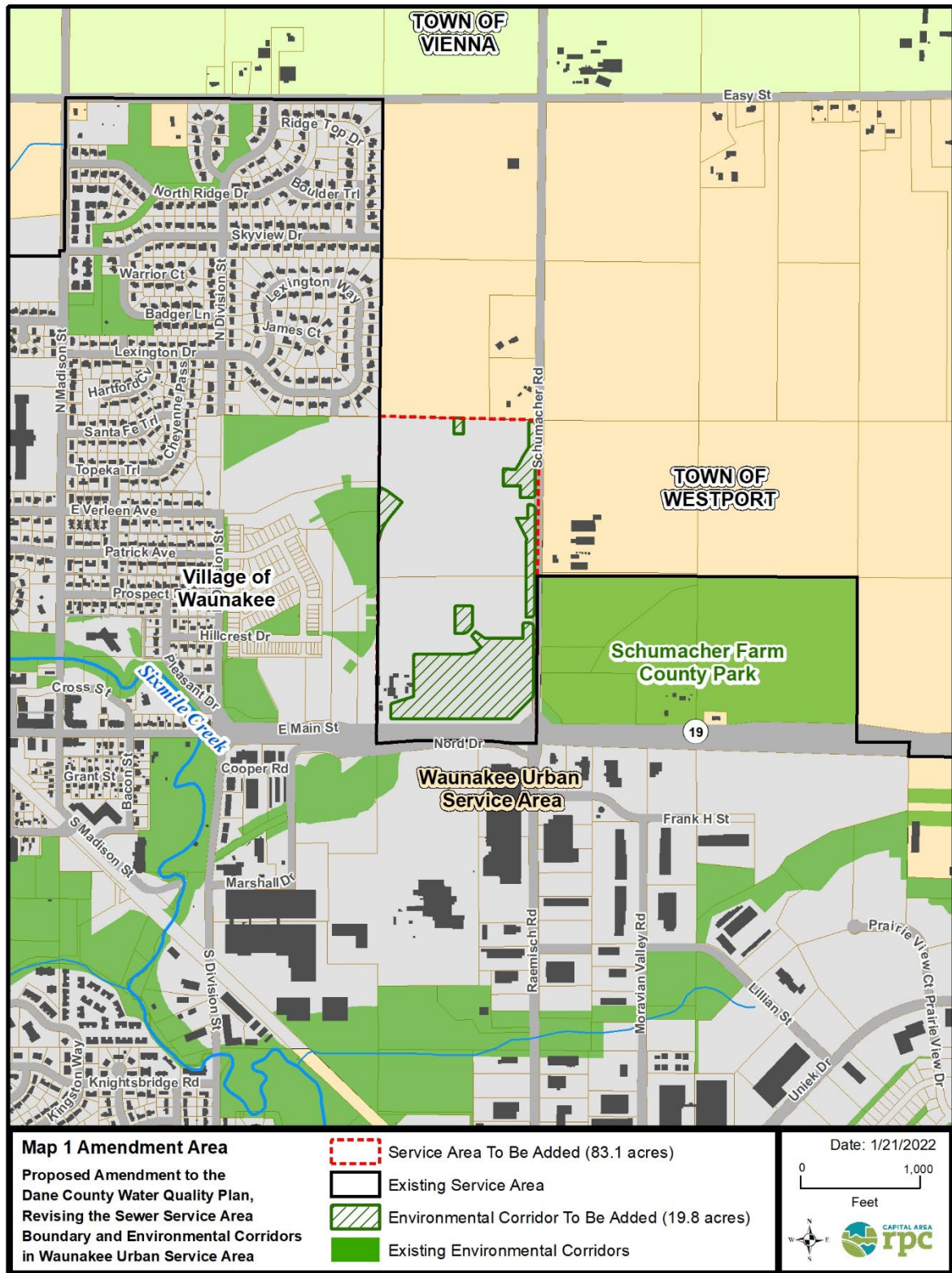
***Recommendations***

It is recommended that the Village of Waunakee pursue the following to further improve water quality and environmental resource management:

1. Continue to foster the responsible use of chlorides by using Salt Wise practices and encouraging winter maintenance professionals within the Village of Waunakee to attend the winter salt certification classes offered by Wisconsin Salt Wise.
2. Encourage the use of native flora favored by the Rusty Patched Bumble Bee in landscaping to provide suitable habitat for this pollinator, where appropriate.
3. Reevaluate the approved Stormwater Management Plan to see if it can be cost-effectively modified to meet post-construction peak runoff rate control for the 200-year, 24-hour design storm as currently required by Dane County Ordinance.

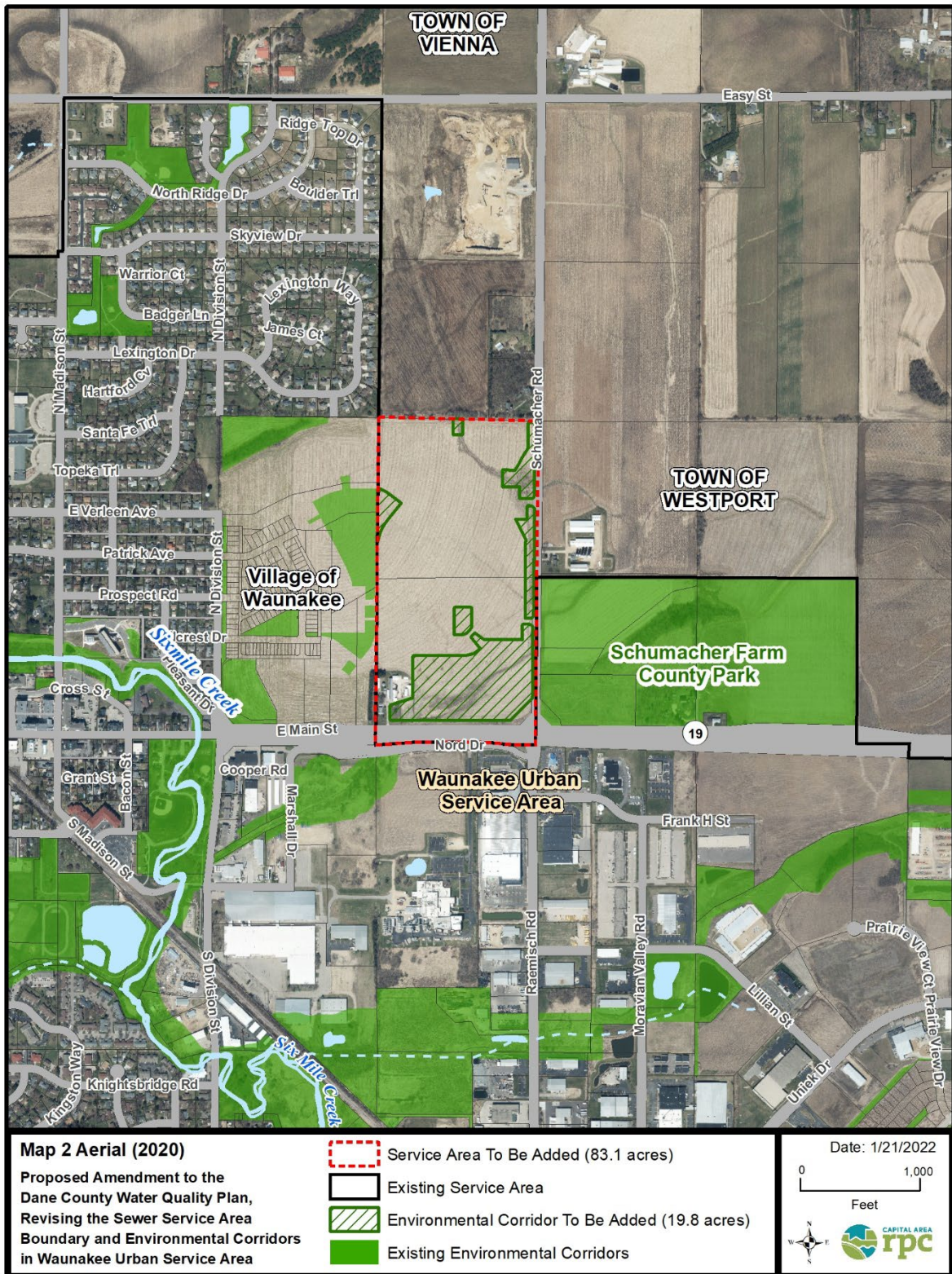


Map 1 - Amendment Area



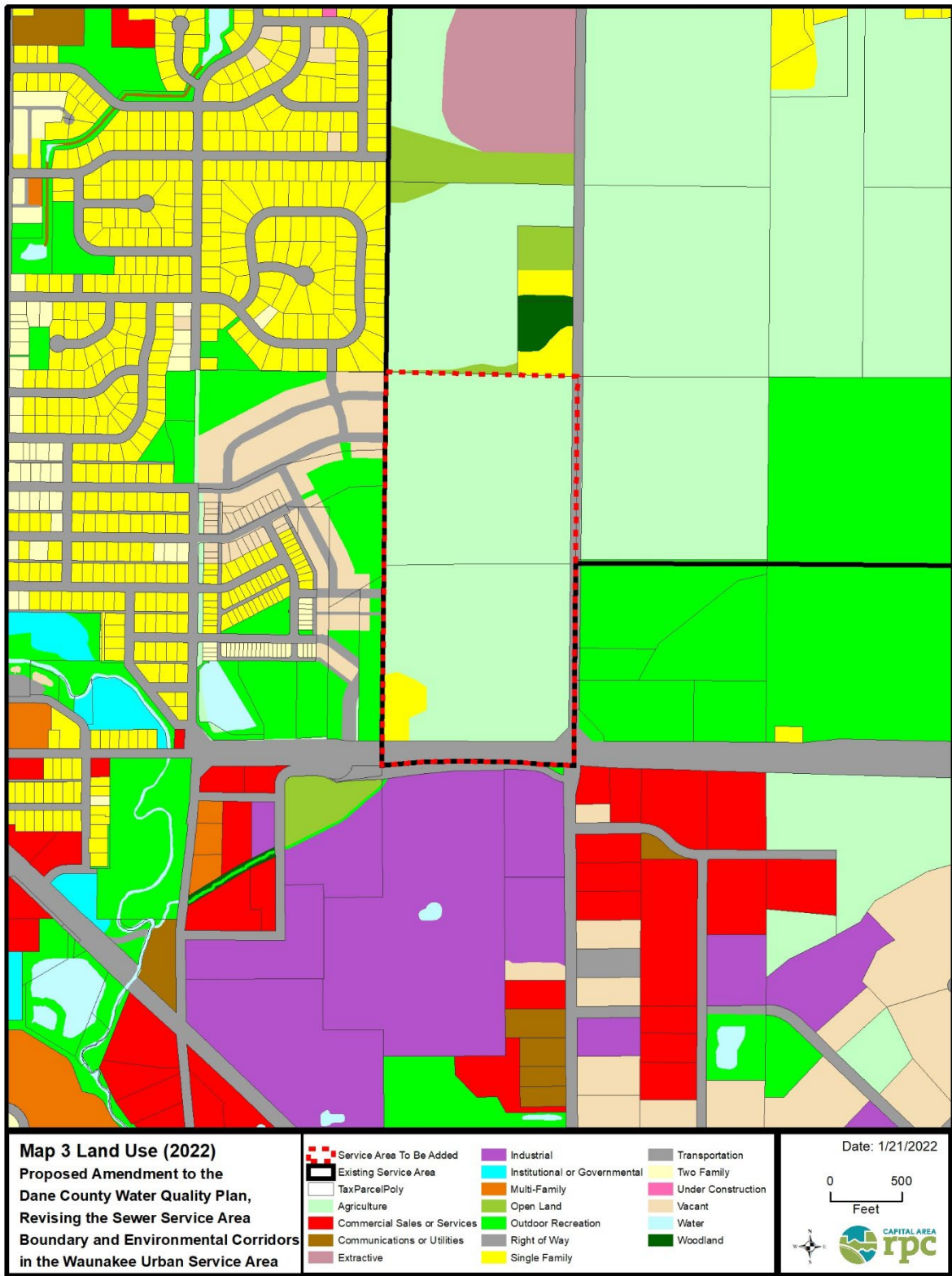


Map 2 – Aerial

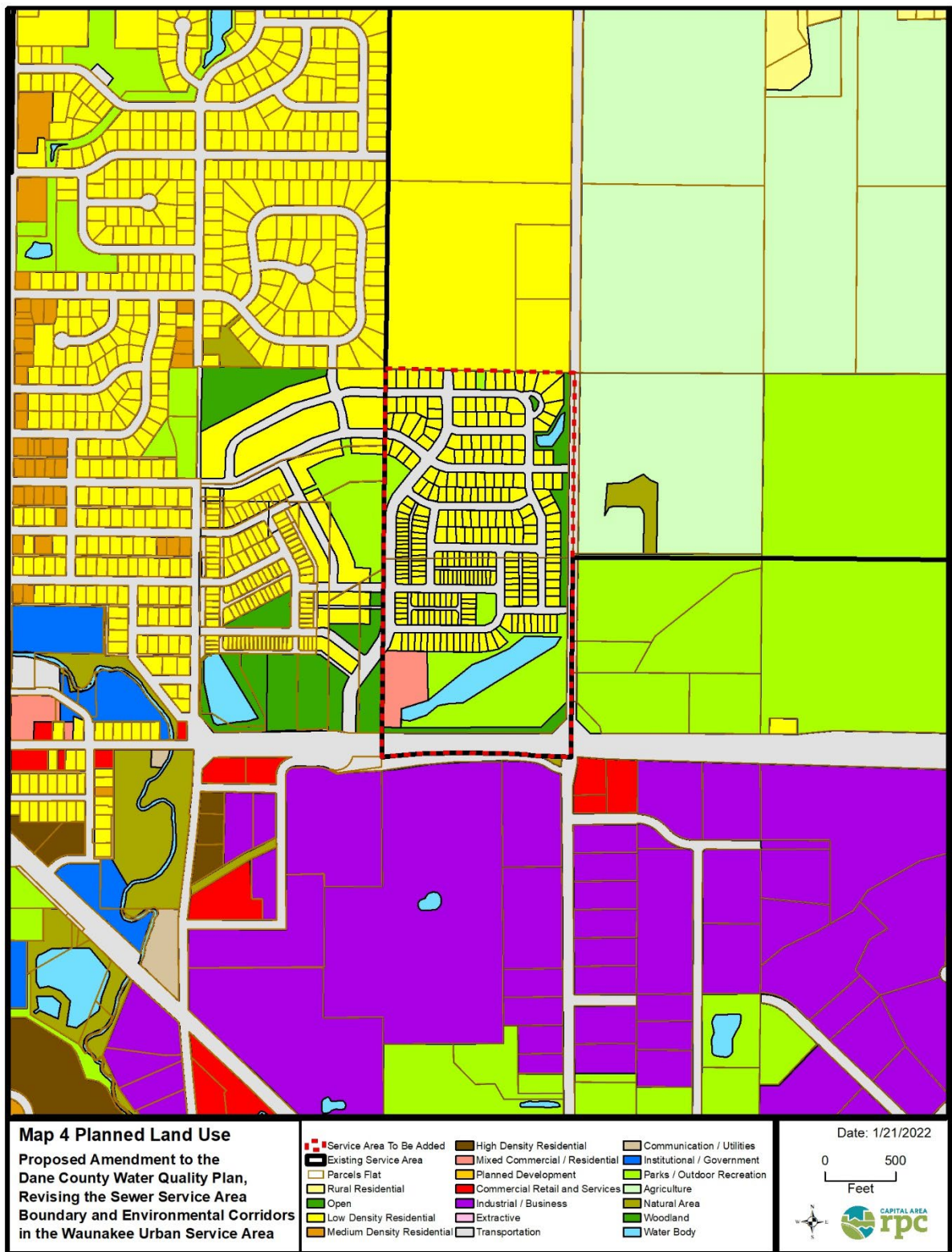




Map 3 – 2022 Land Use

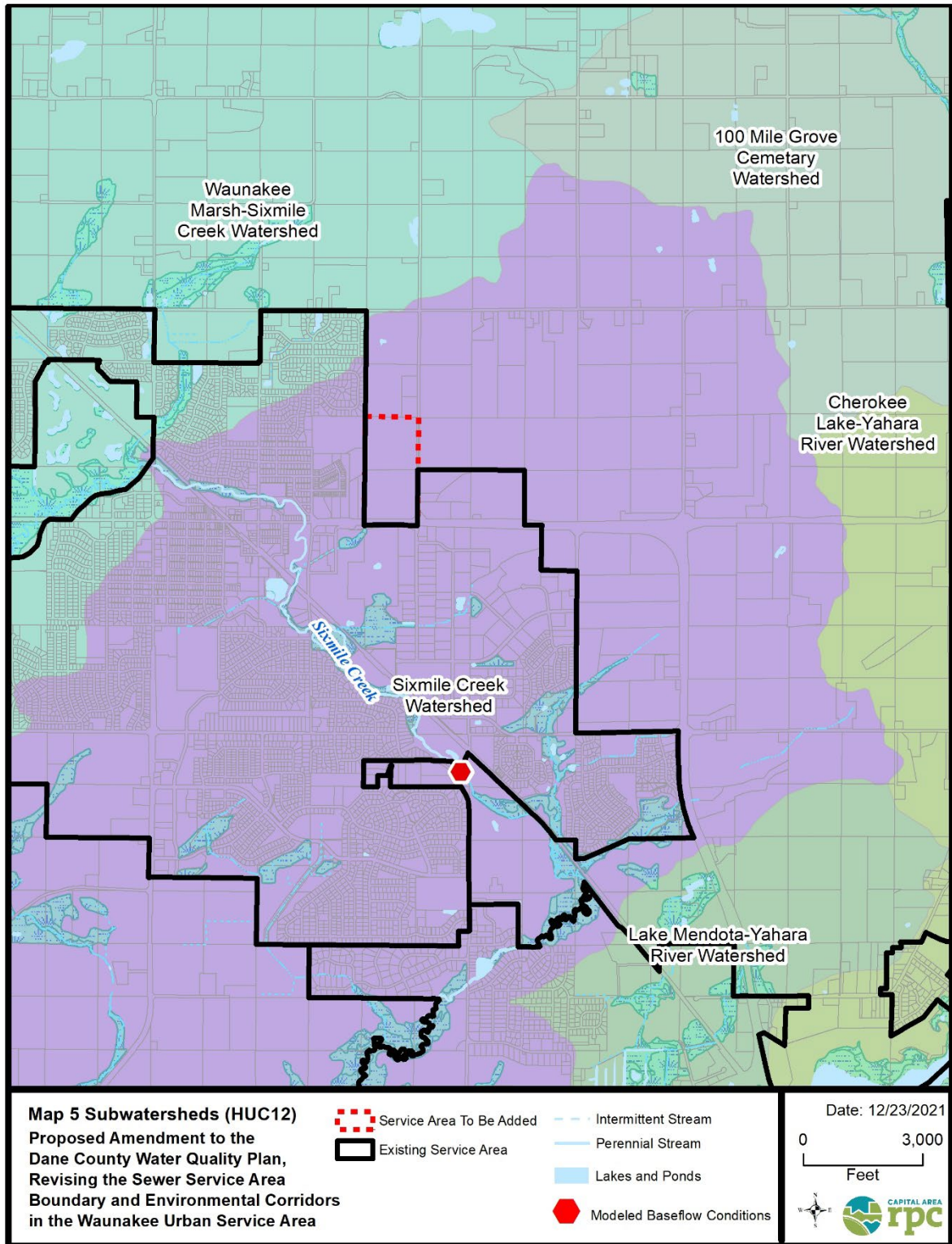


Map 4 – Planned Land Use



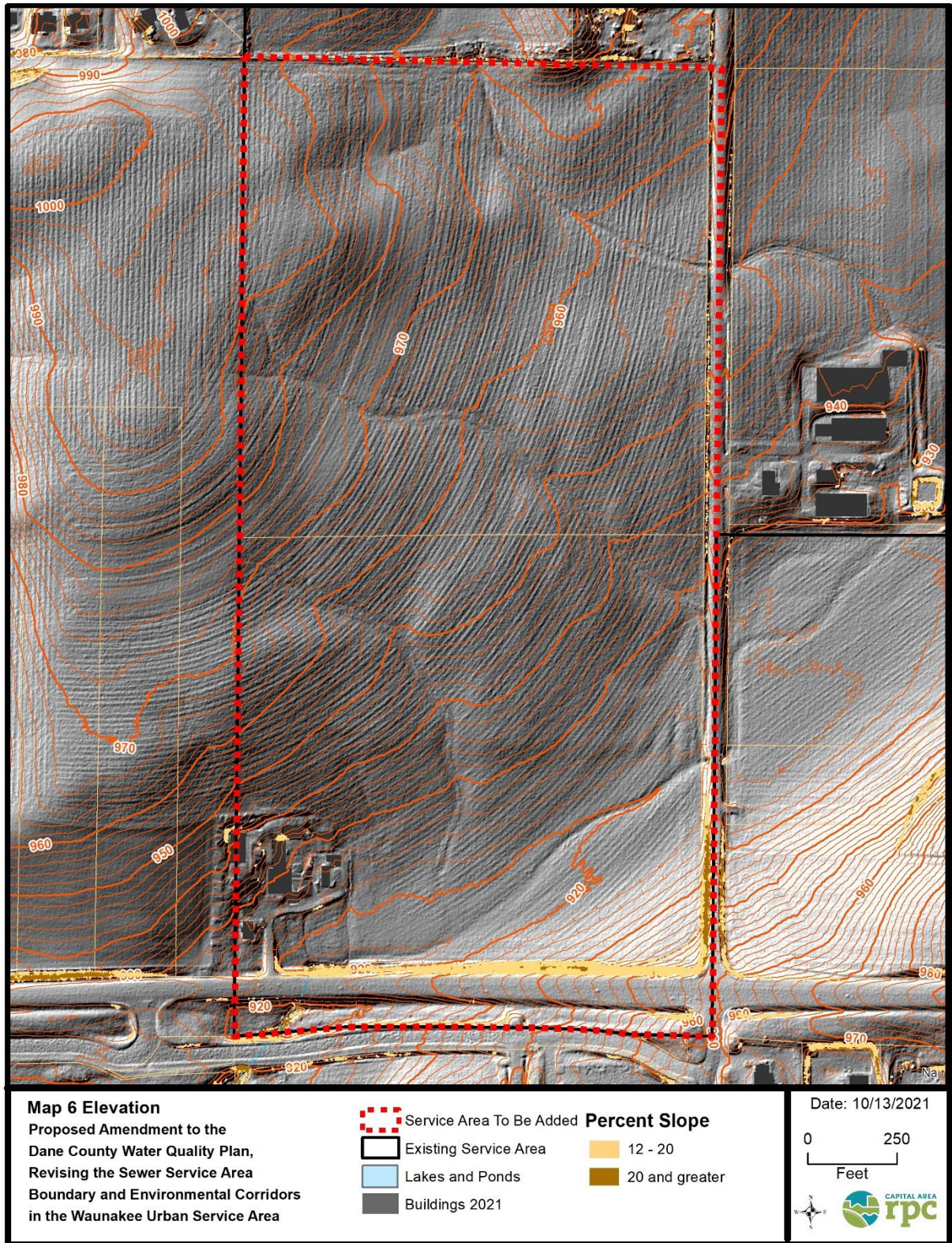


Map 5 – Subwatersheds





Map 6 - Elevations

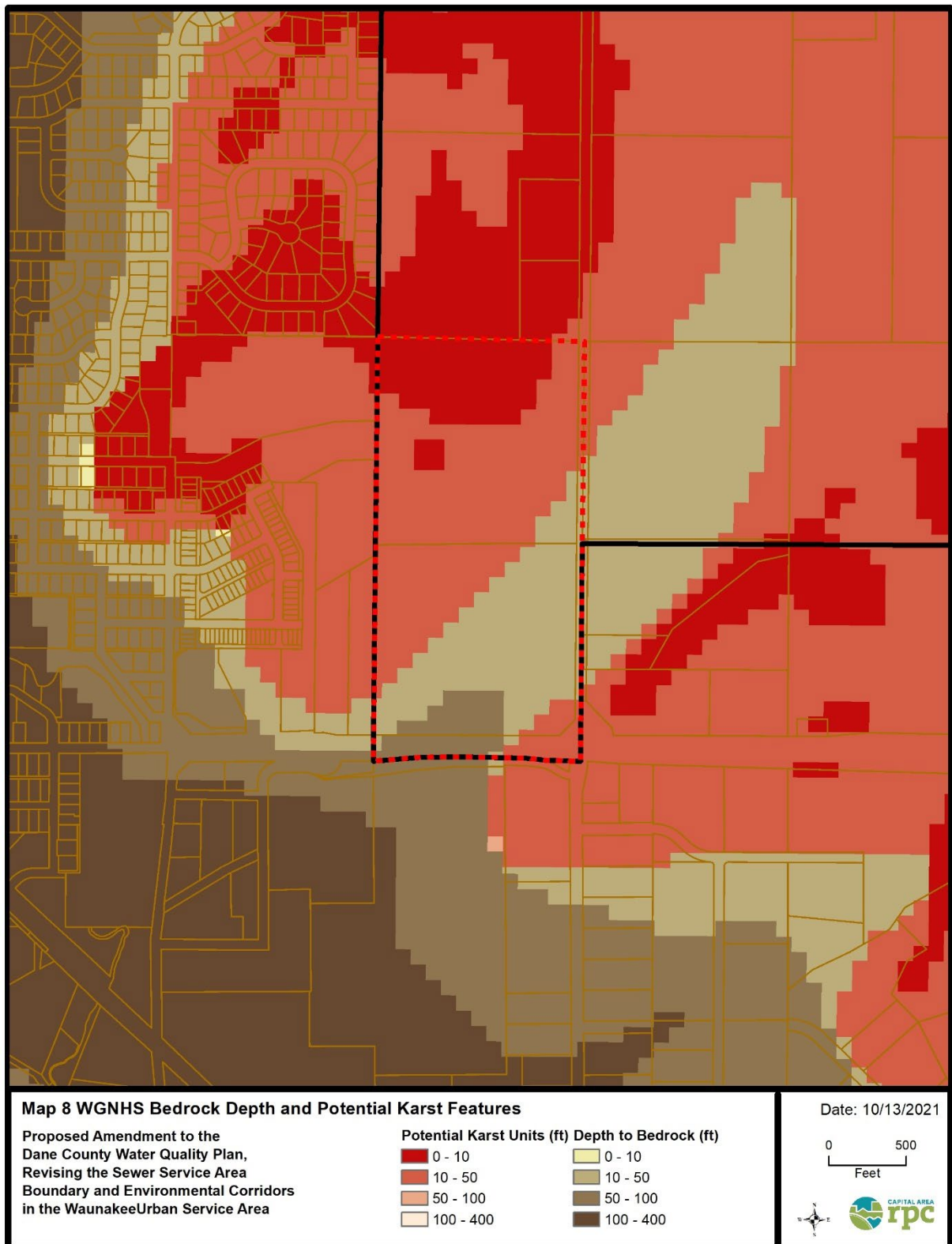




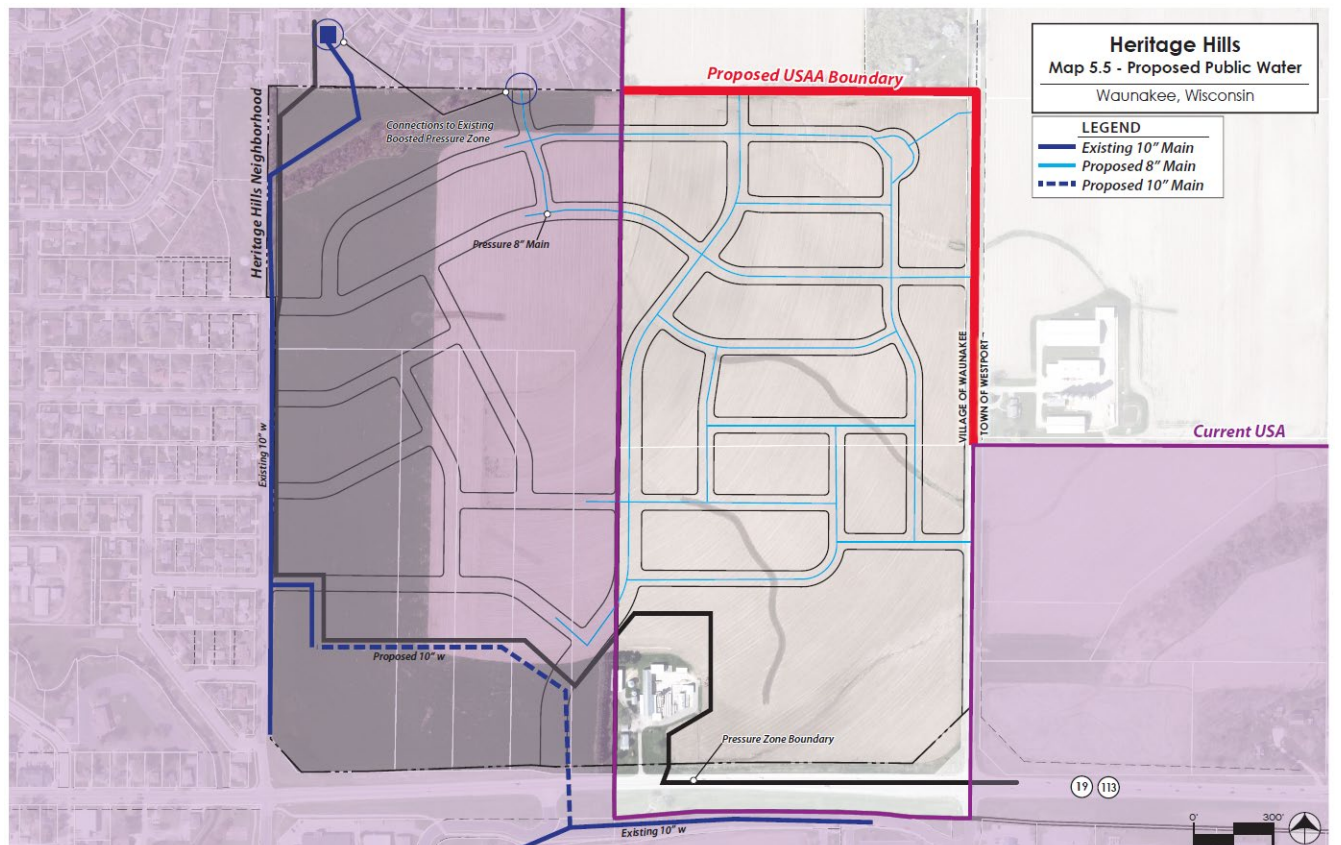
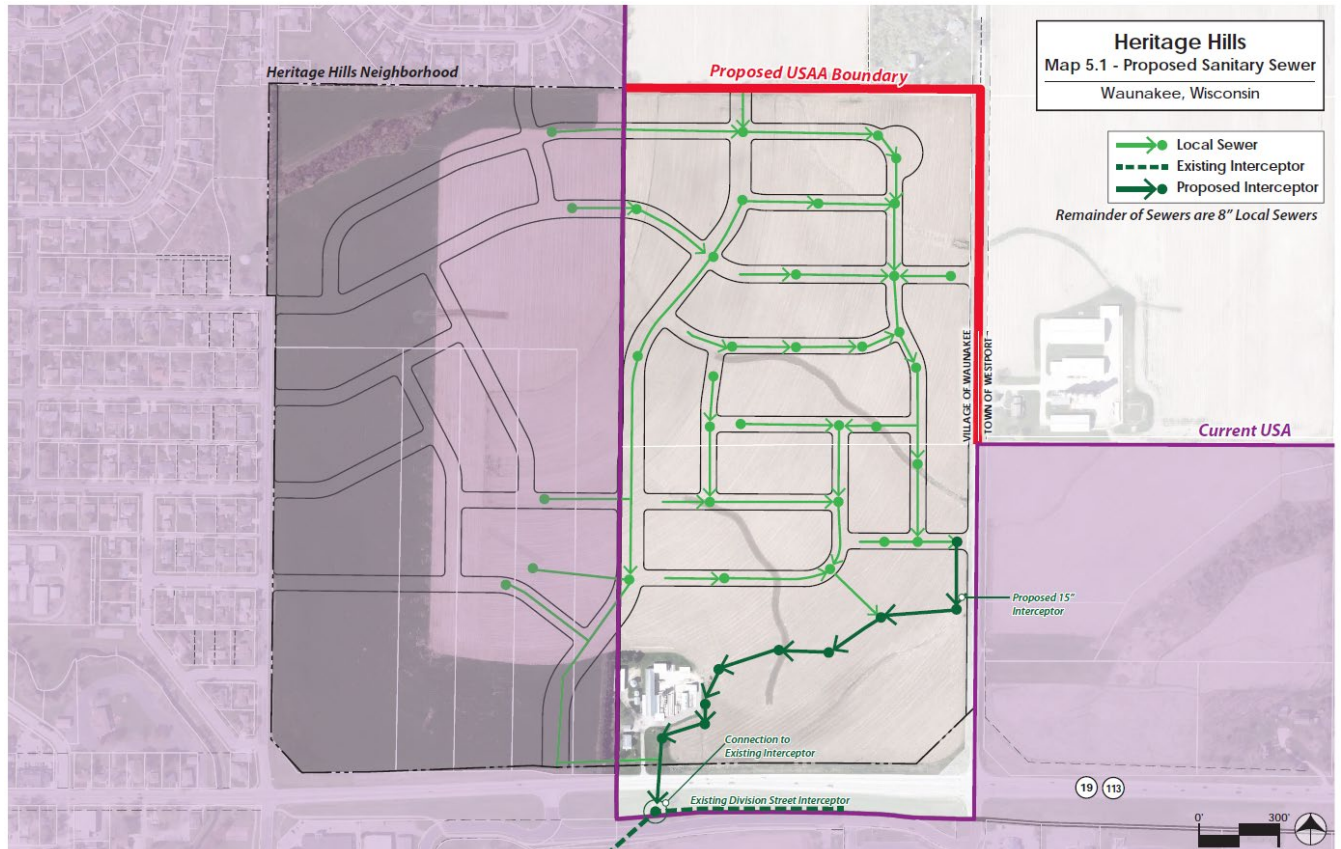
Map 7 - Soil Type



Map 8 – WGNHS Bedrock Depth and Potential Karst Features



Map 9A – Proposed Sanitary Sewer and Water Main





**Heritage Hills**  
Map 5.9 - Stormwater Management  
Waunakee, Wisconsin

**Heritage Hills Neighborhood**

**Proposed USAA Boundary**

**Current USA**

**Stormwater**

**Wetland**

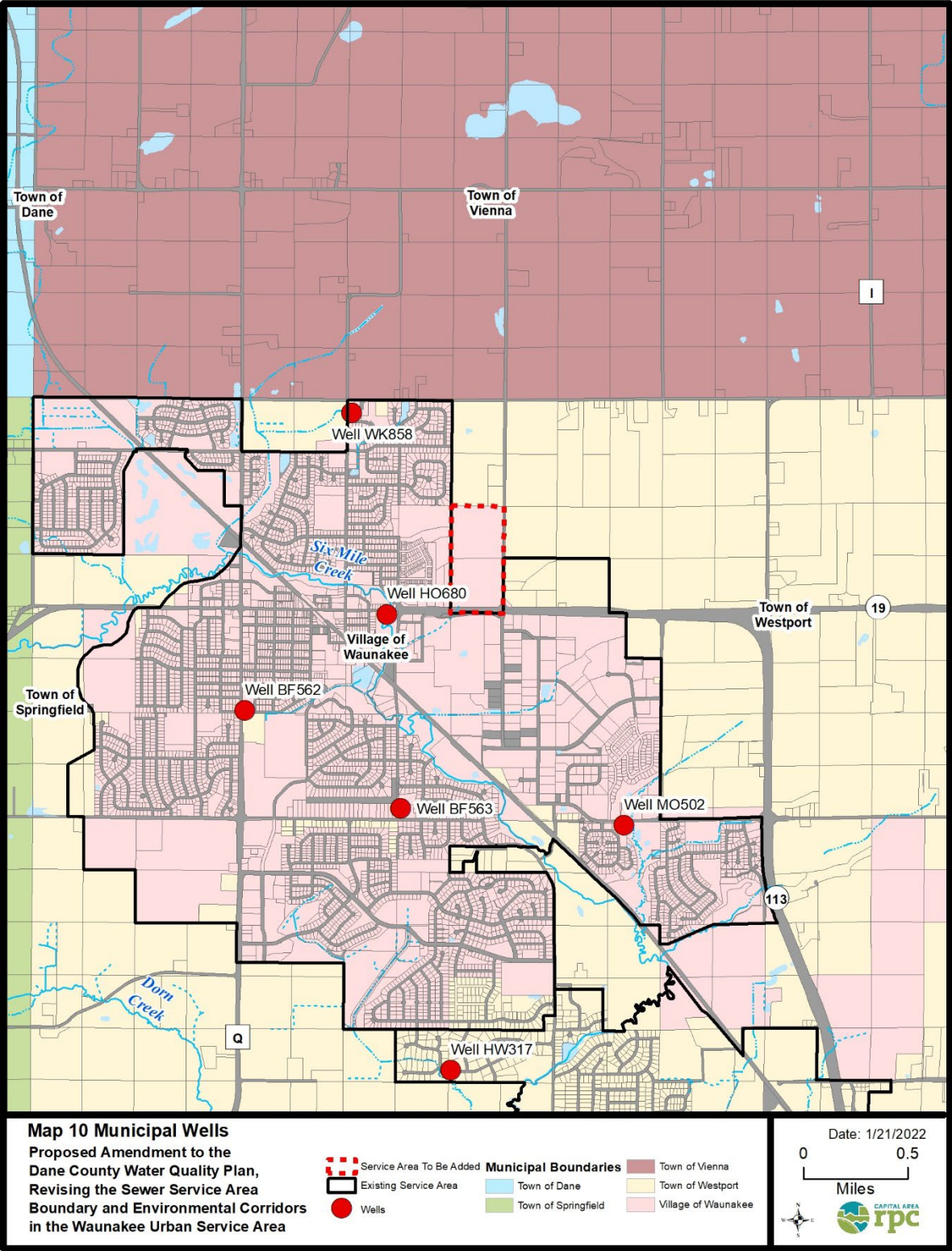
**VILLAGE OF WAUNAKEE**

**TOWN OF WESTPORT**

**TOWN OF WESTPORT**  
**VILLAGE OF WAUNAKEE**

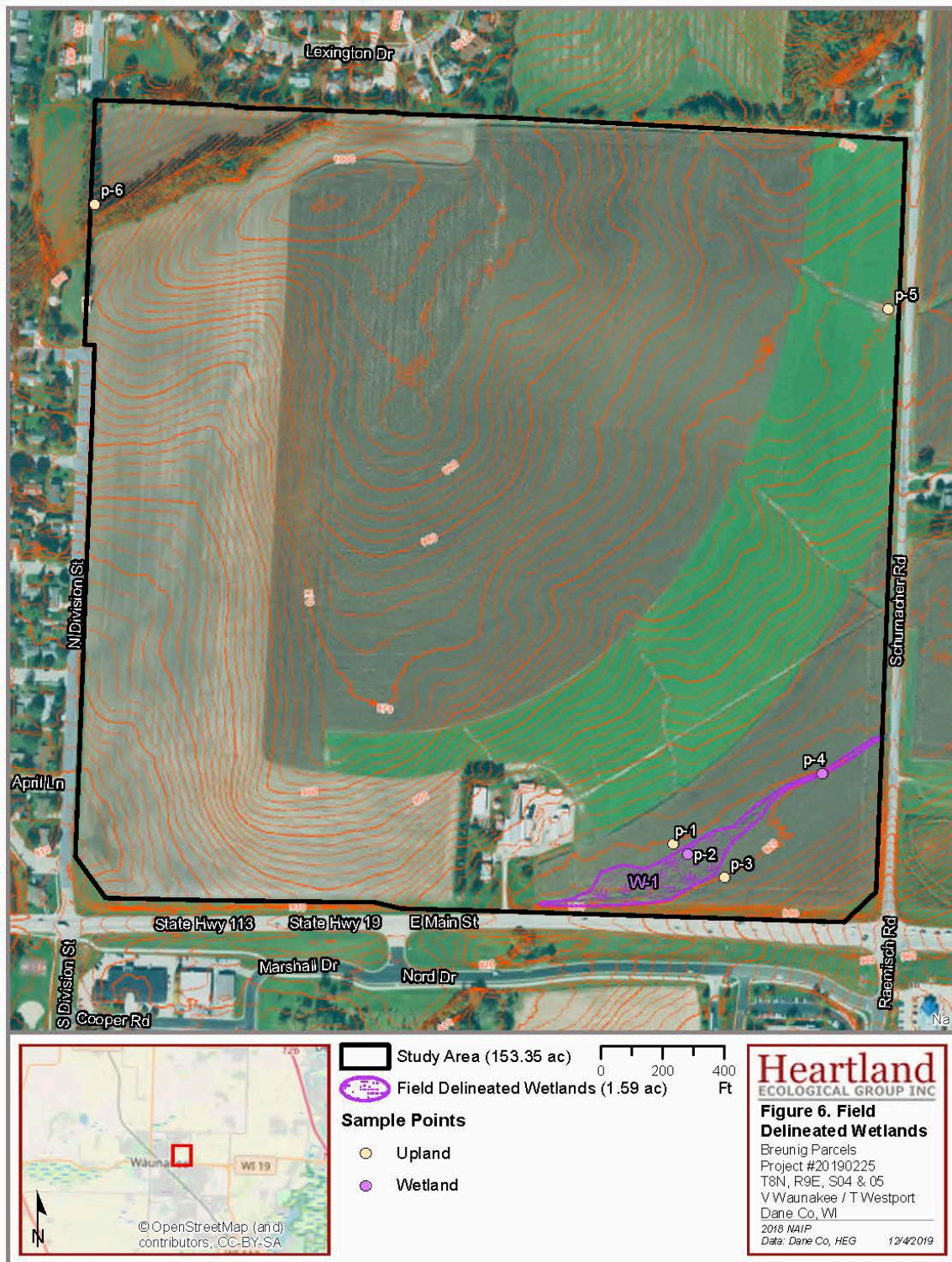
0' 200' 400'

Map 10 – Municipal Wells





Map 11 – Wetland Delineation Map







January 24<sup>th</sup>, 2022

Mr. Sean Higgins  
Capital Area Regional Planning Commission  
100 State St, Ste 400  
Madison WI 53703-2573

RE: Proposed Amendments to Waunakee (Dane County) Water Quality Plan.

Dear Mr. Higgins:

No previously recorded archaeological sites have been recorded in, or adjacent to the parcels delineated in the amendment. The Service Area is not in proximity to wetlands, drainages, or other landscape features that are typical indicators of American Indian settlement and the parcel has been subjected to significant ground disturbance. Therefore, we see no reason why the Waunakee amendment cannot proceed without survey.

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. **Work cannot resume until the Wisconsin Historical Society gives permission.**

This letter does not constitute a Wisconsin Historical Society review for any project that may be governed by Federal or State Compliance laws, e.g. Section 106, Wis Stat. §44.40, Wis Stat. §66.1111, or Wis Stat. §157.70

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

Sincerely:

James M. Skibo, PhD  
State Archaeologist  
State Archaeology and Maritime Preservation  
608-264-6496  
[James.Skibo@wisconsinhistory.org](mailto:James.Skibo@wisconsinhistory.org)

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