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

History of the Northern Urban Service Area

The Northern Urban Service Area (USA) was formed in 2001 through merging the Windsor Urban Service Area and DeForest Urban Service Area. The first amendment to the Northern USA occurred at the time of its creation when 203 developable acres were added. There has been a total of 37 amendments to this urban service area since its creation, 18 initiated by the Village of DeForest. This has resulted in a net addition of 2,645 developable acres and 719 acres of Environmental Corridor. The most recent amendment of the service area by the Village of DeForest occurred in 2017, adding approximately 116 acres.

Planning in DeForest

The Village of DeForest updated their comprehensive plan in April of 2023. The Comprehensive Plan is substantially consistent with the adopted [2050 Regional Development Framework](#) (Framework). The requested amendment area is immediately adjacent to two designated business growth areas. Additionally, the Economic Development chapter of the Plan includes objectives and policies that support the RDF objective and strategy to promote areas for quality business growth.

Existing Conditions

Land Use

The Village of DeForest is requesting an amendment to the Northern USA southwest of the Village, bounded to the north and east by the I-39/90/94 corridor, to the west by Canadian Pacific Railroad right-of-way, and to the south by Daentl Road. Land use to the east is predominantly industrial. Land uses on all other sides include a combination of agricultural land and woodlands (a part of the Cherokee Marsh). The proposed land use is industrial. The requested amendment area is approximately 93 acres.

Refer to Table 1 for existing and planned land uses.

Surrounding Planned Land Uses:

- **North:** Right-of-way and Industrial
- **West:** Agricultural and Natural Area
- **South:** Agriculture and Natural Area
- **East:** Right-of-way and Industrial

Table 1
Existing and Planned Land Use

| Land Use Category | Existing Land Use Acres (see Map 3) | Proposed Land Use Acres (see Map 4) |
|--------------------------|--|--|
| Agriculture | 63.0 | |
| Commercial | 7.7 | |
| Industrial/Business | | 78.2 |
| Natural Area | | 0.5 |
| Open Land | 5.9 | |
| Rural Residential | 2.7 | 1.0 |
| Transportation | 13.3 | 13.3 |
| Water | 0.3 | |
| | 93.0 | 93.0 |

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. No cultural heritage sites are reported within the bounds of the proposed Northern Urban Service Area. Some sections of the proposed Northern Urban Service Area have previously been surveyed for archaeological and burial sites, with negative results. However, given that survey took place within areas likely to have been previously disturbed, and given the presence of former wetlands and streams adjoining this area, and given the identification of substantial multi-component archaeological sites in similar settings within a mile of the proposed Urban Service Area, archaeological survey is recommended.

Natural Resources

The proposed amendment area is in the Cherokee Lake-Yahara River (HUC 12: 070900020504) and Token Creek (HUC 12: 070900020503) subwatersheds (see Map 5). A delineated wetland is present within the amendment area. There are no floodplains within the amendment area.

Wastewater from the amendment area will be treated at the Madison Metropolitan Sewerage District (MMSD) Wastewater Treatment Facility (see Map 5). The treated effluent is discharged to Badfish Creek and Badger Mill Creek, bypassing the Yahara chain of lakes.

Wetlands

WDNR's Wisconsin Wetland Inventory (WWI) shows one wetland classified as palustrine persistent emergent/wet meadow, that is farmed in dry years, within the amendment area. A wetland delineation ([link to report](#)) was conducted by Ruekert & Mielke, Inc. in October 2021 within the amendment area.

The site investigation and field delineation determined that there was one wetland within the study area (see Map 11). The delineated wetland is described as a farmed wetland/wet meadow complex with vegetation dominated by fall panic grass (*Panicum dichotomiflorum*), reed canary grass (*Phalaris arundinacea*), hybrid cattail (*Typha x glauca*), barnyard grass (*Echinochloa crus-galli*), and nut grass (*Cyperus esculentus*). The delineator classified the wetland as “moderately susceptible” to stormwater runoff.

An artificial wetland exemption was requested from the WDNR in January 2023. In February 2023, the request was “mostly denied”, except a strip along a fence along the I-39/90/94 corridor (EXE-SC-2023-13-00317). The remainder of the delineated wetland, with a minimum 75’ vegetated buffer, is required to be designated as Environmental Corridor per the adopted Policies and Criteria for Environmental Corridors ([link to document](#)), as part of the *Dane County Water Quality Plan*.

In addition to the wetlands within the amendment area, there are also other wetlands near the amendment area. According to the WWI, the wetlands directly to the west and southwest are part of a large wetland complex associated with Cherokee Marsh and classified as palustrine persistent emergent/wet meadow, persistent narrow-leaved emergent/wet meadow, broad-leaved deciduous scrub/shrub, and broad-leaved deciduous forest. According to the Minnesota Stormwater Manual ([link to webpage](#)), shrub-carrs are moderately susceptible to degradation by stormwater input, fresh (wet) meadows are slightly to moderately susceptible, and floodplain forests are slightly susceptible.

Yahara River

The Yahara River (WBIC 798300 / WATERS ID 355202) is 63 miles long and originates in Columbia County, connecting Lakes Mendota, Monona, Kegonsa, and Waubesa. The Cherokee Lake-Yahara River subwatershed (the majority of the portion from Lake Mendota to the headwaters) is approximately 28.5 square miles. Pollutants of concern in the Yahara River are sediment/total suspended solids and total phosphorus, which have resulted in a degraded habitat and low dissolved oxygen. Total Maximum Daily Loads (TMDL) for total phosphorus and sediment were approved by the US EPA in 2011. The Token Creek to the headwaters segment (from mile 47.02 to 63.02) is downstream of the amendment area and supports a Warmwater Sport Fishery (see Map 5). This 16-mile segment was listed as an impaired water per Section 303(d) of the Clean Water Act in 2014 for phosphorus. An assessment for chloride in 2016 found levels to be too high and the segment was listed as impaired. This segment was assessed during the 2022 listing cycle and based on the sample data chloride was proposed for delisting.

There are two North Temperate Lakes Long-Term Ecological Research (NTL-LTER) program - Madison Area Lakes monitoring stations ([Station ID 10039181](#) and [Station ID 10039184](#)) downstream of the amendment area along the Yahara River, upstream of Cherokee Lake, that were last monitored in 2018. Average total phosphorus measurements from 2018 were 0.09 mg/L. Chloride data is not collected at these monitoring stations. USGS baseflow monitoring on the Yahara River at State Highway 113 ([Station ID 05427850](#)) measures discharge and water level but does not collect water quality data.

Token Creek

Token Creek (WBIC 806600 / WATERS ID 11675) is 11.65 miles long and flows along the northern edge of the Village of Sun Prairie, ultimately draining to Cherokee Marsh and providing significant base flow for the Yahara River north of Lake Mendota. The 25.1 square mile watershed encompasses predominately

agricultural lands, wetlands, and the growing communities in Windsor, DeForest, and Sun Prairie. The first two miles of the creek are a warm water sport fishery with some rough species. From mile marker 2 to 4, the stream is fed by springs and supports water cress and a diverse fishery of cold water, sport, and forage fish. The segment of the creek that passes south of the amendment area (from mile 0 to 2.95) was evaluated in the 2016 and 2018 cycles for temperature and biology. This segment is on the Healthy Waters List. The dam on Token Creek was removed so there is no longer a barrier to fish passage.

There is one NTL-LTER program - Madison Area Lakes monitoring station ([Station ID 10013299](#)) on Token Creek downstream of the amendment area, upstream of its confluence with the Yahara River, that was last monitored in 2018. The measurement for total phosphorus in 2018 was 0.02 mg/L. Chloride data was not collected at this station.

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. From 2014 to 2017, the WGNHS surveyed springs statewide that were expected to have flow rates of at least 0.25 cubic feet per second (cfs). The Token Creek subwatershed contains two inventoried springs, Dane County Spring #9 and Dane County Spring #10. Dane County Spring #9 is located at Token Creek Natural Resource Area, north of State Highway 19. It was surveyed in 2014 with a discharge rate of 5.29 cfs, specific conductance of 727 $\mu\text{S}/\text{cm}$, temperature of 50° F, and a pH of 7.41. Dane County Spring #10 is located at Token Creek Conservancy. This spring was also surveyed in 2014 with a discharge rate of 1.72 cfs, specific conductance of 898 $\mu\text{S}/\text{cm}$, temperature of 51° F, and pH of 7.96. There are no known springs in the Cherokee Lake-Yahara River subwatershed.

Groundwater

Groundwater modeling using the 2016 Groundwater Flow Model for Dane County, developed by the WGNHS ([link to website](#)), shows that 2010 modeled baseflow in the Yahara River at the confluence with Token Creek (see location on Map 5) decreased compared to predevelopment flow conditions (51 to 46 cfs; see Table 4). These reductions are primarily due to the cumulative effects of well water withdrawals from multiple municipalities in the groundwatershed. Pre-development conditions represent no well pumping within the model.

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 approximately 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 CARPC staff for species designated as endangered, threatened, or of special concern identified several special concern species: two plant and one reptile species; one threatened bird and three threatened plant species; one endangered amphibian; and three natural communities within a 1 to 2-mile radius of the amendment

area. Two state lands were identified with a 1-mile radius of the amendment area: Cherokee Marsh Fishery Area and Cherokee Marsh State Natural Area. Therefore, it is recommended that a formal Endangered Resources Review be conducted by the WDNR or one of their certified reviewers for potential impacts to endangered resources and habitat protection measures to be implemented if species are found.

The amendment area was reviewed for the High Potential Zone (species likely present) for the federally endangered Rusty Patched Bumble Bee ([link to web map](#)). None of the proposed developable area falls within the High Potential Zone.

Soils and Geology

The western two-thirds of the amendment area is located within the Dane-Jefferson Drumlins and Lakes Land Type Association of Wisconsin. The Association classifies the surficial geology of this area as an undulating complex of till plains where drumlins, outwash plains, lake plains and muck deposits are common. The eastern third of the amendment area is located within the Bristol Till Plain Land Type Association of Wisconsin. The Association classifies the surficial geology of this area as undulating till plain with low drumlins and scattered wetlands and bedrock knolls.

Surface elevations within the amendment area range from around 861 feet to 891 feet. There are areas of steep (> 12%) and very steep (>20%) slopes associated with the road embankments along I-39/90/94 in the eastern portion of the amendment area (see Map 6). These 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 the western edge of the amendment area are in the Batavia-Houghton-Dresden association. These soils are well to poorly drained, deep to moderately deep silt loams and mucks that are underlain by silt, sand, and gravel. The soils in the remainder of the amendment area are in the Dodge-St. Charles-McHenry association. These soils are well to moderately well drained deep silt loams. Table 2 shows detailed classifications for soils in the amendment area (see Map 7) while Table 3 shows important soil characteristics for the amendment area.

There is one hydric soil within the amendment area, the Orion soil (the Os map unit) (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 NRCS ([link to web soil survey](#)), the Virgil, Troxel, and Radford soils (the VwA, TrB, and RaA 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. The Troxel soils are classified as moderately well drained, and therefore do not pose a limitation for buildings with basements. The Virgil and Radford soils are classified as somewhat poorly drained and do pose severe limitations for buildings with basements.

Table 2
Soils Classification

| Soil | % of Area | General Characteristics |
|---------------------------|-----------|--|
| Pecatonica Silt Loam; PeB | 62.6 | Deep, well-drained, gently sloping and sloping soils on glaciated uplands and high benches in stream valleys. Soils have high fertility, moderate permeability, and a moderate hazard of erosion. Poses slight limitations for development. |
| Virgil Silt Loam; VwA | 20.2 | Deep, nearly level and gently sloping, poorly drained soils on low benches in stream valleys. Soils have high fertility, moderately slow permeability, and a low hazard of erosion. Poses severe limitations for development due to depth to saturated zone. |
| Dodge Silt Loam; DnB | 4.8 | Deep, well drained, gently sloping and sloping soils on glaciated uplands. Soils have high fertility, moderate permeability, and a moderate to severe hazard of erosion. Poses moderate limitations for development due slope and shrink/swell potential. |
| Troxel Silt Loam; TrB | 4.7 | 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 severe limitations for development due to low bearing capacity. |
| Kegonsa Silt Loam; KeB | 3.2 | Well drained, nearly level and gently sloping, moderately deep soils on benches on outwash plains. Soils have medium fertility, moderate to rapid permeability, and moderate hazard of erosion. Poses no limitations for development. |
| Orion Silt Loam; Os | 3.1 | 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. |

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 | PeB, DnB, TrB, KeB | 75.3 |
| Hydric Soils (Indicates Potential / Restorable Wetlands) | Os | 3.1 |

| | | |
|--|--------------------------------|------|
| Poorly Drained Soils with Seasonal High Water Table (< 5') | VwA, RaA | 20.7 |
| Soils Associated with Steep Slopes (> 12%) | KdD2 | 0.1 |
| Soils Associated with Shallow Bedrock (< 5') | None | 0 |
| Best Potential for Infiltration in Subsoils | PeB, VwA, DnB, KeB, DnC2, KdD2 | 91.6 |

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

According to WGNHS data, bedrock within the western two-thirds of the amendment area is in the Wonewoc Formation. Bedrock in the Wonewoc Formation is quartz sandstone, medium grained, brownish yellow to white, with medium- to large-scale cross bedding commonly seen in outcrop. Thickness is up to 165 feet in eastern Dane County. The eastern 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 100-200 feet, with the shallowest depths generally being in the southern portion of the amendment area and deepest depths being in the northern portion.

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. Karst features are unlikely to be encountered in the amendment area.

Given the expected separation of typical stormwater management practices compared to the anticipated depth of potential karst (over 20 feet), there is not a concern for groundwater contamination due to karst features. In addition, *WDNR Conservation Practice Standard 1001 – Wet Detention Pond* (2007) and *WDNR Conservation Practice Standard 1002 – Site Evaluation for Stormwater Infiltration* (2017) require field verification for areas of the development site considered suitable for stormwater management. 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.

Per Dane County ordinance, infiltration practices receiving runoff from source areas that contain impervious surfaces must be located to allow a separation distance of at least 5 feet between the bottom of the infiltration system and the elevation of seasonal high groundwater, or the top of bedrock, along with certain soil filtering characteristics. There is no minimum separation distance for roofs draining to surface infiltration practices. 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

The proposed development includes several stormwater management areas, totaling 12.1 acres within the amendment area (see Map 2). Open space, totaling 7.8 acres within the amendment area, is also proposed. No parkland is proposed. All stormwater and open space areas are proposed for placement in Environmental Corridors.

Wastewater

Sanitary sewer service will be provided to the amendment area by connection to the Village of DeForest sanitary sewer collection and treatment system. The proposed development will be served by a proposed private lift station within the development and force main which will connect to existing sanitary sewer along Daentl Road, east of the amendment area (see Map 9A). The existing sanitary sewer gravity flows to the existing Village of DeForest Daentl Road Lift Station, which then pumps into the Madison Metropolitan Sewerage District's (MMSD's) Northeast Interceptor – Highway 19 Extension. From there, wastewater flows via the Northeast Interceptor – DeForest Extension to Pump Station 14 within the MMSD system, and eventually to the Nine Springs Treatment Facility.

The proposed development within the amendment area consists of approximately 57 acres of industrial land uses (including 8 acres of existing development) contributing to wastewater flows. There are two existing single-family residential units (currently on well and septic systems) within the amendment area, one of which will be demolished. The one remaining unit is not anticipated to connect to the public sewer at this time but has been included in wastewater generation estimates and may connect to the proposed interceptor in the future. The Village estimates that the amendment area will generate an annual average of approximately 23,100 gallons per day (gpd) of wastewater, or 16 gallons per minute (gpm). This assumes 2.67 persons per single-family dwelling unit and an average wastewater generation rate of 85 gallons per capita per day (gpcd) for residential land uses (based on water sales records and 35 gpcd infiltration/inflow allowances). For industrial land uses, this assumes 400 gallons per acre (gal/ac). The Village estimates that the amendment area will generate a peak daily flow rate of approximately 92,430 gpd, or 64 gpm, utilizing a peaking factor of 4 for all land uses.

The design pumping capacity of the Daentl Road Lift Station is 400 gpm. Based on 2022 records, the Village estimates the average daily flow to this lift station to be 48,000 gpd, or 33 gpm. Assuming a peaking factor of 4, the estimated existing peak flow at the lift station is 133 gpm. Together with the estimated peak flows from the amendment area, the total anticipated peak flow in the receiving Daentl Road sewer and lift station is approximately 197 gpm, which is less than the capacity of the lift station (400 gpm) and less than the pipe capacity of the existing 8-inch sewer main on Daentl Road (332 gpm), assuming a slope of 0.40% (minimum allowable per NR 110). Furthermore, the *2018 MMSD Collection System Evaluation* conducted on the receiving MMSD interceptor sewers shows that the MMSD interceptor sewers have sufficient capacity to serve the amendment area.

Wastewater Treatment Facility

Madison Metropolitan Sewerage District (MMSD) will provide wastewater treatment for the amendment area. The amendment area will need to be annexed into the MMSD service boundary. The Nine Springs Wastewater Treatment Facility (WWTF) is located on Moorland Road, Madison, 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 million gallons per day (MGD) and the maximum daily design flow capacity is 68.6 MGD. In the year 2021, the facility received an average monthly influent hydraulic loading of 36.4 MGD (65% of the 56.0 MGD design capacity), including infiltration and inflow, according to the 2021 Compliance Maintenance Annual Report (CMAR) ([link to 2021 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 2021. MMSD completed a facility plan in 2017, titled [Liquid Processing Facilities Plan](#), that recommended improvements to the liquid treatment processes at the plant, including the addition of hydraulic capacity. These improvements are being implemented in multiple phases between 2018 and 2030. 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 staff were contacted regarding this amendment and do not have concerns with the District serving this additional area.

MMSD did not have issues meeting its WPDES permit limits for the quality of effluent discharged to Badfish Creek and Badger Mill Creek, according to their 2021 CMAR. Permit limits are specific to each outfall; however, effluent sampling is performed upstream of the flow split to each outfall. 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 2021 CMAR for the Badfish Creek outfall:

- The biochemical oxygen demand (BOD) effluent quality for 2021 was well below the monthly average limit, with a monthly average of 2.9 mg/L (15% of the limit) and a maximum concentration of 4 mg/L (21% of the limit) for the month of February and November.
- The total suspended solids (TSS) effluent quality for 2021 was below the monthly average limit, with a monthly average of 4.9 mg/L (25% of the limit) and a maximum concentration of 7 mg/L (35% of the limit) for the month of November.
- The ammonia (NH₃) effluent quality for 2021 was below the monthly average limits (limits vary by month), with a monthly average of 0.370 mg/L (2-30% of the limit) and a maximum concentration of 0.774 mg/L (19% of the limit) for the month of March.
- The phosphorus (P) effluent quality for 2021 was below the monthly average limit, with a monthly average of 0.33 mg/L (21-55% of the limit) and a maximum concentration of 0.55 mg/L (55% of the limit) for the month of August.

Badfish Creek is a tributary to the Rock River, and thus the WPDES permit for MMSD includes phosphorus and TSS limits for effluent to Badfish Creek 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 interim limit for phosphorus discharged to Badfish Creek 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 of 395 mg/L required by NR 105. With this variance, the WPDES permit sets interim (variance) monthly limits above the chronic water quality standard 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](#)).

Water System

DeForest Municipal Water Utility provides municipal water through a public water distribution system comprised of the original DeForest system (“DeForest North”) and the former Token Creek Sanitary District system (“DeForest South”). In 2021, the Village completed a project to connect the systems, providing a booster station with a pressure control valve to allow water to be pumped from DeForest South to the DeForest North or for water to flow from North to South. Together, the system includes approximately 426,000 linear feet of water main and four active high-capacity groundwater wells within the Village that pump into the distribution system. The active wells are at depths ranging from approximately 412 to 695 feet with an average capacity of 300 to 1,600 gallons per minute (gpm). In total, the gross capacity of the municipal wells is approximately 3,560 gpm, or 5.13 million gallons per day (MGD). The firm capacity (with the largest well assumed to be out of service) is approximately 1,960 gpm, or 2.82 MGD. The Village has three elevated storage tanks, with a combined capacity of 1.10 million gallons. According to the 2022 Annual Report to the Public Service Commission of Wisconsin ([link to 2022 Annual Report](#)), the Village pumped an average of 612 gpm, or 0.88 MGD, in 2022, which is approximately 31% of its firm pumping capacity. In 2022, the maximum amount pumped in any one day was 1,627 gpm, or 2.34 MGD. Applying the Village’s peak hour to maximum day factor of 2.0, the current estimated peak hourly demand is 3,254 gpm, or 4.68 MGD.

Water losses in the Village’s distribution system were an average of 33,334 gpd, or 0.03 MGD, in 2022, which accounted for 4% of the net water supplied. Approximately 21% of this was due to unreported and background leakage, with the remaining due to reported leaks and other apparent losses. In 2022, there were 13 main breaks and 0 service breaks which were repaired. Water losses in the Village’s distribution system were 2% in 2021 and 2% in 2020. 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%.

Water supply within the amendment area will be provided by connecting to existing 12-inch water main along Daentl Road and extending approximately 300 feet to the west to serve the proposed development. Water main will be extended north into the development area with individual service laterals to be provided to each building within the amendment area. Water main within the amendment area will be internally looped, and later externally looped via a secondary connection to the public distribution system at one of two locations along the northeast or northwest corners of the amendment area (see Map 9B). The Village will require the secondary connection to be made upon a predetermined level of development activity.

The proposed development within the amendment area consists of approximately 57 acres of industrial land uses (including 8 acres of existing development) contributing to water demand. There are two existing single-family residential units (currently on well and septic systems) within the amendment area, one of which will be demolished. The one remaining unit is not anticipated to connect to the public water system at this time but has been included in water demand estimates and may connect to the proposed system in the future.

The Village anticipates the annual average daily water demand for the amendment area to be approximately 23,300 gallons per day (gpd), or 16 gpm. This assumes an average daily demand of 136 gpd for the one single-family dwelling unit and 400 gallons per acre per day (gpd/ac) for the industrial land uses. The estimated peak hourly demand is approximately 3,800 gallons/hour, or 64 gpm, based on a peak hourly demand factor (peak hour to maximum day) of 2 for all land uses. Including the projected demand from the amendment area, the total peak daily demand on the water system is anticipated to be 1,658 gpm. The peak hourly demand is anticipated to be 3,317 gpm. This is within the gross capacity of the system with all four wells running but does exceed the firm capacity. If one well is down, water from storage will be required to meet the peak hourly demands on the system (note: this is already the case without adding the additional demand from the amendment area). Nonetheless, it is anticipated that the existing water supply system will support the additional demand from the proposed amendment area. The estimated average daily water demand represents an increase of approximately 3% of the current demands on the system.

The Village estimates that static pressures within the amendment area will range between 73 psi (at the highest elevations) to 85 psi (at the lowest elevations), providing acceptable pressure. Furthermore, the Village estimates the system will be able to provide 3,500 gpm for a duration of 3 hours, in accordance with typical Insurance Services Office (ISO) recommendations, by utilizing existing storage volume.

Stormwater Management System

The northern approximately one-half of the amendment area is within the Cherokee Lake-Yahara River subwatershed (HUC 12: 070900020504) and the southern one-half is within the Token Creek subwatershed (HUC 12: 070900020503). The approximately 90-acre amendment area currently consists of mostly active agricultural lands, two single-family homes (one of two to be demolished), an approximately 12-acre area of existing industrial/commercial development (to remain), and a drainage channel and wetlands in the northern one-third of the area.

The drainage divide runs through the center of the site, with the northern half draining to the northwest and the southern half draining to the southwest. Runoff from the northern half is generally collected

within the onsite wetlands and drainage channel that continues westward offsite within the Town of Burke, eventually being collected within the Yahara River approximately 2,700 feet to the west. Runoff from the southern half generally is routed along Daentl Road and crosses to the south through an existing culvert, entering wetlands within the Town of Burke and eventually being collected within Token Creek approximately 1,200 feet to the south.

The size of the existing culvert crossing Daentl Road is unknown. Based on Dane County LiDAR contour data, during large storms events exceeding the capacity of the culvert, stormwater will continue to the west and likely overtop the roadway near the western corner of the amendment area. Given the proximity of the railroad and existing homes west of the railroad, detailed analysis of the discharge location(s) should be conducted, and appropriate improvements made to the crossing to ensure safe overland flow from the amendment area exists.

According to the Village's application, new development within the amendment area will meet or exceed current stormwater regulations for peak rate control and attenuation, water quality (TSS reduction), volume control (infiltration), thermal control, and oil/grease control. Pretreatment of stormwater runoff prior to entering the wetlands will be required in accordance with NR 151 regulations.

A conceptual stormwater management plan has been prepared for the 53-acre site owned by Likewise Partners, which comprises the active agricultural lands. The preliminary results indicate that the development site will meet all applicable stormwater management requirements. Conceptual areas of stormwater management have been laid out (see Map 9B). The proposed drainage conditions will generally match existing conditions. Plat-wide or regional stormwater facilities will be placed in outlots dedicated to the public and will be owned and managed by the Village, while any stormwater facilities privately owned and managed will be subject to a stormwater maintenance agreement to be recorded with the Dane County Register of Deeds.

A detailed stormwater management plan review and approval is required prior to beginning any development construction. The plan will be required to meet all stormwater management and performance standards of the Village of DeForest, Dane County, and WDNR current at the time of development.

Performance Standards

The Village of DeForest stormwater management and performance standards are contained within Chapter 24 of the Village of DeForest Code of Ordinances. Dane County stormwater standards are detailed within Dane County Code of Ordinances, Chapter 14. WDNR stormwater standards are within Administrative Code Chapters NR 151 and NR 216. Development within the amendment area will be required to follow the more protective requirements contained within the respective standards.

The Village proposes stormwater management performance measures for the amendment area to meet, or exceed, applicable stormwater standards currently required by the State of Wisconsin, Dane County, and Village of DeForest, and include:

1. Require post-construction sediment control for the average annual rainfall period to reduce total suspended solids leaving the site by at least 80%, as compared to no runoff management controls, with sediment control pretreatment occurring prior to infiltration for runoff from parking lots and new road construction within commercial, industrial, and institutional land uses. This is consistent with the standards currently required by Dane County and Village of DeForest ordinances.
2. Require post-construction peak runoff rate control for the 1-, 2-, 10-, 100-, and 200-year, 24-hour design storms (using NRCS MSE4 storm distributions) to match predevelopment peak runoff rates. This is consistent with the standards currently required by Dane County and Village of DeForest ordinances.
3. Require post-construction peak runoff rate control for the 5- and 25-year, 24-hour design storms (using NRCS MSE4 storm distributions) to match predevelopment peak runoff rates. This is consistent with the standards currently required by Village of DeForest ordinances and exceeds Dane County ordinances.
4. Require post-development infiltration (stay-on) volume of at least 90% of the pre-development infiltration (stay-on) volume for the average annual rainfall period. This is consistent with the standards currently required by Dane County and Village of DeForest ordinances.
5. Maintain predevelopment groundwater annual recharge rates of approximately 9 to 10 inches per year, as estimated by the Wisconsin Geological and Natural History Survey in *Groundwater Recharge in Dane County, Wisconsin Estimated by a GIS-Based Water Balance Model* (2012). This is consistent with the standards currently required by Dane County and Village of DeForest ordinances.
6. Require thermal control to reduce the temperature of stormwater runoff from development sites within thermally sensitive watersheds, in accordance with the Village of DeForest and Dane County Stormwater Ordinance.
7. Treat the first one-half inch of runoff to provide oil and grease control using the best available technology for commercial, institutional, and any other land 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 DeForest ordinances.

Impacts and Effects of Proposal

Environmental Corridors

The proposed amendment area includes a total of approximately 20 acres of Environmental Corridor (see Map 12). This will include delineated wetlands with associated buffers and proposed stormwater management, park, and open space areas in accordance with the Environmental Corridor Policies and Criteria ([link to document](#)) adopted in the *Dane County Water Quality Plan*. Some of what is proposed as Environmental Corridor also coincides with mapped Stewardship Areas, as described below.

Protection Areas must be included in Environmental Corridors when those areas are added to the urban service area. Protection Areas include natural resource features such as the 1% annual chance floodplain, waterbodies, streams and wetlands, plus their required vegetative buffers, riparian steep slopes, existing public lands, parks, and conservancy areas, and existing stormwater management facilities. Protection areas are mapped based on regionally available information, such as the Wisconsin Wetland Inventory data.

The [2050 Regional Development Framework](#) (Framework) is designed to serve as a guide for local communities as they plan for future growth and development. One of the three goals of the Framework is to foster regional development that conserves water resources and natural areas. To achieve this goal, the Framework advocates for enhancing Stewardship and Natural Resource Areas. Stewardship Areas are advisory areas to consider for inclusion in Environmental Corridors above the minimum requirements. Stewardship Areas may include natural resource features such as the 0.2% annual chance floodplain, potentially restorable wetlands, internally drained areas, hydric soils, current/potential Ice Age Trail Corridor, and Natural Resource Area boundaries identified in the Dane County Parks and Open Space Plan.

The proposed amendment area includes 10.1 acres mapped as Stewardship Area, including potentially restorable wetlands, hydric soils, and internally drained areas, of which 3.1 acres are proposed to be designated as Environmental Corridor with this amendment (see Map 12).

Meeting Projected Demand

Based on projections in the Framework, employment in DeForest will grow by at least 20% (1,350 jobs) in the next 30 years. The Framework identifies locations that should be planned for business growth to occur. Two such growth areas are located just north of the requested amendment area. The Framework also suggests that this business growth should offer higher wages and stronger career pathways in addition to importing dollars from outside the region that support other industries. Examples include information and communications technology, health care, advanced manufacturing, and biotechnology.

Phasing

The proposed amendment area is smaller than 100 acres. It does not require a phasing plan.

Surface Water Impacts

Development creates impervious surfaces (e.g., 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 (e.g., 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 bank-full 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 communities in Dane County.

The Village of DeForest 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 current Dane County standards for pollutant reduction, runoff volumes, peak flows, water temperature, and groundwater recharge. Such practices will help 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](#). WI Salt Wise's chloride reduction trainings are open to all municipal and private winter maintenance professionals in the region. Village of DeForest staff have attended winter salt certification classes and training for winter road maintenance and are encouraged to stay current on the latest trainings and development.

The Village of DeForest is also a participant in the Madison Area Municipal Storm Water Partnership (MAMSWaP), which is a coalition of Dane County municipalities and organizations working together to promote practices that reduce and improve stormwater runoff into Dane County lakes, rivers, and

streams. The MAMSWaP Information and Education (I&E) Committee works to develop and implement projects and plans through regional outreach and consistent messaging throughout the communities, including maintaining the www.ripple-effects.com website, distributing tools and articles to municipalities, community groups, and neighborhood associations, and providing presentations to focused audiences. Specific goals include promoting beneficial onsite reuse of leaves and grass clippings, proper use of lawn and garden fertilizers and pesticides, and promoting infiltration of residential stormwater runoff from rooftops, driveways, and sidewalks.

Groundwater Impacts

Without effective mitigation practices, converting natural areas to urban development shifts the ground/surface water balance in streams and wetlands 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 biological communities more tolerant to these changing conditions.

Groundwater modeling indicates that the cumulative effects of well withdrawals have resulted in a 5 cubic feet per second (cfs) decrease in baseflow of the Yahara River at the confluence with Token Creek (see location on Map 5) from predevelopment (no pumping) to 2010 (see Table 4). An additional 2 cfs decline compared to 2010 conditions is anticipated for the year 2040, according to modeling.

Table 4
Modeled Baseflow Results Due to Current and Anticipated
Future Municipal Well Water Withdrawals
 (All Municipal Wells)

| Stream | No Pumping | 2010 | 2040 |
|--------------|------------|--------|--------|
| Yahara River | 51 cfs | 46 cfs | 44 cfs |

Generally, groundwater discharge occurs along the entire length of perennial streams and is the source of stream baseflow. The loss of baseflow from the cumulative effects of well water pumping and urbanization 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 regional groundwater model is a useful tool for evaluating different configurations and scenarios of municipal groundwater well withdrawals on these stream systems.

Comments at the Public Hearing

A public hearing was held on the proposed amendment at the July 13, 2023, meeting of the Capital Area Regional Planning Commission. Representatives from the Village of DeForest spoke in favor of the amendment. There were no registrants opposed to the amendment. Commissioner Wallner inquired

about the Town of Burke cooperative boundary agreement, to which Mark Roffers, Village Planning Consultant, addressed during the meeting.

Conclusions and Staff Water Quality Recommendations

There is sufficient existing treatment plant system capacity at MMSD's Nine Springs Wastewater Treatment Facility and 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. Most recently, in 2021 Dane County adopted requirements for peak rate control for the 200-year storm event and for closed basins that now apply to all communities in Dane County. The Village of DeForest proposes to mitigate the potential urban nonpoint source impacts of the proposed development on the receiving waters by requiring the implementation of stormwater best management practices that are designed and constructed to meet current standards for pollutant reduction, runoff volumes, peak flow rates, water temperature, and groundwater recharge.

It is CARPC 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 existing 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

CARPC staff recommend approval of this amendment 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-, 5-, 10-, 25-, 100-, and 200-year 24-hour design storms to pre-development levels, in accordance with the Village of DeForest and Dane County Stormwater Ordinances.
 - c. Sediment control is required to achieve at least 80% sediment control for the amendment area based on the average annual rainfall period, with sediment control pretreatment occurring prior to infiltration for runoff from parking lots and new road construction within

commercial, industrial, and institutional land uses, in accordance with the Village of DeForest and Dane County Stormwater Ordinances.

- d. Runoff volume control is required to maintain 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 DeForest and Dane County Stormwater Ordinances.
 - e. Maintain predevelopment 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*", for the amendment area (a range of 9 to 10 inches/year) or by a site-specific analysis, when required by the Village of DeForest and Dane County Stormwater Ordinances.
 - f. Thermal control is required to reduce the temperature of stormwater runoff from development sites within thermally sensitive watersheds, in accordance with the Village of DeForest and Dane County Stormwater Ordinances.
 - g. Oil and grease control are required to treat the first 0.5 inches of runoff using best management practices at commercial and industrial sites and any other uses where the potential for pollution by oil or grease, or both, exists, in accordance with the Village of DeForest and Dane County Stormwater Ordinances.
2. Easements and perpetual legal maintenance agreements with the Village, to allow the Village to maintain stormwater management facilities if owners fail to do so, are required for any facilities located on private property.
 3. Environmental corridors are required to be delineated to meet the Environmental Corridor Policies and Criteria adopted in the *Dane County Water Quality Plan*.

Additional Agreements for the Amendment Area

In addition to the existing state and local requirements, the Village of DeForest and the development team have agreed to pursue the following water resource management measures for the amendment area:

1. Conduct a safe overflow analysis along the southern end of the amendment area to demonstrate a safe flow route exists overtop Daentl Road without increased flooding potential for existing or proposed improvements.

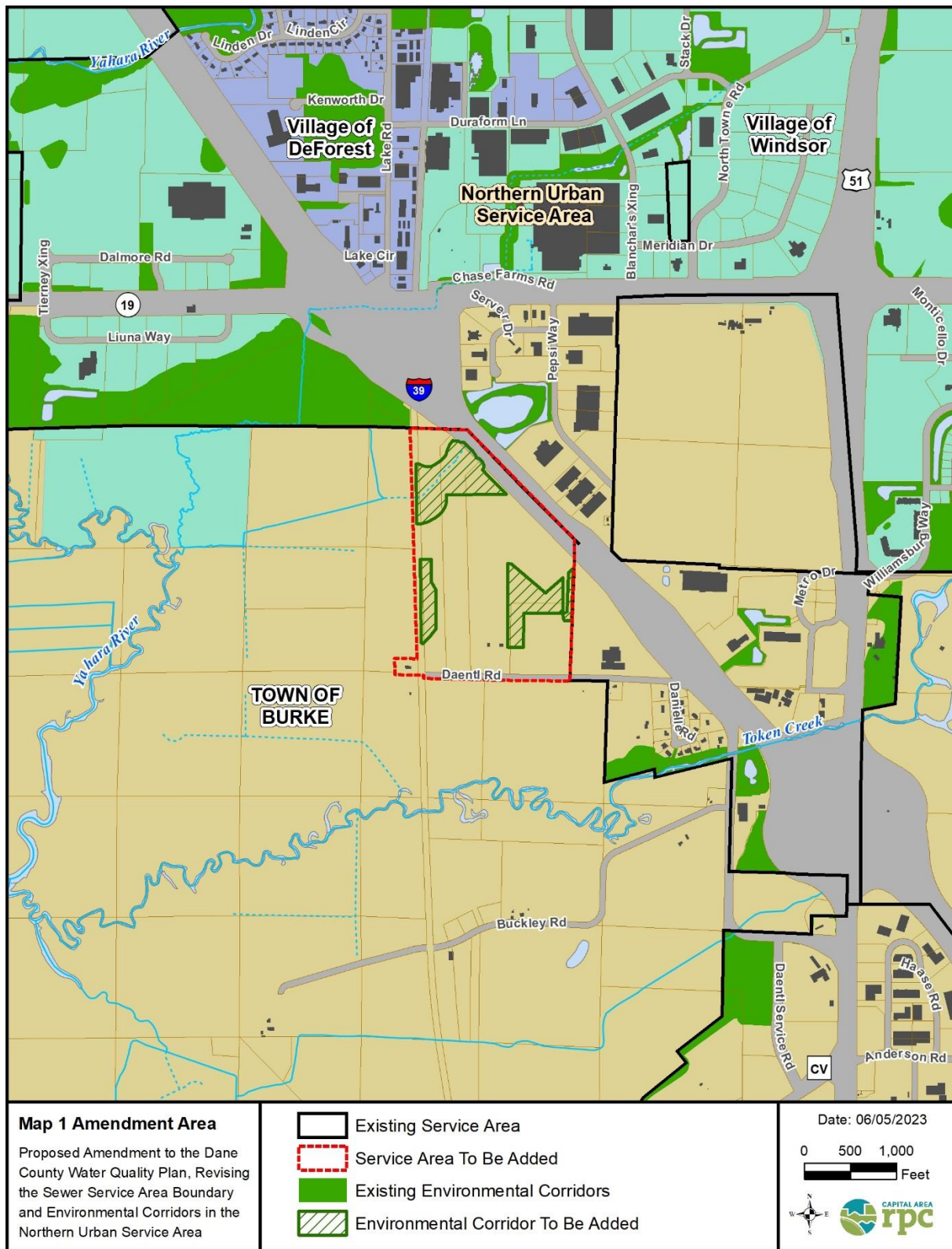
Recommendations

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

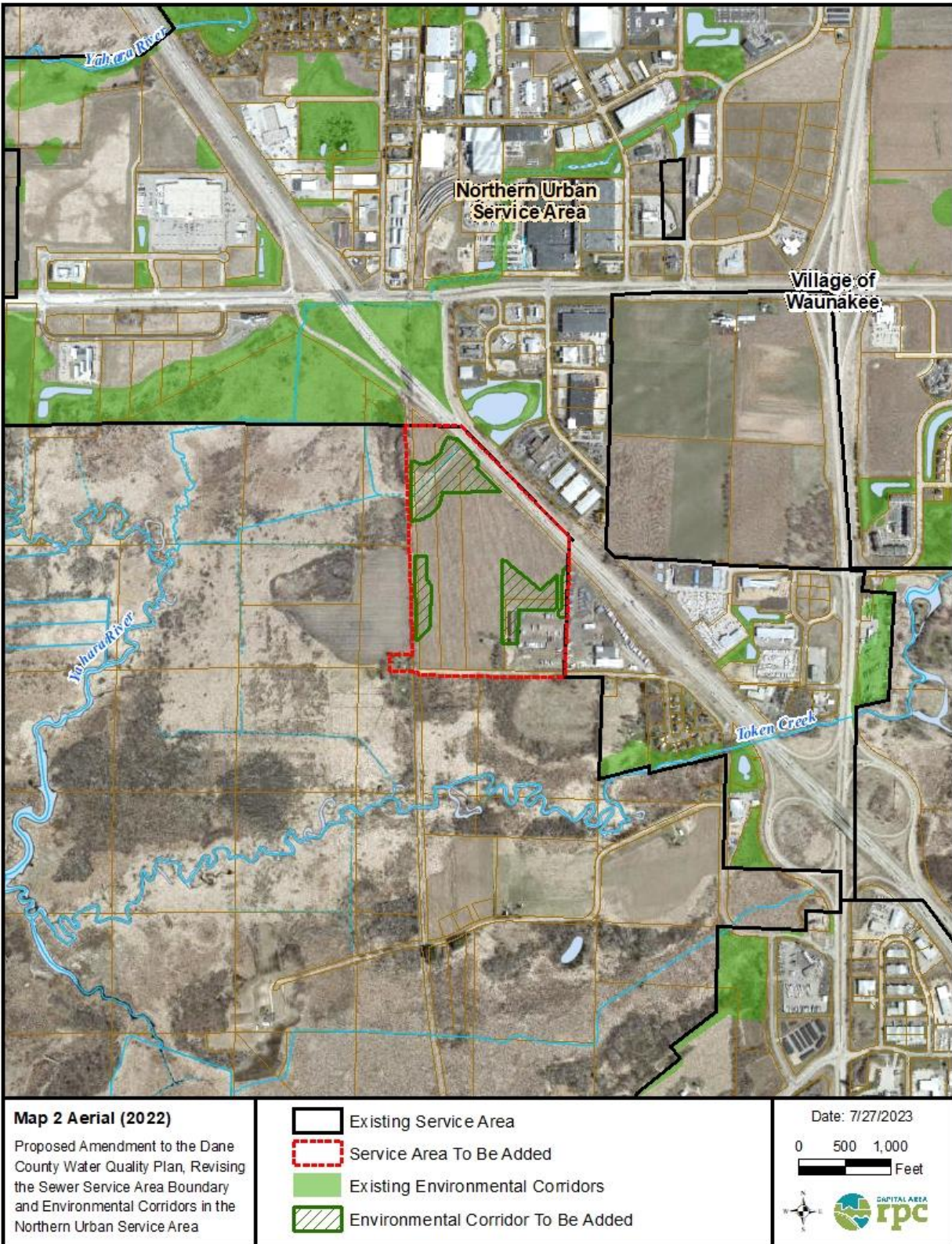
1. Pursue restoration of the wetlands located in the northern end of the amendment area (not those which have received a DNR exemption) to restore natural wetland hydrology and improve water quality in the Yahara Watershed.

2. Continue to participate in regional water quality initiatives including Wisconsin Salt Wise, the Madison Area Municipal Storm Water Partnership, and Yahara WINS.
3. 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, based on the results of screening conducted.
4. Request an archaeological survey to be performed by a qualified archaeologist for the amendment area as recommended by the Wisconsin Historical Society and take necessary protection measures if artifacts are found.

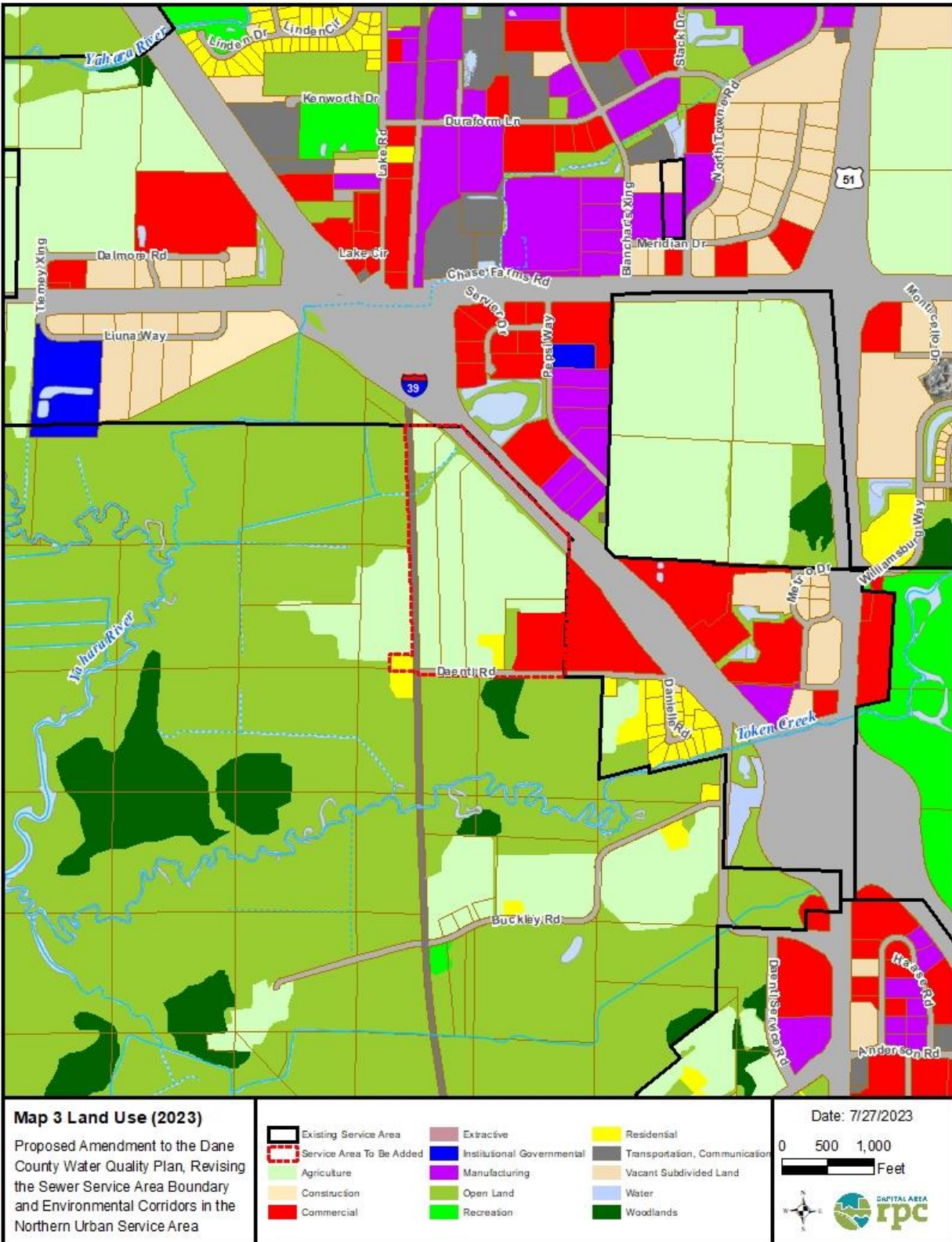
Map 1 - Amendment Area



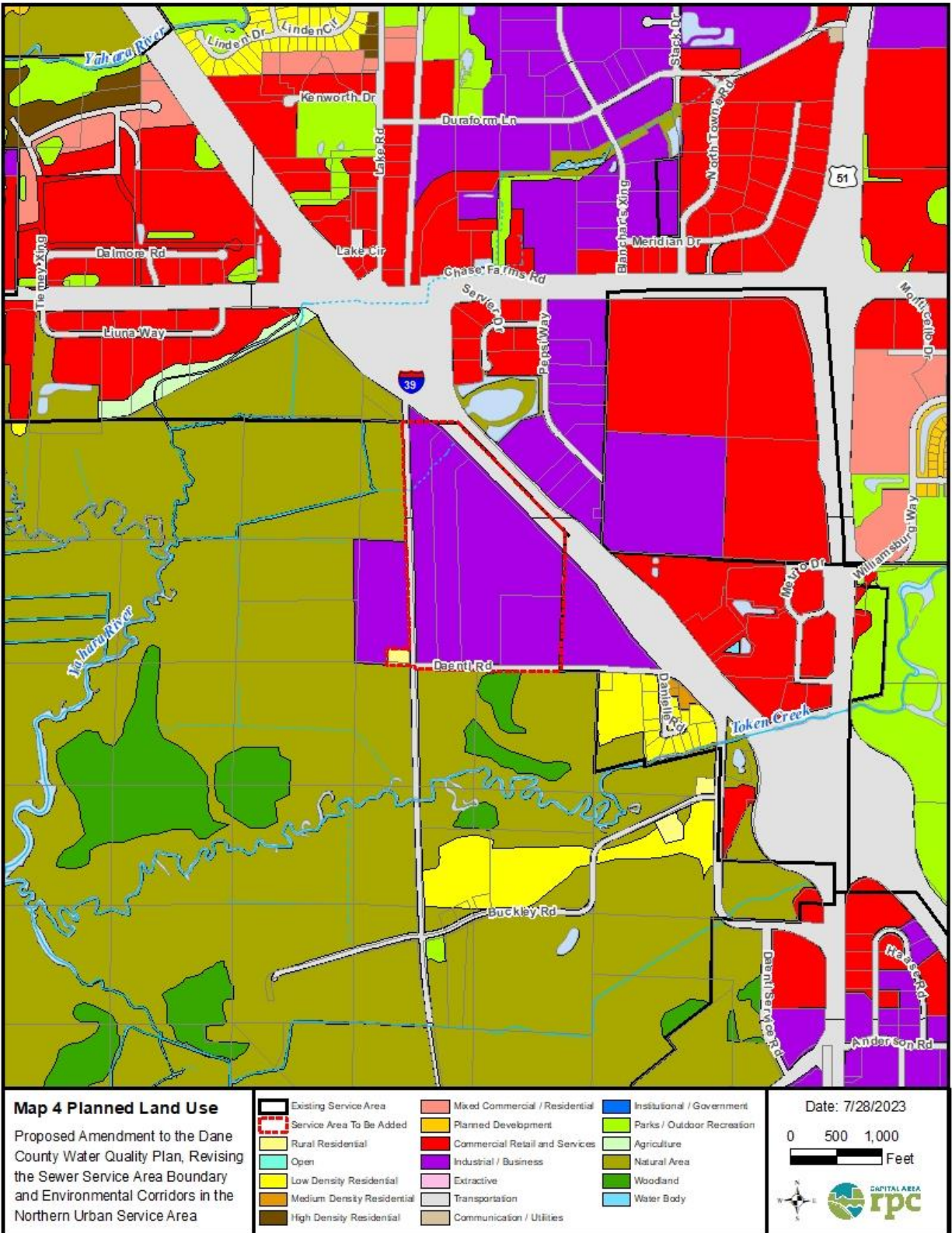
Map 2 – Aerial



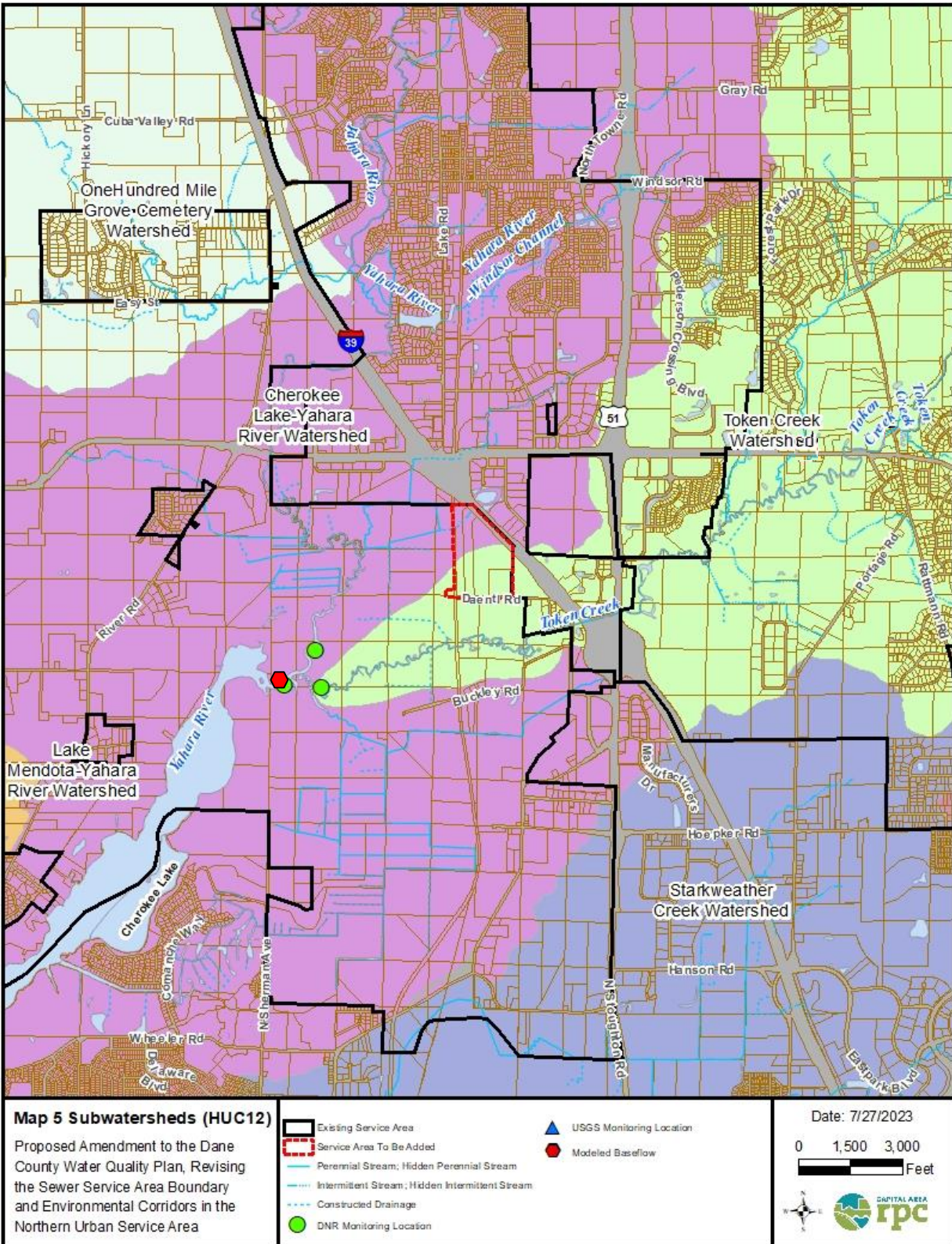
Map 3 – Existing Land Use



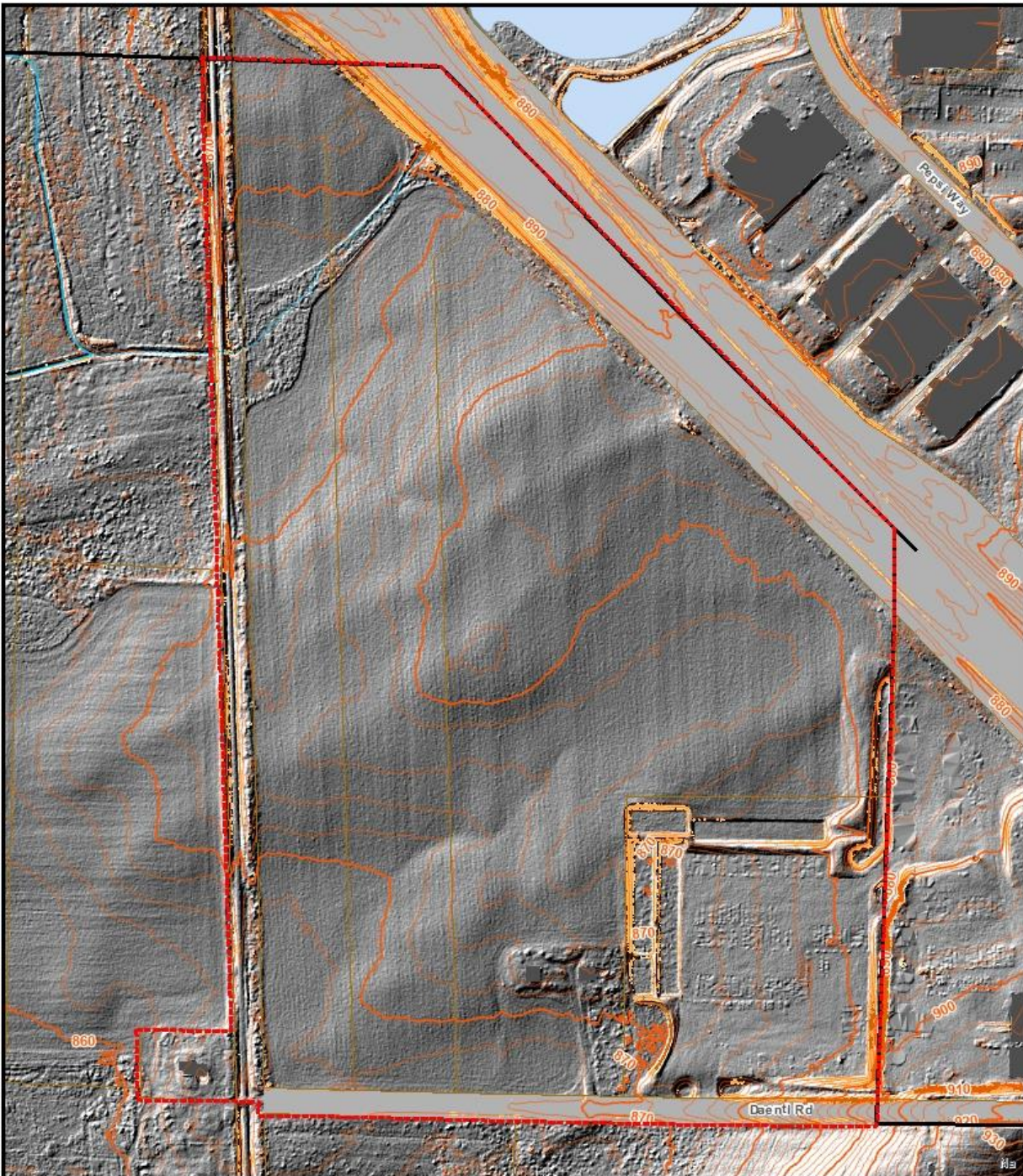
Map 4 – Planned Land Use



Map 5 – Subwatersheds





Map 6 – Elevations





Map 6 Elevation

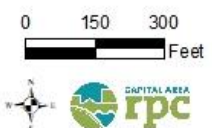
Proposed Amendment to the Dane County Water Quality Plan, Revising the Sewer Service Area Boundary and Environmental Corridors in the Northern Urban Service Area

-  Existing Service Area
-  Service Area To Be Added

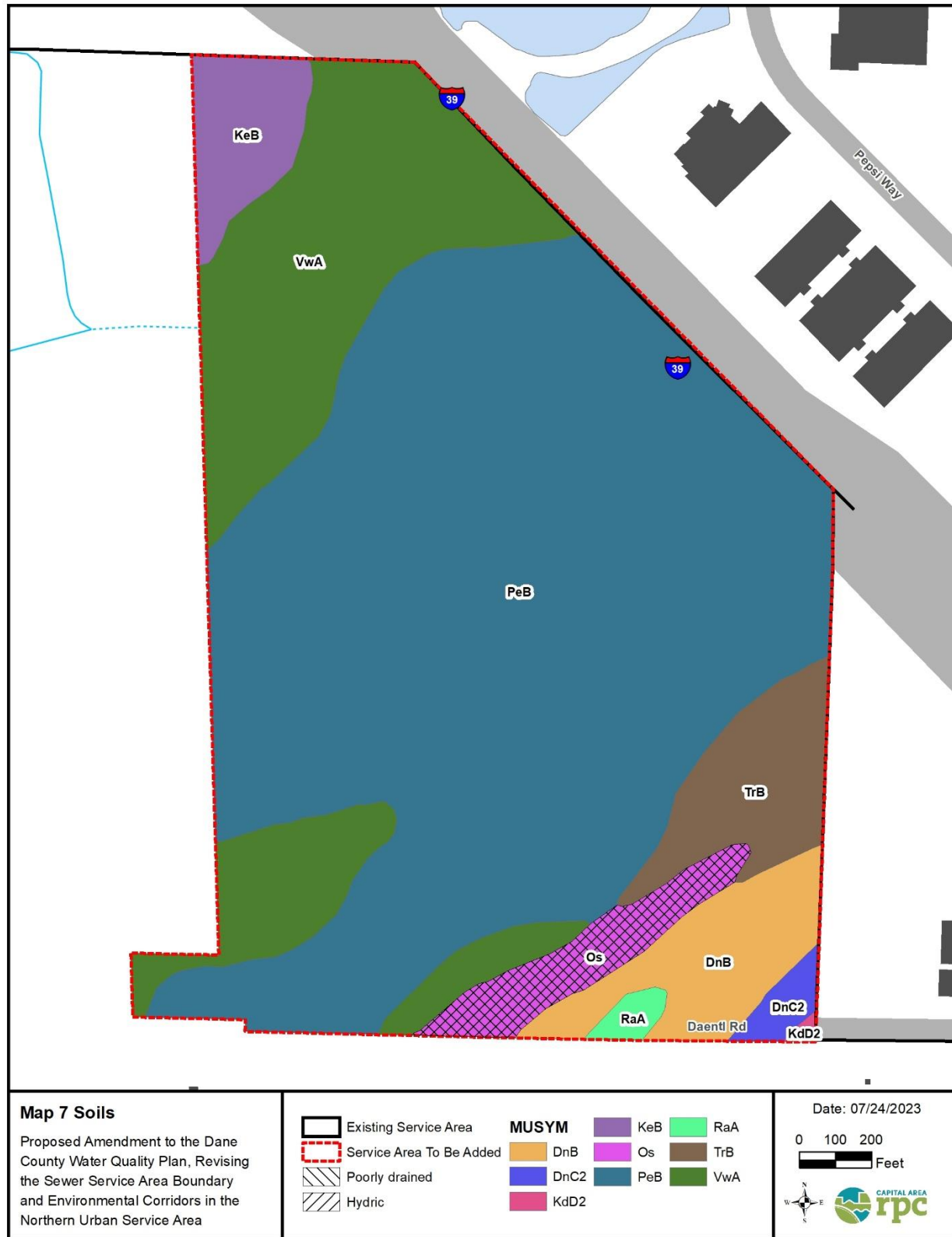
Percent Slope

-  12 - 20
-  20 and greater

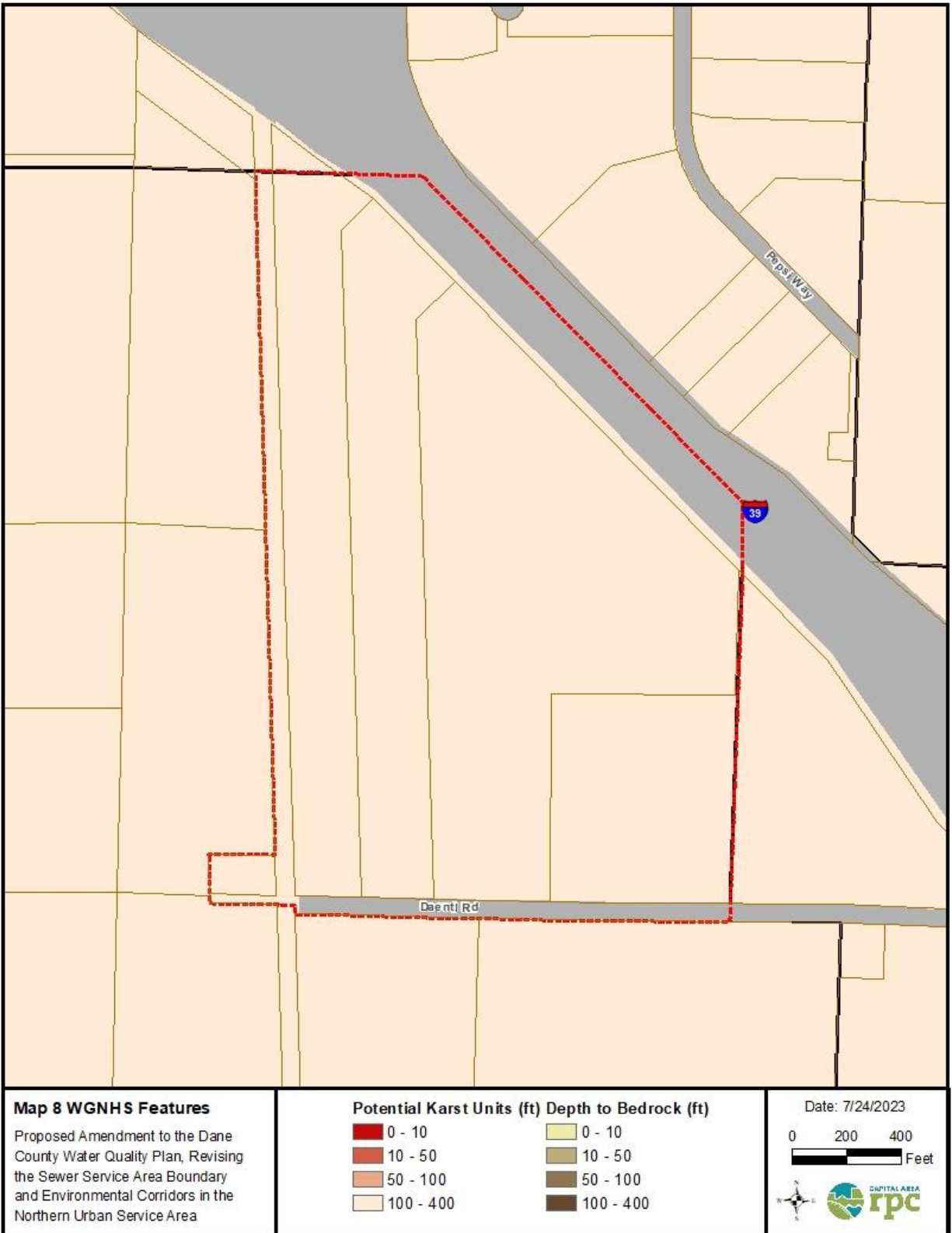
Date: 7/27/2023



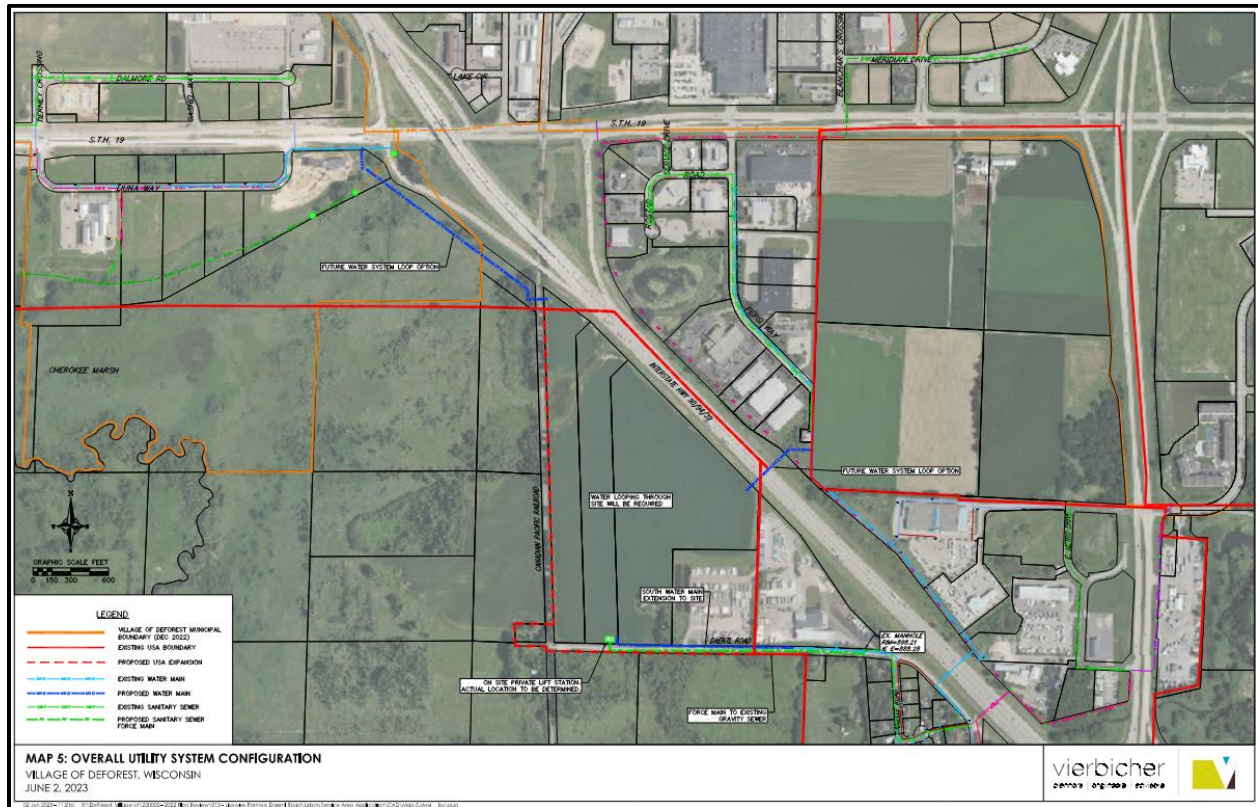
Map 7 - Soil Type



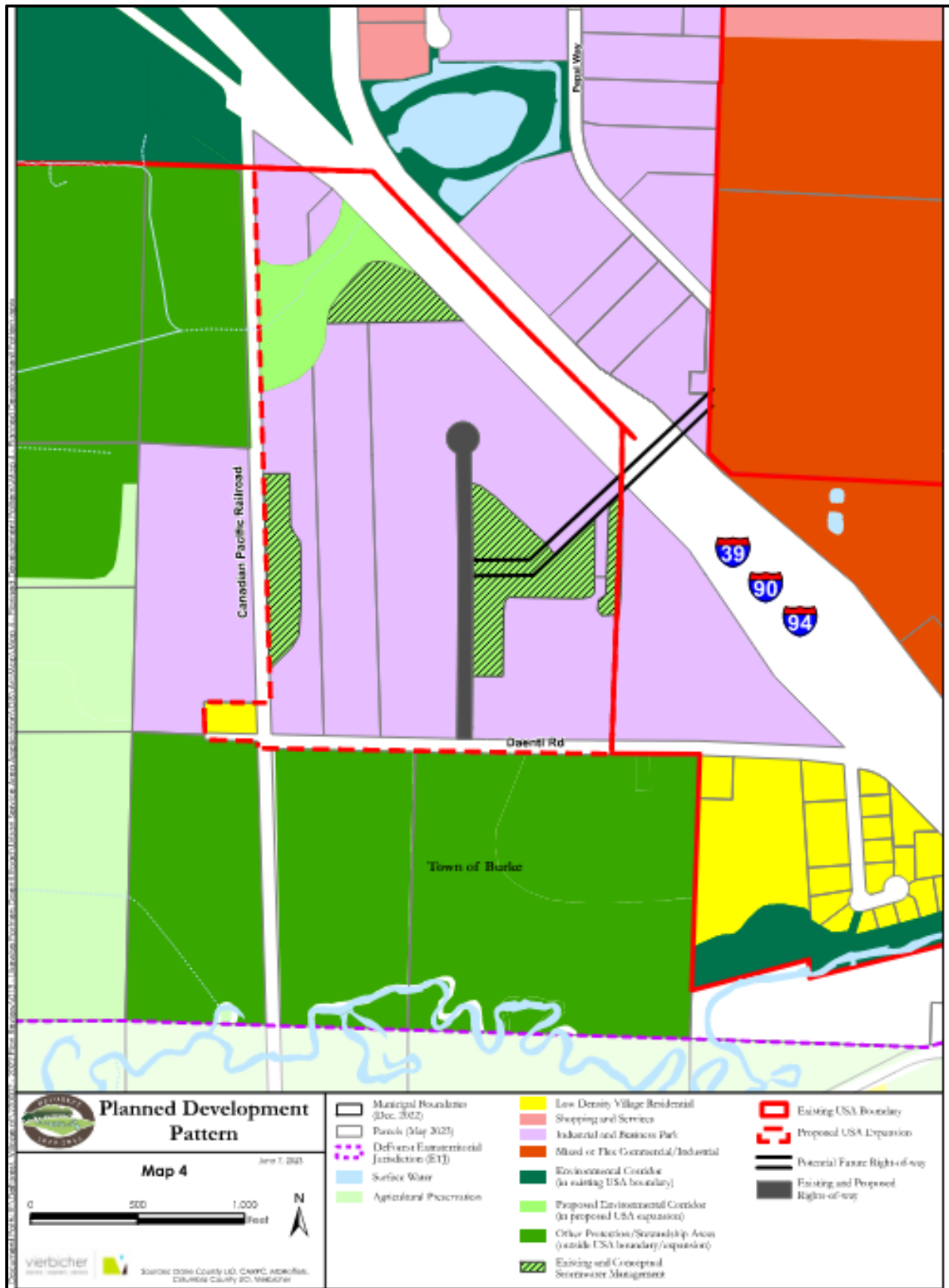
Map 8 – WGNHS Bedrock Depth and Potential Karst Features



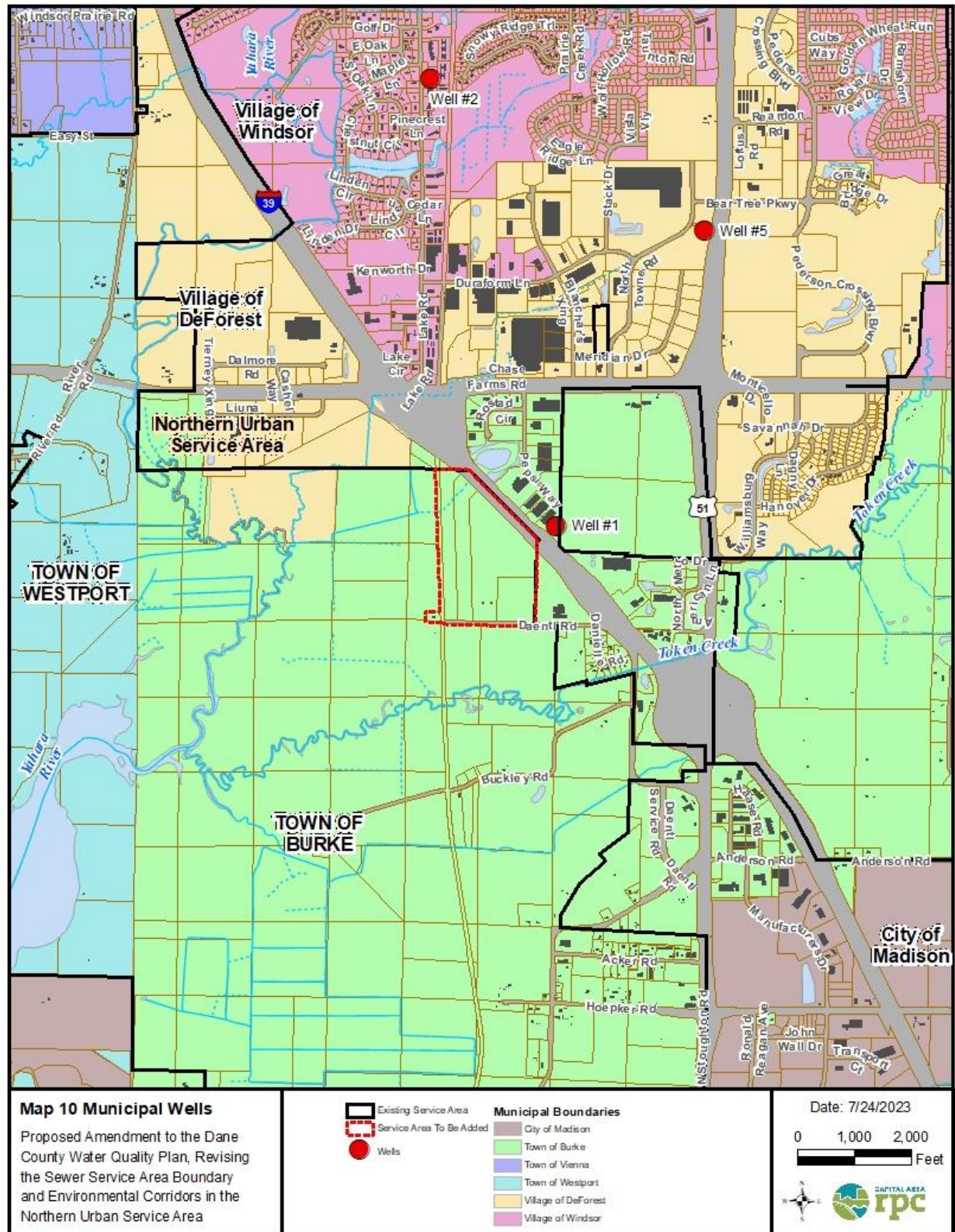
Map 9A – Proposed Sanitary Sewer and Water Main



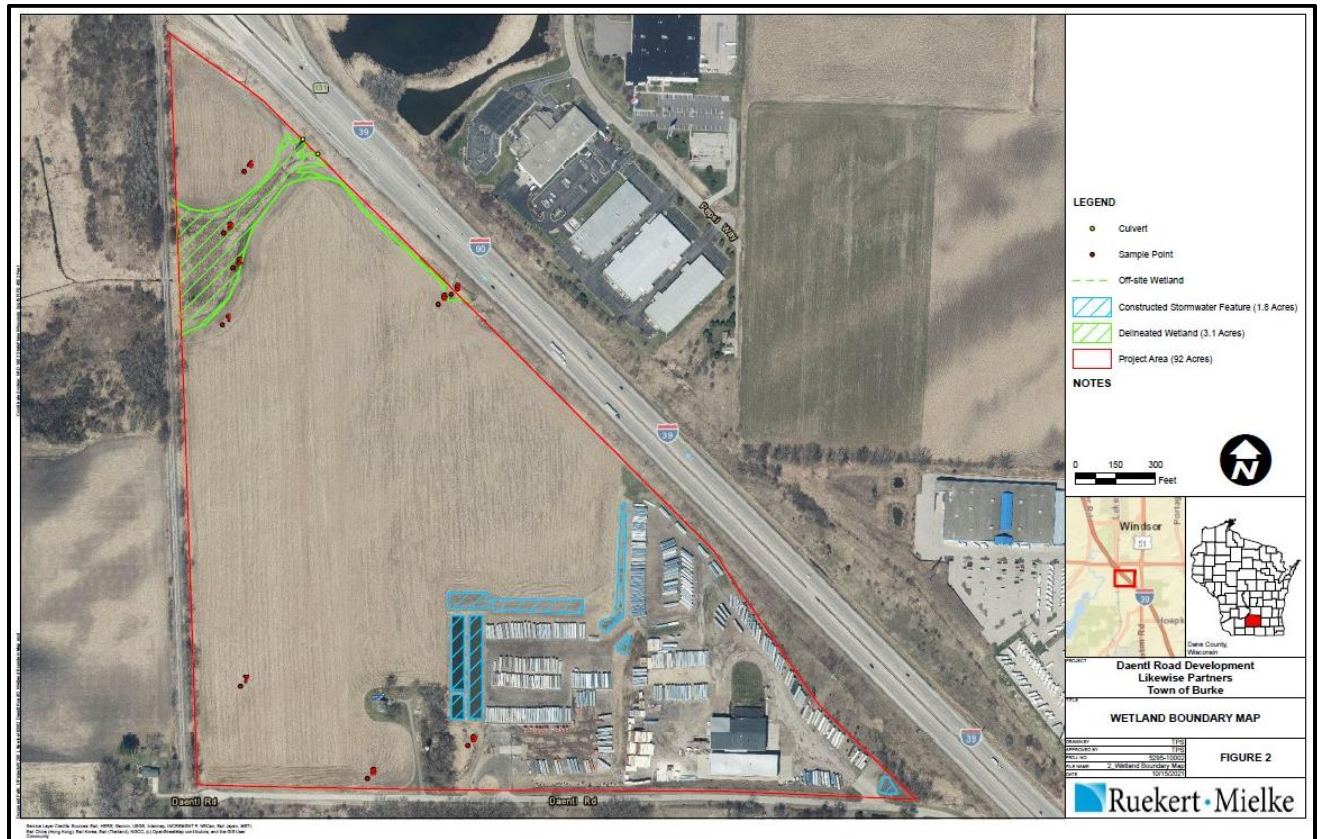
Map 9B – Proposed Stormwater Management



Map 10 – Municipal Wells



Map 11 – Wetland Delineations



Map 12 – Proposed Environmental Corridor

