TOWN OF CLAYTON Wisconsin
WINNEBAGO COUNTY

WATER & WASTEWATER UTILITY FEASIBILITY STUDY

June 2015

Cedar corporation
1496 Bellevue Street
Suite 502
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EXECUTIVE SUMMARY

Purpose

The Town of Clayton is planning for substantial commercial/industrial growth along the eastern border of the Town. Wastewater collection and treatment as well as a municipal water system do not exist within the area of planned growth. There is a desire to provide wastewater and water utilities to support the planned growth. Cedar Corporation developed population projections to estimate water and wastewater flows for total build-out, the year 2025 and the year 2040 for the three planning areas along the eastern border of the Town of Clayton. Using these flows, an evaluation was made to provide information to the Town of Clayton to determine the feasibility of providing wastewater and water utilities within the designated planning areas of the Town. The Water and Wastewater Utilities Feasibility Study is intended to establish the framework for wastewater collection, wastewater treatment and drinking water systems for the established planning areas within the Town of Clayton.

Population Projections

The Town of Clayton Comprehensive Plan adopted December 16, 2009 includes a Future Land Use Plan that was used to determine build-out population projections. The Fox Cities 2030 Sewer Service Area Plan Update prepared by East Central Wisconsin Regional Planning Commission as approved by WDNR February 13, 2006 provided population densities by land use. It was determined that the Grand Chute/ Menasha West Sewer Service Area Plan had the most appropriate population densities to use for the build-out population projections in the Town of Clayton. The following is the data used:

- Single Family 2.4 Units/ Acre
- Multi-Family 8.83 Units/ Acre
- Commercial/Industrial 11.27 Employees/Acre
- Persons per Household 2.43

These criteria were used to project build-out population in the planning areas for use in estimating the build-out projected flows for water and wastewater.

The Wisconsin Department of Administration (DOA) provided population projections for the entire Town of Clayton which included the year 2025 and the year 2040. Aerial photos were used to estimate existing residential houses and businesses within the planning areas. Using the same criteria used to estimate build-out population, the existing population was estimated. This information was used as the base for projecting population in the planning areas to the year 2025 and the year 2040 using the same percent increase in population as determined by the DOA for the entire Town. Table ES-1 provides the estimated build-out population and the estimated existing population in the planning areas.

Table ES-1
Estimated Build-Out Population and Estimated Existing Population

Planning Area	Build-Out		Existing Estimate	
	Population	Employees	Population	Employees
1	1761	13909	165	557
1A	6009	2202	77	0
2	4608	996	372	289
All in Total	**12378**	**17107**	**537**	**846**

Discussions with East Central Wisconsin Regional Planning Commission representatives suggested for reasonable growth for commercial/industrial use is 100 acres to 2040. Using the estimated existing population and the commercial/industrial growth as a base, population was projected for the year 2025 and the year 2040 as shown in Table ES-2. Town personnel advised that Planning Area 1A was a long range growth plan greater that the year 2040. Therefore, no projections were made for Planning Area 1A, for Year 2025 and Year 2040.

Table ES-2
Estimated Year 2025 and Year 2040 Population within the Planning Areas 1 and 2

Planning Area	Year 2025		Year 2040	
	Population	Employees	Population	Employees
1	194	865	227	1327
2	437	432	512	646
All in Total	**631**	**1297**	**739**	**1973**

Wastewater Flows for Sanitary Sewer

Where water supply and wastewater flow data are lacking, the Wisconsin Administrative Code NR110 requires the use of average unit flows ranging from 60 to 80 gallons per capita per day (gpcd) to determine wastewater flows to the wastewater treatment plant. An average of 70 gpcd was used for this study. The publication Gravity Sanitary Sewer Design and Construction published by American Society of Civil Engineers and Water Environment Federation provides data for typical nonresidential wastewater flows of 30 gallons per employee per acre per day. This average unit flow was used for commercial/industrial employee wastewater estimates. Infiltration allowances of 200 gallons per day per sewer inch-diameter per mile was used and added to average base wastewater flow. Maximum day design flow was estimated at 2.5 times average design flow. Kimberly Clark Company located in Planning Area 1 and JJ Keller and Associates located in Planning Area 2 provided wastewater flows for their facilities which was added to the flow projections. Since the sanitary sewer pipe sizes should be designed for build-out because of the longevity of the pipe material, wastewater flows were estimated for build-out only. Table ES-3 shows the estimated wastewater flows for each drainage basin and planning area.

Table ES-3
Summary of Sanitary Sewer Drainage Area Total Build-Out Estimated Flows

PLANNING AREA DESIGNATION	DRAINAGE AREA DESIGNATION	AVERAGE DESIGN FLOW (GPD)	MAXIMUM DAY DESIGN FLOW (GPD)
1	1	178,000	444,000
1	10	142,000	354,000
1	20	236,000	589,000
1A	50	241,000	604,000
1A	70	255,000	639,000
2	1	300,000	749,000
2	30	11,000	28,000
2	40	66,000	165,000
TOTAL PLANNING AREA 1		**556,000**	**1,387,000**
TOTAL PLANNING AREA 1A		**496,000**	**1,243,000**
TOTAL PLANNING AREA 2		**377,000**	**942,000**
TOTAL ALL PLANNING AREAS		**1,429,000**	**3,572,000**

Sanitary Sewer System

The sanitary sewer system layout includes selecting an outlet, determining the tributary areas, locating trunk and main sewers, and determining the need for and location of pumping stations and force mains. Topographic maps for the planning areas were obtained from Winnebago County and used to determine the sanitary sewer layout. Three separate drainage areas (designated 1, 10, 20) were determined for Planning Area 1; two separate drainage areas (designated 50 and 70) were determined for Planning Area 1A; and three drainage areas (designated 1, 30, 40) were determined for Planning Area 2. All sanitary sewer drains to one location in the drainage area where an interceptor sewer or lift station connect to transport the wastewater to a treatment location. In general, the determination of how the wastewater is conveyed from the drainage areas was determined based on the location of the wastewater treatment plant.

If a new wastewater treatment plant (WWTP) is constructed at the Larsen-Winchester Sanitary District site, then Planning Area 1, a portion of Planning Area 1A and Planning Area 2 need to be pumped to a new interceptor sewer. Drainage Area 70 in Planning Area 1A can flow by gravity via a new interceptor sewer to the new WWTP. Separate lift stations are required for the other drainage areas. Planning Area 1, Drainage Area 1 and 10 will be connected by gravity then pumped using one lift station to Drainage Area 50 and Drainage Area 50 will pump to Drainage Area 70. Planning Area 1, Drainage Area 20 will pump by lift station to Drainage Area 70. In Planning Area 2, Drainage Area 1 and Drainage Area 30 will pump by lift station to Drainage Area 40. Drainage Area 40 will pump by lift station to the new interceptor sewer. Therefore, two lift stations are required in Planning Area 1, Drainage Area 1 and in Drainage Area 20. One lift station is required in Planning Area 1A, Drainage Area 50. Three lift stations are required for each drainage area in Planning Area 2. Although Planning Area 1A is a long range plan for growth, portions of the sanitary sewer within Planning Area 1A will need to be constructed to accommodate wastewater pumped from Planning Area 1.

If a connection to the Town of Menasha and City of Neenah existing interceptor sewers are possible, then in Planning Area 1A, Drainage Area 70 would pump by lift station to Drainage Area 70 and Drainage Area 70 would pump by lift station to Drainage Area 10 in Planning Area 1. Planning Area 1, Drainage Area 1 would pump to the existing Town of Menasha interceptor sewer located on Smoke Tree Road near the Town of Clayton boundary. Planning Area 1, Drainage Area 20 would pump by lift station to Drainage Area 10 and Drainage Area 10 would flow by gravity to the existing Town of Menasha interceptor sewer location on Jacobson Road near the Town of Clayton boundary. In Planning Area 2, Drainage Areas 30 and 40 would each pump by lift station to Drainage Area 1. Planning Area 2, Drainage Area 1 would flow by gravity with a new interceptor sewer a little less than a mile to the existing City of Neenah interceptor sewer.

If wastewater treatment pods were used, then each pod would serve each drainage area. It is anticipated that the pods could be located such that each drainage area could flow by gravity to the pod for treatment. The only exception is the small Drainage Area 30 in Planning Area 2 would be pumped to Drainage Area 40 for treatment at that pod. Therefore, no interceptor sewers or lift stations are anticipated. With this option Planning Area 1A would not be served by sanitary sewer.

Wastewater Flows for Wastewater Treatment

Wastewater flows for treatment were determined for build-out condition, year 2025 condition and year 2040 condition. These flows were determined in the same manner as the flows for sanitary sewers. The maximum day design flow was assumed to be 2.5 times the average daily design flow and the maximum hourly design flow rate of 3.5 times base average flow rate . The build-out flows include all the planning areas, where the year 2025 and the year 2040 included only Planning Areas 1 and 2. Table ES-4 shows a summary of the total wastewater treatment design flows for each condition. Since the individual treatment pods were designed for the year 2025, Table ES-5 shows the estimated flows for each drainage area for the year 2025.

Table ES-4
Summary of Estimated Wastewater Treatment Facility Design Flows

Condition	Average Day Base Flow (GPD)	Average Day Design Flow (GPD)	Maximum Day Design Flow (GPD)
Build-Out	1,379,000	1,429,000	3,573,000
Year 2025	83,600	87,600	219,000
Year 2040	126,800	146,900	367,200

Table ES-5
Summary of Estimated Year 2025
Wastewater Treatment Facility Design Flows

Planning Area	Drainage Area	Average Day Base Flow (GPD)	Average Day Design Flow (GPD)	Maximum Day Design Flow (GPD)
1	1	5,000	5,200	13,000
1	10	11,800	12,400	31,000
1	20	23,000	24,100	60,000
2	1	34,000	35,600	89,000
2	30	1,800	1,900	5,000
2	40	8,000	8,400	21,000
Totals		**83,600**	**87,600**	**219,000**

Wastewater Treatment Facility Alternatives

Three alternatives were evaluated for treating wastewater from the planning areas: Regionalization with neighboring communities, expansion of the Larsen-Winchester Sanitary District wastewater treatment plant (WWTP), and recirculation textile filter wastewater treatment pods.

Regionalization of wastewater treatment includes connecting to two existing Town of Menasha sanitary interceptor sewers near the Town of Clayton boundary which would serve Planning Areas 1 and 1A. An 18” diameter interceptor sewer is located on Smoke Tree Road and a 21” diameter interceptor sewer is located on Jacobsen Road in the Town of Menasha. Planning Area 1, Drainage Area 1 would pump to the 18” interceptor sewer. Planning Area 1A and Planning Area 1, Drainage Area 20 pumps to Drainage Area 10 and then flows by gravity with a connecting interceptor sewer to the 21” interceptor sewer. Planning Area 2 would connect to the City of Neenah 21” sanitary interceptor sewer located a little less than a mile from the Town of Clayton boundary on Breezewood Lane. A new interceptor sewer would connect Planning Area 2 with the existing 21” interceptor sewer. All of the existing interceptor sewers convey wastewater to a regional wastewater treatment plant operated by the Neenah/Menasha Sewerage Commission. It is unknown if the interceptor sewers and the wastewater treatment plant has the capacity to receive the Town of Clayton wastewater. The Town of Menasha has started the process to become a village. Preliminary information suggests that the Town of Menasha would only allow connection to their interceptor sewers if the service areas would annex to the future Village of Menasha. That would be unacceptable to the Town of Clayton and therefore this alternative would not be implementable. However, connecting to the City of Neenah interceptor sewer to treat Planning Area 2 wastewater may still be viable. Further discussions need to take place.

Expansion of the Larsen-Winchester WWTP requires an interceptor sewer from Planning Area 1A to the Larsen-Winchester WWTP. Planning Area 1, Drainage Areas 1 and 10 would pump wastewater to Planning Area 1A, Drainage Area 50. Drainage Area 20 would pump wastewater to Drainage Area 70. Planning Area 1A, Drainage Area 50 would pump to Drainage Area 70 and Drainage Area 70 would flow by gravity via a new interceptor sewer to the Larsen-Winchester WWTP site. Planning Area 2 would pump wastewater approximately 2.25 miles to the new interceptor sewer. Indications are that the existing Larsen-Winchester Lagoon system is near capacity requiring improvements in the near future. A new WWTP would be constructed at the site. The new WWTP could ultimately serve all the planning areas. Since Planning Area 1A growth is not anticipated to occur in the next 20 plus years, the initial WWTP could serve Planning Areas 1 and 2. Since the Wisconsin Department of Natural Resources (WDNR) will only approve facilities serve a maximum of a 20-year projection, the year 2040 wastewater projections for growth in Planning Area 1 and 2 is most viable. Actual determination of the type of wastewater treatment would be determined during a facility planning study required by the WDNR to determine the most cost effective facilities.

Recirculation textile filter (RTF) wastewater treatment pods would provide wastewater treatment for each drainage area in Planning Areas 1 and 2. The exception is in Planning Area 2 the small Drainage Area 30 would pump to Drainage Area 40 for treatment. It is anticipated that the treatment pods may be located in each drainage area such that the wastewater could enter by gravity. The proposed treatment system is a multiple-pass, packed bed aerobic wastewater treatment system. This system operates similar to a recirculating sand filter. It is made up of several filtering pods that use textile instead of a sand media. The system consists of a primary tank, a recirculation tank, RTF units and ultraviolet disinfection with surface discharge to a nearby stream. These systems are intended to treat wastewater for small areas and, therefore, are sized to wastewater projected to the year 2025. This provides some growth, but would not be the ultimate treatment solution for the year 2040 or build-out. The WDNR will need to approve each facility and will require a WPDES permit to discharge to an adjacent stream. Wastewater Facilities Cost Estimates for each of the wastewater alternatives evaluated are summarized in Tables ES-6-A through ES-6-F.

Table ES-6-A

Individual Wastewater Treatment Pods Planning Areas 1 & 2

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Wastewater Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000						$515,000	$3,047,000
Drainage Area 10	$1,219,000						$1,038,000	$2,257,000
Drainage Area 20	$3,661,000						$1,930,000	$5,591,000
Total Planning Area 1	**$7,412,000**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**$3,483,000**	**$10,895,000**
Planning Area 2								
Drainage Area 1	$3,482,000						$2,792,000	$6,274,000
Drainage Area 30	$140,000	$106,000						$246,000
Drainage Area 40	$761,000						$921,000	$1,682,000
Total Planning Area 2	**$4,383,000**	**$106,000**	**N/A**	**N/A**	**N/A**	**N/A**	**$3,713,000**	**$8,202,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$106,000**	**N/A**	**N/A**	**N/A**	**N/A**	**$7,196,000**	**$19,097,000**

Table ES-6-B
Larsen-Winchester WWTP Planning Areas 1 & 2 – Year 2040 Projections

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$1,130,000		$797,000				$4,459,000
Drainage Area 10	$1,219,000							$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000				$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**		**$12,657,000**
Planning Area 2								
Drainage Area 1	$3,482,000	$719,000						$4,201,000
Drainage Area 30	$140,000	$599,000						$739,000
Drainage Area 40	$761,000	$998,000						$1,759,000
Total Planning Area 2	**$4,383,000**	**$2,316,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$6,699,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$4,045,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$4,800,000**	**$24,156,000**

Table ES-6-C

Larsen-Winchester WWTP All Planning Areas Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$1,130,000		$797,000				$4,459,000
Drainage Area 10	$1,219,000	$0		$0				$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000				$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**N/A**	**N/A**		**$10,321,000**
Planning Area 2								
Drainage Area 1	$3,482,000	$719,000						$4,201,000
Drainage Area 30	$140,000	$106,000						$246,000
Drainage Area 40	$761,000	$998,000						$1,759,000
Total Planning Area 2	**$4,383,000**	**$1,823,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$6,206,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$3,552,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$10,000,000**	**$28,863,000**
Total Future Planning Area 1A	**$1,523,000**	**$0**	**N/A**	**N/A**	**N/A**	**N/A**		**$1,523,000**
Total Planning Areas 1, 2 & 1A	**$13,318,000**	**$3,552,000**	**N/A**	**N/A**	**$2,336,000**	**N/A**	**$10,000,000**	**$30,386,000**

Table ES-6-D

Larsen-Winchester WWTP Planning Areas 1 & 2 Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$1,130,000		$797,000				$4,459,000
Drainage Area 10	$1,219,000	$0		$0				$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000				$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**N/A**	**N/A**		**$10,321,000**
Planning Area 2								
Drainage Area 1	$3,482,000	$719,000						$4,201,000
Drainage Area 30	$140,000	$106,000						$246,000
Drainage Area 40	$761,000	$998,000						$1,759,000
Total Planning Area 2	**$4,383,000**	**$1,823,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$6,206,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$3,552,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$9,000,000**	**$27,863,000**

Table ES-6-E
Larsen-Winchester WWTP Planning Area 1 Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$1,130,000		$797,000				$4,459,000
Drainage Area 10	$1,219,000	$0		$0				$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000				$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$8,100,000**	**$20,757,000**

Table ES-6-F

Regional WWTP By Others – All Planning Areas Total Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$185,000			$23,000	$300,000		$3,040,000
Drainage Area 10	$1,219,000	$0	$81,000		$26,000	$300,000		$1,626,000
Drainage Area 20	$3,661,000	$265,000			$0	$0		$3,926,000
Total Planning Area 1	**$7,412,000**	**$450,000**	**$81,000**	**N/A**	**$49,000**	**$600,000**		**$8,592,000**
Planning Area 2								
Drainage Area 1	$3,482,000							$3,482,000
Drainage Area 30	$140,000	$162,000						$302,000
Drainage Area 40	$761,000	$230,000						$991,000
Total Planning Area 2	**$4,383,000**	**$392,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$4,775,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$842,000**	**$81,000**	**N/A**	**$49,000**	**$600,000**	**Unk.**	**$13,367,000**
Total Future Planning Area 1A	**$2,579,000**	**$928,000**						**$3,507,000**
Total Planning Areas 1, 2 & 1A	**$14,374,000**	**$1,770,000**	**$81,000**	**N/A**	**$49,000**	**$600,000**	**Unk.**	**$16,874,000**

Wastewater Facilities Recommendations

It is recommended that sanitary sewer be provided for the drainage areas in Planning Areas 1 and 2 with the most existing population and where growth could occur to the year 2040. Sewers should be sized for ultimate build-out.

It is recommended that further discussion occur with the Town of Menasha and the City of Neenah to determine if accepting the Town of Clayton's wastewater is viable. It is not anticipated at this time that connecting to the Town of Menasha interceptor sewers is implementable. However, connecting Planning Area 2 to the City of Neenah interceptor sewer may be implementable and should be given serious consideration. It is recommended wastewater be conveyed to the Larsen-Winchester WWTP site with a new wastewater treatment plant designed for the year 2040. Of the alternatives evaluated, this appears to be the most reasonable long-term alternative. However, the treatment POD alternative may have short-term value if there is an immediate need to serve an area.

Specific wastewater collection and treatment system facilities will be determined in the preparation of a facility planning study that is required by WDNR before design and construction of any facilities. Also, the Town of Clayton Sanitary District has been dormant and needs to be resurrected along with a determination of the sewer service area prepared by East Central Regional Planning Commission.

Water Demand

Domestic water demand was determined using the population projections discussed above and using the same flow rates per capita as for wastewater. Industrial water demand was added for Kimberly-Clark located in Planning Area 1 and JJ Keller located in Planning Area 2. Peaking coefficients 2.3 times average daily water demand was used to determine peak day demand and 3.2 times average daily water demand was used to determine peak hour water use. Water demand projections were determined for ultimate build-out as shown in Table ES-7 and the year 2040 as shown in Table ES-8.

Table ES-7
Build-Out Total Domestic and Industrial Water Demand Estimates

PLANNING AREA	AVERAGE DAY WATER DEMAND (GPD)	PEAK DAY WATER DEMAND (GPD)	PEAK HOUR WATER DEMAND (GPM)
1	552,000	1,274,000	1,220
1A	487,000	1,119,000	1,100
2	365,000	846,000	835
TOTAL	**1,404,000**	**3,239,000**	**3,155**

Table ES-8
Year 2040 Domestic and Industrial Water Demand Estimates

PLANNING AREA	AVERAGE DAY WATER DEMAND (GPD)	PEAK DAY WATER DEMAND (GPD)	PEAK HOUR WATER DEMAND (GPM)
1	68,000	158,000	150
1A	N/A	N/A	N/A
2	67,000	162,000	185
TOTAL	**135,000**	**320,000**	**335**

Insurance Services Office, Inc. provides guidance for determining needed fire flows and evaluates fire departments with recommendations for fire flows. Fire protection demand was based on residential fire flows of 2,000 gallons per minute for a 2-hour duration and commercial/industrial fire flows of 3,000 gallons per minute for a 3-hour duration. The desired fire flows should be determined by the Town of Clayton.

Water Supply

Two alternatives were evaluated for water supply. One alternative would be for the Town of Clayton to provide water supply with groundwater wells. The other alternative would be to obtain water supply from the existing City of Neenah Water Utility. Based on the estimated water demand, the ultimate build-out peak day water demand would require 3,000 gallons per minute supplied within approximately 18 hours. The year 2040 peak day water demand would require 300 gallons per minute supplied within approximately 18 hours.
Groundwater wells within the Town of Clayton come with some risk of high arsenic levels since the Town is within the WDNR Arsenic Advisory Area. The WDNR has requirements for well casing depths and grouting to minimize the potential for high arsenic levels in wells. Information from the Wisconsin Geological and Natural History Survey indicates well yields of 500 to 1,000 gpm should be possible the sandstone aquifer. This is verified by the yields from neighboring municipal wells. Peak day water demand should be supplied with the largest single well out of service to provide reliability. For ultimate build-out it is recommended five wells be provided at approximately 750 gpm each. For the year 2040 it is recommended two wells be provided sized for future 750 gpm with pumps providing approximately 300 gpm each. In each of these situations the wells should not be over-pumped and will provide peak day water demand with one well out of service. With proper well construction, it is not anticipated excessive arsenic levels will occur.

The City of Neenah Water Utility has indicated an excess water supply capacity and may be interested in supplying water to the Town of Clayton. The City of Neenah Water Utility can provide sufficient treated surface water supply from Lake Winnebago. Discussions with the City of Neenah Water Utility indicate that a 16” water main is available for possible extension to the Town of Clayton located on CTH JJ near Pendleton Road. Extending the water main on CTH JJ to the Town of Clayton would provide water service to Planning Area 2. There is also a 12” water main across USH 41 on Main Street and on Rock Ledge Lane which may be connected and extended along Oakridge Road to Larsen Road and then north on Clayton Avenue in the Town of Clayton to provide water service to Planning Areas 1 and 1A. Booster pump stations will probably be required to deliver water to the Planning Areas. Further discussion with the City of Neenah Water Utility is required to determine if this is a viable alternative.

Water Distribution

Water distribution is sized to provide peak day water demand and fire flow while maintaining adequate pressures to all planning areas for ultimate build-out. With Planning Area 2 being approximately 2 miles south of Planning Areas 1 and 1A, the distribution system was sized independently. Basically, the water distribution system has to get water from water storage to the point of use. Therefore, if water storage is provided in Planning Area 1/1A, then a connecting pipe will be required between Planning Area 1/1A and Planning Area 2. Since Planning Area 2 is lower that the north planning areas, a pressure reducing station would be required to establish two pressure zones. If separate tanks are provided in each planning area, then the connecting water main would not be required.

Water Storage

Water storage provides water for large demands over short periods of time that are greater than the water supply capacity. Water storage also provides water for fire protection flow requiring large flows of water within a short period of time. The recommended elevated water storage type facility provides reliability of stored water at a usable pressure to supply water for short periods of time. In general, water storage should provide the greater of average day water demand or water for fire protection plus peaking water use requirements. The build-out average day water demand is 1,404,000 gallons. The fire flow plus peaking water demand is 569,000 gallons. For the ultimate build-out condition average day water demand governs the size for water storage of standard size 1.5 million gallons. The year 2040 average day demand is 135,000 gallons and the fire flow plus peaking demand is 554,000 gallons. In this case fire flow plus peaking demand governs. To closely meet the year 2040 water storage requirements, it is recommended that a standard 500,000 gallon elevated water storage tank be provided on Town property along CTH II west of STH 76. The ground elevation is approximately 900 feet above sea level (USGS).

Water Treatment – Arsenic

In case the Town provides wells for water supply there may be a need to treat the well water for high levels of arsenic. The National Primary Drinking Water Regulations maximum contaminate level for arsenic is 0.010 mg/l (10 ppb). If water supply exceeds this level, then water may be blended with water from wells of lower levels or provide water treatment. It is anticipated that water treatment for arsenic will not be required with proper well construction. If arsenic removal is required, the simple operation of ion exchange is recommended.

Table ES-9-A

Total Build-Out with Water Supply Provided by Wells within Town of Clayton

	Water Supply	Water Treatment	Water Distribution	Connection of Planning Areas 1 & 2	Water Storage	Total Costs
Planning Area 1	$2,049,000	$1,905,000			$2,762,000	
Drainage Area 1			$2,576,000			
Drainage Area 10			$2,073,000			
Drainage Area 20			$3,040,000			
Total Planning Area 1	**$2,049,000**	**$1,905,000**	**$7,689,000**		**$2,762,000**	**$14,405,000**
Planning Area 2	$1,366,000					
Drainage Area 1			$2,932,000			
Drainage Area 30			$225,000			
Drainage Area 40			$880,000			
Total Planning Area 2	**$1,366,000**	**$0**	**$4,037,000**		**$0**	**$5,403,000**
Total Planning Areas 1 and 2	**$3,415,000**	**$1,905,000**	**$11,726,000**	**$950,000**	**$2,762,000**	**$20,758,000**
Total Future Planning Area 1A			**$3,524,000**			**$3,524,000**
Total Planning Areas 1, 1A & 2	**$3,415,000**	**$1,905,000**	**$15,250,000**	**$950,000**	**$2,762,000**	**$24,282,000**

Table ES-9-B
Total Build-Out with Water Supply Provided by City of Neenah

	Water Supply	Water Treatment	Water Distribution	Connection of Planning Areas 1 & 2	Water Storage	Total Costs
Planning Area 1	$1,618,000				$2,762,000	
Drainage Area 1			$2,576,000			
Drainage Area 10			$2,073,000			
Drainage Area 20			$3,040,000			
Total Planning Area 1	**$1,618,000**	**$0**	**$7,689,000**		**$2,762,000**	**$12,069,000**
Planning Area 2	$823,000					
Drainage Area 1			$2,932,000			
Drainage Area 30			$225,000			
Drainage Area 40			$880,000			
Total Planning Area 2	**$823,000**	**$0**	**$4,037,000**		**$0**	**$4,860,000**
Total Planning Areas 1 and 2	**$2,441,000**	**$0**	**$11,726,000**	**$950,000**	**$2,762,000**	**$17,879,000**
Total Future Planning Area 1A			**$3,524,000**			**$3,524,000**
Total Planning Areas 1, 1A and 2	**$2,441,000**	**$0**	**$15,250,000**	**$950,000**	**$2,762,000**	**$21,403,000**

Table ES-9-C
Year 2040 with Water Supply Provided by Wells within Town of Clayton

	Water Supply	Water Treatment	Water Distribution	Connection of Planning Areas 1 & 2	Water Storage	Total Costs
Planning Area 1	$1,366,000	$1,905,000			$1,277,000	
Drainage Area 1			$2,576,000			
Drainage Area 10			$2,073,000			
Drainage Area 20			$3,040,000			
Total Planning Area 1	**$1,366,000**	**$1,905,000**	**$7,689,000**		**$1,277,000**	**$12,237,000**
Planning Area 2						
Drainage Area 1			$2,932,000			
Drainage Area 30			$225,000			
Drainage Area 40			$880,000			
Total Planning Area 2	**$0**	**$0**	**$4,037,000**		**$0**	**$4,037,000**
Total Planning Areas 1 and 2	**$1,366,000**	**$1,905,000**	**$11,726,000**	**$950,000**	**$1,277,000**	**$17,224,000**
Total Future Planning Area 1A			**$3,524,000**			**$3,524,000**
Total Planning Areas 1, 1A and 2	**$1,366,000**	**$1,905,000**	**$15,250,000**	**$950,000**	**$1,277,000**	**$20,748,000**

Table ES-9-D

Year 2040 with Water Supply Provided by City of Neenah

	Water Supply	Water Treatment	Water Distribution	Connection of Planning Areas 1 & 2	Water Storage	Total Costs
Planning Area 1	$1,618,000				$1,277,000	
Drainage Area 1			$2,576,000			
Drainage Area 10			$2,073,000			
Drainage Area 20			$3,040,000			
Total Planning Area 1	**$1,618,000**	**$0**	**$7,689,000**		**$1,277,000**	**$10,584,000**
Planning Area 2						
Drainage Area 1			$2,932,000			
Drainage Area 30			$225,000			
Drainage Area 40			$880,000			
Total Planning Area 2	**$0**	**$0**	**$4,037,000**		**$0**	**$4,037,000**
Total Planning Areas 1 and 2	**$1,618,000**	**$0**	**$11,726,000**	**$950,000**	**$1,277,000**	**$15,571,000**
Total Future Planning Area 1A			**$3,524,000**			**$3,524,000**
Total Planning Areas 1, 1A and 2	**$1,618,000**	**$0**	**$15,250,000**	**$950,000**	**$1,277,000**	**$19,095,000**

Water System Facilities Recommendations

Before proceeding with design and construction of a water system, it will be necessary to prepare information to the Public Service Commission stating why a municipal water system is necessary and what is planned.

In general, it is recommended that water main pipe be sized to serve ultimate build-out and other facilities be sized to serve the year 2040. Water supply discussions should continue with the City of Neenah Water Utility to determine if this is a viable alternative. Wells, if utilized, should be sized for future pumping capacity of 750 gpm, but 300 gpm pumps should be provided to meet year 2040 needs. Two wells should be provided located in Planning Area 1. Water distribution system should be provided for the year 2040 in the same locations as the sanitary sewer. An elevated water storage tank with 500,000 gallon capacity should be provided located off CTH II on Town property. A water main should be provided between Planning Area 1 and Planning Area 2 with a pressure reducing station to maintain two pressure zones.

1 INTRODUCTION

The Town of Clayton is experiencing significant growth within the rural community due to the close proximity to Appleton, Neenah and Oshkosh. See Figure 1-1 for the location of the Town of Clayton in Winnebago County and nearby communities. This growth is likely to continue within the eastern portion of the Town. Being a progressive rural community, the Town of Clayton wants to meet the needs of the community and enhance the quality of life by evaluating the feasibility of providing wastewater collection and treatment as well as a municipal water system in the area of growth.

1.1 Purpose

The Town of Clayton is planning for substantial commercial/industrial growth along the eastern border of the Town. Wastewater collection and treatment does not exist within the area of planned growth. The only wastewater collection and treatment in the Town of Clayton is in a small area of the Town along the western border provided by the Larsen-Winchester Sanitary District. Water supply is provided by private wells within the area of the Wisconsin Department of Natural Resources high arsenic advisory area. There is a desire to provide wastewater and water utilities to support the planned growth. The purpose of this study is to evaluate the feasibility of providing wastewater and water utilities within the Town of Clayton planned growth area. The Water and Wastewater Utilities Feasibility Study is intended to establish the framework for wastewater collection, wastewater treatment and drinking water systems for established planning areas within the Town of Clayton. The Study focuses on the three primary planning areas of growth in the Northeast and Southeast quadrants of the Town.

1.2 Study Areas

The main focus of the Study includes Planning Area 1, Planning Area 1A (future) and Planning Area 2 located as shown in Figure 1-2. East-west U.S. Highway 10 and north-south State Highway 76 are prominent features in the planning areas. Planning Area 1 is approximately 1,920 acres in size and Planning Area 1A is approximately 960 acres in size. Planning Areas 1 and 1A are located in the Northeastern quadrant of the Town with Oakwood Avenue forming the western boundary, Clayton Avenue (east boundary of Town) forming the eastern boundary, Shady Lane forming the northern boundary, County Road II forming the southern boundary west of State Road 76, and on the east side of State Road 76 the southern boundary includes the northern half of Section 24 south of County Road II.

Planning Area 2 is approximately 1,600 acres located in the Southeastern quadrant of the town and extending slightly to the South of the Town boundary in the Town of Vinland. The Area is bounded to the west by the western boundary of Section 35; bounded to the east by the east boundary of the Town of Clayton and Woodenshoe Road; bounded to the north near the north quarter line of Sections 35 and 36; and bounded to the south approximately one-half section south of the north boundary of the Town of Vinland.

1.3 Regulatory Authority

1.3.1 Wastewater Collection and Treatment System

The Wisconsin Department of Natural Resources regulates the planning, design, construction and operation of municipal wastewater collection and treatment systems. The wastewater collection and treatment plan will require an approved area wide waste treatment management plan developed pursuant to Section 208 of the Federal Water Pollution Control Act. The plan called a sewer service area plan is developed through East Central Wisconsin Regional Planning Commission. The following identify the Wisconsin Administrative Codes which apply to the planning and design of a municipal wastewater collection and treatment facility within the Town of Clayton.

- NR 110 – Sewerage Systems
    - ✓ Applicable to all new or modified sewerage systems, excluding only industrial waste treatment facilities.
    - ✓ Includes wastewater collection systems, lift stations and wastewater treatment facilities.
    - ✓ Establishes basis design requirements.
    - ✓ Requires submittal of a facility plan engineering report and detailed plans and specifications for WDNR approval.

- NR 121 – Areawide Water Quality Management Plans
    - ✓ Establishes the process for preparation of areawide plans for managing the quality of waters of the state, ground and surface, public and private.
    - ✓ WDNR has responsibility for the general supervision of this continuing water pollution control planning process.
    - ✓ Preparation of the areawide water quality management plans is the responsibility of designated areawide water quality planning agencies.
    - ✓ Purpose is to systematically evaluate alternative means of achieving state and federal water quality goals and related standards.

- NR 210 – Sewage Treatment Works
    - ✓ Establish effluent limitations, performance requirements and monitoring provisions to be used in permits for discharges from wastewater treatment plants.

1.3.2 Municipal Water System

A public water system, as defined by the Wisconsin Department of Natural Resources (WDNR), "is a water system for the provision to the public of piped water for human consumption, having at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year." A public water system it is further classified as either a "municipal" or "community" water system:

- "Municipal Water System means a community water system owned by a city, village, county, town, town sanitary district, utility district, public inland lake and rehabilitation district, municipal water district or a federal, state, county or municipal owned institution for congregate care or correction, or a privately owned water utility serving the foregoing."

- "Community Water System means a public water system which serves at least 15 service connections used by year-round residents or regularly serves at least 25 year-round residents. Any water system serving seven or more homes, 10 or more mobile homes, 10 or more apartment units or 10 or more condominium units shall be considered a community water system unless information is provided by the owners indicating that 25 year-round residents will not be served."

A water system meeting the above definitions would be subject to the regulatory authority of the Wisconsin Department of Natural Resources (WDNR) and the Wisconsin Public Service Commission (PSC). Application would be required to the Wisconsin Public Service Commission to demonstrate a need and obtain approval to create a municipal water system. The following identify the Wisconsin Administrative Codes which would apply to the design and operation of a municipal water supply within the Town of Clayton.

Wisconsin Department of Natural Resources (WDNR) regulates the water system design and operation in the following Chapters of the "Wisconsin Administrative Code".

- NR 809 - Safe Drinking Water
  - ✓ Generally addresses water quality, monitoring requirements and record keeping.
  - ✓ Subchapter VIII-Water System Capacity, requires demonstrating to the WDNR that the water system shall have and maintain adequate financial, managerial and technical capacity to meet the requirements of this chapter and the requirements of the federal Safe Drinking Water Act.

- NR 811 - Requirements for the Operation and Design of Community Water Systems
  - ✓ Establishes the basic design requirements
  - ✓ Requires submittal of an engineering report and detailed plans and specifications for WDNR approval.
  - ✓ Requires a resident project representative at the site during construction.

- NR 812 - Well Construction and Pump Installation
  - ✓ Generally provides requirements for locating and constructing a well.
  - ✓ Generally provides requirements for well pumps and discharge facilities.

Wisconsin Public Service Commission (PSC) regulates the rate structure and system operation for municipal water systems in the following chapter of the "Wisconsin Administrative Code."

- PSC 185 - Standards for Water Public Utility Service.
  - ✓ Rate Schedules and Rules.
  - ✓ Service and Billing.
  - ✓ Records.
  - ✓ Engineering.
  - ✓ Customer meters and meter testing.
  - ✓ Operating requirements.

2 STUDY AREA CHARACTERISTICS

This section discusses study area characteristics relevant to the development of the water and wastewater utility feasibility study. It discusses physical environment, climate, geology, soils, water resources, environmentally sensitive areas, land use, and population projections.

2.1 Physical Environment

2.1.1 Geographic Location

The Town of Clayton is located in Winnebago County, Wisconsin within the Fox-Wolf River drainage basin. In general, the eastern portion of the Town from around State Highway 76 drains to the east within the Mud Creek drainage basin which flows east toward the Fox River. The northern half of the remaining western portion of the Town drains west within the Rat River drainage basin which discharges to the Wolf River. The southern half of the remaining portion of the Town drains west within the Arrowhead River drainage basin which discharges to Lake Winnebago. Topography is gently rolling to nearly level with elevations ranging from about 910 feet above sea level along State Highway 76 to about 760 feet above sea level near the Rat and Arrowhead Rivers near the western Town boundary.

The Town lies near the northeast corner of Winnebago County with U.S. Highway 10 extending east-west at approximately the northern one-third line through the town. State Highway 76 extends north-south through the town at the one-sixth line from the eastern Town boundary. The Town of Menasha and the Town of Neenah borders the Town along the east boundary; the Town of Greenville borders the Town along the north boundary; and the Town of Vinland borders the Town to the South. Refer to Figure 2-1 Town of Clayton Official Map and Figure 2-2 Town of Clayton Topographic Map.

2.1.2 Climate

The climate of Winnebago County is characterized by mild, humid summers and rather long, severe winters. The average annual temperature at Oshkosh is 45.9°F. Average monthly temperatures range from 18.6°F in January to 72.3°F in July. Average annual precipitation in the county, including snowfall, is about 28 inches. Average monthly precipitation ranges from about 1.2 inches in February to about 3.9 inches in June. The precipitation generally is distributed evenly throughout the county, and about 58 percent of the total annual precipitation falls during the growing season from May through September.

2.1.3 Geology

The geology in the area is fairly unique in that there is a number geologic formations which were formed at various ages. If one were to look at a geologic section from top to bottom it would generally look as follows:

- **Glacial deposits**
  - ✓ Consist mostly of a combination of till and lake clay. These formations are typically referred to as the water table aquifer. These unconsolidated formations are capable of providing good well yields where the formation is thick enough and where layers of course sands and gravel are found.

- **Ordovician Formation**
  - ✓ Consist of a mixture of shale, dolomite/limestone and sandstones. From top to bottom this formation would consist of the Maquoketa shale, Galena-Platteville dolomite, St. Peter sandstone and the Prairie du Chien dolomite. These formations are also generally capable of providing good well yields in the proper location.

    - ➢ ***Maquoketa shale*** - This formation is extremely scarce if even existent in this area. The Maquoketa yields very little water if any, thus is a very important part of geology when dealing with groundwater sources in that it acts as a confining layer that can separate the aquifers above and below.

- ***Galena-Platteville dolomite*** - This formation is predominantly the bedrock formation located directly below the glacial deposits. Depths to the dolomite range from 10 to 150 feet below the surface. As a water producer this formation typically yields very little water except along thin fracture zones.

- ***St. Peter sandstone*** - This formation is quite thin in this area. Thickness of the St. Peter Sandstone is typically less than 100 feet. As a water producer this formation typically has excellent well yield, but is limited by its thin nature. This formation is thought to be the source of the elevated levels of arsenic in the area, and is also the primary source of water for the private wells in the area.

- ***Prairie du Chien dolomite*** - This formation consists primarily of dolomite, but does have some streaks of chert and shale. As a water producer this formation typically has very poor well yields. Due to its characteristics this formation acts somewhat as a barrier between the St. Peter and the Cambrian sandstones below. However, it is generally not tight enough to result in true confinement and thus is considered "leaky".

- **Cambrian Formation**
  - ✓ Consist primarily of sandstones, with some streaks of dolomite and shale. As a water producer this formation typically has excellent well yields, especially in the lower portions which contain less dolomite. Due to this characteristic the Cambrian Sandstones have become the primary producer of municipal water throughout northeast Wisconsin. This formation also has its drawbacks in that there are typically zones high in radioactivity and the water usually has elevated levels of iron and hardness.

- **Precambrian Formation**
  - ✓ Consists of granite and is essentially impermeable to water.

The Town of Clayton is located in the Wisconsin Department of Natural Resources Arsenic Advisory Area (Refer to Figure 2-3 “Arsenic Advisory Area”). Bedrock in the Town of Clayton includes the Ordovician Prairie du Chien dolomites underlain by Cambrian sandstones, the Ordovician St. Peter sandstone, and the Sinnipee (Galena-Platteville formations) dolomites. Naturally occurring arsenic-bearing minerals are present throughout these geologic units, but are primarily concentrated within approximately 80 feet of the St. Peter-Sinnipee formations. The original mineralizing fluids that carried the arsenic primarily migrated through the St. Peter sandstone, and then into fractures, joints, and bedding planes of the carbonate units both above and below.

2.1.4 Soils

The Town of Clayton Comprehensive Plan Adopted December 16, 2009 prepared by Martenson & Eisele, Inc. provided information on soil types and characteristics. Soils information including bedrock and water table locations provides useful data as to the support of sanitary sewer structures and construction methods. As stated in the Comprehensive Plan, the dominate soil association located in the Planning Areas is the Kewaunee-Manawa-Hortonville association which generally covers the eastern two-thirds of the town. Kewaunee soils are on gently sloping land that is fairly well drained. Manawa soils are on nearly level and gently sloping land, but usually found on valley terraces and in drainage ways, so they are somewhat poorly drained. Hortonville soils, which are well drained, are on gently sloping to sloping land. The soils in this area are used mainly for cultivated crops. Most of the urban centers in Winnebago County have been developed on these soils.

Figure 2-4 "Soil Potential for Homes with Basements" was copied from the Comprehensive plan. Consideration for the soil conditions to support sanitary sewer structures and any wastewater treatment plant assists in locating these facilities as well as providing some indication of construction methods that will be required. Figure 2-5 "Areas of High Ground Water" also provides information for locating facilities and possible construction methods for the facilities. Information from existing well logs was obtained to verify depth to rock and other upper level soil conditions.

2.1.5 Water Resources

Sources of water in Winnebago County include surface water from the Fox and Wolf Rivers and their associated lakes, and ground water from sandstone, dolomite, and sand and gravel deposits. Surface water is hard and generally requires treatment, but is then suitable for municipal and most industrial uses. Pollution is only a local problem in the lakes and rivers, but algae are present in most of the lakes. Ground water in Winnebago County is hard to very hard, and dissolved iron is a problem in a large area of the county.

A thick, southeastward-dipping sandstone aquifer, yielding as much as 1,000 gallons per minute to municipal and industrial wells, underlies Winnebago County. A dolomite aquifer in the eastern and southern part of the county yields as much as 50 gallons per minute to wells. Sand and gravel layers and lenses in pre-glacial bedrock channels, in northwestern Winnebago County and in the upper Fox River valley, yield as much as 50 gallons per minute to wells. Present water problems in the county include algae and local pollution in the Lake Winnebago Pool, iron in water from the sandstone aquifer, and saline ground water in the eastern part of the county. Potential problems include rapid decline of water levels because of interference between closely spaced wells, migration of saline ground water toward areas of pumping, surface water pollution from inadequate sewage and industrial-waste processing plants, and ground-water pollution in dolomite formations.

2.1.6 Environmentally Sensitive Areas

Environmentally sensitive areas are defined by the WDNR as “areas such as wetlands, steep slopes, waterways, underground water recharge areas, shores, and natural plant and animal habitats that are easily disturbed by development.” Refer to Figure 2-6 “Surface Water, Wetlands, Floodplains, DNR Lands” which was copied from the Town’s Comprehensive Plan. The figure does not show any significant concerns in the planning areas where sanitary sewer and water mains would be constructed.

Refer to Figure 2-7 “Endangered Species” which was copied from the Town’s Comprehensive Plan. This figure shows endangered species for Winnebago County. There does not appear to be any concerns in the planning areas for this report.

2.2 Land Use and Population

2.2.1 Existing Land Use

The Town of Clayton Comprehensive Plan adopted December 16, 2009 shows the majority of the existing land uses within the planning areas for this study as agricultural uses. The residential uses in the planning areas are single family homes mostly scattered along the roadways. Commercial uses are primarily scattered along the STH 76 corridor. Industrial development is mostly located along CTH II east of STH 76. In Planning Area 2 most of the industrial development is located in the Town of Vinland. Refer to Figure 2-8 Town of Clayton Existing Land Use Map copied from the Town of Clayton Comprehensive Plan for existing land use.

There are two sanitary districts associated with the Town of Clayton. Clayton Sanitary District No. 1 is located in the east-central part of the town within Planning Area 1. The boundaries for the sanitary district were established in the early 1970’s, but the district never began operating. Part of the Larsen-Winchester Sanitary District is located in the Town of Clayton along the west central border of the town. Wastewater treatment is provided by a lagoon type system located toward the western border in the Town of Clayton. The location of the two sanitary districts is shown in Figure 2-9 as shown in the town’s comprehensive plan.

The Neenah and Menasha sewer service areas adjacent to the Town of Clayton on the east with a portion of the Neenah sewer service area extending into the Town of Clayton in the southeast corner. Refer to Figure 2-10 Neenah-Menasha Sewer Service Area and Figure 2-11 Grand Chute-Menasha West Sewer Service Area.

2.2.2 2030 Land Use

The Town of Clayton's Comprehensive Plan proposes a Future Land Use Plan that was used for this Study. Refer to Figure 2-12 which was reproduced from the Comprehensive Plan. The Comprehensive Plan proposes providing sanitary sewer and a water system to support the proposed growth shown in the Future Land Use Plan. Substantial business (commercial and industrial) growth is proposed in this future plan. The Town of Clayton made some changes to the Future Land Use Plan. Approximately 40 acres south of Fairview Road between Oakwood Avenue and STH 76 was changed from "Recreation and Conservation" to "Business". Approximately 40 acres north of future American Drive between Oakwood Avenue and STH 76 was changed from "Agriculture/Rural Residential" to "Residential – Single and Two Family". Approximately 100 acres south of Shady Lane and West of Clayton Avenue was changed from "Agriculture/Rural Residential" to "Residential – Single and Two Family". This Study is intended to support the proposed land use plan and the changes in the defined planning areas.

In Planning Area 2 the Town of Clayton advised that there was interest in development of "Agriculture/Rural Residential" areas north of Breezewood Lane and CTH JJ that should show a plan on how to serve the areas with sewer and water. Also, the same situation occurs with property west of STH 76 and north of Breezewood. The 2030 Land Use for these areas remains unchanged, but planning for service will consider these areas as "Residential – Single and Two Family".

2.2.3 Population

The population within the Town of Clayton has grown significantly in the last few decades. Most of this population growth has occurred in the eastern part of the Town. Census data shows changes in population increasing from 1990 to 2000 by over 31 percent and from 2000 to 2010 by over 32 percent. Table 2-1 shows census data population and Wisconsin Department of Administration (DOA) projected population. The DOA estimates the 2014 population of the Town of Clayton at 4,016.

Table 2-1
Town of Clayton DOA Population Projections

YEAR	POPULATION	% CHANGE
1990	2264	
2000	2974	31.4
2010	3951	32.8
2015	4140	4.8
2020	4510	8.9
2025	4855	7.6
2030	5200	7.1
2035	5470	5.2
2040	5685	3.9

Build-Out population estimates were made for the purpose of this Study to size proposed facilities. Population density data provided in the Fox Cities 2030 Sewer Service Area Plan Update prepared by East Central Wisconsin Regional Planning Commission as approved by WDNR dated February 13, 2006 was used for this study. Population densities and number of persons per household were presented in the plan for four sewer service areas: Neenah/Menasha, Grand Chute/Menasha West, Appleton and Heart of the Valley. See Table 2-2 for a summary of the data for each sewer service area.

Table 2-2
Population Densities of Neighboring Sewer Service Areas
Fox Cities 2030 Sewer Service Area Plan Update
Prepared By the East Central Wisconsin Regional Planning Commission
WDNR Approval February 13, 2006

	SINGLE FAMILY (UNITS/ACRE)	DUPLEX (UNITS/ACRE)	MULTI-FAMILY (UNITS/ACRE)	COMMERCIAL / INDUSTRIAL (EMPLOYEES/ACRE)
NEENAH / MENASHA SEWER SERVICE AREA PLAN	3.3	5.6	11.36	21.68
GRAND CHUTE / MENASHA WEST SEWER SERVICE AREA PLAN	2.4	4.8	8.83	11.27
APPLETON SEWER SERVICE AREA PLAN	2.73	5.45	10	24.24
HEART OF THE VALLEY SEWER SERVICE AREA PLAN	2.53	5.07	12.08	12.8

Year 2030 Persons Per Household
Appendix C

	PERSONS/HOUSEHOLD
NEENAH/MENASHA SEWER SERVICE AREA PLAN	2.4
GRAND CHUTE/MENASHA WEST SEWER SERVICE AREA PLAN	2.43
APPLETON SEWER SERVICE AREA PLAN	2.39
HEART OF THE VALLEY SEWER SERVICE AREA PLAN	2.48

It was decided that Grand Chute/Menasha West sewer service area was similar in characteristics to the Town of Clayton and, therefore, that data was used for this study. The following was used to estimate build-out population and number of employees based on land use.

- Single Family 2.4 Units/ Acre
- Multi-Family 8.83 Units/ Acre
- Commercial/Industrial 11.27 Employees/Acre
- Persons per Household 2.43

Aerial photos were used to estimate existing residential houses and businesses within the planning areas. Using the same criteria used to estimate build-out population and number of employees above, the existing potential population was estimated. This information was used as the base for projecting population in the planning areas to the year 2025 and the year 2040. Table 2-3 shows the calculated build-out and existing potential population and number of commercial/industrial employees determined for each sanitary sewer drainage area established in each planning area. The sanitary sewer drainage areas will be described in Section 3. Population data was used to determine wastewater flows and water demand.

Table 2-3
Estimated Build-Out Population and Estimated Existing Potential Population

Planning Area & Drainage Area	Build-Out		Existing Estimate	
	Population	Employees	Population	Employees
1, 1	668	4090	22	68
1, 10	1023	2167	109	60
1, 20	70	7652	34	429
1A, 50	2670	1592	46	0
1A, 70	3339	610	31	0
2, 1	3571	962	264	258
2, 30	135	34	10	31
2, 40	902	0	98	0
Total Planning Area 1	**1761**	**13909**	**165**	**557**
Total Planning Area 1A	**6009**	**2202**	**77**	**0**
Total Planning Area 2	**4608**	**996**	**372**	**289**
Total All Planning Areas	**12378**	**17107**	**537**	**846**

The WDNR will only approve facilities that are reasonably projected to serve the proposed area for 20 years. Therefore, population projections for the planning areas need to be provided to determine what will be approved for implementation. Population projections are projected to 2040 which provides 5 years to plan, design, construct and place the proposed facilities in operation. The DOA population projections are for the entire Town of Clayton which may occur anywhere within the Town. The process used to project population to the year 2040 is to increase the existing potential population 37.32 percent which is the increase projected by the DOA for the entire Town of Clayton.

Discussions with East Central Wisconsin Regional Planning Commission representatives suggested for reasonable growth for commercial/industrial use is 100 acres to 2040. Using the same criteria of 11.27 employees per acre, the increase in number of employees is 1127 within the planning areas. In Planning Area 2, Drainage Area 30 commercial/industrial uses is not expected to change. The 1127 additional employees were distributed across the other areas based on the percentage of the total existing potential employees.
Population projections were also estimated to the year 2025. Using the same process stated above the existing potential population would increase 17.27 percent. Using a straight line projection, the commercial/industrial use to the year 2025 would increase 40 acres. The additional 451 employees were distributed as stated above.
Table 2-4 provides the projected population for the year 2025 and the year 2040. Population was not projected for Planning Area 1A because of the minimal current population and anticipated minimal growth. This area is considered a long-term growth plan beyond the projection years shown here. These population projections and the build-out population projection will be used to determine wastewater flows and water demand.

Table 2-4
Estimated Year 2025 and Year 2040 Population within the Planning Areas

Planning Area & Drainage Area	Year 2025		Year 2040	
	Population	Employees	Population	Employees
1, 1	26	106	30	162
1, 10	128	93	150	143
1, 20	40	666	47	1022
1A, 50	0	0	0	0
1A, 70	0	0	0	0
2, 1	310	401	363	615
2, 30	12	31	14	31
2, 40	115	0	135	0
Total Planning Area 1	**194**	**865**	**227**	**1327**
Total Planning Area 1A	**0**	**0**	**0**	**0**
Total Planning Area 2	**437**	**432**	**512**	**646**
Total All Planning Areas	**631**	**1297**	**739**	**1973**

3 SANITARY SEWER COLLECTION SYSTEM ANALYSIS

A sanitary sewer collection system must collect wastewater from users and convey the wastewater to a wastewater treatment plant without interruption and without detrimental effect on the environment. Gravity pipelines, manholes for access, and lift stations with force main pipe for pumping wastewater to other gravity pipelines are the main components of the sanitary sewer collection system. The lift stations and force mains are addressed separate from the sanitary sewer collection system.

3.1 Service Area

The sanitary sewer collection system is intended to provide service to the planning areas previously described in Section 1.2 and shown in Figure 1-2. The sanitary sewer locations were designed based on future land uses and proposed road locations within the described areas. The topography of Area 1 generally slopes to the east. The topography in Area 1A generally slopes to the west. Area 2 topography generally slopes to the east-southeast from approximately 1300 feet west of State Highway 76 and to the west-northwest from approximately 1300 feet west of State Highway 76. This generally describes the potential sanitary sewer drainage areas.

Sewer Service Area (SSA) Planning is required under Wisconsin Administrative Code NR 121. This planning process is designed to anticipate a community's future needs for wastewater treatment. The plan is intended to protect communities from adverse water quality impacts through development of cost-effective and environmentally sound 20-year sewerage system growth plans. A SSA plan identifies existing sewered areas as well as adjacent land most suitable for new development. The plan provides structure to a community's wastewater collection system to accommodate current and future growth. A SSA plan will need to be developed by East Central Wisconsin Regional Planning Commission for the designated Planning Areas discussed in this report.

3.2 Wastewater Flow Projections

Estimating quantities of wastewater is the first step in designing new sanitary sewer pipes to serve the designated planning areas. There are four general categories of wastewater flow in sanitary sewers: residential, nonresidential, industrial process wastewater, and infiltration/inflow (I/I). Residential wastewater is from dwellings such as homes, apartments, and condominiums. Nonresidential wastewater is from commercial/industrial uses such as offices, retail stores, shopping malls, warehouses, factories, schools, hospitals, churches and community centers. Industrial process wastewater is from "wet" industries that use water in their process and dispose of the used process water to the sanitary sewer. Infiltration is groundwater entering the sanitary sewer system through joints, porous walls, and cracks. Inflow is extraneous flow that enters a sanitary sewer from sources other than infiltration such as connections from roof leaders, basement drains, land drains, and manhole covers. Inflow typically results directly from rainfall events. A properly managed new system typically has minimal inflow.

3.2.1 Basis for Analysis

For the purposes of this study, flow projections were based on the planning areas to be served, future land use within the planning areas, estimated population densities for each land use, estimated persons per household for residential areas, and estimated employees per acre for commercial and industrial areas.

This evaluation estimated wastewater flows based on total build-out of the planning areas' future land use. This information is used to size sanitary sewers for the distant future because the life of the pipes could be 50 to 100 years. The total area in acres served by each drainage area was determined for each land use within the drainage area. Using the number of units per acre for single family and multi-family densities stated above along with the number of persons per household, the build-out population was projected. Also, using the commercial/industrial area and the number of employees per acre as stated above, the total number of employees was determined for total build-out of the areas.

Where water supply and wastewater flow data are lacking, the Wisconsin Administrative Code NR110 requires the use of average unit flows ranging from 60 to 80 gallons per capita per day (gpcd) to determine wastewater flows to the wastewater treatment plant. An average of 70 gpcd was used for this study. The publication Gravity Sanitary Sewer Design and Construction published by American Society of Civil Engineers and Water Environment Federation provides data for typical nonresidential wastewater flows of 30 gallons per employee per acre per day. This average unit flow was used for commercial/industrial employee wastewater estimates.

Estimated wastewater flows were based on the following components: Average day wastewater flows from single family, multi-family and commercial/industrial land uses; sanitary sewer infiltration; and peak flow factors applied to average flows. Based on data provided in the publication Gravity Sanitary Sewer Design and Construction and the fact that this project will require new sanitary sewer construction, infiltration allowances of 200 gallons per day per sewer inch-diameter per mile was used and added to average base wastewater flow. Since infiltration is within the sanitary sewer system, these allowances are typically based on sanitary sewer diameter and length. Peak flow factors generally range between 2 and 3 times average daily flows. Maximum day design flow was estimated at 2.5 times average design flow.

Kimberly Clark Company is located on Martin Drive off County Trunk Highway II in Planning Area 1. Kimberly Clark has an existing industrial facility with two 12,000 gallon holding tanks that are pumped once or twice per week. Based on this information the process wastewater was estimated to add 8,000 gallons per day to the sanitary sewer which was included in the sanitary sewer flows.

JJ Keller and Associates is located at the corner of County Trunk Highway 76 and Breezewood Lane in Planning Area 2. JJ Keller has septic tanks that are pumped on a regular basis and represents approximately 10,405 gallons per day in wastewater. The average wastewater was added to wastewater quantities for sanitary sewer flows.

Wastewater flow projections were made based on build-out population and number of employees and the average unit flows to determine average day wastewater flows. Industrial flows were added to the average day wastewater flows. Sewer infiltration estimates were added to the average day wastewater flows to determine average day design flow. The peaking factor of 2.5 times average design flow was used to determine the maximum day design flow.

Flows estimated for the year 2025 population and for the year 2040 population in Planning Areas 1 and 2 were also determined in the same manner as stated above.
The Town of Clayton has stated that Planning Area 1A is a longer range plan and, therefore, not included for these estimates. These estimates are used to determine which drainage areas are providing the most growth and not used for sanitary sewer design. Pipe sizing was based on total build-out flow estimates.

3.2.2 Flow Projections for Sanitary Sewer Design

Flow projections were estimated for sanitary sewer design for each drainage tributary and the accumulated flow for each major drainage area. The sanitary sewer drainage areas area provided with separate sanitary sewer collection systems to convey wastewater to one terminal location in the drainage area. The drainage areas are mostly governed by topography. Three drainage areas were determined in Planning Area 1; two drainage areas were determined in Planning Area 1A; and three drainage areas were determined in Planning Area 2. Figure 3-1 shows the location of the drainage areas within the designated planning areas. Table 3-1 is a summary of the major drainage areas showing the estimated accumulated flow for each major drainage area.

Table 3-1
Summary of Sanitary Sewer Drainage Area Total Build-Out Estimated Flows

Planning Area Designation	Drainage Area Designation	Average Design Flow (GPD)	Maximum Day Design Flow (GPD)
1	1	178,000	444,000
1	10	142,000	354,000
1	20	236,000	589,000
1A	50	241,000	604,000
1A	70	255,000	639,000
2	1	300,000	749,000
2	30	11,000	28,000
2	40	66,000	165,000
Total Planning Area 1		**556,000**	**1,387,000**
Total Planning Area 1A		**496,000**	**1,243,000**
Total Planning Area 2		**377,000**	**942,000**
Total All Planning Areas		**1,429,000**	**3,572,000**

3.3 Collection System Routing and Sizing

The functional purpose of a sanitary sewer is to safely convey wastewater to its destination. Sanitary sewer analysis and design requires the evaluation of varied local land use, topography, subterranean, structural, and hydraulic conditions combined to optimize design. The prime functional goals for sewers are to carry maximum daily flows without significant surcharge, and to achieve adequate self-cleaning during low-flow periods. Flow rates in a sanitary sewer vary greatly within a given day and much more over the service life of the sewer.

3.3.1 Basis for Analysis

Gravity sanitary sewer was located along existing and proposed future roads where possible to serve the defined areas. In some cases the topography was such that it was not possible to reasonably serve some areas within the roads by gravity sanitary sewer resulting in off-road locations. The goal was to serve as much area by gravity sewer as the topography would allow and minimize the number of terminal locations.

The hydraulics of sewers is affected by the sewer diameter, sewer depth, sewer slope, sewer alignment, and sewer material. The Manning equation is widely used and is one of the best open-channel hydraulics equations for determining pipe flow capacity. This equation was used to determine sewer pipe flow capacity and pipe flow velocity. The Wisconsin Administrative Code NR110 minimum requirements for gravity sanitary sewer diameters and slopes were adhered to.

The sanitary sewer depth was intended to provide gravity basement drainage for sanitary wastes where economically feasible as well as to provide sufficient depth to prevent freezing. Some sanitary sewer depths are greater than necessary to serve basements but are necessary to minimize lift stations. The assumed sewer pipe material was PVC which normally has an “n” factor in the Manning equation of 0.009. Typically, an “n” factor of 0.013 is used to compensate for flows through manholes and pipe aging. Sewer diameter and slope have the largest impact on the flow carrying capacity of sanitary sewers. In selecting the sewer diameters and slopes it is desirable to maintain a minimum velocity of 2.0 feet per second at the incoming flow. This flow velocity is generally accepted as the minimum required providing self-cleansing of solids within the pipe flow.

3.3.2 Recommended Build-Out Sanitary Sewer Wastewater Collection System

Three separate drainage areas (designated 1, 10, 20) were determined for Planning Area 1; two separate drainage areas (designated 50 and 70) for Planning Area 1A; and three drainage areas (designated 1, 30, 40) for Planning Area 2. The sanitary sewer system layout includes selecting an outlet, determining the tributary areas, locating trunk and main sewers, and determining the need for and location of pumping stations and force mains. Topographic maps for the planning areas were obtained from Winnebago County and used to determine the sanitary sewer layout. Manholes are located a maximum of 400 feet apart to meet WDNR requirements and at changes in grade, alignment and pipe size. Sanitary sewer is proposed to serve each drainage area defined in each planning area. The sanitary sewer consists of proposed sanitary sewer main trunks that collect tributary sewers necessary to serve the drainage area. The sanitary sewer for each drainage area flows to one manhole location where a lift station will be required or an interceptor sewer will need to be connected. The type of connections will be discussed later with more detail. Refer to Figure 3-2 for the sanitary sewer layout for the planning areas.

Planning Area 1, Drainage Area 1 sanitary sewer terminates at Lift Station 1 located 900 feet north of the intersection of Clayton Avenue and Smoke Tree Road extended. The total pipe length for this area is 27,330 feet. Drainage Area 10 sanitary sewer terminates at Manhole 10 located at the intersection of Clayton Avenue and Fairview Road. The total pipe length for this area is 16,980 feet. Drainage Area 20 sanitary sewer terminates at Manhole 20 located at the intersection of Clayton Avenue and County Trunk Highway II. The total pipe length for this area is 33,270 feet.

Planning Area 1A, Drainage Area 50 sanitary sewer terminates at Manhole 50 located at the intersection of Oakwood Avenue and Fairview Road. The total pipe length for this area is 20,590 feet. Drainage Area 70 sanitary sewer terminates at Manhole 70 located at Oakwood Ave. approximately 1000 feet south of the Canadian National Railroad. The total pipe length for this area is 10,970 feet.

Planning Area 2, Drainage Area 1 sanitary sewer terminates at Manhole 1 located at the intersection of Breezewood Lane and Woodenshoe Road. The total pipe length for this area is 34,610 feet. Drainage Area 30 sanitary sewer terminates at Manhole 30 located Breezewood Lane approximately 1000 feet west of Sunburst Lane. The total pipe length for this area is 1,830 feet. Drainage Area 40 sanitary sewer terminates at Manhole 40 located on Corona Way extended approximately 600 feet north of Sunburst Lane. The total pipe length for this area is 9,380 feet.

Wastewater treatment options will be discussed later, but will have an impact on the proposed sanitary sewer system. The layout will remain the same no matter what wastewater treatment option is pursued, but drainage areas may require a lift station at the drainage area terminal manhole to pump to different locations in the sanitary sewer collection system depending on the wastewater treatment alternative. This may affect the size of the downstream sanitary sewer from the location where a lift station may discharge. This will be discussed with the wastewater treatment options.

3.3.3 Suggested Year 2040 Sanitary Sewer Wastewater Collection System

After review of the location of existing potential users and the year 2040 projections in each drainage area, the following sanitary sewer is suggested as an immediate project to serve the most existing and future users to the year 2040. The sanitary sewer was sized for build-out conditions due to the longevity of the pipe material.

Planning Area 1 Potential Immediate Project:

- Fairview Road from Clayton Avenue to State Trunk Highway (STH) 76 (MH 10 to MH 10-15) – 5,170 feet of sanitary sewer.

- County Trunk Highway (CTH) II from Clayton Avenue to STH 76 and then north and south on STH 76 (MH 20 to MH 36)(MH 34 to MH 34-2) – 6,350 feet of sanitary sewer.
- Martin Drive north from CTH II and Janssen Drive over land from Martin Drive (MH 25 to MH 25-5)(MH 25-1 to MH 25-1-4)(MH 25-1-4 to MH 25-1-4-2) – 4,020 feet of sanitary sewer.

- Winncrest Road from CTH II south, then overland west to STH 76 and south on STH 76 (MH 31 to MH 31-4)(MH 31-4 to MH 31-4-6) – 3,330 feet of sanitary sewer.

Planning Area 2 Potential Immediate Project:

- Breezewood Lane from Woodenshoe Road to west of STH 76 (MH 1 to MH 16)(MH 16 to MH 16-3) – 6,370 feet of sanitary sewer.

- STH 76 from Breezewood south (MH 16 to MH 16s-3) – 1,200 feet sanitary sewer.

- Commerce Plaza Drive from Breezewood south (MH 14 to MH 14-2) – 600 feet of sanitary sewer.

- Woodenshoe Road from Breezewood to CTH JJ (MH 1 to MH 1-5) – 1,540 feet of sanitary sewer.

- CTH JJ from Woodenshoe Road to Breezewood (MH 1-5 to MH 1-5-5) – 2,000 feet of sanitary sewer.

- Oakcrest Drive (MH 1-1 to MH 1-1-2)(MH 1-3 to MH 1-3-4) – 1,690 feet of sanitary sewer.

- Murray Road (MH 7 to MH 7-4) – 1,360 feet of sanitary sewer

- Darrow Road (MH 8 to MH 8-4) – 2,950 feet of sanitary sewer

- Carden Drive (MH 12 to MH 12-2) – 670 feet of sanitary sewer

- Sunwood Drive and Sunburst Lane (MH 40 to MH 40-10)(MH 40-2 to MH 40-2-5) – 4,990 feet of sanitary sewer

3.4 Need for Collection System Lift Stations

Lift stations are sewage pumping stations that lift wastewater collected at a low point in the drainage area and pumped to another location. The lift stations may pump to another location in the sanitary sewer system of a different drainage area or may pump directly to a wastewater treatment plant. In the sanitary sewer system proposed, the need for lift stations and determination of pump flow rates depends on the wastewater treatment alternative. Due to long force main lengths, each lift station should be equipped with odor and corrosion control. The three treatment alternatives includes 1) discharge for treatment by others into existing interceptor sewers located in the Town of Menasha and in the Town of Neenah, 2) a new wastewater treatment plant west of the planning areas, and 3) wastewater treatment pods located at each drainage area except Planning Area 1A.

If a new wastewater treatment plant was constructed west of the planning areas, then all wastewater flows from Planning Areas 1 and 1A would be directed to the west Drainage Area 70 (Manhole 70) located in Planning Area 1A. To accomplish that, a lift station would be constructed in Drainage Area 20 (Manhole 20) pumping to Drainage Area 70 (Manhole 70-13); Drainage Area 10 would be connected to Drainage Area 1 by gravity with 400 feet of 8” sewer between Manhole 9 and Manhole 10; a lift station would be constructed in Drainage Area 1 located north of Manhole 1 pumping to Drainage Area 50 (Manhole 50-17); a lift station would be constructed in Drainage Area 50 (Manhole 50) pumping the flow from Drainage Area 50 and the flow from the lift station in Drainage Area 1 to Drainage Area 70 (Manhole 70-24). The wastewater flows from Planning Area 1 and 1A would then collect at Manhole 70 in Drainage Area 70 to transport to the WWTP by gravity. The lift stations all discharge into the sanitary sewer collection system requiring the sewers to carry larger volumes of wastewater. Some of the sanitary sewers in Drainage Areas 50 and 70 require increased size to convey the additional flows from the lift stations. In Planning Area 2, Drainage Area 1 would be pumped to Drainage Area 40 and Drainage Area 30 would be pumped to Drainage Area 40. A lift station in Drainage Area 40 would then pump the Planning Area 2 wastewater to the proposed interceptor sewer on CTH II. Table 3-2 shows the lift stations needed, pumping flow rate, and force main size and length for this option. Figure 3-3 shows the location of the proposed lift stations, location of force main from the lift stations to the adjacent drainage areas and location of the proposed interceptor sewer to the existing Larsen-Winchester Wastewater Treatment Plant.

Table 3-2
Summary of Lift Stations and Force Mains for Wastewater Flow to New WWTP

PLANNING AREA	DRAINAGE AREA	LIFT STATION MH LOCATION	PUMP FLOW RATE (GPM)	FORCE MAIN LENGTH (INCHES)	FORCE MAIN LENGTH (FEET)
1	1&10	1	555	8	8400
1	20	20	410	6	7000
1A	50	50	975	10	1950
2	1	1	520	6	7680
2	30	30	20	2	1800
2	40	40	655	6	13610

If wastewater is conveyed to the Town of Menasha's and the City of Neenah's interceptor sewers, then all wastewater flows would be directed to the east. In Planning Areas 1 and 1A, a lift station in Drainage Area 70 (Manhole 70) would pump to Drainage Area 50 (Manhole 50-22); a lift station in Drainage Area 50 (Manhole 50) would pump to Drainage Area 10 (Manhole 10-15); a lift station would be constructed in Drainage Area 20 (Manhole 20) and pumped to Drainage Area 10. The flows from Drainage Areas 10, 20, 50 and 70 would flow by gravity to the Town of Menasha interceptor sewer located near the Town of Clayton boundary on Jacobson Road. Drainage Area 1 would be pumped to the Town of Menasha interceptor sewer located near the Town of Clayton boundary on Smoke Tree Road. In Planning Area 2 lift stations in Drainage Areas 30 and 40 would pump to Drainage Area 1 (MH16-5). The wastewater from Planning Area 2 would then be conveyed by gravity from Drainage Area 1 (Manhole 1) to the City of Neenah interceptor sewer located on Breezewood Lane at Pendleton Road. Table 3-3 shows the lift stations needed, pumping flow rate, and force main size and length for this option. Figure 3-4 shows the location of the proposed lift stations, location of force main from the lift stations to the adjacent drainage areas, and the interceptor sewer connections to the Town of Menasha and the Town of Neenah.

Table 3-3
Summary of Lift Stations and Force Mains for Wastewater Flow to Town of Menasha and City of Neenah Interceptor Sewers

PLANNING AREA	DRAINAGE AREA	LIFT STATION MH LOCATION	PUMP FLOW RATE *(GPM)*	FORCE MAIN LENGTH *(INCHES)*	FORCE MAIN LENGTH *(FEET)*
1	1	1	310	4	1000
1	20	20	410	6	2000
1A	50	50	865	10	5450
1A	70	70	445	8	2250
2	30	30	20	2	3000
2	40	40	115	4	4650

An alternative to connection to the Town of Menasha interceptor sewers is to pump from Planning Area 1 to an interceptor sewer in Grand Chute. This option was discussed with representatives from East Central Wisconsin Regional Planning Commission and we were advised that there is no capacity for the Town of Clayton.

It is anticipated that if individual wastewater treatment pods were constructed in each drainage area and the sanitary sewer could flow by gravity to the pods, then lift stations may not be needed. The only exception is in Planning Area 2 where Drainage Area 30 is so small that a grinder pump type lift station would pump to Drainage Area 40 for treatment.

3.5 Estimate of Probable Project Costs

The Appendix includes detailed estimates of probable project costs for the costs states below. The project estimates are preliminary budget estimates for construction, technical, administrative and contingency costs. The cost estimates are based on best engineering judgement with limited design information. Economic conditions in the construction industry causes price fluctuations in materials and labor. The time when final design documents and actual construction takes place will have an impact on the project cost estimates.

3.5.1 Cost Estimates for Proposed Improvements

The following cost estimates provide a comparison of costs to collect wastewater and convey to the three treatment alternatives addressed in this report. A cost estimate is also provided for the suggested Year 2040 sanitary sewer. The estimated probable costs for the following options includes sanitary sewer, manholes, lift stations, odor and corrosion control, force main, connections to existing interceptor sewers, interceptor sewer to Larsen-Winchester WWTP, metering and sampling stations, and surface restoration. The sanitary sewer design and cost estimates are based on total build-out pipe sizes. The sanitary sewer cost estimates for the following options do not include sewer service laterals.

Table 3-4 provides cost estimates for conveying wastewater to individual wastewater treatment pods located in each drainage area for Planning Area 1 and Planning Area 2. It is anticipated that the sewer system would flow by gravity to the individual treatment pods located in each drainage area and requires no pumping except for a grinder pump lift station in Drainage Area 30 which pumps to Drainage Area 40.

Table 3-5 provides cost estimates for conveying wastewater to Larsen-Winchester Wastewater Treatment Plant location. Wastewater from Planning Area 1 Drainage Areas 1 and 10 is pumped to Planning Area 1A Drainage Area 50 where it flows by gravity to Lift Station 50 and is pumped to Planning Area 1A Drainage Area 70. From Drainage Area 70 wastewater flows by gravity through an interceptor sewer to the Larsen-Winchester WWTP location. Wastewater from Planning Area 1 Drainage Area 20 is pumped to Planning Area 1A Drainage Area 70 where it flows by gravity to the interceptor sewer to Larsen-Winchester WWTP. The costs for sanitary sewer located in Planning Area 1A required to convey wastewater from Planning Area 1 is included as part of Planning Area 1 costs and the remaining Planning Area 1A sewer costs are shown as a separate line item. Planning Area 2 wastewater is pumped to the interceptor sewer.

Table 3-6 provides cost estimates for conveying wastewater to the existing interceptor sewers owned by others. Two separate interceptor sewers are located in the Town of Menasha near the Town of Clayton border with Planning Area 1 Drainage Area 1 and Drainage Area 10 and one interceptor sewer is located in the City of Neenah located almost one mile from the Town of Clayton border with Planning Area 2 Drainage Area 1. It was stated that the Town of Menasha may not want to accept the Town of Clayton's wastewater without annexation which would be unacceptable to the Town of Clayton. The cost estimates do not include the cost to purchase existing interceptor sewer capacity and wastewater treatment plant capacity. This would be determined if the entities proposed to receive the wastewater are willing to come to an acceptable agreement. In this scenario wastewater is pumped from Planning Area 1A to Planning Area 1 Drainage Area 10 where it flows by gravity to the existing Town of Menasha interceptor sewer. Planning Area 1 is pumped to the Town of Menasha interceptor sewer. Planning Area 1 Drainage Area 20 is pumped to Drainage Area 10. Drainage Areas 30 and 40 in Planning Area 2 pump to Drainage Area 1 where it flows by gravity to the City of Neenah interceptor sewer.

Table 3-4
Wastewater Conveyed to Individual Wastewater Treatment Pods Based on Build-Out Flow Projections

	SANITARY SEWER	LIFT STATIONS & FORCE MAIN	INCREASED SEWER SIZE FOR LIFT STATION DISCHARGE	SANITARY SEWER IN PLANNING AREA 1A	INTERCEPTOR SEWER	METERING & SAMPLING STATION	TOTAL COSTS
PLANNING AREA 1							
DRAINAGE AREA 1	$2,532,000						$2,532,000
DRAINAGE AREA 10	$1,219,000						$1,219,000
DRAINAGE AREA 20	$3,661,000						$3,661,000
TOTAL PLANNING AREA 1	**$7,412,000**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**$7,412,000**
PLANNING AREA 2							
DRAINAGE AREA 1	$3,482,000						$3,482,000
DRAINAGE AREA 30	$140,000	$106,000					$246,000
DRAINAGE AREA 40	$761,000						$761,000
TOTAL PLANNING AREA 2	**$4,383,000**	**$106,000**	**N/A**	**N/A**	**N/A**	**N/A**	**$4,489,000**
TOTAL PLANNING AREAS 1 & 2	**$5,144,000**	**$106,000**	**N/A**	**N/A**	**N/A**	**N/A**	**$11,901,000**

Table 3-5

Wastewater Conveyed to Larsen-Winchester WWTP Based on Build-Out Flow Projections

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Total Costs
Planning Area 1							
Drainage Area 1	$2,532,000	$1,130,000		$797,000			$4,459,000
Drainage Area 10	$1,219,000	$0		$0			$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000			$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$12,657,000**
Planning Area 2 (Pumps to Interceptor Sewer)							
Drainage Area 1	$3,482,000	$719,000					$4,201,000
Drainage Area 30	$140,000	$106,000					$246,000
Drainage Area 40	$761,000	$998,000					$1,759,000
Total Planning Area 2	**$4,383,000**	**$1,823,000**	**N/A**	**N/A**	**N/A**	**N/A**	**$6,206,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$3,552,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$18,863,000**
Total Future Planning Area 1A	**$1,523,000**	**$0**					**$1,523,000**

Table 3-6

Wastewater Conveyed to Existing Interceptor Sewers Owned By Others Based on Build-Out Flow Projections

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Connecting Interceptor Sewer	Metering & Sampling Station	Total Costs
Planning Area 1							
Drainage Area 1	$2,532,000	$185,000			$23,000	$300,000	$3,040,000
Drainage Area 10	$1,219,000	$0	$81,000		$26,000	$300,000	$1,626,000
Drainage Area 20	$3,661,000	$265,000			$0	$0	$3,926,000
Total Planning Area 1	**$7,412,000**	**$450,000**	**$81,000**	**N/A**	**$49,000**	**$600,000**	**$8,592,000**
Planning Area 2							
Drainage Area 1	$3,482,000				$383,000	$300,000	$4,165,000
Drainage Area 30	$140,000	$162,000					$302,000
Drainage Area 40	$761,000	$230,000					$991,000
Total Planning Area 2	**$4,383,000**	**$392,000**	**$0**	**N/A**	**$383,000**	**$300,000**	**$5,458,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$842,000**	**$81,000**	**N/A**	**$432,000**	**$900,000**	**$14,050,000**
Total Future Planning Area 1A	**$2,579,000**	**$928,000**					**$3,507,000**

4 WASTEWATER TREATMENT ALTERNATIVES EVALUATION

4.1 Regulatory Requirements

4.1.1 Wastewater Treatment Facility Regulations

Development of wastewater treatment facilities owned by municipal entities is regulated by the WDNR as required by Chapter NR 110 of the Wisconsin Administrative Code. Any proposal for a new wastewater treatment facility must include a demonstration that the proposed facility is necessary, cost-effective and will be owned by a municipal entity.

Wastewater facility planning studies are required by NR 110 for all reviewable projects involving new or modified sewerage systems owned by municipal or other non-industrial entities. The basic purpose of facility planning is to assess the condition of a sewerage system, establish a need for improvement, evaluate options to address system needs, and to identify the cost-effective alternative. This report does not meet the requirements for wastewater facility plans, however portions of this report may be used in completing a facility plan.

As part of the facility planning process a request to the WDNR is required to obtain effluent discharge limits. The establishment of effluent limitations is governed by NR 210 through the WDNR. The proposed service area, population projection, design flow estimates and discharge locations need to be identified as part of the request to the WDNR.

4.1.2 WPDES Permit Requirements

The WDNR regulates the discharge of pollutants to waters of the state through the Wisconsin Pollutant Discharge Elimination System (WPDES) program. Wastewater permits contain all the discharge limitations, monitoring requirements, special reports, and compliance schedules appropriate to the facility. Obtaining the discharge limits is required as part of a facility planning process. A WPDES permit must be obtained prior to discharge from the wastewater treatment facility.

4.2 Wastewater Characteristics

4.2.1 Design Flow Projections

Development and estimating of flowrates is necessary to determine the design capacity as well as the hydraulic requirements of the treatment system. The process units and hydraulic conduits must be sized to accommodate the anticipated peak flow rates that will pass through the treatment plant. The components of the makeup of the wastewater flow generally includes domestic wastewater (residential, commercial, institutional and similar facilities), industrial wastewater, and infiltration/inflow (I/I) (water that enters the collection system through leaking joints, cracks, and breaks, or porous walls as well as inflow from stormwater). Since flowrate data is not available, estimates were based on population projections and typical flowrates for the type of user. Average daily base flow was based on 70 gallons per capita per day for residential users; 30 gallons per employee per day; know industrial sources and 200 gallons per inch pipe diameter per mile of pipe per day.

Flowrate vary with time and have an effect on the operation of the treatment plant. Data has shown that minimum daily flowrates for similar size facilities may be 30 percent of average flowrates. Average daily design flows are calculated by adding the daily average base flow to the daily average I/I flow. The maximum day design flow was assumed to be 2.5 times the average daily design flow and the maximum hourly design flow rate of 3.5 times base average flow rate was obtained from data based on population size.

The treatment alternatives may vary the flow rates based on changes in sanitary sewer pipe size, pipe lengths and lift station flow rates. Table 4-1 is a summary of the flows from each sanitary sewer drainage area estimated in a build-out condition. Table 4-2 is a summary of estimated flows from the year 2025 user condition. Table 4-3 is a summary of estimated flows from the year 2040 user condition. No year 2025 or year 2040 estimates were made for Planning Area 1A since development in Planning Area 1A is not anticipated to happen by year 2040.

Table 4-1
Summary of Estimated Build-Out
Wastewater Treatment Facility Design Flows

PLANNING AREA	DRAINAGE AREA	AVERAGE DAY BASE FLOW (GPD)	AVERAGE DAY DESIGN FLOW (GPD)	MAXIMUM DAY DESIGN FLOW (GPD)
1	1	170,000	178,000	445,000
1	10	137,000	142,000	354,000
1	20	223,000	236,000	589,000
1A	50	235,000	241,000	603,000
1A	70	252,000	255,000	639,000
2	1	289,000	300,000	749,000
2	30	10,000	11,000	28,000
2	40	63,000	66,000	165,000
TOTALS		**1,379,000**	**1,429,000**	**3,573,000**

Table 4-2
Summary of Estimated Year 2025
Wastewater Treatment Facility Design Flows

PLANNING AREA	DRAINAGE AREA	AVERAGE DAY BASE FLOW (GPD)	AVERAGE DAY DESIGN FLOW (GPD)	MAXIMUM DAY DESIGN FLOW (GPD)
1	1	5,000	5,200	13,000
1	10	11,800	12,400	31,000
1	20	23,000	24,100	60,000
2	1	34,000	35,600	89,000
2	30	1,800	1,900	5,000
2	40	8,000	8,400	21,000
TOTALS		**83,600**	**87,600**	**219,000**

Table 4-3
Summary of Estimated Year 2040
Wastewater Treatment Facility Design Flows

PLANNING AREA	DRAINAGE AREA	AVERAGE DAY BASE FLOW (GPD)	AVERAGE DAY DESIGN FLOW (GPD)	MAXIMUM DAY DESIGN FLOW (GPD)
1	1	7,000	10,000	25,000
1	10	15,000	17,000	43,000
1	20	42,000	47,000	118,000
2	1	54,000	62,000	154,000
2	30	1,900	2,500	6,200
2	40	6,900	8,400	21,000
TOTALS		**126,800**	**146,900**	**367,200**

4.2.2 Loading Projections

Constituent mass loading, the product of constituent concentration and flowrate, is necessary to determine the capacity and operational characteristics of the treatment facility and ancillary equipment to ensure that treatment objectives are met. When operating data is not available, as in this case, NR 110 states that the design loading shall be based on a contribution of 0.17 pounds of biochemical oxygen demand (BOD) per capita per day and 0.20 pounds of suspended solids (SS) per capita per day. Also, when garbage grinders used in areas tributary to a sewage treatment facility, the design basis shall be increased to 0.22 pounds of BOD per capita per day and 0.25 pounds of SS per capita per day.

In evaluating design loadings required by the WDNR in NR 110, it was determined that potentially 20 percent of the users could be using garbage grinders. Therefore, the design loadings used for BOD was 0.18 pounds per capita per day and for SS was 0.21 pounds per capita per day. Wastewater strength for Kimberly Clark and JJ Keller is unknown and was treated as normal waste strength. Table 4-4 is a summary of the BOD and SS from each sanitary sewer drainage area estimated in a build-out condition, year 2015 condition and year 2040 condition. No year 2025 or year 2040 estimates were made for Planning Area 1A since development in Planning Area 1A is not anticipated to happen by year 2040.

Table 4-4
Summary of Estimated Build-Out, Year 2025 and Year 2040
WWTP Design Loadings

PLANNING AREA	DRAINAGE AREA	BUILD-OUT BOD (POUNDS)	BUILD-OUT SS (POUNDS)	YEAR 2025 BOD (POUNDS)	YEAR 2025 SS (POUNDS)	YEAR 2040 BOD (POUNDS)	YEAR 2040 SS (POUNDS)
1	1	436	508	13	15	18	21
1	10	351	410	30	35	38	44
1	20	603	703	59	68	87	102
1A	50	604	704	0	0	0	0
1A	70	648	756	0	0	0	0
2	1	717	836	87	101	113	132
2	30	27	31	5	5	5	6
2	40	162	189	21	24	18	21
TOTALS		**3,548**	**4,137**	**215**	**248**	**279**	**326**

4.3 Wastewater Treatment Facility Alternatives

4.3.1 Regionalization

The Town of Menasha has two sanitary sewer interceptor sewers that are close to the east boundary of the Town of Clayton which may serve Planning Area 1 and Planning Area 1A. The City of Neenah has an interceptor sewer less than a mile from the east boundary of the Town of Clayton which may serve Planning Area 2. The interceptor sewers convey wastewater to the Neenah/Menasha Sewerage Commission's wastewater treatment plant. Communications need to take place with the Town of Menasha, City of Neenah and the Neenah/Menasha Sewerage Commission to determine if they have the capacity to accept Clayton's wastewater and if they are willing to negotiate an acceptable agreement for acceptance including cost.

If these entities are willing to work with the Town of Clayton, then it is anticipated the Town of Clayton would need to purchase interceptor capacity and wastewater treatment plant capacity. Further evaluation for this option is dependent on the neighboring entities willingness to provide service to the Town of Clayton at a reasonable cost without requiring annexation.

4.3.2 Expansion of Existing Wastewater Treatment Facility (Larsen-Winchester)

The existing Larsen-Winchester wastewater treatment plant is located within the Town of Clayton and appears reasonable to combine treatment of the planning areas' wastewater with that of the Larsen-Winchester Sanitary District. It appears the Larsen-Winchester wastewater treatment plant is nearing capacity and may need expansion in the near future. It is proposed to construct a new wastewater treatment plant at the Larsen-Winchester wastewater treatment site. The type of treatment plant processes and operations would be selected with an in depth evaluation as part of a future facility plan.

A wastewater treatment plant to accommodate the total build-out wastewater flows of 3.6 million gallons per day is probably not feasible at this time. Other total build-out options may include serving only Planning Area 1 and Planning Area 2 since Planning Area 1A is considered long-term. A wastewater treatment plant for this scenario would require treatment of wastewater flows of 2.33 million gallons per day or approximately two-thirds of the total build-out wastewater flows. Another scenario may be to provide wastewater treatment for build-out of Planning Area 1 only with Planning Area 2 possibly going to the City of Neenah interceptor sewer. This scenario would require wastewater treatment for flows of 1.4 million gallons per day or a little more than one-third the total build-out wastewater flows.

The WDNR limits wastewater treatment facility design and construction to a 20-year projection. Therefore, the most likely wastewater treatment plant that could be built is to the year 2040 projection. This provides five years to build and place in operation a new wastewater treatment plant with a 20-year life after. The year 2040 wastewater flow projection is 367,000 gallons per day which provides estimated growth to the year 2040 for Planning Areas 1 and 2.

The represented flows are for the Town of Clayton defined planning areas and do not include any flow contribution from the Larsen-Winchester Sanitary District.

4.3.3 Recirculating Textile Filter Wastewater Treatment Pods

The Town of Clayton asked for a review of an alternative to provide smaller wastewater treatment plants for each of the defined drainage areas. Typically, the Wisconsin Department of Safety and Professional Services (DSPS) reviews large private onsite wastewater treatment systems with WDNR review if a WPDES permit is required. These types of facilities treat residential strength wastewater and may not be suitable for other types of wastewater. Also, water softener backwash discharge must not discharge to the onsite wastewater treatment system due to pass through of chlorides. Since the Town of Clayton is considered a municipality, the WDNR will need to review and approve each facility. Each facility will require a WPDES permit to discharge to an adjacent stream.

The proposed treatment system is a multiple-pass, packed bed aerobic wastewater treatment system. This system operates similar to a recirculating sand filter. It is made up of several filtering pods that use textile instead of a sand media. For simplicity the system will be referred to as a recirculating textile filter (RTF). The loading rates for the textile media are greater than that of sand media. Each pod is rated with a maximum flow capacity of 5,000 gpd. The system consists of a primary tank, a recirculation tank, RTF units and ultraviolet disinfection. Primary treatment of raw wastewater is provided through a primary tank (septic tank) sized at 4 times maximum day flow. After primary treatment the effluent enters a recirculation tank sized at 100% maximum day flow and is pumped to a distribution manifold into the filter pods. Effluent percolates through the textile media, where treatment is obtained by microorganisms that populate the filter media. The filter area is 100 square feet per pod with an average loading rate of 25 gpd per square foot and a maximum of 50 gpd per square foot. After passing through the filter the effluent flows to a return line to the recirculating valve where a portion of the effluent is routed back to the treatment pod and a portion is discharged to ultraviolet disinfection. After passing through disinfection the effluent is discharged to a drain field or a stream.

The RTF system has a relatively small foot print and is expandable through the addition of RTF pods. The treatment system is controlled through timers and floats in the primary treatment tank which adjust according to current flow rates. One of the benefits of this system is that it is designed to sit relatively close to the ground surface. It is proposed that the system be sized for the estimated year 2025 wastewater flows. The system is not practical for build-out of the planning areas. Table 4-5 shows the sizes and number of pods required for each drainage area at estimated year 2025 wastewater flows. The estimated minimum land area is for equipment only based on pod discharge to a stream. Isolation from commercial and residential buildings may be required by the WDNR to provide separation to minimize potential odor, noise, and nuisances caused by wastewater treatment facilities. Location and WDNR acceptance would be determined in a facility plan.

Table 4-5

Year 2025 Recirculating Textile Filter Pod Sizes for Each Sewer Drainage Area

Planning Area Served	Drainage Area Served	Maximum Day Design Flow (gpd)	Primary Tank Size (gallons)	Recirculation Tank Size (gallons)	Textile Filter Equipment (No. of pods)	Estimated Equipment Minimum Land Area (s.f.)
1	1	13,000	50,000	13,000	3	4,000
1	10	30,000	118,000	30,000	6	9,000
1	20	57,000	288,000	57,000	12	17,000
2	1	85,000	337,000	85,000	17	25,000
2	30	4,500	18,000	4,500	1	2,000
2	30 and 40	25,000	99,000	25,000	5	7,000

4.4 Transmission of Wastewater to Wastewater Treatment Facility/Facilities

4.4.1 Regionalization

Connections for transmission to the Neenah/Menasha WWTP may be made for Planning Areas 1 and 1A to an 18" Town of Menasha interceptor sewer located near Clayton Avenue on Smoke Tree Road and a 21" Town of Menasha interceptor sewer located near Clayton Avenue on Jacobsen Road. Planning Area 2 may be connected to a 21" City of Neenah interceptor sewer located on Breezewood Lane at Pendleton Road. An alternative for Planning Areas 1 and 1A would to pump wastewater to an interceptor sewer for wastewater treatment at the Grand Chute/Menasha West WWTP. The owners of the interceptor sewers will need to be contacted to determine the available capacity of the interceptor sewers and wastewater treatment plant. Further evaluation for this option is dependent on the owner's willingness to provide service to the Town of Clayton at a reasonable cost without requiring annexation.

Utilizing the two Town of Menasha interceptor sewers requires pumping the two drainage areas located in Planning Area 1A to Planning Area 1 for gravity flow to the interceptor sewers. A 445 gpm lift station pumps the flow from Drainage Area 50 to Drainage Area 70 where an 865 gpm lift station pumps the flow from both drainage areas to Drainage Area 10 in Planning Area 10. In Planning Area 1 a 410 gpm lift station pumps from Drainage Area 20 to Drainage Area 10. A gravity sewer connection made between Drainage Area 10 and the Town of Menasha 21" interceptor sewer crosses Clayton Avenue on Fairview Road and Jacobsen Road. The build-out maximum day flow to the 21" interceptor sewer is estimated to be 2,196,000 gallons per day. A 310 gpm lift station pumps Drainage Area 1 flows to the Town of Menasha 18" interceptor sewer crossing Clayton Avenue on Smoke Tree Road. The build-out maximum day flow to the 18" interceptor sewer is estimated to be 444,000 gallons per day.

Planning Area 2 connects to the City of Neenah 21" interceptor sewer on Breezewood Lane approximately a mile from the Drainage Area 1 collection system. A 20 gpm lift station pumps from Drainage Area 30 to Drainage Area 1. A 115 gpm lift station pumps from Drainage Area 40 to Drainage Area 1. The build-out maximum day flow to the 21" interceptor sewer is estimated to be 942,000 gallons per day.

Refer to Figure 3-3 for the locations of lift stations and proposed sanitary sewers connecting the Town of Menasha and the City of Neenah interceptor sewers.

4.4.2 Expansion of Existing Wastewater Treatment Facility (Larsen-Winchester)

The wastewater from the planning areas to the location of the Larsen-Winchester Sanitary District wastewater treatment plant would be transported by 23,000 feet of 18" gravity interceptor sewer from Planning Area 1A Drainage Area 70. Wastewater from Planning Area 1 would be pumped to Planning Area 1A with all wastewater from Planning Areas 1 and 1A being received by the 18" interceptor sewer at one location (MH 70). Lift stations would transport the wastewater to Drainage Area 70. Planning Area 1 Drainage Areas 1 and 10 would be connected with 400 feet of 10" sanitary sewer and then pumped to Drainage Area 50 at a 555 gpm lift station. Planning Area 1 Drainage Area 20 would pump to Drainage Area 70 at a 410 gpm lift station. Planning Area 1A Drainage Area 50 would pump to Drainage Area 70 at an 975 gpm lift station. The build-out maximum day flow to the 18" interceptor sewer is estimated to be 2,671,000 gallons per day.

Planning Area 2 would pump from Drainage Area 40 to the 18" interceptor sewer connecting on CTH II. A 520 gpm lift station pumps from Drainage Area 1 to Drainage Area 40. A 20 gpm lift station pumps from Drainage Area 30 to Drainage Area 40. A 655 gpm lift station pumps from Drainage Area 40 to the 18" interceptor sewer. This requires approximately 14,000 feet of force main. The build-out maximum day flow to the 18" interceptor sewer is estimated to be 942,000 gallons per day.

The combined build-out maximum day flow from Planning Areas 1, 1A and 2 to the 18" interceptor sewer is estimated to be 3,613,000 gallons per day. Refer to Figure 3-2 for the locations of lift stations and the 18" interceptor sewer to the Larsen-Winchester Wastewater Treatment Plant location. The Larsen-Winchester Sanitary District will need to be contacted to determine what will be required to accept the wastewater from the planning areas and then work an agreement for acceptance of the wastewater and wastewater treatment.

4.5 Estimate of Probable Project Costs

The Appendix includes detailed estimates of probable project costs for the costs states below. The project estimates are preliminary budget estimates for construction, technical, administrative and contingency costs. The cost estimates are based on best engineering judgement with limited design information. Economic conditions in the construction industry causes price fluctuations in materials and labor. The time when final design documents and actual construction takes place will have an impact on the project cost estimates.

The costs to the Town of Clayton for regionalization of wastewater treatment are dependent on negotiations with the neighboring communities to buy into the existing interceptor sewers and the existing wastewater treatment plants. Therefore, these costs are unknown at this time.

The expansion of the wastewater treatment plant at the Larsen-Winchester Wastewater Treatment site to treat the Town of Clayton designated planning areas presented four different scenarios for wastewater flows. The cost estimates for each of the scenarios is presented in Table 4-6. The estimates were based on information on the cost of wastewater treatment plants of similar size and type and do not include a detailed cost breakdown.

Table 4-6
Larsen-Winchester Wastewater Treatment Plant Project Cost Estimates

DESCRIPTION	ESTIMATED PROJECT COST
3.6 MGD WWTP FOR TOTAL BUILD-OUT ALL PLANNING AREAS	$10,000,000
2.33 MGD WWTP FOR TOTAL BUILD-OUT OF PLANNING AREAS 1 AND 2	$9,000,000
1.4 MGD WWTP FOR TOTAL BUILD-OUT OF PLANNING AREA 1	$8,000,000
0.367 MGD WWTP FOR YEAR 2040 PLANNING AREAS 1 AND 2	$4,800,000

The costs for the recirculating textile filter wastewater treatment pods were based on the year 2025 estimates flows from each drainage area. Table 4-7 shows a summary of the total estimated costs for each pod in each drainage area.

Table 4-7
Summary of Estimated Year 2025 Wastewater Treatment Pods Project Cost

LOCATION	ESTIMATED PROJECT COST
PLANNING AREA 1, DRAINAGE AREA 1	$515,000
PLANNING AREA 1, DRAINAGE AREA 10	$1,038,000
PLANNING AREA 1, DRAINAGE AREA 20	$1,930,000
PLANNING AREA 2, DRAINAGE AREA 1	$2,792,000
PLANNING AREA 2, DRAINAGE AREAS 30 AND 40	$921,000
TOTAL ALL WASTEWATER TREATMENT PODS	$7,196,000

5 WATER SUPPLY, STORAGE AND DISTRIBUTION ANALYSIS

5.1 Water Demand

Many factors affect the use of water in a community. Some of the variables or factors responsible for fluctuations in water use include: climate, composition of the community, water pressure, cost of water, metering of water use and water quality. The water usage, due to these factors can vary considerably from year to year, day to day, and community to community. Temperature and rainfall affect water use because of the demands for lawn sprinkling, gardening, bathing, air conditioning and/or running water to prevent freezing of water lines.

Residential, commercial and industrial development within a community affects the volume of water use per capita. Large areas of industry or commercial establishments usually use larger volumes of water than residential developments.

The volume of water both used by customers and lost throughout the system is affected by water pressure. Communities with low water pressure throughout the system typically tend to have lower water use, due to the reduction in volume of water flow over time. However, high water pressure may require more maintenance to prevent an increase in system and plumbing fixture leakage. Higher pressures also increase the volume of water that will flow through plumbing fixtures per unit of time.

The volume of water used by customers who have lower water rates is typically higher. However, if the quality of water is not high it is very unusual for customers to use large volumes. Communities supplying high quality water will find it much easier to justify water rates.

Customers with metered services typically use less water than those on a flat rate. Metered customers can set larger benefits in water conservation as their bill can be lowered. Flat rates pass the risk on to the supplier.

Consumers with higher quality water tend to use more water than where water may be objectionable. If water has an objectionable “taste”or has high chemical and mineral content such as iron, manganese or hardness the consumer tendency is to use less water, or provide some type of individual treatment. Since the Town of Clayton does not have a water system to provide water use data, estimates of water use will be based on data representing typical water use information.

The total demand for water is usually separated into the following distinct components: residential, commercial, industrial, public and maintenance. In addition to these components, water available for fire protection must be considered. For this study water use will be estimated for residential, commercial, industrial for process and water for fire protection. Residential and employees for business areas are considered domestic water users. The known additional water use from industry is estimated separately. The estimated water demand is for the total build-out of the planning areas using the proposed future land use plan.

5.1.1 Domestic Water Demand

Projections of water use for domestic purposes are usually based on water use per capita (person). The planning areas for the Town of Clayton primarily show land uses for residential and business (commercial and industrial). Water use was estimated based on domestic uses in residential and commercial areas. An estimate of employees per acre was used for the business areas. Employee water use is basically domestic with generally less water per employee used than that in residential areas.

The USDA Rural Development uses an average of 50 gallons per capita per day for estimating water use. U.S. Geological Survey Circular 1081, Estimated Use of Water in the United States in 1990, provides an estimated water use for Wisconsin of 52 gallons per capita per day. To be consistent with the estimated flows for wastewater, for the purposes of this evaluation an average of 70 gallons per capita per day will be used for residential water use and 30 gallons per employee per day will be used for business employee water use. Clayton Elementary School is located at the intersection of Fairview Road and STH 76. Typical water use rates range from 11 to 16 gallons per person per day for schools. For the purpose of this study an average of 13 gallons per person per day was used for the Clayton Elementary School water use.

Water use changes with the seasons, the days of the week, and the hours of the day. Fluctuations are greater in small than in large communities and during short rather than during long periods of time. Variations in water consumption are usually expressed as ratios called peaking coefficients to the average day demand. Common peaking coefficients for peak day water use range between 1.8 to 2.8:1 and for peak hour water use range between 2.5 to 4.0:1. Since there is no information to determine peak day water use and peak hour water use, an average of 2.3 times average daily demand will be used to determine the peak day water use and an average of 3.2 times the average day water use to determine the peak hour water use will be used for this study.

Average day water demand is generally used to determine the minimum amount of water storage that should be provided. Peak day water demand is used to determine the required water supply. Peak hour water demand is used to determine the amount of water storage required for operation fluctuations. Table 5-1 provides build-out average domestic water demand estimates. Table 5-2 provides domestic peak water use information for build-out conditions. For comparison, Tables 5-3 and 5-4 provide the year 2040 domestic demand estimates.

Table 5-1
Build-Out Average Domestic Water Demand Estimates

Planning Area	Resid. Pop.	Comm./ Industrial Employees	Clayton Elem. Students	Average Resid. Water Use (70 gpcd) (gpd)	Average Comm./ Industrial (30 gpcd) (gpd)	Clayton Elem. (13 gpsd) (gpd)	Total Average Day Water Demand
1	1,761	13,909	280	123,000	417,000	3,600	544,000
1A	6009	2202		421,000	66,000		487,000
2	4,608	996		323,000	30,000		353,000
Total	**12,378**	**17,107**	**280**	**867,000**	**513,000**	**3,600**	**1,384,000**

Table 5-2
Build-Out Domestic Peak Water Demand Estimates

Planning Area	Average Day Water Demand *(gpd)*	Peak Day Water Demand *(gpd)*	Peak Hour Water Demand *(gpm)*
1	544,000	1,252,000	1,200
1A	487,000	1,119,000	1,100
2	353,000	811,000	800
Total	**1,384,000**	**3,182,000**	**3,100**

Table 5-3
Year 2040 Average Domestic Water Demand Estimates

Planning Area	Resid. Pop.	Comm./ Industrial Employees	Clayton Elem. School Students	Average Resid. Water Use *(70 gpcd) (gpd)*	Average Comm./ Industrial *(30 gpcd) (gpd)*	Clayton Elem. *(13 gpsd) (gpd)*	Total Average Day Water Demand
1	227	1327	280	16,000	40,000	3,600	60,000
1A	NA						
2	512	646		36,000	19,000		55,000
Total	**739**	**1973**	**280**	**52,000**	**59,000**	**3,600**	**115,000**

Table 5-4
Year 2040 Domestic Peak Water Demand Estimates

PLANNING AREA	AVERAGE DAY WATER DEMAND *(GPD)*	PEAK DAY WATER DEMAND *(GPD)*	PEAK HOUR WATER DEMAND *(GPM)*
1	60,000	136,000	130
1A			
2	55,000	127,000	150
TOTAL	**115,000**	**263,000**	**280**

5.1.2 Industrial Water Demand

There are two known industries that exist within the planning areas that use water for other than domestic water uses. Kimberly-Clark is located in Planning Area 1 and JJ Keller is located in Planning Area 2. Both industries were contacted to obtain an estimate of water use. Kimberly-Clark has two wells that serve the PX Experimental Facility located on the end of Martin Drive off County Trunk Highway II. Based on the volume of wastewater pumped from two – 12,000 gallon holding tanks it is estimated that an average day water use of 8,000 gpd was used for other than domestic water.

JJ Keller is a printing company located at the intersection of State Trunk Highway 76 and Breezewood Lane. Water used for other that domestic uses includes process water and water used for irrigating lawns. Based on the volume of water pumped from their wells an average day water use of 12,000 gpd was used for other than domestic purposes.

Sufficient information was not available for the two industries to determine the peaking coefficients for either industry. Since there is no information to determine peak day water use and peak hour water use, the high end of the common peaking coefficients was used. An average of 2.8 times average daily demand was used to determine the peak day water use and an average of 4.0 times the average day water use to determine the peak hour water use was used for this study. Table 5-5 provides water demand estimates for the two industries showing the planning area locations of the industry.

Table 5-5
Industrial Water Demand Estimates – Kimberly Clark and JJ Keller

PLANNING AREA	AVERAGE DAY WATER DEMAND *(GPD)*	PEAK DAY WATER DEMAND *(GPD)*	PEAK HOUR WATER DEMAND *(GPM)*
1	8,000	22,000	20
1A			
2	12,000	35,000	35
TOTAL	**20,000**	**57,000**	**55**

5.1.3 *Total Domestic and Industrial Water Demand*

Design of water facilities requires both the domestic and the industrial flows. Table 5-6 provides the build-out total water demand estimates that will be used for facility design. For comparison, Table 5-7 provides combined year 2040 domestic and industrial water demand estimates.

Table 5-6
Build-Out Total Domestic and Industrial Water Demand Estimates

PLANNING AREA	AVERAGE DAY WATER DEMAND *(GPD)*	PEAK DAY WATER DEMAND *(GPD)*	PEAK HOUR WATER DEMAND *(GPM)*
1	552,000	1,274,000	1,220
1A	487,000	1,119,000	1,100
2	365,000	846,000	835
TOTAL	**1,404,000**	**3,239,000**	**3,155**

Table 5-7
Year 2040 Domestic and Industrial Water Demand Estimates

PLANNING AREA	AVERAGE DAY WATER DEMAND *(GPD)*	PEAK DAY WATER DEMAND *(GPD)*	PEAK HOUR WATER DEMAND *(GPM)*
1	68,000	158,000	150
1A			
2	67,000	162,000	185
TOTAL	**135,000**	**320,000**	**335**

5.1.4 *Fire Protection Demand*

Although the amount of water used in a typical year for extinguishing fires is usually a negligible part of total water used, the rate and volume of water used during a fire can be so great that it becomes the deciding factor in engineering the capacities of water storage, water supply and water distribution.

The Insurance Services Office (ISO) or Commercial Risk Service rates water systems for the purpose of insurance. The three items of fire protection are rated by ISO: Alarm Reaction System, 10%; Fire Department, 50%; and Water Supply, 40%. Although the fire department has the largest portion of the scoring system at 60 points (alarm reaction plus fire department), the water supply portion accounts for a total of 40 points in the rating system. Of these 40 points used in rating a water supply, 35 points is for the performance of the water supply and 5 points is for hydrant condition and maintenance. It is recommended fire hydrants should be operated and maintained in accordance with American Water Works Association Manual of Water Supply Practices No. M17.

The Insurance Services Office (ISO) or Commercial Risk Services also determines recommended fire flows in a given area of the community. The fire flow as defined by ISO is the estimated rate of flow needed, for firefighting purposes, to confine a major fire to the buildings within a block or other group complex. The determination of this fire flow depends upon the size, construction, occupancy, and exposure of buildings within and surrounding the block or group complex. The ISO also identifies a "basic fire flow" for use in areas not included in the specific area identified. This flow is indicative of the quantity of water needed for handling fires throughout the community. A municipality is not required to provide this basic rating within or throughout the water system. Lower fire flow availability will result in higher insurance rates for industrial and commercial developments. Therefore, a municipality must weigh the capital costs of fire protection with the insurance rates paid for by the water customers.

The Wisconsin Department of Natural Resources (WDNR) per NR 811.63.3 requires water distribution mains serving fire hydrants be designed to convey a minimum of 500 gpm at a pressure of 20 psi for firefighting capabilities.

Generally, a water system is designed to provide fire flows somewhere between the minimum of 500 gpm to 3,000 gpm in communities the size of the Town of Clayton. These fire flows are provided over a designated period of time at a minimum of 20 psi. A fire flow that requires a large amount of water storage that cannot be readily "turned over" through water use could result in a problem with stagnant water and, therefore, the volume of domestic water use compared to fire flow volumes should be considered when selecting the desired fire flow. Since the majority of the proposed land use in the planning areas is for commercial and industrial use a higher fire flow should be considered.

Typical fire flows for residential uses is usually between 1,500 gpm and 2,000 gpm for a 2-hour duration. A fire flow of 3,000 gpm for a 3-hour duration is a typical fire flow for large commercial and industrial areas. For the purpose of this evaluation the goal will be to provide 2,000 gpm fire flows in areas proposed for residential uses and 3,000 gpm in areas proposed for commercial and industrial areas. These fire flows are typical for buildings constructed today with sprinkler systems (approximately 800 gpm), and allows for a fire department pumper truck (approximately 1200 gpm) to connect to the hydrants.

5.2 Water Supply

The sources of water for water supply typically come from surface water or groundwater. Surface water sources are normally rivers, lakes, or impoundments, such as manmade reservoirs. Groundwater sources are normally described as coming from glacial deposits or rock formations.

Surface water sources are usually easily obtainable, if available, but tend to require a high degree of treatment to remove the solid matter, objectionable taste, odor, and color which are commonly found in river and lake water. Surface water quality also can vary throughout the year and thus make supplying a consistently quality product more difficult than typical groundwater.

Groundwater is usually clear and free of organic matter due to the filtration effect on water moving through soil, sand, gravel or rock. Its quality, temperature and mineral content are normally constant throughout the year, as well as, over long periods. Water from deep wells (rock wells) is usually clearer, is more consistent in mineral content, and is usually less susceptible to contamination than shallow wells (glacial deposits). Water from deep wells in a given area is generally similar in quality, but is frequently higher in mineral content than shallow wells. Groundwater from deep wells can have high levels of inorganic chemicals and radionuclides.

The primary goal of a municipal water supply system is to furnish water safe for human consumption. A secondary objective is to provide water that is appealing and acceptable to the consumer. The United States Environmental Protection Agency (USEPA) has developed primary drinking water standards and secondary drinking water standards. Primary standards are established and set based on dangers to health. If primary standards are exceeded, the water supplier must either provide additional treatment or an alternative water supply source to protect the health of the consumers. Secondary standards are established for aesthetic purposes.

The primary standards include Maximum Contaminant Limits (MCL's) for inorganic and organic chemicals, turbidity, coliform bacteria and radionuclides. These standards are to be met at the entry point to the system, and at the customer's tap. Therefore, water must be supplied in a form that does not incur contamination from the distribution system.

While primary regulations apply to trace elements, compounds and micro-organisms affecting the health of consumers, secondary regulations deal with the aesthetic qualities of drinking water. The contaminants included in these secondary standards do not have a direct impact on the health of consumers.

5.2.1 Basis for Analysis

The water supply of a municipal water system is evaluated for the quantity and quality of water that can be delivered.

The quality of the water supplied to the customers is evaluated for its conformance with the Safe Drinking Water Standards established by the USEPA. The water supplied is to be below the maximum contaminant levels (MCL) to insure safe consumption. The Primary and Secondary Drinking Water Standards are shown in Appendix A.

In determining the adequacy of water supply facilities, the source of supply must be large enough to meet various water demand conditions, and be able to meet at least a portion of normal demand during emergencies such a power outages and disasters. At a minimum, the source of supply should be capable of meeting the peak day system demand. It is common to provide a source of supply that meets the peak day demand, with the additional supply to meet peak hour demand coming from storage. Good engineering practice dictates that the water supply should be capable of delivering water under peak demand conditions with the single largest water supply source out of service. If the system was designed to provide the entire capacity of the supply to meet peak day demand, any portion of the supply that is placed out of service due to malfunction or maintenance will result in a deficient supply. For example, a community that relies primarily on groundwater for its supply should, at a minimum, be able to meet its peak day demand with at least one of its largest wells out of service. The total water supply available with the largest single source of water out of service is referred to as "firm supply." This is performed to simulate the instance that the largest source of water supply is not available during a peak demand condition. The largest source of water supply could be out of service due to pump repair or other malfunctions. It is also desirable to be capable of supplying the average daily demand rate within an eight hour pumping period and the maximum daily demand within an 18-hour pumping period.

5.2.2 Water Supply Alternatives and Evaluation

The water supply should provide at a minimum two sources of water, each capable of supplying the peak day demand for total planning area build-out of 3,239,000 gpd.

The Town of Clayton is relatively close to Lake Winnebago as a source of surface water supply. The City of Neenah obtains its water supply primarily from Lake Winnebago and provides water treatment. Currently the City of Neenah provides water supply to the City and the Town of Neenah and has excess capacity. The City of Neenah may be a source of water supply. In order for the Town of Clayton to use Lake Winnebago as a source of water on its own, it would be necessary to pump the water 4 to 5 miles to a water treatment plant. Discussions with the City of Neenah Water Utility indicate that a 16” water main is available for possible extension to the Town of Clayton located on CTH JJ near Pendleton Road. Extending the water main on CTH JJ to the Town of Clayton would provide water service to Planning Area 2. The City of Neenah Water Utility Distribution System Map shows a 12” water main across USH 41 on Main Street and on Rock Ledge Lane which may be connected and extended along Oakridge Road to Larsen Road in the Town of Clayton to provide water service to Planning Areas 1 and 1A. Further discussions with the Neenah Water Utility are recommended to determine agreement to obtain water supply to the Town of Clayton.

The Town of Greenville Sanitary District located north of the Town of Clayton provides water supply from three ground water wells: One well is 500 feet deep with a pumping capacity of 300 gpm, one well is 120 feet deep with a pumping capacity of 800 gpm and the third well is 700 feet deep with a pumping capacity of 1000 gpm. The Town of Menasha abuts the Town of Clayton from CTH II north. The Town of Menasha Water Utility West uses four water supply wells with the following depths and pumping capacity: 415 feet with pumping capacity of 980 gpm, 471 feet with a pumping capacity of 1000 gpm, 496 feet with a pumping capacity of 1225 gpm, and 584 feet with a pumping capacity of 1200 gpm. This information provides a good indication of the potential well flow rates for the Town of Clayton.

To maintain the viability of groundwater supply wells it is recommended that average day water demand be provided in an 8-hour pump time and peak day demand in an 18-hour pump time. This allows the well time to recharge and does not lead to over-pumping extending the life of the well. To provide the average day demand in 8 hours and the peak day water demand in less than 18 hours, the groundwater supply sources need to provide a combined flow rate of 3,000 gpm for total build-out. Based on information obtained from the Wisconsin Geological and Natural History Survey shown in Figure 5-1, wells located generally east of the ridge line in the Town of Clayton should provide a yield of between 500 and 1000 gpm if located in the sandstone aquifer. It is recommended that four wells be provided at approximately 1,000 gpm each, if possible, to provide a “firm” water supply for the planning areas build-out. If the aquifer cannot produce that flow rate from each well, then provide five wells at approximately 750 gpm which may be more appropriate for build-out conditions. The location of these wells will need to meet separation requirements of the WDNR.

The build-out peak water demand for Planning Area 1 and 1A is 2,200 gpm and the build-out peak water demand for Planning Area 2 is 800 gpm. Planning Areas 1 and 1A are separated approximately two miles from Planning Area 2. Whether the two areas are connected or not connected, it is recommended that three wells be constructed in Planning Area 1 at approximately 1,100 gpm each to serve Planning Areas 1 and 1A. In Planning Area 2 it is recommended that two wells at approximately 800 gpm each be constructed. This will provide a “firm supply” in each planning area.

If the City of Neenah can supply water to the Town of Clayton, then it is recommended a total of 3,000 gpm be supplied for build-out. It is anticipated that booster pumps will be required to obtain water supply from the City of Neenah. It is estimated 2,200 gpm for Planning Area 1 and 1A and 800 gpm for Planning Area 2.

The year 2040 demand requirements for peak day demand was estimated at 320,000 gpd. Using the same methodology as previously stated, groundwater supply sources need to provide a firm supply of 300 gpm. To meet this requirement it is recommended two wells be provided at approximately 300 gpm each.

Data from the WDNR shows approximately 35 percent of the 301 private wells sampled within the Town of Clayton exceed the maximum contaminate limits for arsenic. The Town of Clayton is located in the Wisconsin DNR Arsenic Advisory Area which requires special well casing pipe depth and special well drilling methods. Depending on the actual locations for the proposed wells, the minimum well casing and cement grout depth ranges from 230 feet to 310 feet within the Town of Clayton east of STH 76. Figure 5-2 shows the WDNR Minimum Well Casing & Cement Grout Depth for Wells within Arsenic Advisory Area by quarter section for the Town of Clayton. With proper well design and drilling methods, arsenic contamination should be minimized. Well construction has a direct bearing on arsenic levels of the water drawn from the well. The well construction recommendations by WDNR have been developed to minimize arsenic concentrations by reducing the introduction of oxygen and isolating the primary arsenic bearing zones. These recommendations have been very successful in most situations at reducing arsenic concentrations to acceptable levels. How long this will last is dependent on water usage and local geology.

5.3 Water Distribution Pipe Sizing and Routing

After a water supply is obtained and treated, the distribution system delivers the water to the ultimate users or to storage. To be adequate, a distribution system must be capable of furnishing an ample supply of water, with satisfactory quality, to all customers throughout the water system. The system must maintain adequate pressures for normal use and the high flows required for fire protection. The distribution system may include booster pump(s), pipelines, control valves, hydrants, service connections, valves and meters.

5.3.1 Basis for Analysis

The pipes of a distribution system are sized utilizing hydraulic criteria such as the length of pipe, friction loss, elevation, restrictions, rates of flow, and location. The most important criteria is configuration, the pipes should be arranged in a gridiron or looped pattern. This gridiron pattern allows water to reach a location in the system through more than one path. A grid system also allows maintenance and repair of sections of the distribution piping without totally cutting off the water supply to large areas; thus, a water main break can be isolated and repaired while service is supplied by another leg(s) of the gridiron system. In actual practice, however, there are economical and logical reasons to have some "dead end" pipes in the system. The "dead end" pipes are usually located where water service is required for only a few users or where a future extension is contemplated for completion of the grid.

According to Wisconsin Administrative Code Chapter NR 811 and the Wisconsin Department of Natural Resources the water distribution system should be sized and configured as follows:

- Deliver water under normal flow conditions at pressures ranging from 35 to 100 psi.
- Deliver desired fire flows (minimum 500 gpm) at a minimum pressure of 20 psi.
- Provide isolation valves located not more than 500-foot intervals in commercial districts and not more than one block or 800-foot intervals in other districts.
- Provide hydrants from 350 to 600 feet depending on the type of area being served and the individual fire hose length and fire-fighting practices utilized.

Good engineering practices also come into effect when planning and constructing distribution piping: The velocity in the water mains should not exceed five (5) feet per second under design conditions to reduce head losses and potential pressure surges. Consideration should also be given to the amount of friction loss in the pipes to minimize operation costs for the pumps and motors. Minimum flow velocity of two (2) feet per second should be maintained help keep the pipelines clean.

Valves should be adequately located and maintained throughout the distribution system to enable a section or sections of the piping to be shut off for maintenance, repair, or construction of an extension to the system with minimal service interruptions to users.

Hydrants should be strategically located to assure a reliable flow of water for firefighting purposes. The hydrant locations should be such that firefighting equipment can be attached and used with efficient fire hose layout and minimum amount of pressure loss through the hoses. In addition to the above flow maximizing characteristics, the following should also be considered:

- Hydrants along busy roadways, in industrial and commercial areas should be installed with valves on the hydrant lead so that hydrant failure or damage will not interrupt customers during repair and maintenance.

- Hydrants should be within 200 feet of the potential fire source to maximize available fire flow from the hydrant and minimize the time required to layout hoses in the event of a fire.

- Hydrants should be standardized for universal connections and ease of maintenance.

5.3.2 Recommended Water Distribution Pipe Sizes and Routes

The proposed water main was located along existing and proposed roads based on the future land use map. The only exception is in Planning Areas 1 and 1A where some of the north-south roads are two miles apart. In these locations water main is placed over land to provide greater flexibility in multiple water lines feeding specific areas. Water main was sized to provide 2000 gpm fire flows to residential areas and 3000 gpm fire flow to commercial/industrial areas. Figures 5-3 and 5-4 show the water distribution system layout for the Planning Areas. A connection between Planning Area 1 and Planning Area 2 is not shown at this time due to the distance between the two areas. Planning Areas 1 and 2 can operate independently or connected with a 16” pipe where Planning Area 1 would feed water to Planning Area 2. A pressure reducing station would be required to create two pressure zones. The connection is dependent on whether two elevated tanks are constructed or just one tank in Planning Area 1.

5.4 Water Storage

The principal functions of a water storage facility are to:

- Store the water required to meet variations in normal operating demand.
- Provide reserves for fire protection or failures in pumping facilities
- Stabilize system flows and pressures.
- Reduce the demands and capacity on the water supply facilities.

Water storage facilities may be of several different types or styles. Generally, storage facilities are constructed of steel or standard reinforced concrete. Local topography typically determines the style of reservoir to be constructed. In hilly areas reservoirs may be located at ground level as long as they are located high enough above the service area. In areas that are relatively flat, elevated water storage is usually constructed. Standpipe construction may also be utilized in place of elevated water storage. However, standpipes utilize large volumes of unusable water to support the useable water instead of legs.

In some areas where topography does not permit the economical location of storage at the desired hydraulic elevation, ground storage tanks and pumping may be the most logical means of providing adequate storage. The economy and desirability of pumped storage as compared to elevated storage must be determined in each individual area. If substantial storage capacity is necessary, a combination of ground and elevated storage may be the most economical solution.

5.4.1 Basis for Analysis

The amount of water storage required is determined in part by customer demands, fire flow requirements, and the capacities of the water supply system. Fire flow conditions require a large amount of water in a short period of time. Thus, it is typically more economical to store most of the water requirements for fire flow conditions rather than design the water supply system to handle these large flow rates.

Storage is typically provided for what is termed as "peaking" or large demands for short periods of time. Storage is needed because the constant speed water supply pumps on wells or ground reservoirs generally operate below the peak hour demand rates. Thus, water is stored so it can be used to supply water when the demand rate exceeds the pumping rate and to allow the pumps to turn off and "rest".

Standard water system engineering and Wisconsin Administrative Code chapter NR 811 requirement is to provide a minimum of the average daily water demand in elevated storage at an elevation to provide the users with water pressures that range from 35 to 100 psi of pressure at ground level.

Table 5-8 provides an evaluation of the volume of storage required under peak demand conditions for total build-out.

Table 5-8
Build-Out Water Storage Requirements

FIRE DEMAND (GPM)	2000	3000
FIRE DURATION	2 hours (120 min.)	3 hours (120 min.)
VOL. OF WATER REQD. FOR FIRE (GALLONS)	240,000	540,000
VOLUME OF WATER FOR PEAK HOUR DEMAND (GALLONS)	379,000	568,000
AVAILABLE "FIRM SUPPLY" (GALLONS)	-360,000	-540,000
NET STORAGE REQUIRED (GALLONS)	259,000	569,000

Table 5-8 indicates that 569,000 gallons of water storage is needed to provide the peak hour demand and fire demand. This volume of water storage is less than the planning areas build-out average day demand of 1,404,000 gallons. It is recommended that the average day demand be provided as a minimum for build-out conditions.

Table 5-9 provides an evaluation of the volume of storage required during peak demand condition for the year 2040.

Table 5-9
Year 2040 Water Storage Requirements

FIRE DEMAND (GPM)	2000	3000
FIRE DURATION	2 hours (120 min.)	3 hours (120 min.)
VOL. OF WATER REQD. FOR FIRE (GALLONS)	240,000	540,000
VOLUME OF WATER FOR PEAK HOUR DEMAND (GALLONS)	40,000	60,000
AVAILABLE "FIRM SUPPLY" (GALLONS)	-36,000	-54,000
NET STORAGE REQUIRED (GALLONS)	244,000	554,000

The average day demand for year 2040 is 135,000 gallons. Therefore, the water storage is governed by fire demand of 554,000 gallons as shown in Table 5-9.

The recommended standard size water storage volume to meet build-out average day demand with one tank is a 1,500,000 gallon elevated water storage tank with a high water level (HWL) of elevation = 1024 feet (USGS). This tank would be located in Planning Area 1 or 1A. An elevated water storage tank at this elevation will provide water to potential customers at pressures ranging from 45 to 90 psi.

Depending on the ultimate determination of water source (wells or City of Neenah) it may be desirable to construct two tanks to meet the build-out average day demand for water storage. The average day water demand in Planning Area 2 is estimated at 365,000 gpd. A standard size water volume of 500,000 gallon elevated water storage tank could be constructed in Planning Area 2 and a 1,000,000 gallon elevated water storage tank could be constructed to serve Planning Areas 1 and 1A for ultimate build-out. A connection to the City of Neenah water system with an elevated water storage tank may be beneficial to the City of Neenah as well. The Town of Clayton would benefit with such an arrangement because year 2040 water use is much lower than build-out water use. Water use would not turn over the water in the tank necessary to maintain fresh water and prevent water freezing in the tank during winter conditions.

Given the general "grid" layout of the water system it would be the most beneficial to locate elevated water storage tank toward the central portion of the water system. Particular attention should be paid to the elevation of the property along with the existing and future land use of the immediate area around the site. The higher elevation of the site will affect the amount of materials needed to construct a facility, but this needs to be balanced with the piping layout needed to effectively supply water throughout the water system. The land use in the immediate vicinity of an elevated storage tank will have an impact on the cost to construct the facility, as well as, the future maintenance. For the purpose of this study and the system modeling, the elevated water storage tank for Planning Areas 1 and 1A was located on Town property along CTH II west of STH 76. The ground elevation at this location is approximately 900 feet above sea level (USGS) and the high water elevation is 1024 feet above sea level (USGS). An elevated water storage tank for Planning Area 2 was located on the highest ground elevation in Planning Area 2 of 860 feet above sea level (USGS) located north of Breezewood Lane approximately 1600 feet west of STH 76. The high water elevation for this tank is 974 feet above sea level (USGS).

The year 2040 water storage requirements to provide fire flow of 3000 gpm for 3 hours is 554,000 gallons. The standard size tank that would provide that capacity is 750,000 gallons. The standard tank size that would closely meet the fire flow is 500,000 gallons. With this size tank a fire flow of 2,750 gpm for 3 hours could be provided. The average day water demand of 135,000 gallons per day would turn over the water in the tank in 3.7 days. The tank size and the use of tank mixing facilities would be determined in design to maintain fresh water and prevent freezing in winter conditions.

5.5 Water Treatment Evaluation – Arsenic

The Town of Clayton is within the WDNR Arsenic Advisory Area for well water. Arsenic in the area is from natural deposits in the geologic formations. To reduce the potential for arsenic in well water the WDNR has established minimum casing depths and grouting within the Town of Clayton for drilled wells. If arsenic is found in well water, water treatment will need to be provided to reduce the arsenic levels to below the drinking water regulations maximum contaminate level of 0.01 mg/l.

5.5.1 Basis for Analysis

As previously stated, the Town of Clayton is located within the WDNR Arsenic Advisory Area which requires special well construction methods to reduce the potential of exceeding maximum contaminate levels in the water supply. The National Primary Drinking Water Regulations maximum contaminate level for arsenic is 0.010 mg/l (10 ppb). Figure 5-5 WDNR Map of Public Wells with Arsenic Detects Greater Than or Equal to 10 ppb and Figure 5-6 WDNR Map of Private Drinking Water Wells with Arsenic Detects Greater Than 10 ppb show concentrations of arsenic contaminated water from wells in the area of the Town of Clayton.

The first step to determining treatment alternatives is to test the raw water for key parameters. Some of these parameters may contain interfering ions which compete with arsenic and some can plug media and/or cause aesthetic problems (e.g., iron and manganese). The may be other contaminates desirable for removal e.g., nitrate, total dissolved solids and iron. Before evaluating treatment processes consideration should be given to non-treatment options such as drilling a new well or blending of well water to reduce arsenic to acceptable levels.

Arsenic is found in water in two oxidation states – arsenite (trivalent as III) and arsenate (pentavalent as V). Arsenite is difficult to remove and arsenate is easier to remove. Oxidation is the first step toward removal of arsenic. The use of chlorine, potassium permanganate and ozone are used in the oxidation process. All three processes have pros and cons. Chlorine is generally the most practical. Treatment technologies generally considered for arsenic removal include sorption processes, membrane processes and precipitation/filtration processes.

5.5.2 Water Treatment Alternatives and Evaluation

Of the three treatment technologies generally considered for arsenic removal, sorption processes are likely the treatment choice of most small water systems. Three sorption processes are generally available for arsenic removal: ion exchange, activated alumina, and iron based sorbents. The sorption process ion exchange is generally simple, affordable, to some extent, flexible and least operator intensive. Obviously, since raw water quality parameters are not known, general considerations will be discussed when considering anion exchange processes. Ion exchange is similar to a large water softener used in the home. Figure 5-7 shows a schematic of an ion exchange process. In this process not all the raw water is treated. A determination of the percent flow necessary to reduce arsenic to below the maximum contaminate level is determined with the treated water portion and the raw water portion combined after treatment. In most cases pre-filtration will be required to reduce exchange media fowling during the anion exchange process. Sodium hydroxide is injected to the treated water for pH adjustment.

<u>The advantages to the ion exchange process:</u>

- Operates on demand
- Relatively insensitive to flow variations, short contact time required.
- Relatively insensitive to trace-level contaminant concentration.
- Essentially zero level of effluent contaminant possible.
- Large variety of specific resins is available.
- Insensitive to pH
- Capable of removing other contaminates
- Resin can be regenerated
- 98+ percent water recovery

Disadvantages to the ion exchange process:

- Excess oxidant may degrade resin (>0.1 mg/l free chlorine
- Pre-filtration generally required
- High sulfate levels can be a problem with performance
- Finished water pH adjustment generally required
- Large volumes of brine requires disposal where small wastewater treatment plants may not be capable of treating and removing chlorides.

Although the ion exchange process is probably the most feasible for most applications, raw water testing will be required to determine actual treatment method most applicable to the water quality.

5.6 Estimate of Probable Project Costs

The Appendix includes detailed estimates of probable project costs for the costs states below. The project estimates are preliminary budget estimates for construction, technical, administrative and contingency costs. The cost estimates are based on best engineering judgement with limited design information. Economic conditions in the construction industry causes price fluctuations in materials and labor. The time when final design documents and actual construction takes place will have an impact on the project cost estimates.

5.6.1 Cost Estimates of Proposed Improvements

Two water supply options were proposed with one connected to the City of Neenah water system for supply to the Town of Clayton and the other supply provided by wells within the Town of Clayton. The option to connect to the City of Neenah water system requires two water main extensions from the City of Neenah water main to the Town of Clayton. Each water main extension will require water booster pumps to boost pressure to fill the water storage tanks. Appendix E shows detailed cost estimates. One water main extension connects on Main Street at USH 41 and extends to Clayton Avenue at CTH II to provide water supply for Planning Areas 1 and 1A. The estimated cost for this water main extension is $1,118,000.

The other water main extension connects on CTH JJ at Pendleton Road and extends along CTH JJ to Woodenshoe Road to provide water supply for Planning Area 2. The estimated cost for this water main extension is $323,000.

Each water main extension from the City of Neenah requires a water booster station at an estimated cost of $500,000 each.

The option to provide water supply wells recommended three wells constructed in Planning Area 1 and two wells constructed in Planning Area 2. The estimated cost for each well is $233,000. Each well will require a well house to house the well and discharge piping at an estimated cost of $450,000 each.

The water distribution system was estimated at $7,689,000 for Planning Area 1, $3,524,000 for Planning Area 1A, and $4,037,000 for Planning Area 2. Detailed cost estimates by sanitary sewer drainage areas are included in Appendix D.

It was recommended for build-out that a 1,000,000 gallon elevated water storage tank be constructed to serve Planning Areas 1 and 1A and a 500,000 gallon elevated water storage tank be constructed to serve Planning Area 2. The estimated cost for a 500,000 gallon elevated water storage tank is $1,277,000 and for a 1,000,000 gallon elevated water storage tank $2,087,000. The Appendix E contains a detailed cost estimate for water storage. If only one tank is constructed in Planning Areas 1 and 1A, then approximately 11,800 feet of 16" water main and a pressure reducing station would be required to connect to Planning Area 2. The connecting water main is estimated to cost $800,000 and the pressure reducing station is estimated to cost $150,000.

If water supply is provided by the use of wells and arsenic is found to be a problem, then water treatment may be needed. The estimated cost for a water treatment plant to remove arsenic is $1,905,000. This may be required at no wells, one well or all wells. It is anticipated that proper well design and construction would eliminate the need for arsenic removal treatment. If water supply is obtained from the City of Neenah, then no additional water treatment is expected.

6 RECOMMENDATIONS

6.1 Sanitary Sewer Collection System and Wastewater Treatment

The wastewater collection and treatment systems are dependent on the Town of Clayton's success in discussions with the entities that may accept the wastewater. One scenario is for the adjacent communities of the Town of Menasha and the City of Neenah to receive wastewater at existing interceptor sewers for treatment at existing regional wastewater treatment plants. This scenario is contingent on the entities' interceptor sewer capacity to receive the Town of Clayton's wastewater and the ability of the existing wastewater treatment plants to treat the wastewater.

Another scenario is for the Larsen-Winchester Sanitary District to receive the wastewater with the construction of an interceptor sewer to the existing Larsen-Winchester Wastewater Treatment Plant for treatment. The different size wastewater treatment plants reviewed show that in each case a new wastewater treatment plant would be required. The most feasible size wastewater treatment plant would be for the year 2040 which is for a 20-year projection of the growth for the Planning Areas 1 and 2.

The scenario to treat wastewater using the individual treatment pods likely would not require lift stations or interceptor sewers to get wastewater to the pods. Pods could be provided for all of the drainage areas or any one of the drainage areas within Planning Areas 1 and 2. The pods provide treatment for a 5-year growth projection to the year 2025.

With any of the scenarios the Town of Clayton will need to complete a facility planning study meeting WDNR requirements and establish the sewer service area working with East Central Wisconsin Regional Planning Commission.
The following Tables, 6-1-A through 6-1-F, summarize the costs for the sanitary sewer system alternatives and the wastewater treatment alternatives. There is not sufficient information to compare the alternatives on a total cost basis. If the Town of Menasha and the City of Neenah were to accept the Town of Clayton's wastewater, the cost to buy into the interceptor sewers and the wastewater treatment plant is unknown. The Larsen-Winchester wastewater treatment plant alternative provides the costs to construct a new wastewater treatment plant. The cost estimates for the wastewater treatment pods include only the year 2025 projected users in Planning Areas 1 and 2. Also, the Larsen-Winchester wastewater treatment plant for the year 2040 projected users is for Planning Areas 1 and 2. The other costs for wastewater treatment include total build-out of Planning Areas. In all cases the pipe sizes are designed for total build-out.

Table 6-1-A
Individual Wastewater Treatment PODS Planning Areas 1 & 2 – Year 2025 Projections

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Wastewater Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000						$515,000	$3,047,000
Drainage Area 10	$1,219,000						$1,038,000	$2,257,000
Drainage Area 20	$3,661,000						$1,930,000	$5,591,000
Total Planning Area 1	**$7,412,000**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**$3,483,000**	**$10,895,000**
Planning Area 2								
Drainage Area 1	$3,482,000						$2,792,000	$6,274,000
Drainage Area 30	$140,000	$106,000						$246,000
Drainage Area 40	$761,000						$921,000	$1,682,000
Total Planning Area 2	**$4,383,000**	**$106,000**	**N/A**	**N/A**	**N/A**	**N/A**	**$3,713,000**	**$8,202,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$106,000**	**N/A**	**N/A**	**N/A**	**N/A**	**$7,196,000**	**$19,097,000**

Table 6-1-B
Larsen-Winchester WWTP Planning Areas 1 & 2 – Year 2040 Projections

	SANITARY SEWER	LIFT STATIONS & FORCE MAIN	INCREASED SEWER SIZE FOR LIFT STATION DISCHARGE	SANITARY SEWER IN PLANNING AREA 1A	INTERCEPT OR SEWER	METERING & SAMPLING STATION	WASTE-WATER TREATMENT	TOTAL COSTS
PLANNING AREA 1								
DRAINAGE AREA 1	$2,532,000	$1,130,000		$797,000				$4,459,000
DRAINAGE AREA 10	$1,219,000							$1,219,000
DRAINAGE AREA 20	$3,661,000	$599,000		$383,000				$4,643,000
TOTAL PLANNING AREA 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**		**$12,657,000**
PLANNING AREA 2								
DRAINAGE AREA 1	$3,482,000	$719,000						$4,201,000
DRAINAGE AREA 30	$140,000	$599,000						$739,000
DRAINAGE AREA 40	$761,000	$998,000						$1,759,000
TOTAL PLANNING AREA 2	**$4,383,000**	**$2,316,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$6,699,000**
TOTAL PLANNING AREAS 1 & 2	**$11,795,000**	**$4,045,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$4,800,000**	**$24,156,000**

Table 6-1-C
Larsen-Winchester WWTP All Planning Areas Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$1,130,000		$797,000				$4,459,000
Drainage Area 10	$1,219,000	$0		$0				$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000				$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**N/A**	**N/A**		**$10,321,000**
Planning Area 2								
Drainage Area 1	$3,482,000	$719,000						$4,201,000
Drainage Area 30	$140,000	$106,000						$246,000
Drainage Area 40	$761,000	$998,000						$1,759,000
Total Planning Area 2	**$4,383,000**	**$1,823,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$6,206,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$3,552,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$10,000,000**	**$28,863,000**
Total Future Planning Area 1A	**$1,523,000**	**$0**	**N/A**	**N/A**	**N/A**	**N/A**		**$1,523,000**
Total Planning Areas 1, 2 & 1A	**$13,318,000**	**$3,552,000**	**N/A**	**N/A**	**$2,336,000**	**N/A**	**$10,000,000**	**$30,386,000**

Table 6-1-D
Larsen-Winchester WWTP Planning Areas 1 & 2 Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$1,130,000		$797,000				$4,459,000
Drainage Area 10	$1,219,000	$0		$0				$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000				$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**N/A**	**N/A**		**$10,321,000**
Planning Area 2								
Drainage Area 1	$3,482,000	$719,000						$4,201,000
Drainage Area 30	$140,000	$106,000						$246,000
Drainage Area 40	$761,000	$998,000						$1,759,000
Total Planning Area 2	**$4,383,000**	**$1,823,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$6,206,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$3,552,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$9,000,000**	**$27,863,000**

Table 6-1-E

Larsen-Winchester WWTP Planning Area 1 Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Intercepto r Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$1,130,000		$797,000				$4,459,000
Drainage Area 10	$1,219,000	$0		$0				$1,219,000
Drainage Area 20	$3,661,000	$599,000		$383,000				$4,643,000
Total Planning Area 1	**$7,412,000**	**$1,729,000**	**N/A**	**$1,180,000**	**$2,336,000**	**N/A**	**$8,100,000**	**$20,757,000**

Table 6-1-F
Regional WWTP By Others – All Planning Areas Total Build-Out

	Sanitary Sewer	Lift Stations & Force Main	Increased Sewer Size for Lift Station Discharge	Sanitary Sewer in Planning Area 1A	Interceptor Sewer	Metering & Sampling Station	Waste-water Treatment	Total Costs
Planning Area 1								
Drainage Area 1	$2,532,000	$185,000			$23,000	$300,000		$3,040,000
Drainage Area 10	$1,219,000	$0	$81,000		$26,000	$300,000		$1,626,000
Drainage Area 20	$3,661,000	$265,000			$0	$0		$3,926,000
Total Planning Area 1	**$7,412,000**	**$450,000**	**$81,000**	**N/A**	**$49,000**	**$600,000**		**$8,592,000**
Planning Area 2								
Drainage Area 1	$3,482,000							$3,482,000
Drainage Area 30	$140,000	$162,000						$302,000
Drainage Area 40	$761,000	$230,000						$991,000
Total Planning Area 2	**$4,383,000**	**$392,000**	**N/A**	**N/A**	**N/A**	**N/A**		**$4,775,000**
Total Planning Areas 1 & 2	**$11,795,000**	**$842,000**	**$81,000**	**N/A**	**$49,000**	**$600,000**	**Unkn.**	**$13,367,000**
Total Future Planning Area 1A	**$2,579,000**	**$928,000**						**$3,507,000**
Total Planning Areas 1, 2 & 1A	**$14,374,000**	**$1,770,000**	**$81,000**	**N/A**	**$49,000**	**$600,000**	**Unkn.**	**$16,874,000**

6.2 Municipal Water System

Preliminary discussions with the City of Neenah Water Utility indicate a willingness to supply water to the Town of Clayton. Further discussions between the Town of Clayton and the City of Neenah water utility need to determine the cost and feasibility of obtaining water from the Neenah Water Utility. The advantages of the Neenah Water Utility supplying water are that they could operate the system; their water supply is treated surface water reducing a concern for arsenic contamination; water storage in the Town of Clayton may be an advantage to Neenah Water Utility as well as the Town of Clayton.

Whether the Town of Clayton obtains water from the Neenah Water Utility or constructs their own water supply, the Public Service Commission will need to be contacted providing information as to the need for a water system in the Town of Clayton. The Public Service Commission would need to approve the formation of a municipal water utility before any further action can take place.

The following tables, 6-2-A through 6-2-D, summarize the costs for the water system alternatives. Water supplied by the Town includes wells, well houses, and water main extensions. Water Treatment is assumed to be needed for one well only. Water supply from the City of Neenah includes connecting water main and booster pump stations. The cost to purchase water from the City of Neenah is not included in the cost estimates and should be factored in when known. Water storage is based on one elevated water storage tank located in Planning Area 1 or 1A and connection water main with pressure reducing station to Planning Area 2.

Table 6-2-A
Total Build-Out with Water Supply Provided by Wells within Town of Clayton

	WATER SUPPLY	WATER TREATMENT	WATER DISTRIBUTION	CONNECTION OF PLANNING AREAS 1 & 2	WATER STORAGE	TOTAL COSTS
PLANNING AREA 1	$2,049,000	$1,905,000			$2,762,000	
DRAINAGE AREA 1			$2,576,000			
DRAINAGE AREA 10			$2,073,000			
DRAINAGE AREA 20			$3,040,000			
TOTAL PLANNING AREA 1	**$2,049,000**	**$1,905,000**	**$7,689,000**		**$2,762,000**	**$14,405,000**
PLANNING AREA 2	$1,366,000					
DRAINAGE AREA 1			$2,932,000			
DRAINAGE AREA 30			$225,000			
DRAINAGE AREA 40			$880,000			
TOTAL PLANNING AREA 2	**$1,366,000**	**$0**	**$4,037,000**		**$0**	**$5,403,000**
TOTAL PLANNING AREAS 1 AND 2	**$3,415,000**	**$1,905,000**	**$11,726,000**	**$950,000**	**$2,762,000**	**$20,758,000**
TOTAL FUTURE PLANNING AREA 1A			**$3,524,000**			**$3,524,000**
TOTAL PLANNING AREAS 1, 1A & 2	**$3,415,000**	**$1,905,000**	**$15,250,000**	**$950,000**	**$2,762,000**	**$24,282,000**

Table 6-2-B
Total Build-Out with Water Supply Provided by City of Neenah

	Water Supply	Water Treatment	Water Distribution	Connection of Planning Areas 1 & 2	Water Storage	Total Costs
Planning Area 1	$1,618,000				$2,762,000	
Drainage Area 1			$2,576,000			
Drainage Area 10			$2,073,000			
Drainage Area 20			$3,040,000			
Total Planning Area 1	**$1,618,000**	**$0**	**$7,689,000**		**$2,762,000**	**$12,069,000**
Planning Area 2	$823,000					
Drainage Area 1			$2,932,000			
Drainage Area 30			$225,000			
Drainage Area 40			$880,000			
Total Planning Area 2	**$823,000**	**$0**	**$4,037,000**		**$0**	**$4,860,000**
Total Planning Areas 1 and 2	**$2,441,000**	**$0**	**$11,726,000**	**$950,000**	**$2,762,000**	**$17,879,000**
Total Future Planning Area 1A			**$3,524,000**			**$3,524,000**
Total Planning Areas 1, 1A and 2	**$2,441,000**	**$0**	**$15,250,000**	**$950,000**	**$2,762,000**	**$21,403,000**

Table 6-2-C
Year 2040 with Water Supply Provided by Wells within Town of Clayton

	Water Supply	Water Treatment	Water Distribution	Connection of Planning Areas 1 & 2	Water Storage	Total Costs
Planning Area 1	$1,366,000	$1,905,000			$1,277,000	
Drainage Area 1			$2,576,000			
Drainage Area 10			$2,073,000			
Drainage Area 20			$3,040,000			
Total Planning Area 1	**$1,366,000**	**$1,905,000**	**$7,689,000**		**$1,277,000**	**$12,237,000**
Planning Area 2						
Drainage Area 1			$2,932,000			
Drainage Area 30			$225,000			
Drainage Area 40			$880,000			
Total Planning Area 2	**$0**	**$0**	**$4,037,000**		**$0**	**$4,037,000**
Total Planning Areas 1 and 2	**$1,366,000**	**$1,905,000**	**$11,726,000**	**$950,000**	**$1,277,000**	**$17,224,000**
Total Future Planning Area 1A			**$3,524,000**			**$3,524,000**
Total Planning Areas 1, 1A and 2	**$1,366,000**	**$1,905,000**	**$15,250,000**	**$950,000**	**$1,277,000**	**$20,748,000**

Table 6-2-D
Year 2040 with Water Supply Provided by City of Neenah

	Water Supply	Water Treatment	Water Distribution	Connection of Planning Areas 1 & 2	Water Storage	Total Costs
Planning Area 1	$1,618,000				$1,277,000	
Drainage Area 1			$2,576,000			
Drainage Area 10			$2,073,000			
Drainage Area 20			$3,040,000			
Total Planning Area 1	**$1,618,000**	**$0**	**$7,689,000**		**$1,277,000**	**$10,584,000**
Planning Area 2						
Drainage Area 1			$2,932,000			
Drainage Area 30			$225,000			
Drainage Area 40			$880,000			
Total Planning Area 2	**$0**	**$0**	**$4,037,000**		**$0**	**$4,037,000**
Total Planning Areas 1 and 2	**$1,618,000**	**$0**	**$11,726,000**	**$950,000**	**$1,277,000**	**$15,571,000**
Total Future Planning Area 1A			**$3,524,000**			**$3,524,000**
Total Planning Areas 1, 1A and 2	**$1,618,000**	**$0**	**$15,250,000**	**$950,000**	**$1,277,000**	**$19,095,000**

It is recommended that if the Town of Clayton provides water supply on its own, then start out with two wells in Planning Area 1 large enough for future build-out but with well pumps sized for year 2040. Also, it is recommended that one elevated water storage tank with 500,000 gallon capacity be constructed in Planning Area 1 or 1A with water main and pressure reducing station connecting Planning Area 2. If the City of Neenah provides water supply, then the connection should be in Planning Area 1. A future connection can be made to Planning Area 2 when water demand requires.

7 FINANCING

7.1 Debt Types

There are a number of debt types that can be used by municipalities to finance the capital costs of the proposed improvements project. Table 7-1, Debt Types is a summary of generally accepted municipal financing methods which need to be considered to finance proposed improvements by the Town of Clayton. After reviewing the financing alternatives, the Town of Clayton will need to look at combinations of financing that is considered fair and equitable to their constituents.

Table 7-1
Debt Types

DEBT TYPE	GENERAL OBLIGATION NOTES & BONDS	REVENUE BONDS	SPECIAL ASSESSMENT B-BONDS	HYBRID REVENUE BONDS
REPAYMENT SOURCE	• Primarily property tax revenue	• User charges from specified activity, e.g., sewer charges or water charges	• Revenue from special assessments levied against benefitted properties	• Combination of user charge revenue & special assessment revenue
MUNICIPAL LIMIT	• Aggregate limit of 5% of equalized value of real estate	• None. However, practical limit is amount of revenues available to pay debt service	• None, however practical limit is amount of special assessments that can be levied on properties.	• Same as revenue & special assessments
ADVANTAGES	• Most common debt type • Simpler than other debt types • Typically lowest cost	• Preserves GO borrowing capacity • Encourages utilities to be self-supporting enterprises	• Preserves GO borrowing capacity • Keeps user charge lower • Raises money from undeveloped properties • May qualify low income households for grants	• Flexibility in allocating debt burden between user charge & amount of special assessments levied
EFFECT ON HOUSEHOLDS	• Debt burden is spread based on property value	• Depends on structure of user charge - fixed vs variable charges	• Depends on methodology of special assessments	• Depends on split between debt costs put on user charge & special assessment methodology for both
OTHER COMMENTS	• Debt service may become deductible for people who itemize income taxes	• Revenue bonds have priorities similar to mortgages & typically have a debt coverage requirement of up to 140% of annual debt service	• Spec. assessments must equal bond amount & match bond payment schedule • Assessments are for capital, not operating costs • Assessments process is more complicated/time consuming • Accounting system is complicated to track assessment transactions	• This is the structure the WDNR CWF/SDWF uses on all projects w/ special assessments pledged as a primary source of loan repayment

7.2 Potential Funding Sources

WDNR Clean Water Fund Program

The Clean Water Fund Program is available to any town, village, city, county, county utility district, town sanitary district, public inland lake protection & rehabilitation district, metropolitan sewerage district or federally recognized American Indian tribe or band to construct or modify municipal wastewater systems. The funding is in the form of a low interest loan and/or hardship grant.

To be eligible for hardship financial assistance a municipality must meet all of the following criteria:

- The wastewater project is for compliance maintenance, unsewered, or new/changes limits.
- The municipality's median household income (currently $71,641) is 80 percent or less of the state's median household income (currently $52,413).
- The estimated total annual charges per residential user for wastewater treatment, without hardship assistance, exceed 2 percent of the municipality's median household income.

The Town of Clayton's current median household income is $71,641. 80% of $71,641= $57,313 which is more than the state's current median household income of $52,413. The Town of Clayton does not meet the median household income of the above requirements to qualify for a hardship grant.

Low interest loans are subject to the following:

- Interest rates are subject to change
- Maximum loan term of 20 years
- Bond counsel required for loans
- Provide Clean Water Fund Program with a tax exempt bond or note which can be a general obligation, revenue, special assessment pledge, or combination
- Must make a good faith effort to utilize disadvantaged businesses
- Must comply with Davis-Bacon requirements
- 20 percent of federal capitalization grant to green projects or project elements

The current market interest rate is 3.0 percent. The chart below shows the interest rate by project type base on the current market rate.

PROJECT TYPE	PERCENT OF MARKET RATE	CURRENT INTEREST RATE[1]	STATE SUBSIDY
CLEAN WATER FUND PROGRAM PROJECTS TO MAINTAIN COMPLIANCE WITH EXISTING EFFLUENT LIMITS OR TO MEET NEW OR CHANGED EFFLUENT LIMITS	75%	2.25%	0.75%
CLEAN WATER FUND PROGRAM PROJECTS FOR STORM WATER AND NON-POINT	75%	2.25%	0.75%
CLEAN WATER FUND PROGRAM PROJECTS TO SEWER PREVIOUSLY UNSEWERED AREAS	75%	2.25%	0.75%
CLEAN WATER FUND PROGRAM THE PORTION OF PROJECTS FOR RECEIVING & STORING SEPTAGE AND CAPACITY FOR TREATING SEPTAGE	0%	0%	0%
MARKET RATE	100%	3.00%	0.0%

[1] Current rates are effective as of January 1, 2015. These rates are subject to change as determined by the WI Department of Administration.

WDNR Safe Drinking Water Loan Program

The Safe Drinking Water Loan Program (SDWLP) is available to any city, village, town, county, town sanitary district, public inland lake protection & rehabilitation district or municipal water district to construct or modify public water systems to comply with public health protection objectives of the Safe Drinking Water Act. The funding is in the form of a low interest loan only.

Low interest loans are subject to the following:

- Interest rates are subject to change
- Maximum loan term of 20 years
- Bond counsel required for loans
- Provide Safe Drinking Water Loan Program with a tax exempt bond or note which can be a general obligation, revenue, special assessment pledge, or combination
- Must make a good faith effort to utilize disadvantaged businesses
- Must comply with Davis-Bacon requirements
- Cannot refinance existing long-term project loans

The current market interest rate is 3.00 percent. The chart below shows the interest rate based on the state subsidy.

PROJECT TYPE	PERCENT OF MARKET RATE	CURRENT INTEREST RATE[1]	STATE SUBSIDY
SAFE DRINKING WATER LOAN PROGRAM PROJECTS OF MUNICIPALITIES WITH LESS THAN 10,000 POPULATION AND MHIS LESS THAN 80% OF THE STATE MHI	33%	0.99%	2.01%
SAFE DRINKING WATER LOAN PROGRAM PROJECTS OF MUNICIPALITIES NOT MEETING THE ABOVE CRITERIA	55%	1.65%	1.35%
MARKET RATE	100%	3.00%	0.0%

[1] Current rates are effective as of January 1, 2015. These rates are subject to change as determined by the WI Department of Administration.

Wisconsin 2015 MHI = $52,413;80% of Wisconsin 2015 MHI = $42,192

USDA Rural Development Financial Assistance

The USDA Rural Development financial assistance is available cities, villages, tribes, sanitary districts and towns in rural areas with a population up to 10,000 to construct, improve or modify municipal drinking water and wastewater systems. The funding can be in the form of a grant and a loan or strictly in the form of a loan. The municipality's median household income must be equal to or less than $56,439 in order to qualify for a grant. The Town of Clayton does not meet this criterion and, therefore, would not be eligible for a grant.

The Town of Clayton should be eligible for a loan.

Program information:

- Priority given to municipalities with population less than 5,500
- Priority given to projects serving low income communities
- Priority given to projects necessary to alleviate health or sanitary problem
- Maximum loan term is 40 years
- Bonds can be pledged of revenue, special Assessment, or general obligation
- There is a credit test requirement

WDNR Well Abandonment Grant Program

The Well Compensation Grant Program is available for residential homeowners to fill and seal existing wells. If a municipal water system is provided, the private wells may be required to be abandoned. This program is income level dependent. To be eligible family income cannot be more than $65,000 for previous year. Further, if family income is between $45,000 and $65,000, the award will be reduced by $0.30 for each dollar of income exceeding $45,000. The grant is for 75 percent of total eligible cost, up to a maximum amount of $9,000 for a private residence.

Special Assessments

Special assessments can be levied against property which is specially benefitted by a public improvement or work. The wastewater system and water system improvements would meet the requirement of a public improvement. A special assessment based on the exercise of the police power requires the governing body to determine the actual existence of benefits to the properties proposed for special assessment.

There are many acceptable means for assessing benefitted property. The method of levying a special assessment against benefitted property varies depending on how the property is benefitted. There are "area" assessments, "front footage" assessments, "roof top" assessments, user equivalents, and others which have been tested as acceptable means for assessment. It will be necessary to determine the most equitable method or methods to use for this project.

User Charge

The user charges for the water system will be determined by the Public Service Commission, as it relates to the cost of providing the service, but the Town of Clayton has the flexibility of determining how much of the user charge will be used to pay off debt.

Long term debt and yearly operation and maintenance are typical components of a user charge. User charge projections were not included in this study.

8 IMPLEMENTATION

If the Town of Clayton decides to proceed with wastewater collection and treatment system as well as a water system, considerable time can occur to work through the regulatory process to obtain approval from WDNR that a need exists for a wastewater collection and treatment system. Similar amount of time may occur to obtain approval from the Public Service Commission (PSC) to form a municipal water utility. Also, if the existing Town of Clayton Sanitary District is going to lead the effort for implementation, it may take some time to have existing boundaries amended and have sanitary district commissioners in place to proceed with implementation.

A sewer service area plan will need to be developed and implemented in the planning areas to determine what can be reasonably served in the next 20 years. Part of the Neenah-Menasha Sewer Service Area is located in the southeast corner of the Town of Clayton. Therefore, in order to include this area in the Town of Clayton's sewer service area an amendment will be required to remove the area from the Neenah-Menasha Sewer Service Area.
Both the WDNR and the PSC will want to know the results of examining alternatives for cooperative arrangements with neighboring systems. Further discussions and firm comment or non-commitment needs to be documented to satisfy the WDNR and the PSC. The sooner the Town can confirm that the neighboring entities are in or out, the quicker the process can be communicated to WDNR and PSC. It also is critical in determining whether there is a source for wastewater treatment and water supply or the Town has to pursue their own facilities. This can make a significant difference with the schedule for time of completion.

8.1 Wastewater Collection and Treatment

Before the design and construction of any sanitary sewer or wastewater treatment can begin, a facilities planning study meeting WDNR requirements will need to be completed demonstrating a need for the facilities with a cost effective analysis showing the proposed improvements. This will need to be submitted to the WDNR for approval. Also, East Central Wisconsin Regional Planning Commission will need to prepare a sewer service area plan for the proposed improvements. Prior to or concurrent with the above, the Town of Clayton Sanitary District will need to be resurrected into a viable entity. The time for East Central Regional Planning Commission to complete a sewer service area plan and the time to resurrect and expand boundaries of the sanitary district is unknown. Preparation of a facilities plan could take 120 days to complete once the alternatives are known and another 90 days to obtain WDNR approval. Table 8-1 provides a general estimate of schedule to design and construct sanitary sewer, lift stations and wastewater treatment facilities. The estimate of schedule would apply to the options of providing wastewater treatment via the pods or a Larsen-Winchester WWTP. If obtaining regional treatment is a viable option, it may take some time to negotiate reasonable terms.

Table 8-1
Estimate of Time for Completion of Wastewater Collection & Treatment after WDNR Approval

TASK	NO. OF DAYS TO BEGIN	NO. OF DAYS TO COMPLETE	CUMULATIVE DAYS TO COMPLETE
PROPERTY ACQUISITION	0	120	120
DESIGN OF SANITARY SEWER AND WWTP	120	120	240
WDNR APPROVALS	240	90	330
BIDDING AND CONTRACT AWARD PROCESS	330	60	390
SANITARY SEWER AND TREATMENT PLANT CONSTRUCTION	390	270	660

WDNR does not provide any time frames for review of submittals in NR110. 90 days is used as a normal review time.

Implementation Schedule Summary

The majority of the wastewater system components can be underway concurrently which could result in a two (2) year timeframe from start of preliminary design to completion of construction after WDNR approvals.

8.2 Water System

Before any public water system can be constructed, authorization will need to be obtained from the Public Service Commission (PSC). An application to PSC will require a description of the project with maps, supporting information as to the necessity of the project, the effect of the project on quality and reliability of service, description and analysis of alternatives, cost breakdown of project, proposed method of financing, estimated annual O & M costs, description and cost of property being replaced, and persons affected and notified of the proposed project. Prior to submittal of information to the PSC, confirmation should be completed as to the City of Neenah providing water supply. It is estimated it will take approximately 60 days to provide this information to the PSC. It will take PSC approximately 60 days to respond or request additional information after they receive the application. If there are questions, it could take up to 120 days for authorization. If they decide a public hearing is necessary, then more time may be necessary before PSC authorizes the formation of the municipal water utility and authorization to proceed with the proposed project. Approval from PSC requires approval before design can begin. Also, a water system study showing the alternatives and recommended project will need to be submitted to WDNR for approval. This study can be completed concurrently with the PSC submittal. The WDNR could take 90 days for approval.

If the Town decides to provide water supply on their own, implementation of the recommended "public water system" begins with a well site survey to determine acceptable locations for groundwater supply wells. If the Town can obtain water supply from the City of Neenah, then this does not apply. The water main and booster station(s) required to obtain water from the City of Neenah can be completed concurrently with the water distribution system. In general, Table 8-2 provides an estimate of time to complete the water supply portion of the public water system:

Table 8-2
Estimate of Time for Completion of Water Supply and Treatment after PSC & DNR Approvals of the Project

TASK	NO. OF DAYS TO BEGIN	NO. OF DAYS TO COMPLETE	CUMULATIVE DAYS TO COMPLETE
WELL SITE SURVEY	0	60	60
WDNR WELL SITE APPROVAL*	60	90	150
PROPERTY ACQUISITION	60	120	180
WELL DESIGN	90	30	180
WDNR WELL CONSTRUCTION APPROVAL*	180	90	270
WELL BIDDING AND CONTRACT AWARD PROCESS	270	30	300
WELL CONSTRUCTION, TESTING AND SAMPLING	300	90	390
PREPARATION OF WELLHEAD PROTECTION PLAN	360	30	390
PUMP STATION AND TREATMENT DESIGN	330	90	420
WDNR WELLHEAD PROTECTION APPROVAL*	390	90	480
WDNR PUMP STATION AND TREATMENT APPROVAL*	420	90	510
PUMP STATION, TREATMENT PLANT BIDDING, & CONTRACT AWARD PROCESS	480	70	550
PUMP STATION AND TREATMENT PLANT CONSTRUCTION	550	180	730

*In accordance with Administrative Code NR 811 the WDNR has 90 days to review a submittal. Typically the process does not take this long, but this will be used for planning purposes.

In general the water distribution portion of the water system would have the following format:

Table 8-3
Estimate of Time to Complete Water Distribution System after PSC & DNR Approvals of the Project

TASK	NO. OF DAYS TO BEGIN	NO. OF DAYS TO COMPLETE	CUMULATIVE DAYS TO COMPLETE
WATER DISTRIBUTION SYSTEM DESIGN	0	120	120
WDNR CONSTRUCTION APPROVAL*	120	90	210
WATER DISTRIBUTION BIDDING AND CONTRACT AWARD	210	60	270
WATER DISTRIBUTION SYSTEM CONSTRUCTION	270	300	570

*In accordance with Administrative Code NR 811 the WDNR has 90 days to review a submittal. Typically the process does not take this long, but this will be used for planning purposes.

The elevated water storage tank schedule would be impacted by the time of year at which the project is bid, because of the narrow window in northeast Wisconsin for painting. In general the water storage portion of the water system would have the following format:

Table 8-4
Estimate of Time for Completion of Elevated Water Storage Tank after PSC & DNR Approvals of the Project

TASK	NO. OF DAYS TO BEGIN	NO. OF DAYS TO COMPLETE	CUMULATIVE DAYS TO COMPLETE
PROPERTY ACQUISITION	0	120	120
ELEVATED WATER STORAGE TANK DESIGN	120	30	150
WDNR CONSTRUCTION APPROVAL*	150	90	240
WATER STORAGE TANK BIDDING AND CONTRACT AWARD	210	60	270
WATER STORAGE TANK CONSTRUCTION	270	270	540

*In accordance with Administrative Code NR 811 the WDNR has 90 days to review a submittal. Typically the process does not take this long, but this will be used for planning purposes.

Implementation Schedule Summary

The majority of the water system components can be underway concurrently which could result in a two (2) year timeframe from start of preliminary design to completion of construction after PSC and WDNR approvals.

9 FINANCIAL IMPACTS TO THE TOWN

The Town of Clayton is preparing a review of their tax base to determine the financial impacts of being annexed to neighboring communities. This information along with the information in this study will provide the Town with a basis for determining the benefits for pursuing wastewater and water facilities. Generally, having wastewater and water facilities available tends to attract commercial/industrial growth. The Town is also projecting what the potential increase in tax base may be if facilities were provided that would attract more development. The results of the Town's financial impacts review are included as Attachment A to this report.

FIGURES

Figure 1-1: Map of Winnebago County, WI

Figure 1-1: Map of Winnebago County, WI.

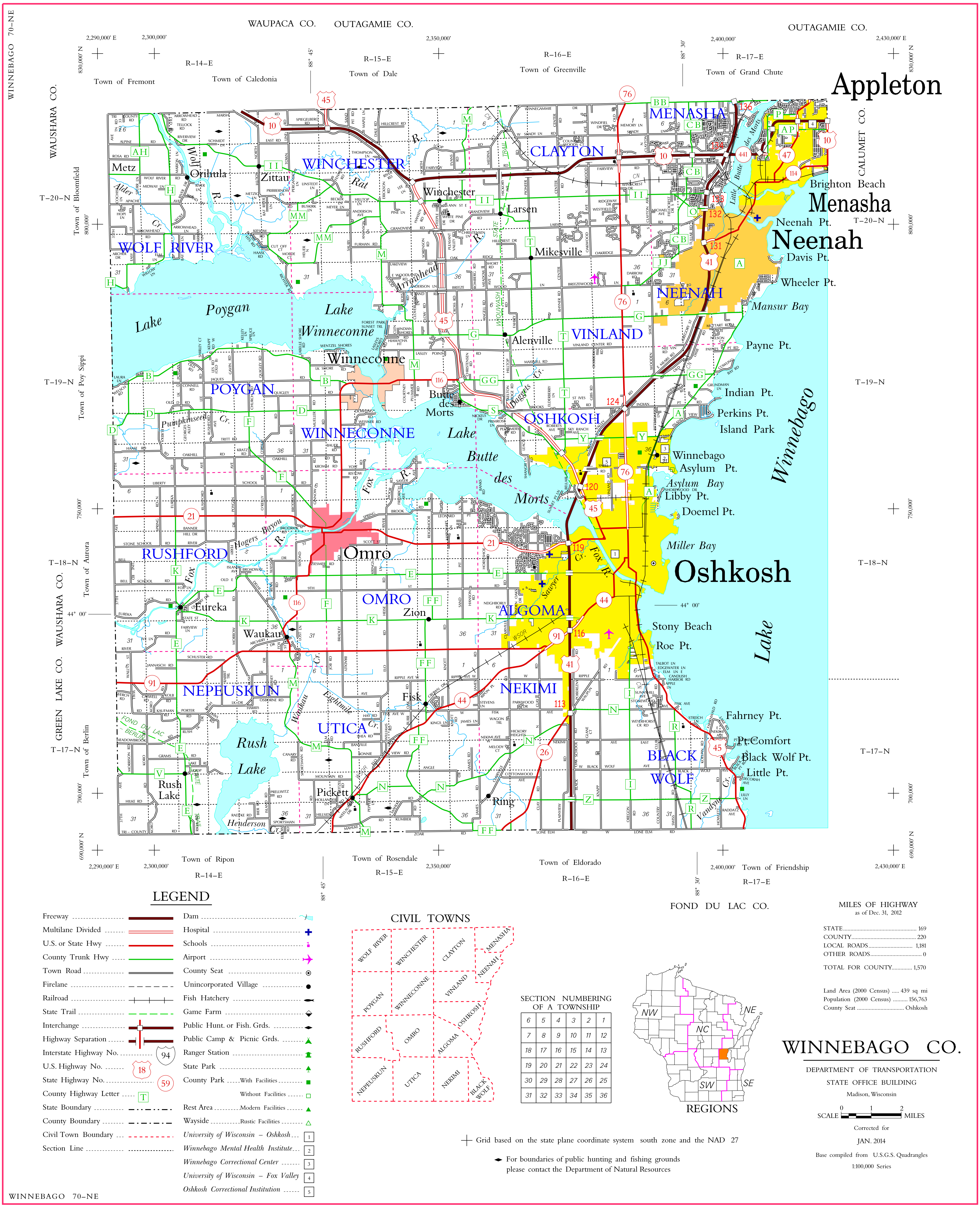
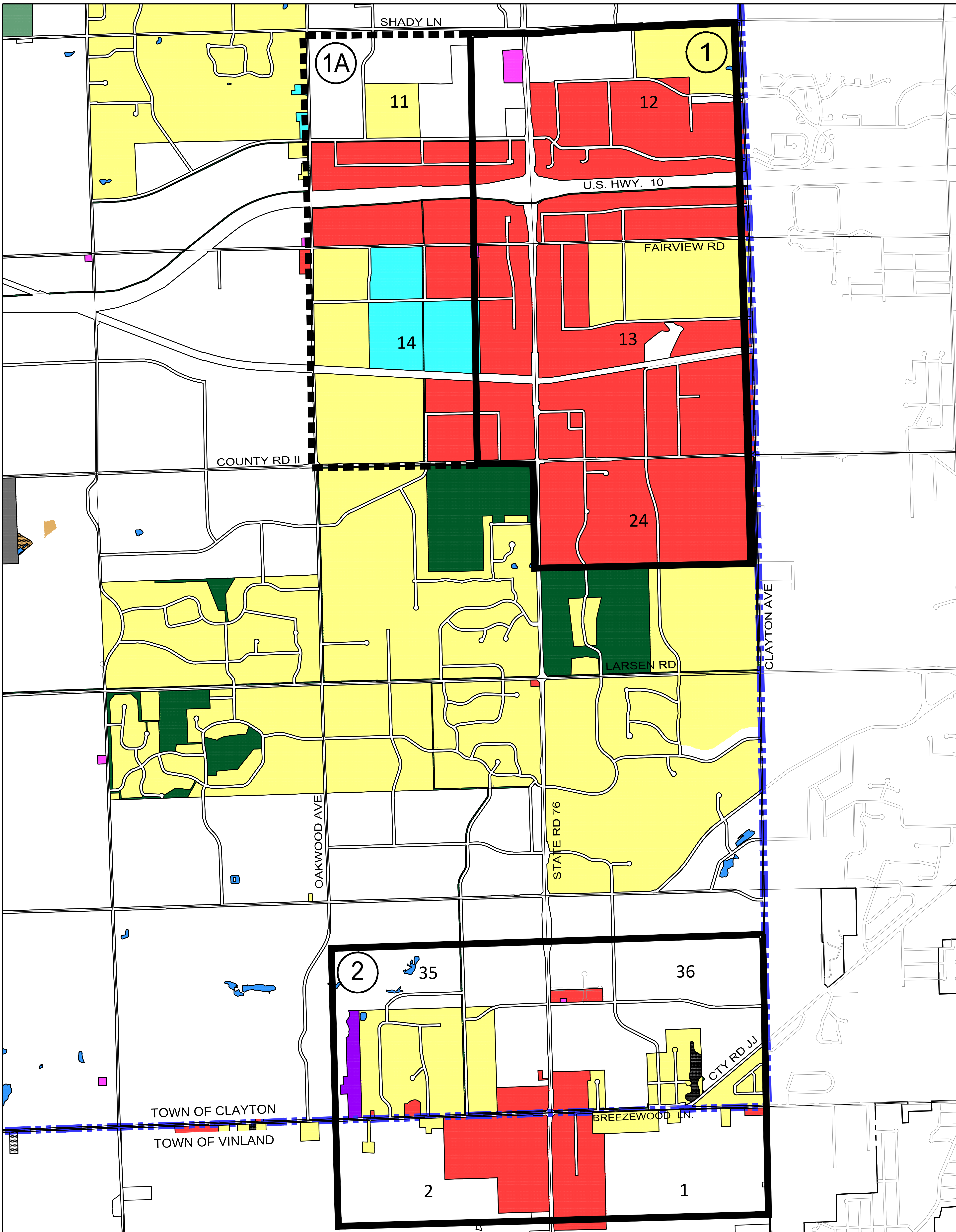


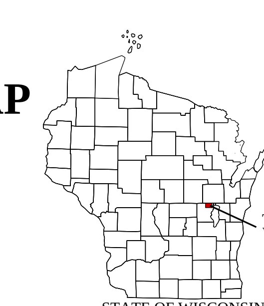
Figure 1-2: Location of Study Areas Map



TOWN OF CLAYTON

LOCATION OF STUDY AREAS MAP
PLANNING AREA 1, 1A AND 2

FIGURE 1-2



N

NOT TO SCALE

LEGEND:

STUDY AREA BOUNDARY 1
STUDY AREA BOUNDARY 1A
STUDY AREA BOUNDARY 2
TOWN OF CLAYTON BOUNDARY

THIS MAP CONTAINS DATA FROM WINNEBAGO COUNTY, FOX CITIES 2030 SEWER SERVICE AREA PLAN UPDATE PREPARED BY THE EAST CENTRAL WISCONSIN REGIONAL PLANNING COMMISSION, FEB. 13, 2006, AND THE TOWN OF CLAYTON COMPREHENSIVE PLAN BY MARTENSON & EISELE, DEC. 16, 2009.

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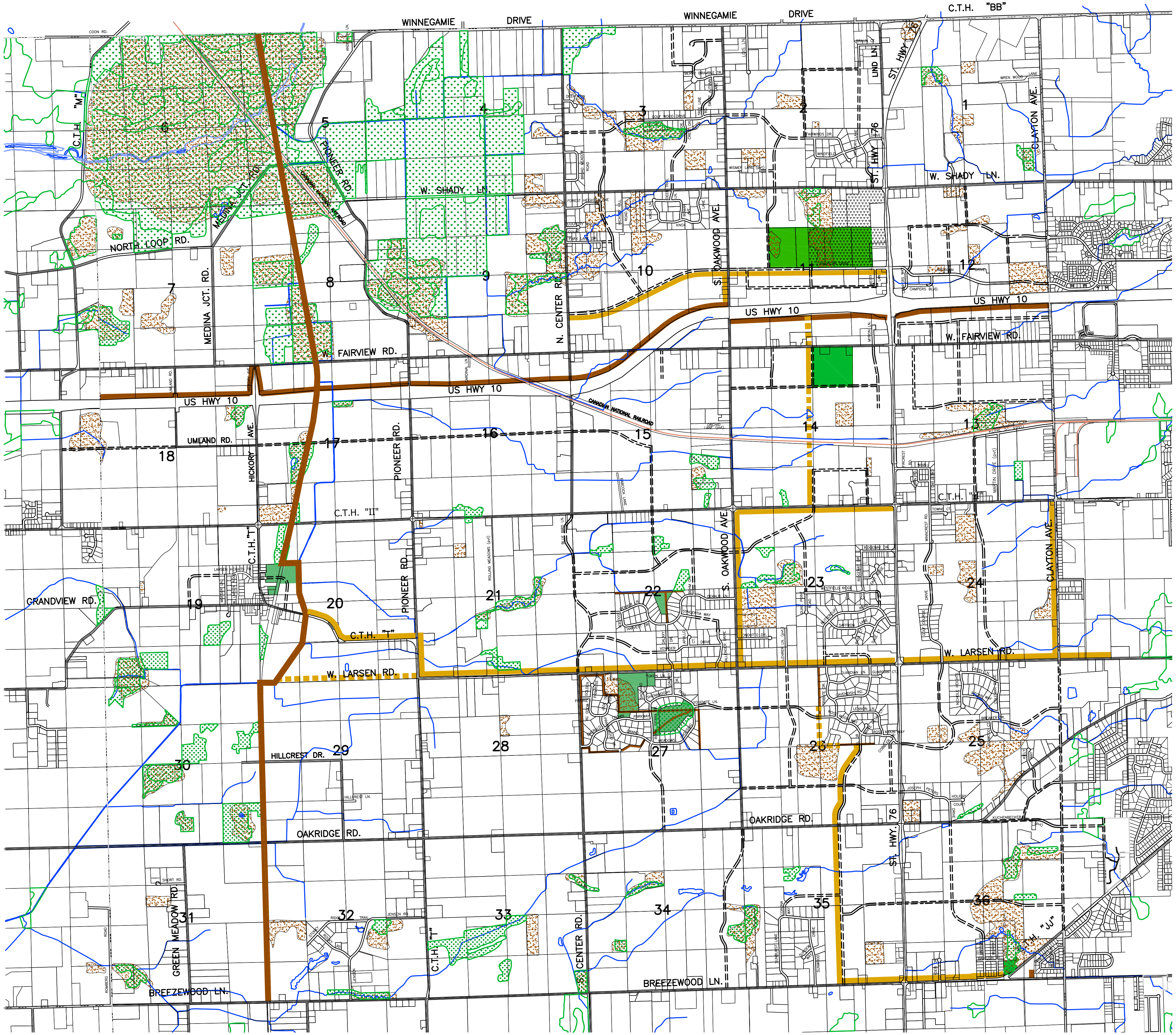
Figure 1-2: Town of Clayton Planning Area Location Map

Figure 2-1: Town of Clayton Official Map

Figure 2-1:

Town of Clayton

Official Map



N
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Legend

- Future Roads
- Future On-Road Trails
- Future Off-Road Trails
- Future Parks
- Existing Trails
- Existing Parks

Land Coverages

- Wetlands
- Woods
- Special Agriculture Area (Tree Farms, Nurseries, Vineyards, etc.)

This is a true copy of the Official Map described in and accompanying Ordinance XX that was adopted on Date

Mark Luebke, Town Chairperson — Date

Susan Nestor-Huebner, Town Clerk/Treasurer — Date

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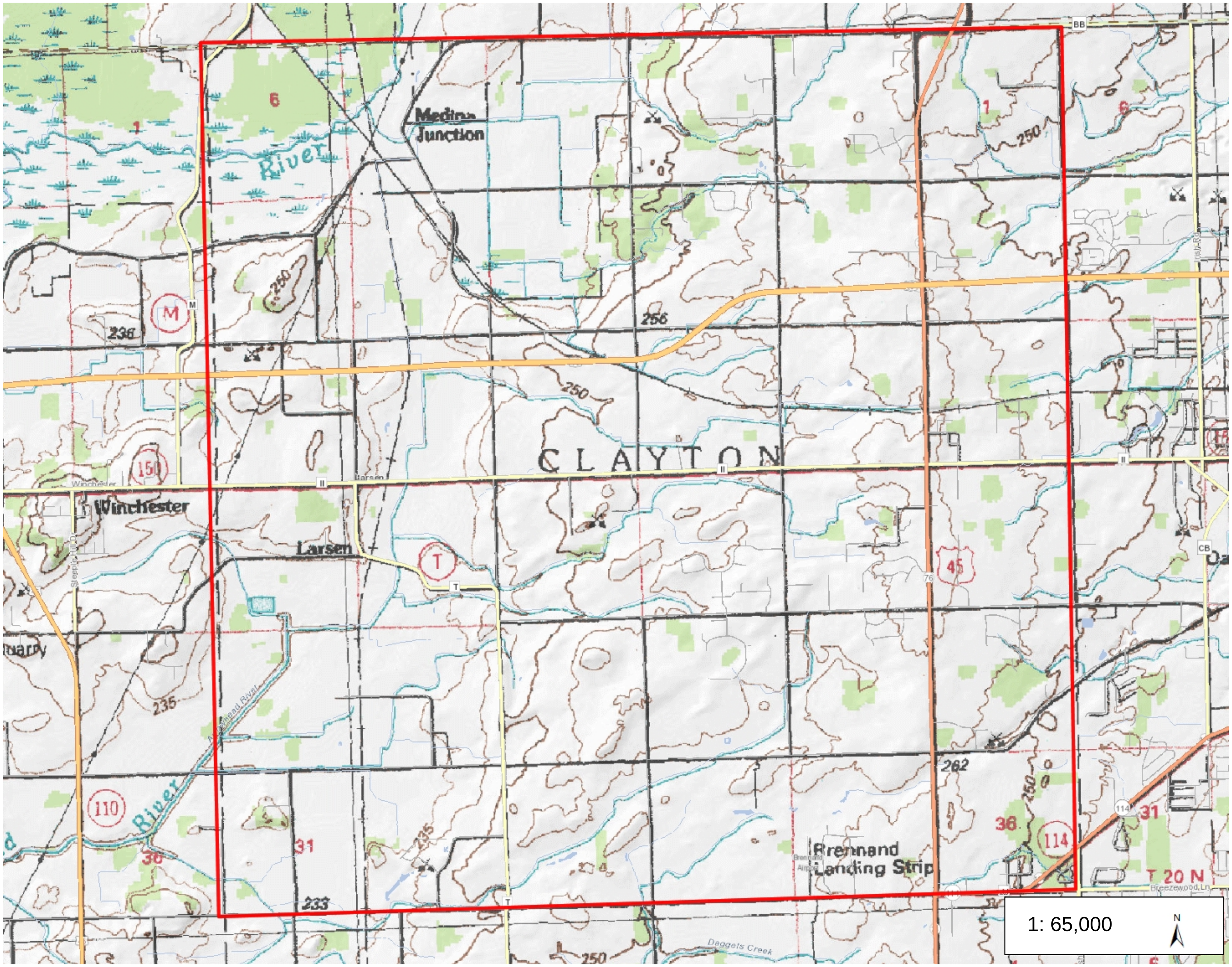
pnac267584om.dwg_12/16/2009

Figure 2-2: Town of Clayton Topographic Map

Figure 2-2:

Town of Clayton Topo Map



Legend

Rivers and Streams

Open Water

1: 65,000

N

2.1 0 1.03 2.1 Miles

NAD_1983_HARN_Wisconsin_TM

Notes

Figure 2-3: Area of Arsenic Study Area

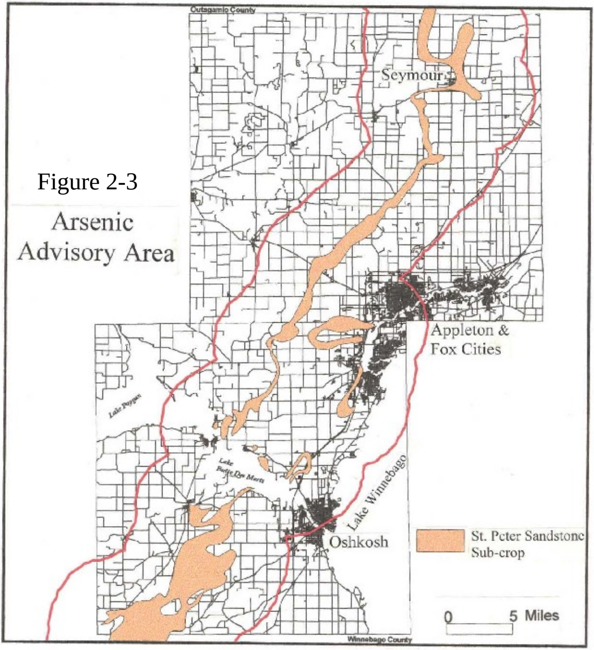


Figure 2-3

Arsenic Advisory Area

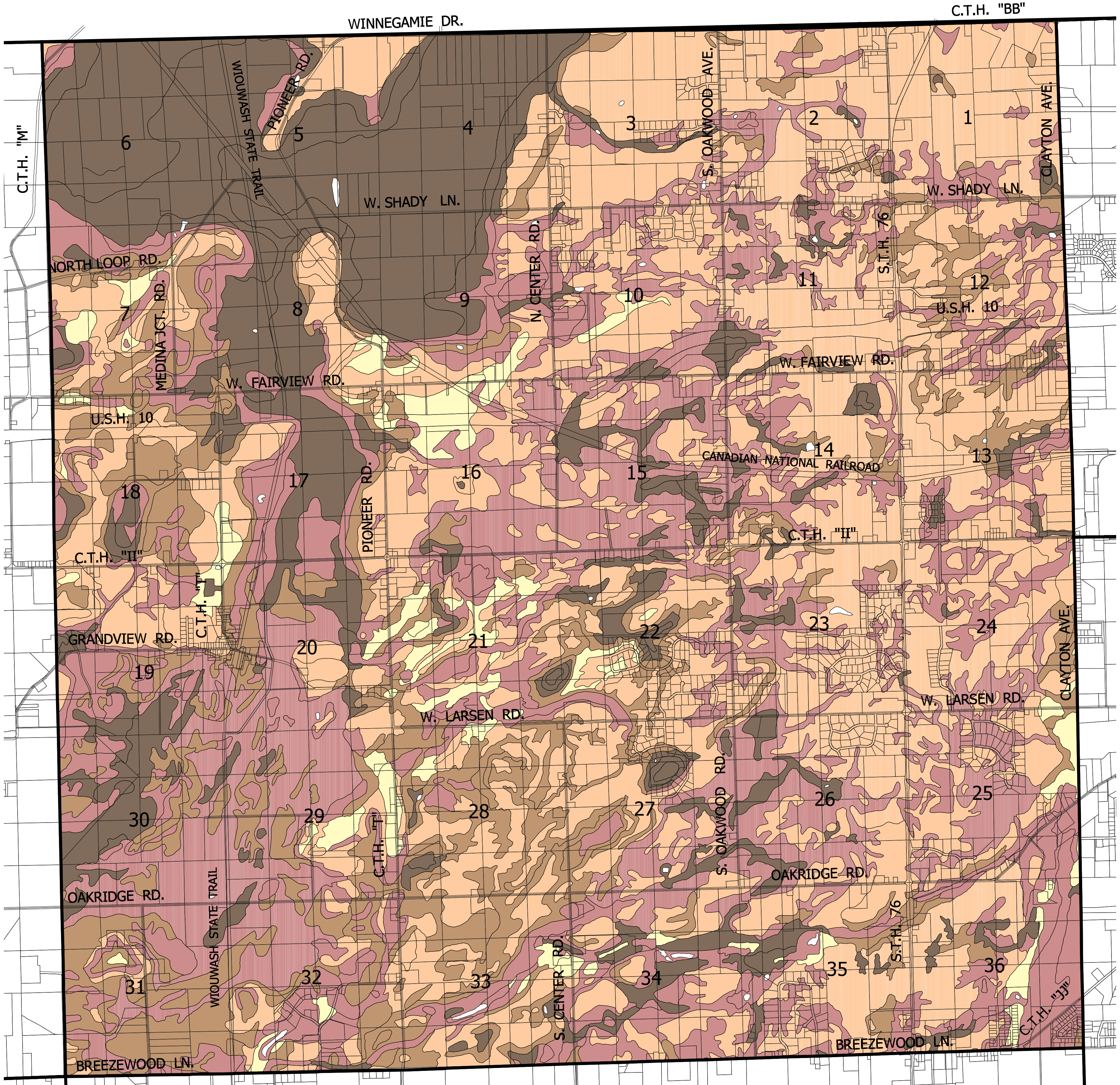
Figure 2-4: Soil Potential for Homes with Basements

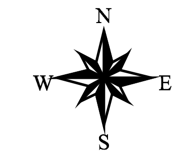
Figure 2-4:

Map 8

Town of Clayton

Soil Potential for Homes with Basements





Legend

Soil Properties

- Very High - Favorable Soil Properties
- High
- Medium - Moderate Limitations
- Low
- Very low - Severe Soil Limitations

Soil properties affecting site preparation, construction, and continuing limitations are considered.

Disclaimer

Soils Data extracted from the Standard State Soil Survey Database as provided by the USDA and the Natural Resources Conservation Service which is the best available information, it has not been field verified.

This base was created by Winnebago County Planning/GIS Department. Winnebago County expressly disclaims all liability regarding fitness of the use of the information for other than Winnebago County business by the WINGS Projects.

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pn267906_fnav267900soils_cla_March 2004

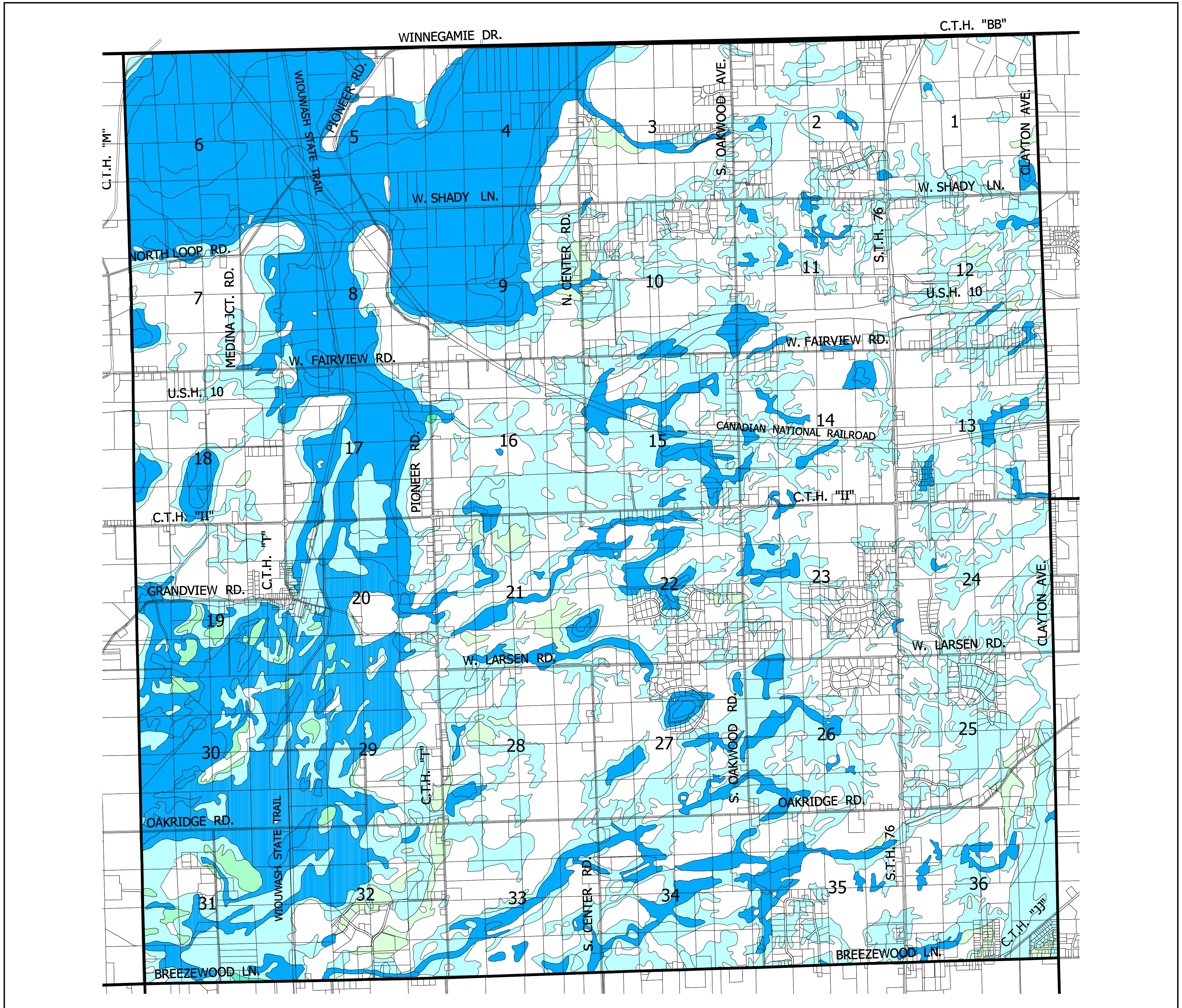
Figure 2-5: Areas of High Ground Water

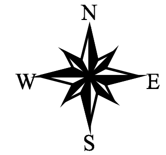
Figure 2-5:

Map 5

Town of Clayton

Areas of High Ground Water





Legend

High Water Table measuring 5 feet or less

- -0.8 ft
- 0 ft.
- 0.9 - 1.5 ft.
- 1.6 - 2 ft.
- 2.1 - 2.5 ft.
- 2.6 - 2.8 ft.
- 2.9 - 4 ft.
- 4.1 - 4.5 ft.
- >4.6 ft.

Disclaimer

Soils Data extracted from the Standard State Soil Survey Database as provided by the USDA and the Natural Resources Conservation Service which is the best available information, it has not been field verified.

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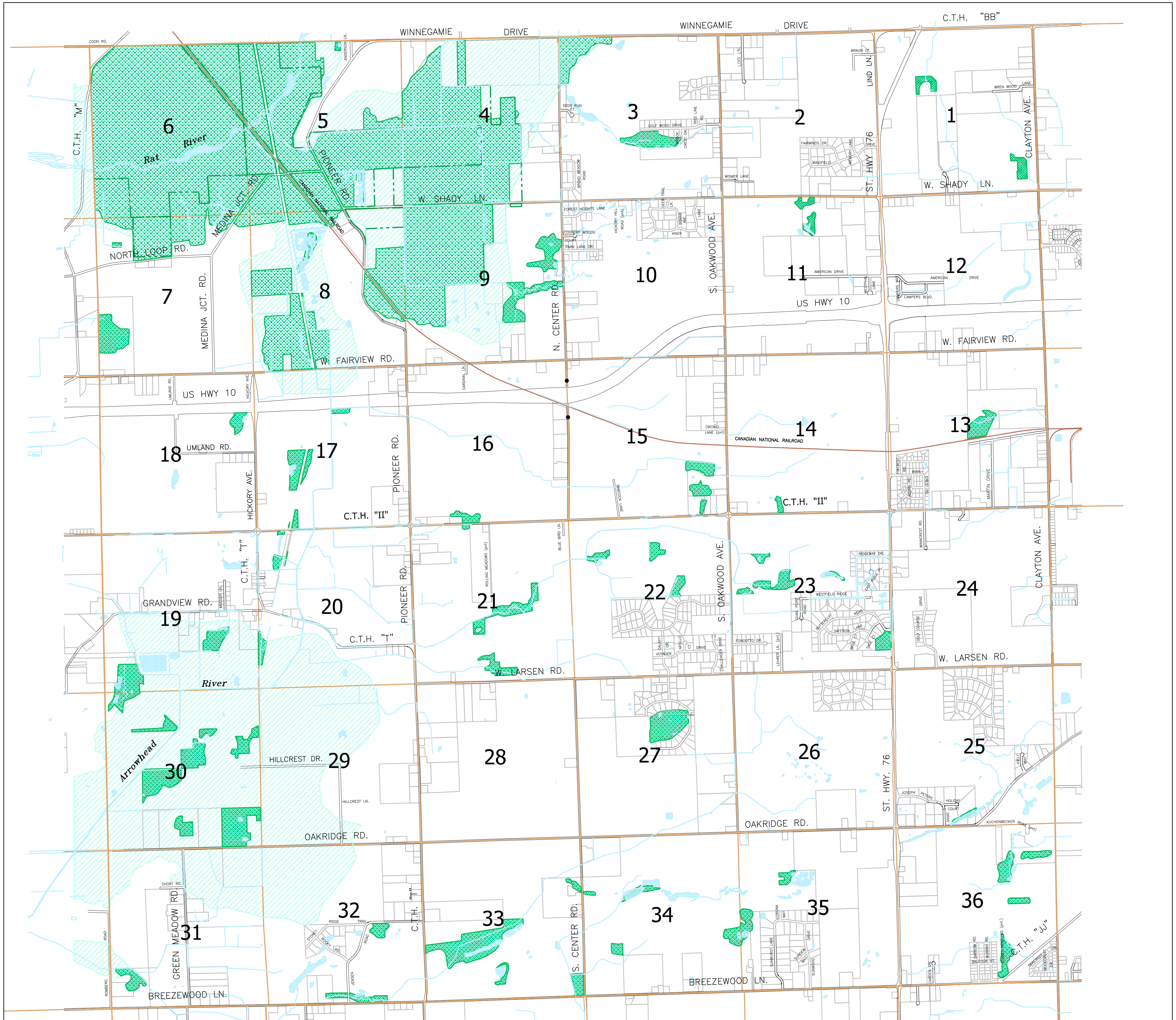
pn267906_fnav267900soils_cla_12-11-03

Figure 2-6: Surface Water, Wetlands, Floodplains, WDNR Lands

Figure 2-6: Map 4

Town of Clayton

Surface Water, Wetlands, FLoodplains, DNR Lands



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Legend

Designated Wetland Areas

Floodplains

Boundary of DNR Property

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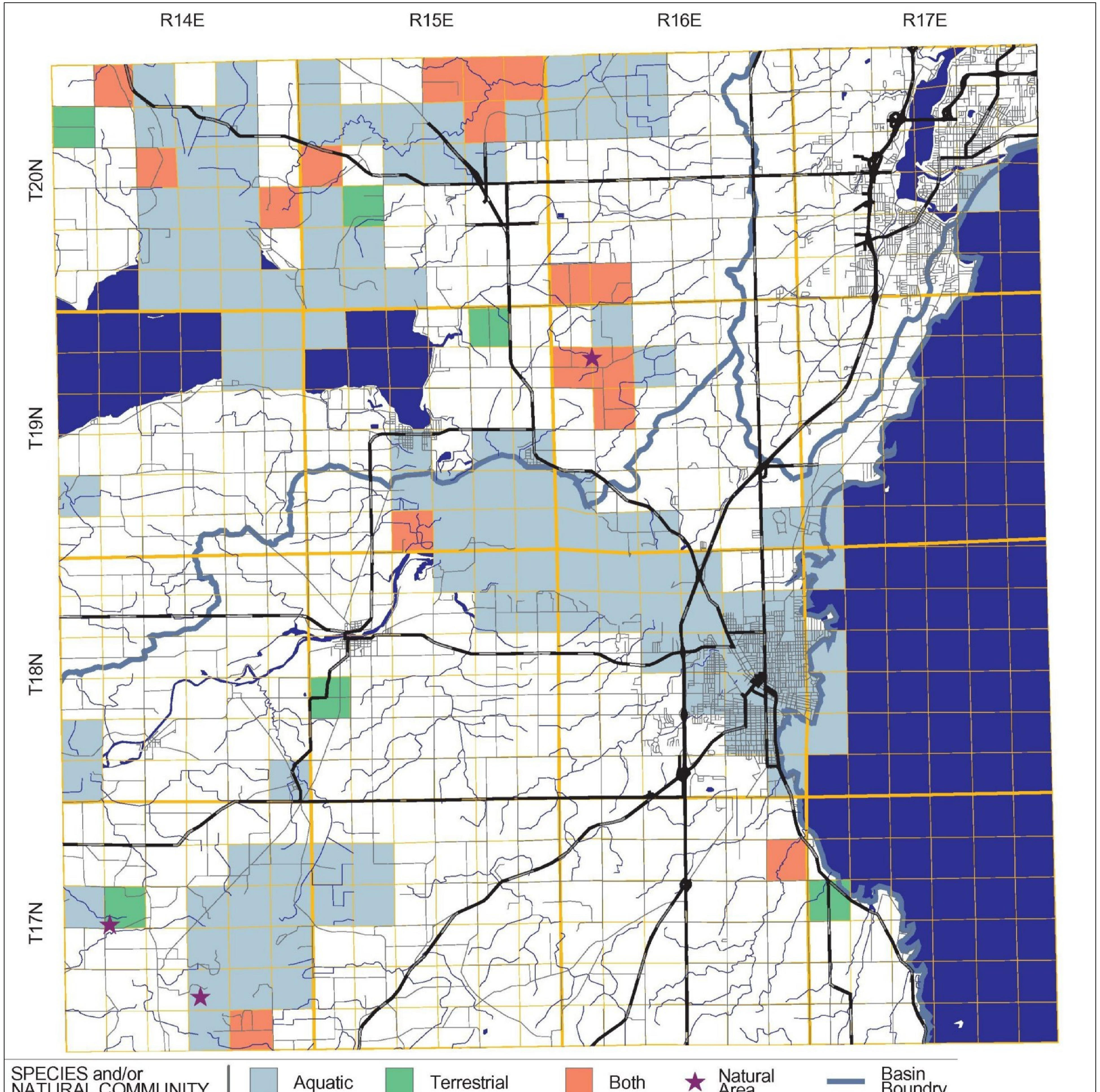
pnac267906cp_March 2004

Figure 2-7: Endangered Species

Figure 2-7:

Endangered Species

Winnebago County



AQUATIC OCCURRENCES

ANIMALS

- Black tern *Chlidonias niger* 2001
- Lake sturgeon *Acipenser fulvescens* 1991
- Common moorhen *Gallinula chloropus* 1990
- Lake chubsucker *Erimyzon sucetta* 1974
- Buckhorn *Tritogonia verrucosa* 1995
- Common tern *Sterna hirundo* 2000
- Plains clubtail *Gomphurus externus* 1999
- Black crowned night heron *Nycticorax nycticorax* 2001
- Forster s tern *Sterna forsteri* 2000
- Round pigtoe *Pleurobema sintoxia* 1995
- Least bittern *Ixobrychus exilis* 2000
- Blanchard s cricket frog *Acris crepitans blanchardi* 1991
- American bittern *Botaurus lentiginosus* 2001
- Striped shiner *Luxilus chrysocephalus* 0
- Mulberry wing *Poanes massasoit* 1991
- Banded killifish *Fundulus diaphanus* 1979
- Greater redhorse *Moxostoma valenciennesi* 1974
- Wood turtle *Clemmys insculpta* 1948
- Caspian tern *Sterna caspia* 1990
- Pugnose minnow *Opsopoeodus emiliae* 1981
- Pugnose shiner *Notropis anogenus* 0
- Blanding s turtle *Emydoidea blandingii* 1993
- Western grebe *Aechmophorus occidentalis* 1990
- Red necked grebe *Podiceps grisegena* 1997
- Arctic shrew *Sorex arcticus* 1999
- Creek chubsucker *Erimyzon oblongus* 0
- Pigmy shrew *Sorex hoyi* 1975

PLANTS

- Waxleaf meadowrue *Thalictrum revolutum* 2000
- Prairie white fringed orchid *Platanthera leucophaea* 2000
- Small white lady s slipper *Cypripedium candidum* 1992
- Small yellow lady s slipper *Cypripedium parviflorum* 1890
- Marsh blazing star *Liatris spicata* 2000
- Lake cress *Armoracia lacustris* 1980
- Marsh valerian *Valeriana sitchensis ssp uliginosa* 1944
- Bog bluegrass *Poa paludigena* 1986
- Common bog arrow grass *Triglochin maritima* 2000
- Rams head ladys slipper *Cypripedium arietinum* 1928

NATURAL COMMUNITIES

- Floodplain forest 1999
- Northern wet mesic forest 1978
- Emergent aquatic 2000
- Southern sedge meadow 1999
- Wet mesic prairie 2000
- Emergent aquatic wild rice 1999
- Northern sedge meadow 2000
- Wet prairie 1984

TERRESTRIAL OCCURRENCES

ANIMALS

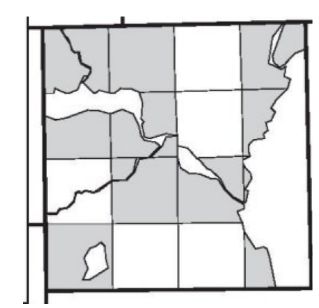
- Broad winged skipper *Poanes viator* 2000
- Cerulean warbler *Dendroica cerulea* 2000
- Bird rookery *Bird rookery* 1990
- Gorgone checker spot *Chlosyne gorgone* 1991

PLANTS

- Wooly milkweed *Asclepias lanuginosa* 1938
- Purple milkweed *Asclepias purpurascens* 1941
- Dwarf milkweed *Asclepias ovalifolia* 2000
- Kentucky coffee tree *Gymnocladus dioicus* 1993
- Harbinger of spring *Erigenia bulbosa* 0
- Narrow leaved vervain *Verbena simplex* 1979
- Forked aster *Aster furcatus* 1906
- Cuckooflower *Cardamine pratensis* 1999
- Indian cucumber root *Medeola virginiana* 1992

NATURAL COMMUNITIES

- Northern mesic forest 1999
- Southern dry mesic forest 1979
- Mesic prairie 1987
- Northern dry mesic forest 1979
- Oak opening 1987



This map represents the known occurrences of rare species and natural communities that have been recorded in the Wisconsin Natural Heritage Inventory (NHI). Colored sections indicate the presence of one or more occurrences within that section. Townships shaded in the inset map to the left indicate one or more occurrences reported only at the township level. The date following the names above notes the most recent year the occurrence was recorded in the county.

Map generated using 01/14/2002 NHI data.

Bureau of Endangered Resources

This information was obtained from the WI DNR—Bureau of Endanger Resources. For current and updated information, visit their website:
http://www.dnr.state.wi.us/org/land/er/workinglists/mapsbycounty.htm

For further information regarding the Wisconsin Natural Heritage Inventory Map, refer to their website:
http://www.dnr.state.wi.us/org/land/er/workinglists/maplegend.htm

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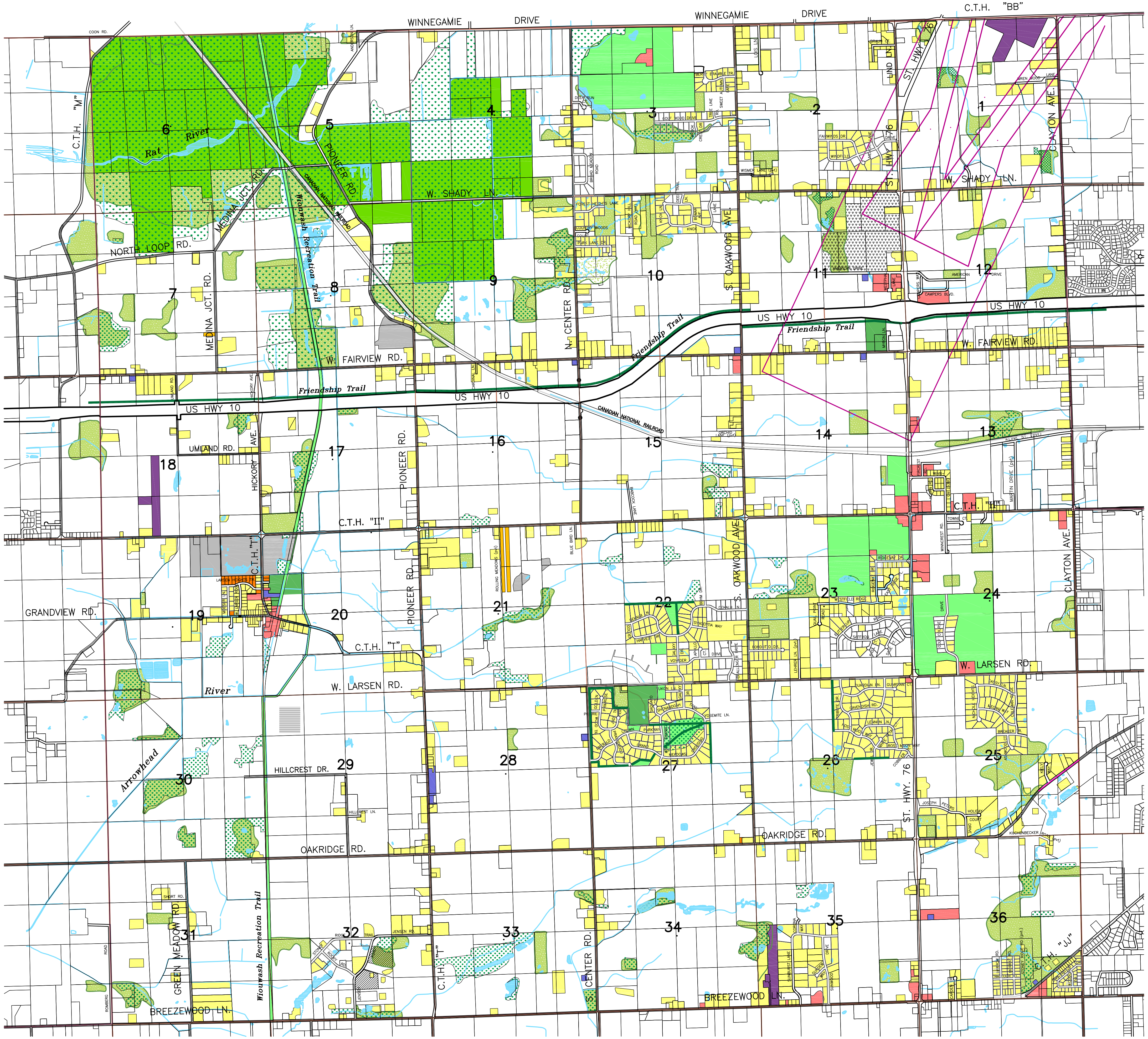
pnac185902es_11-03-03

Figure 2-8: Existing Land Use Map

Figure 2-8:

Town of Clayton

Existing Land Use Map 2004



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Legend

- Single Family Residential
- Two Family Residential
- Multi-Family/Group Quarters
- Manufactured Housing
- Commercial
- Industrial
- Non-Metallic Mining Sites
- Utilities and Public Facilities
- Recreation and Conservation
- Wisconsin/DNR Lands
- Special Agriculture Area (Tree Farms, Nurseries, Vineyards, ect.)
- Undeveloped/Agriculture Area
- Wetlands
- Woods
- Open Water/Pool Lakes
- Airport
- Airport Zoning Boundary
- Existing Trails

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pnac267559lu_ad2007.dwg_03/19/09

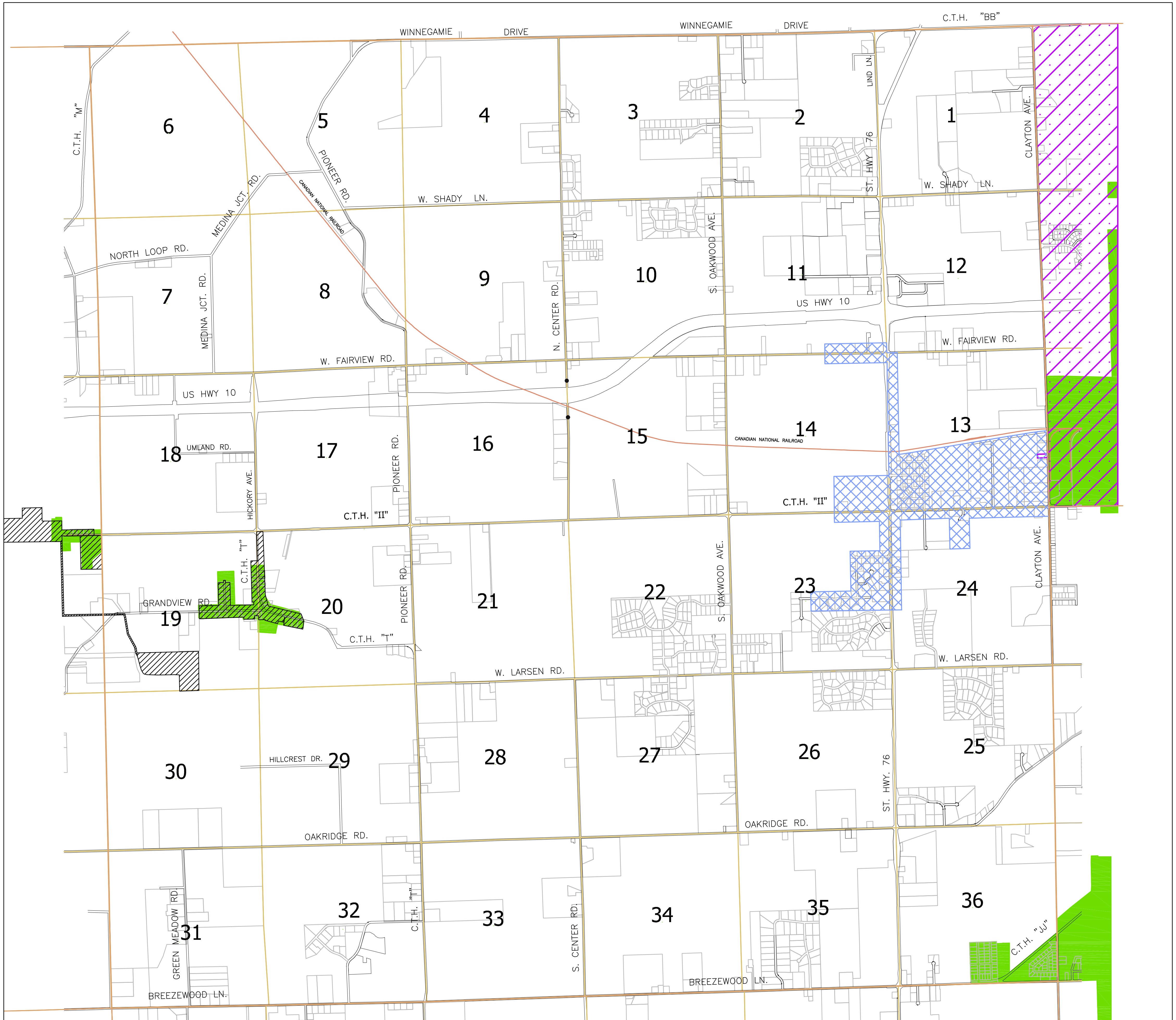
Figure 2-9: Town of Clayton Sanitary Districts and Sewer Service Area

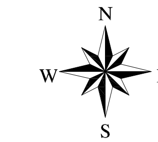
Map 13

Figure 2-9:

Town of Clayton

Sanitary Districts and Sewer Service Areas





Legend

- Clayton Sanitary District #1
- Larsen-Winchester Sanitary District
- Neenah-Menasha Sanitary District
- Sewer Service Area

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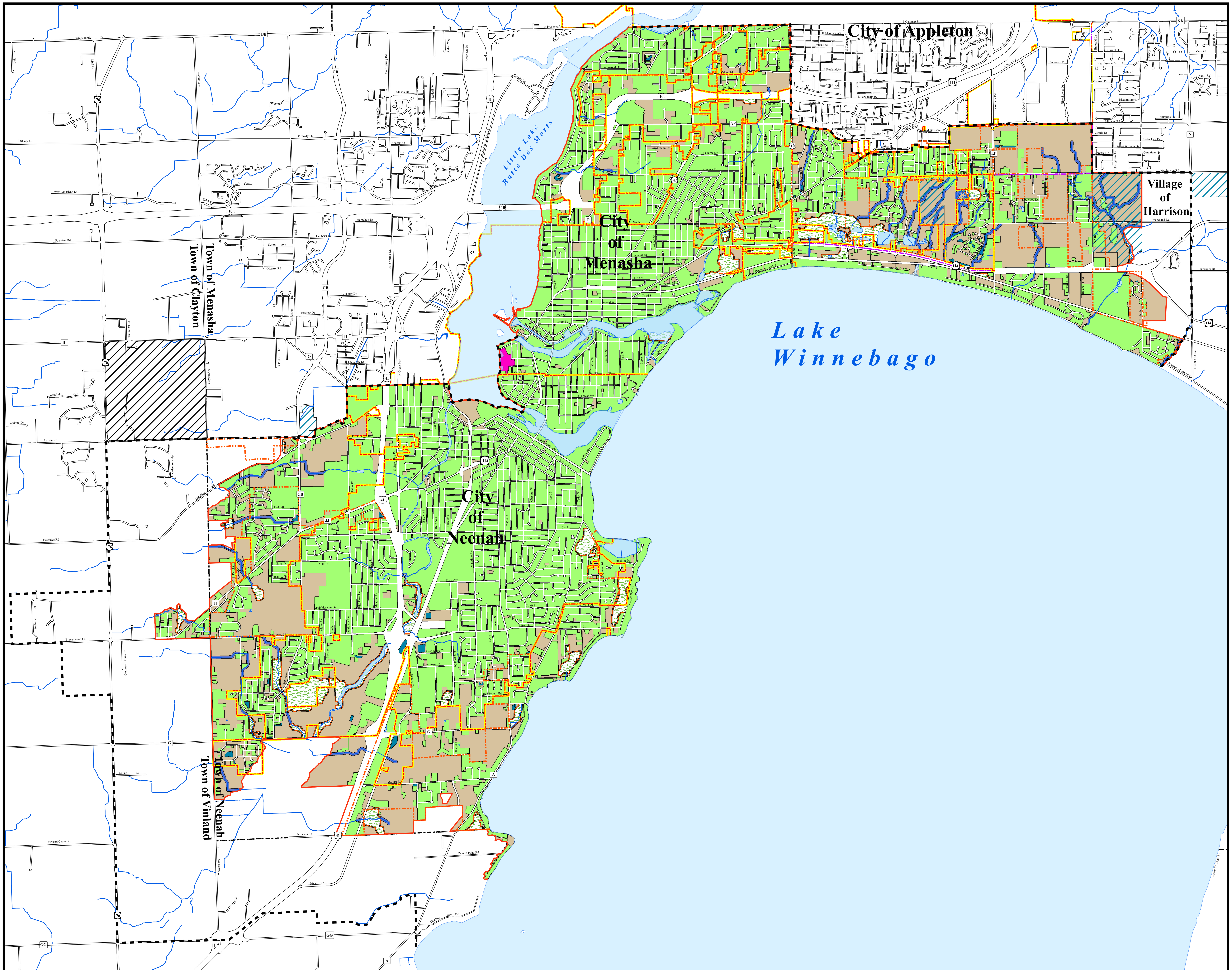
pnac267906cp_March 2004

Figure 2-10: 2030 Neenah-Menasha Sewer Service Area



2030 NEENAH-MENASHA SEWER SERVICE AREA

Figure 2-10:

MAP AMENDMENTS

	Description of Amendment	Amendment Date
1	Hold Status Removal - C. Menasha (Lake Park Heights)	April 27, 2006
3	Hold Status Removal - C. Appleton/T. Harrison	March 14, 2007
8	Swap Amendment - T. Neenah S.D. #2 (Osero)	May 27, 2009

2,640 1,320 0 2,640

Scale in Feet

This map and its associated sewer service area descriptions do not obligate a community(ies) to provide sewer service to property owners contained herein.

BOUNDARY LINE LEGEND

- 2050 Planning Area Boundary
- Sanitary District Boundary
- 2030 Sewer Service Area Boundary
- City Corporate Limits
- Village Corporate Limits
- Township Boundary
- Streams

2030 SEWER SERVICE AREA

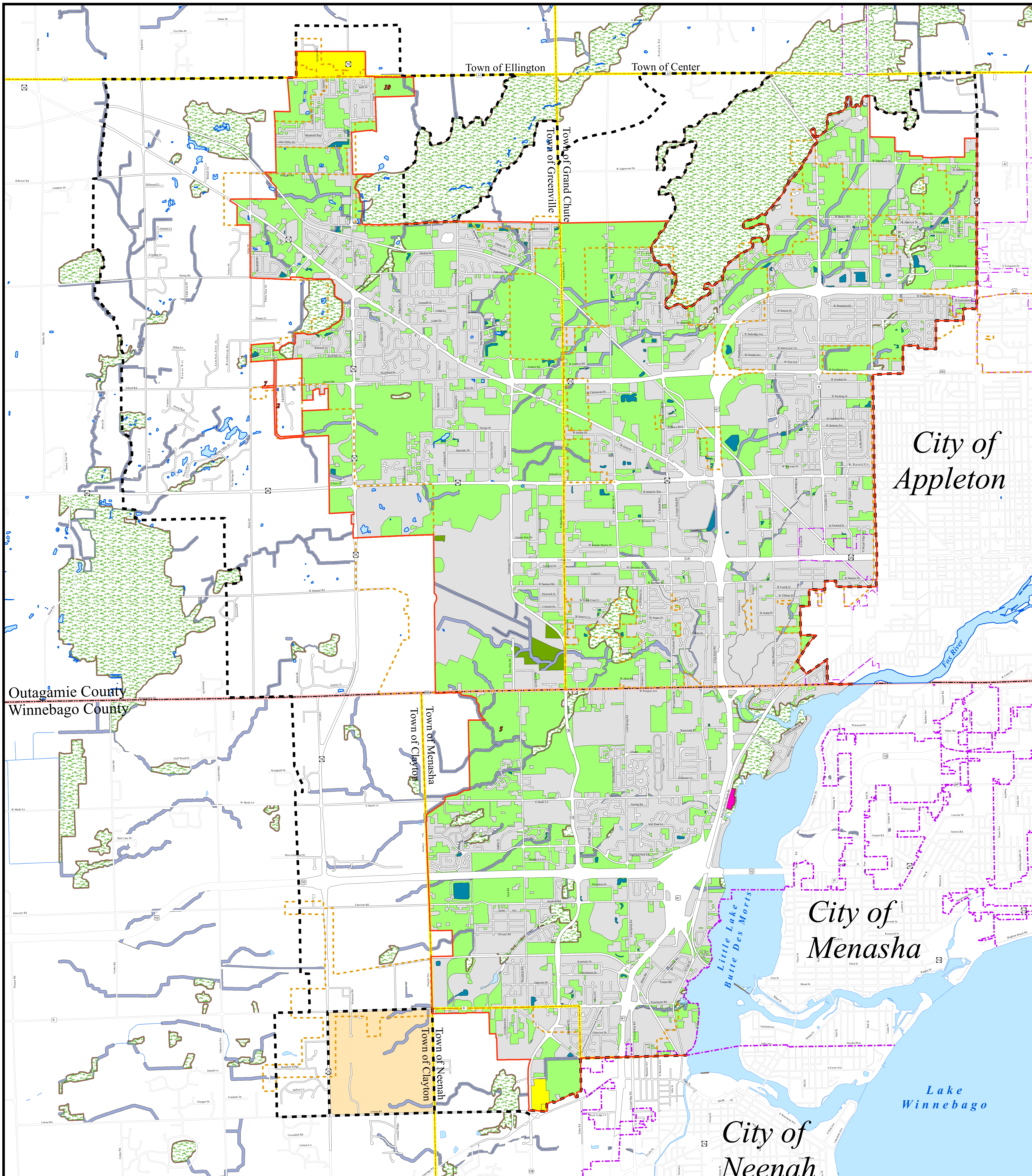
- 2030 SSA Developed Areas
- 2030 SSA Undeveloped Areas
- Transportation
- Wastewater Treatment Facility
- Sewer Extension Hold Areas
- Stormwater Detention Facilities
- 75 Foot Stream Buffer
- 50 Foot Wetland Buffer
- WDNR Designated Wetlands
- Undefined Planning Area

East Central Wisconsin Regional Planning Commission
ECWRPC
Calumet•Menominee•Outagamie•Shawano•Waupaca•Waushara•Winnebago

Wisconsin Department of Natural Resources Certification Date - February 13, 2006

P:\12XX-SSA_GIS\Neenah_Menasha\Neen_Men_2030_SSA_Web.mxd

Figure 2-11: 2030 Grand Chute-Menasha West Sewer Service Area



2030 GRAND CHUTE-MENASHA WEST SEWER SERVICE AREA

MAP AMENDMENTS		
	Description of Amendment	Amendment Date
2	Interceptor Sewer Easement - T. Greenville (Interceptor)	October 4, 2006
5	Hold Staus Removal - Menasha Utility District (LU Amendment)	May 14, 2008
7	Interceptor Sewer Easement - T. Greenville (Immanuel Lutheran)	January 28, 2009
10	Unique Facilities - T. Greenville SD (Scholl Development)	July 16, 2013

N W E S

3,000 0 3,000

Scale in Feet

This map and its associated sewer service area descriptions do not obligate a community(ies) to provide sewer service to property owners contained herein.

- 2030 Sewer Service Area Boundary
- 2050 Planning Area Boundary
- City Corporate Limits
- Township Boundary
- County Boundary
- Sanitary District Boundary
- 2030 SSA Developed Areas
- 2030 SSA Undeveloped Areas
- Undevelopable
- Wastewater Treatment Facility
- Stormwater Detention Facilities
- Transportation
- WDNR Designated Wetlands
- 75 Foot Stream Buffer
- 50 Foot Wetland Buffer
- Undefined Planning Area
- Sewer Extension Hold Areas

Wisconsin Department of Natural Resources Certification Date - February 13, 2006

FIGURE 2-11

East Central Wisconsin Regional Planning Commission
ECWRPC
Calumet•Menominee•Outagamie•Shawano•Waupaca•Waushara•Winnebago

P:\12XX-SSA_GIS\Grand_Chute\2030_GCMW_SSA_Web.mxd

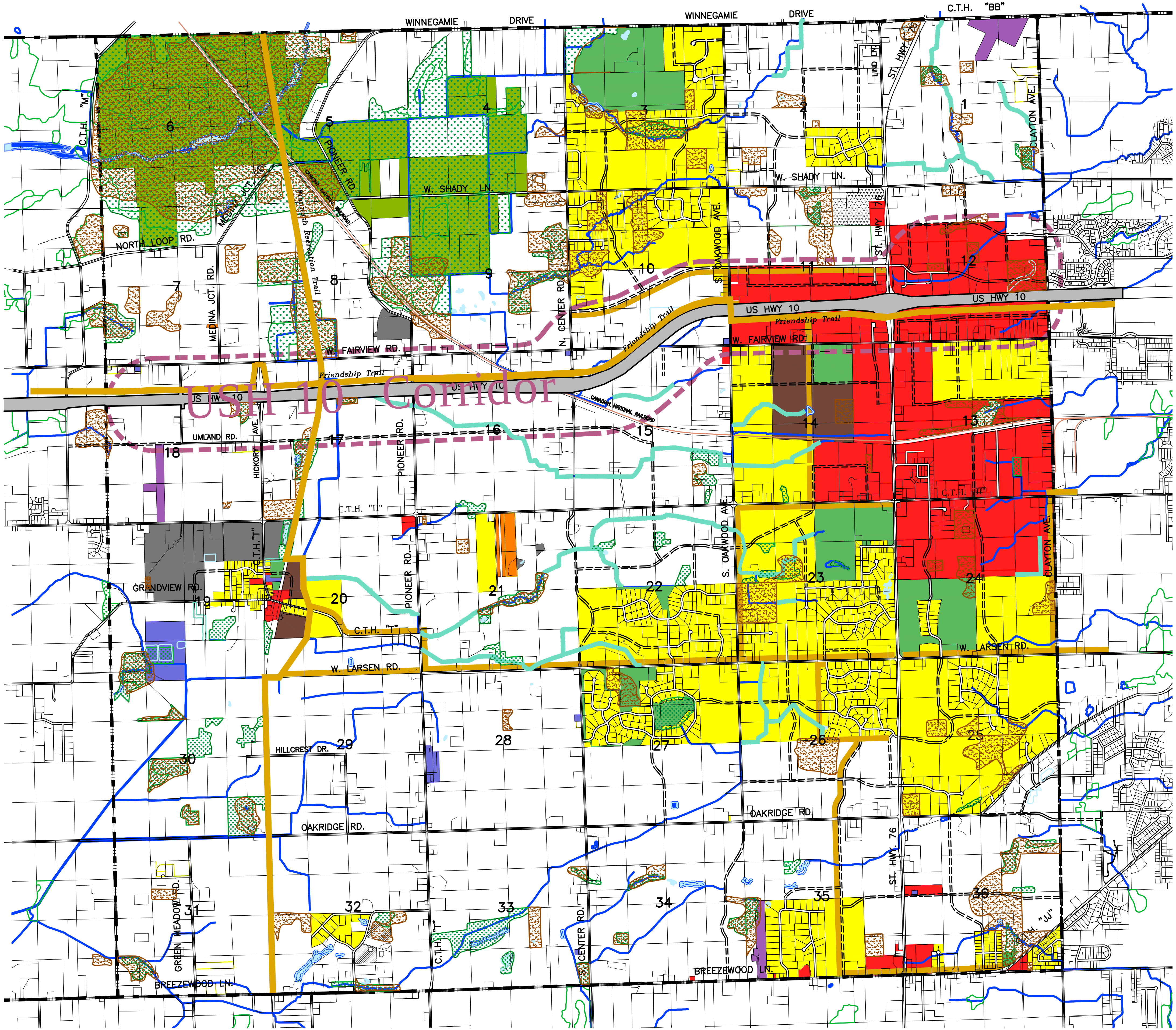
Figure 2-12: Future Land Use Map

Figure 2-12:

Map 1

Town of Clayton

Future Land Use Plan



N
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Legend

- Agriculture/Rural Residential
- Residential - Single and Two Family
- Multi-Family Residential
- Manufactured Housing Community
- Business (See Note)
- Non-Metallic Mining Sites
- Utilities and Public Facilities
- Recreation and Conservation
- Airport
- Wisconsin DNR Lands
- Special Agriculture Area (Tree Farms, Nurseries, Vineyards, etc.)
- Abandoned Landfill Site
- Open Water/Pool Lakes
- Recreational Trails
- Future Roads
- Conservation/Drainage Way

Land Coverages

- Wetlands
- Woods

NOTE 1: "Business" represents Commercial and Industrial uses identified in the Winnebago County Commercial and Industrial Zoning Districts, subject to Town Site Plan and County Zoning Regulations.

NOTE 2: In the interest of making sound land use decisions, property owners in the USH 10 Corridor west of Oakwood Avenue are advised that at some point in the future, the demand for commercial development may expand west from the area shown as Business on this Future Land Use Plan. Property owners in the Corridor are advised that the Town of Clayton will support the expansion of commercial development in the USH 10 Corridor west of Oakwood Avenue when the infrastructure needed to support the commercial development can be provided in a cost effective and efficient manner. Property owners in the Corridor are advised that, in planning for the sale and/or development of their property, they should consider the potential impact of future commercial development on their property.

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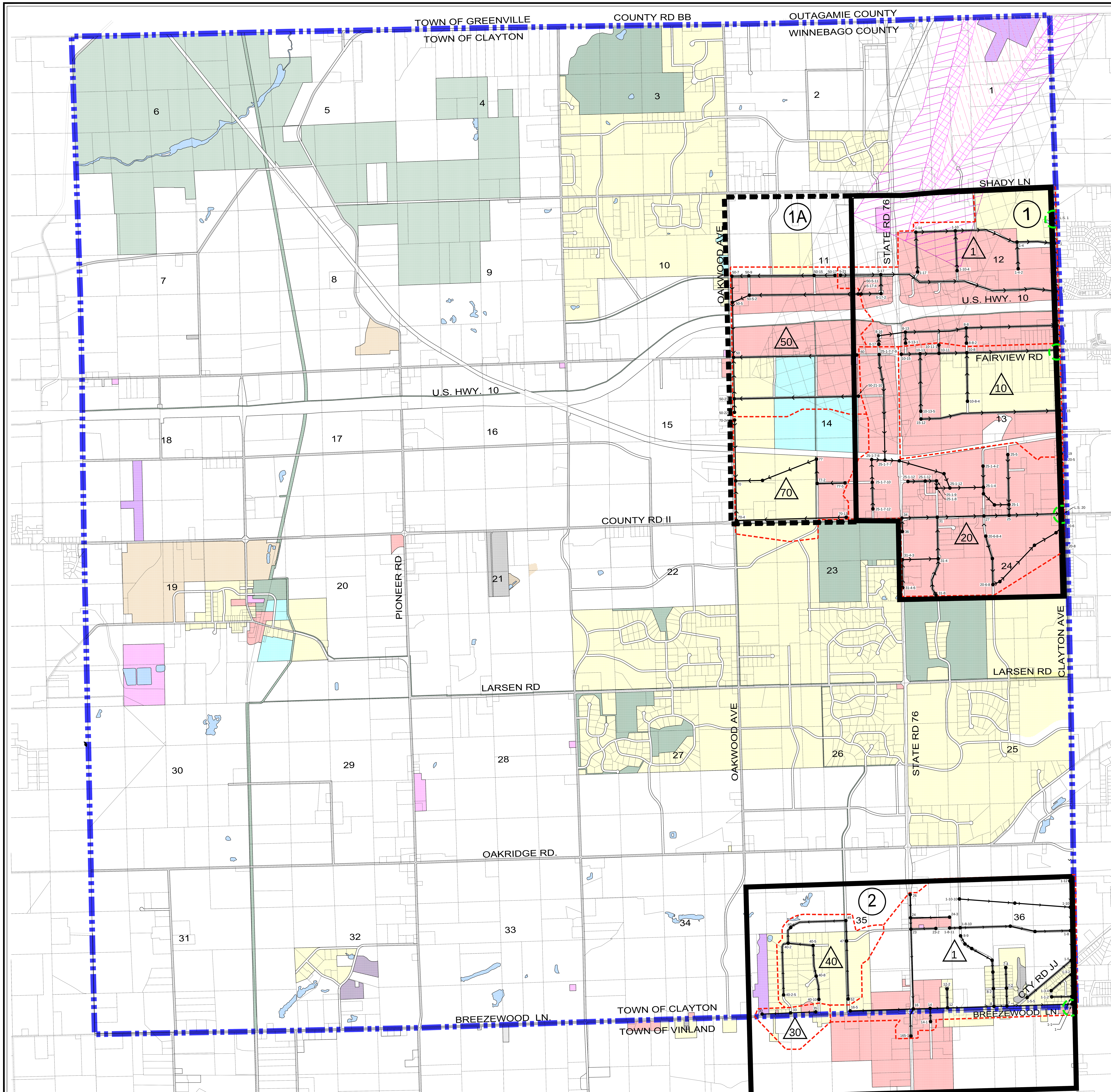
pnac267559lu_ad2009.dwg_Amended_12/16/2009

Figure 3-1, 3-2: Sanitary Sewer Layout & Drainage Basins



TOWN OF CLAYTON

SANITARY SEWER LAYOUT AND DRAINAGE BASINS PLANNING AREA 1, 1A AND 2

FIGURE 3-1, 3-2

LEGEND:

- STUDY AREA BOUNDARY 1
- STUDY AREA BOUNDARY 1A
- STUDY AREA BOUNDARY 2
- DRAINAGE BASIN
- SANITARY SEWER
- SANITARY MANHOLE
- DIRECTION OF FLOW
- TOWN OF CLAYTON BOUNDARY
- RECIRCULATING TEXTILE FILTER WASTEWATER TREATMENT POD
- DRAINAGE AREA

ZONING:

- AGRICULTURAL/RURAL RESIDENTIAL
- RESIDENTIAL-SINGLE & TWO FAMILY
- MULTI-FAMILY RESIDENTIAL
- MANUFACTURED HOUSING COMMUNITY
- BUSINESS (COMMERCIAL & INDUSTRIAL)
- NON-METALLIC MINING
- UTILITIES AND PUBLIC FACILITIES
- RECREATION & CONSERVATION
- AIRPORT
- WISCONSIN DNR LANDS
- SPECIAL AGRICULTURAL AREA (TREE FARMS, NURSERIES, ETC)
- ABANDONED LANDFILL SITE
- OPEN WATER/POOL/LAKE
- AIRPORT ZONING 1
- AIRPORT ZONING 2A
- AIRPORT ZONING 2B
- AIRPORT ZONING 3

STUDY AREA BOUNDARY 1

THIS MAP CONTAINS DATA FROM WINNEBAGO COUNTY, FOX CITIES 2030 SEWER SERVICE AREA PLAN UPDATE PREPARED BY THE EAST CENTRAL WISCONSIN REGIONAL PLANNING COMMISSION, FEB. 13, 2006, AND THE TOWN OF CLAYTON COMPREHENSIVE PLAN BY MARTENSON & EISELE, DEC. 16, 2009.

TOWN OF CLAYTON
WINNEBAGO COUNTY

STATE OF WISCONSIN

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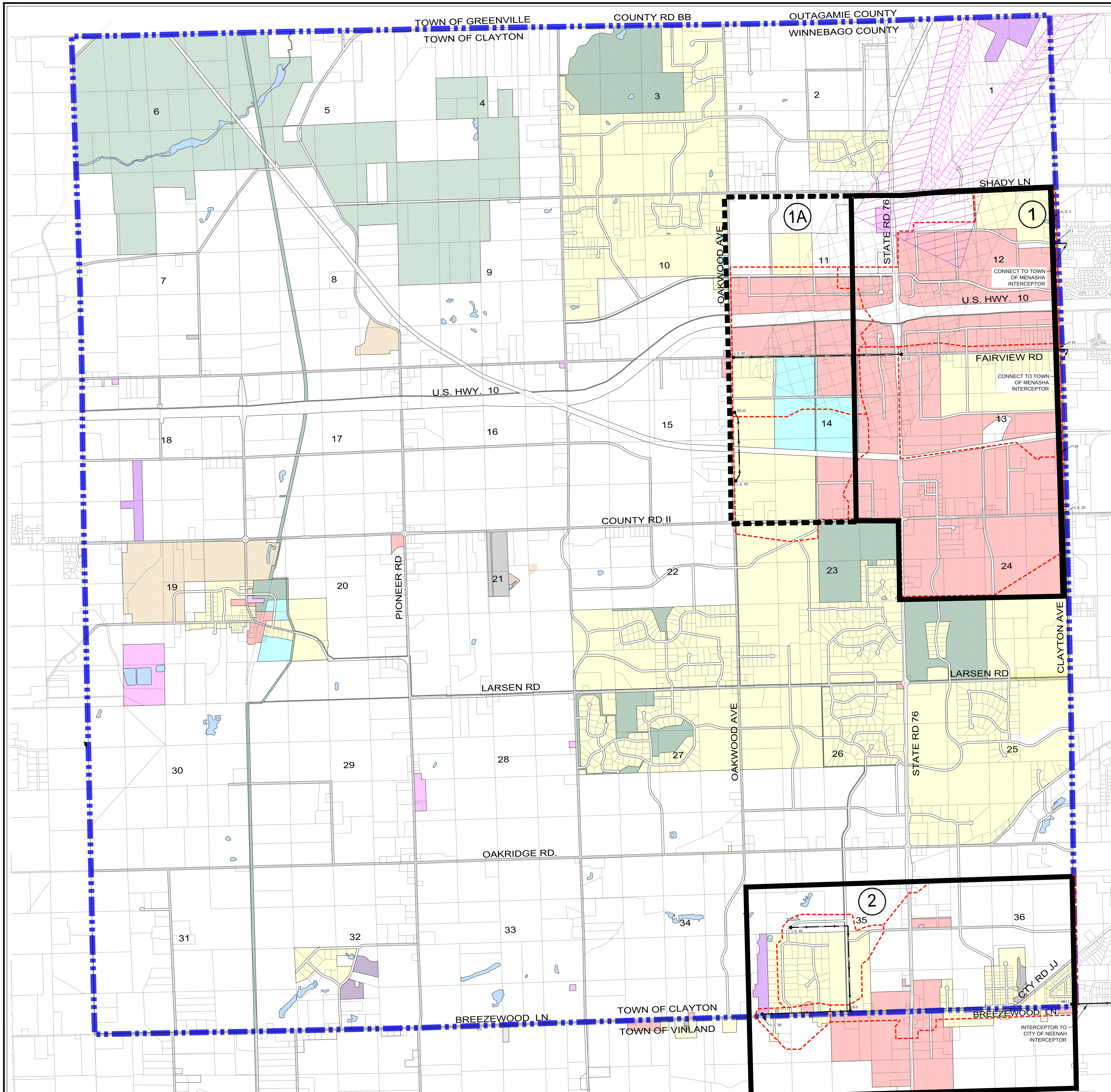
Figure 3-3: Lift Station and Force Main to Existing Interceptor Sewers

TOWN OF CLAYTON

LIFT STATION AND FORCEMAIN TO EXISTING INTERCEPTOR SEWERS PLANNING AREA 1, 1A AND 2

FIGURE 3-3



LEGEND:

- STUDY AREA BOUNDARY 1
- STUDY AREA BOUNDARY 1A
- STUDY AREA BOUNDARY 2
- DRAINAGE BASIN
- FORCE MAIN
- SANITARY MANHOLE
- DIRECTION OF FLOW
- TOWN OF CLAYTON BOUNDARY

ZONING:

- AGRICULTURAL/RURAL RESIDENTIAL
- RESIDENTIAL-SINGLE & TWO FAMILY
- MULTI-FAMILY RESIDENTIAL
- MANUFACTURED HOUSING COMMUNITY
- BUSINESS (COMMERCIAL & INDUSTRIAL)
- NON-METALLIC MINING
- UTILITIES AND PUBLIC FACILITIES
- RECREATION & CONSERVATION
- AIRPORT
- WISCONSIN DNR LANDS
- SPECIAL AGRICULTURAL AREA (TREE FARMS, NURSERIES, ETC)
- ABANDONED LANDFILL SITE
- OPEN WATER/POOL/LAKE
- AIRPORT ZONING 1
- AIRPORT ZONING 2A
- AIRPORT ZONING 2B
- AIRPORT ZONING 3

THIS MAP CONTAINS DATA FROM WINNEBAGO COUNTY, FOX CITIES 2030 SEWER SERVICE AREA PLAN UPDATE PREPARED BY THE EAST CENTRAL WISCONSIN REGIONAL PLANNING COMMISSION, FEB. 13, 2006, AND THE TOWN OF CLAYTON COMPREHENSIVE PLAN BY MARTENSON & EISELE, DEC. 16, 2009.

TOWN OF CLAYTON WINNEBAGO COUNTY

STATE OF WISCONSIN

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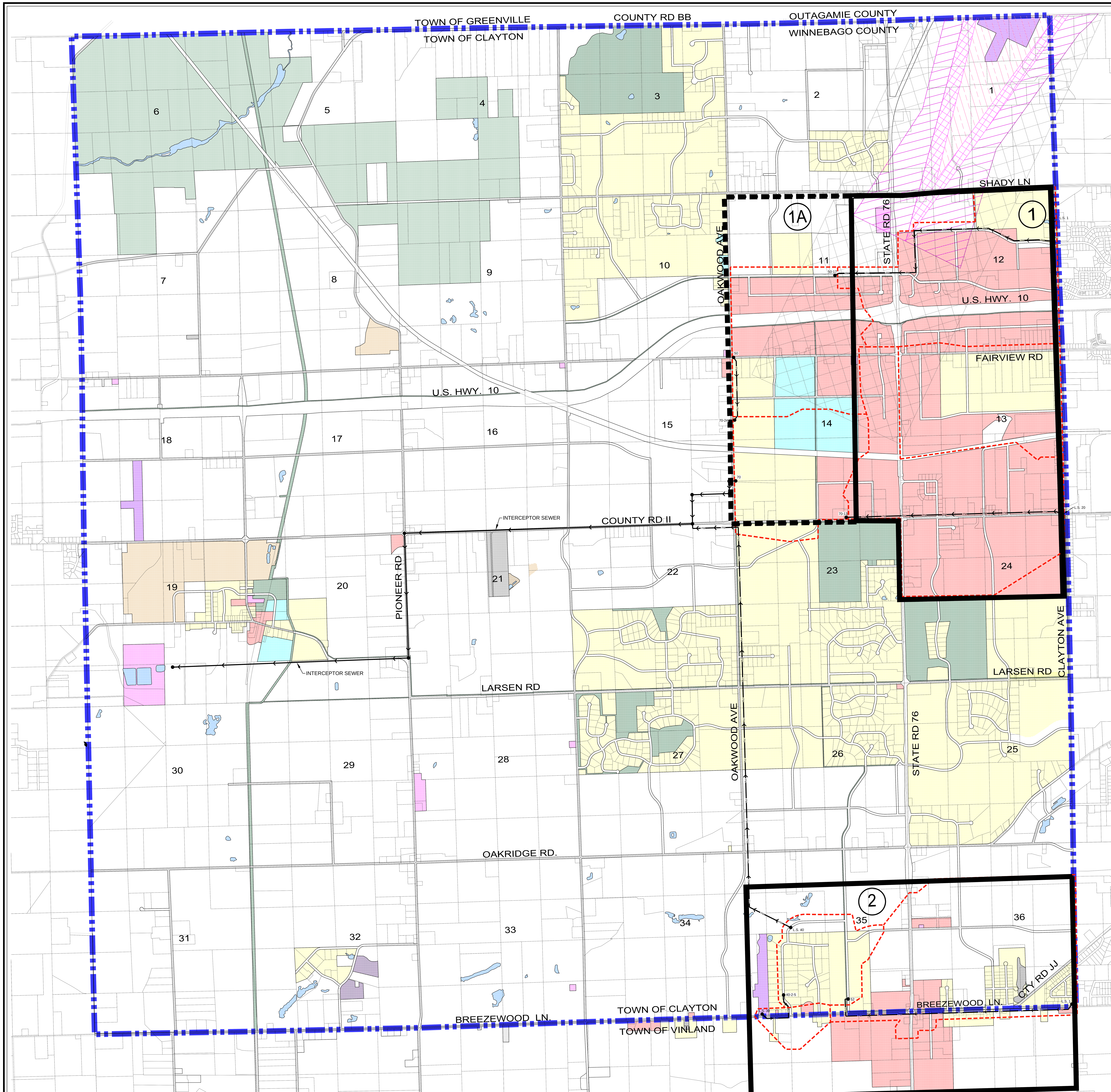
Figure 3-4: Lift Station and Force Main to Larsen-Winchester WWTP

TOWN OF CLAYTON

LIFT STATION AND FORCEMAIN TO LARSEN-WINCHESTER WWTP PLANNING AREA 1, 1A AND 2

FIGURE 3-4



LEGEND:

- STUDY AREA BOUNDARY 1
- STUDY AREA BOUNDARY 1A
- STUDY AREA BOUNDARY 2
- DRAINAGE BASIN
- FORCE MAIN
- SANITARY MANHOLE
- DIRECTION OF FLOW
- TOWN OF CLAYTON BOUNDARY

ZONING:

- AGRICULTURAL/RURAL RESIDENTIAL
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- AIRPORT ZONING 3

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Figure 4-2: Wastewater Treatment Plant Preliminary Layout – Typical Recirculating Textile Fabric Filter Pods

Figure 4-2: WWTP Preliminary Layout - Typical Recirculating Textile Fabric Filter Pods

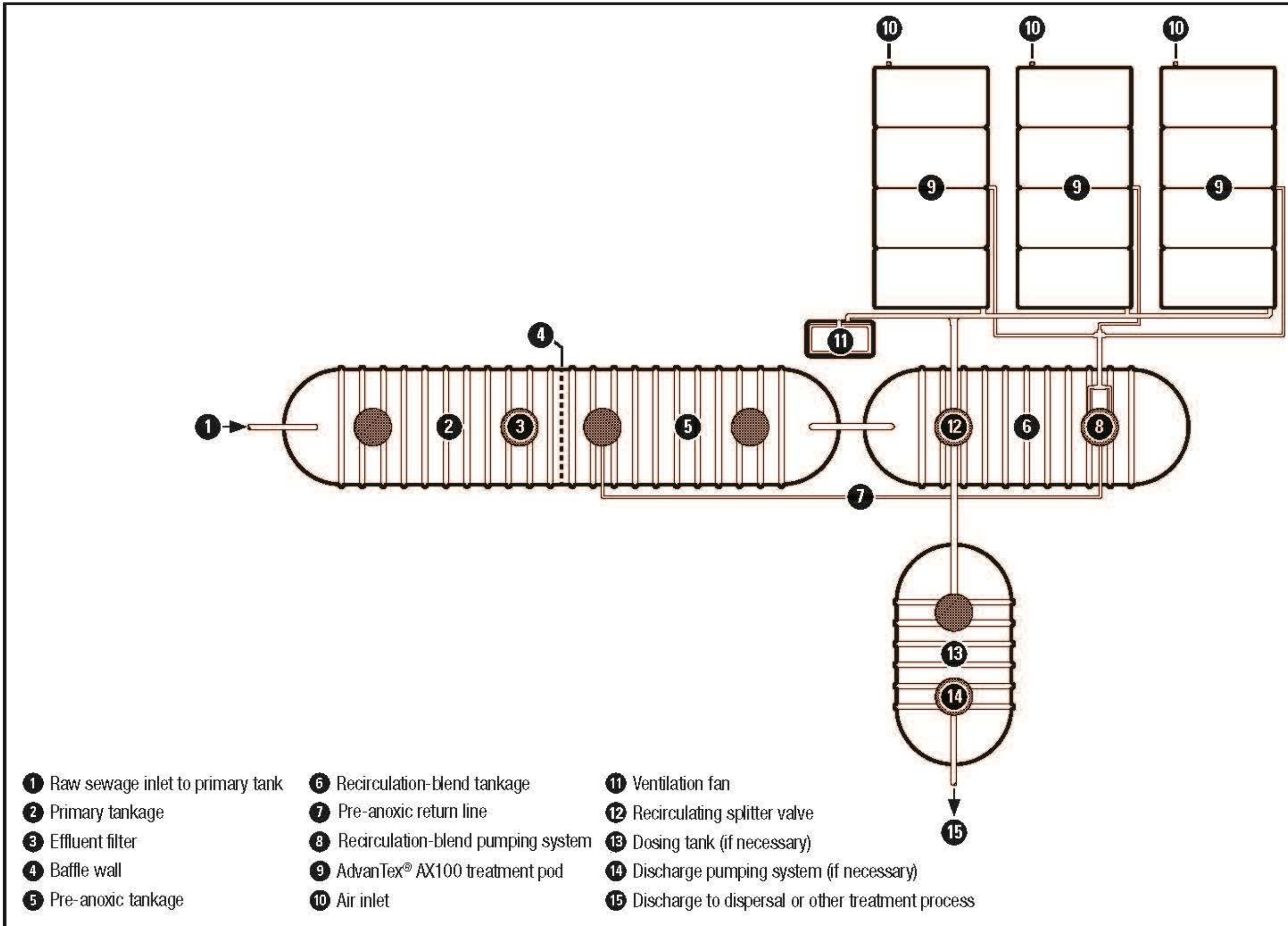
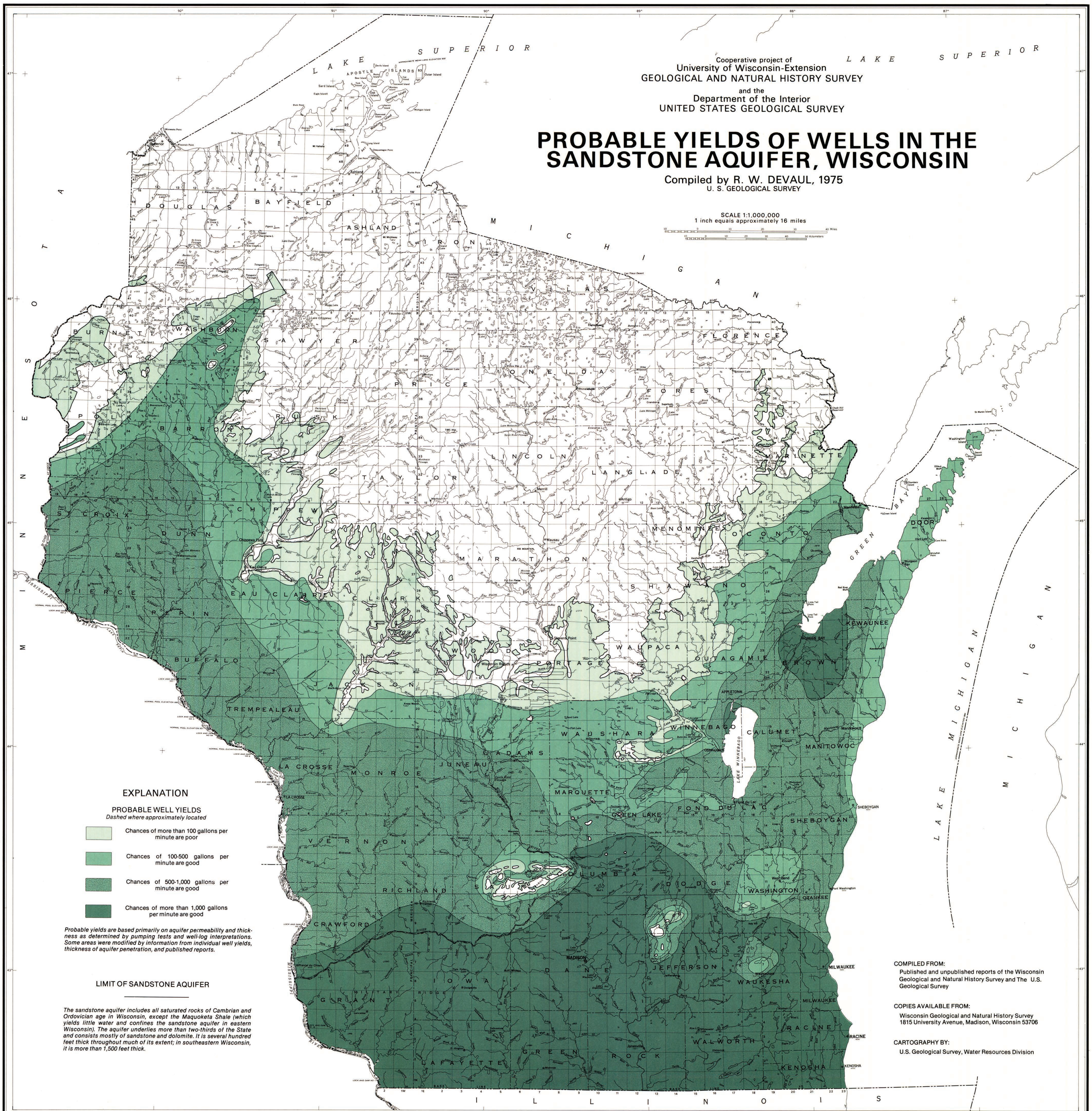


Figure 5-1: Map of WI Potential Well Yields in Sandstone

Figure 5-1:



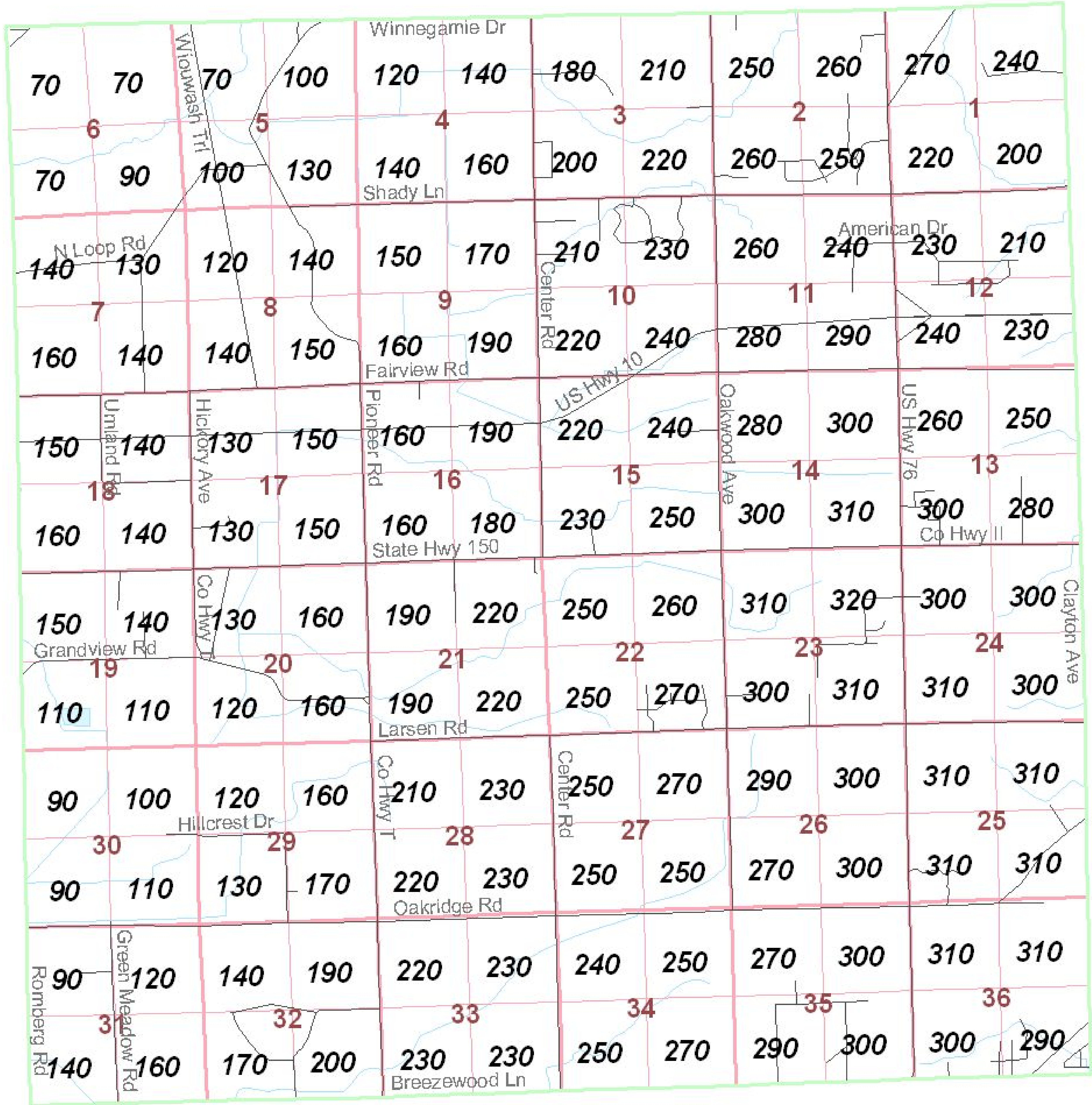
Base from U.S. Geological Survey
State base map, 1968

Lambert conformal conic projection based on standard parallels 33° and 45°

Figure 5-2: WDNR Minimum Well Casing & Cement Grout Depth for Wells within Arsenic Advisory Area

Minimum Well Casing & Cement Grout Depth* For Bedrock Wells Within the Arsenic "Special Well Casing Pipe Depth Area"
Town of Clayton, Winnebago County
T20N, R16E

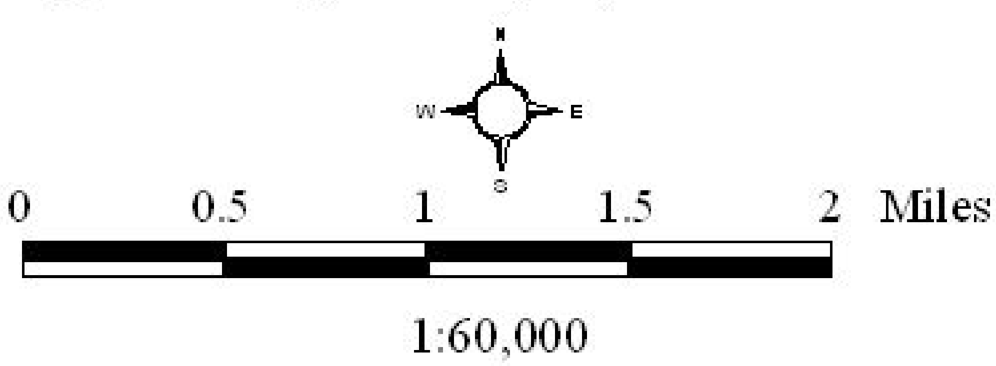
Figure 5-2:

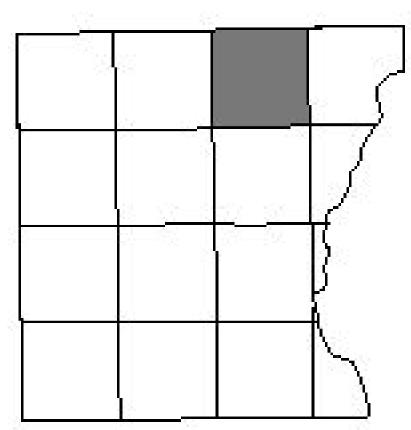


*Within each quarter section the minimum depth of the upper-enlarged drillhole, casing pipe and cement grout is indicated by the number provided. Although unlikely, the minimum casing/grout depths provided above may not get you down to the Cambrian Sandstone. However, in any case, the casing and grout shall extend at least to the top of the Cambrian Sandstone.

Note: The first 10-15 feet of the Cambrian Sandstone is usually reddish in color and can produce water with a high iron content. You may want to also case and grout through this top layer.

Section Boundary
Quarter-Section Boundary
Township Boundary
Roads
Rivers/Streams



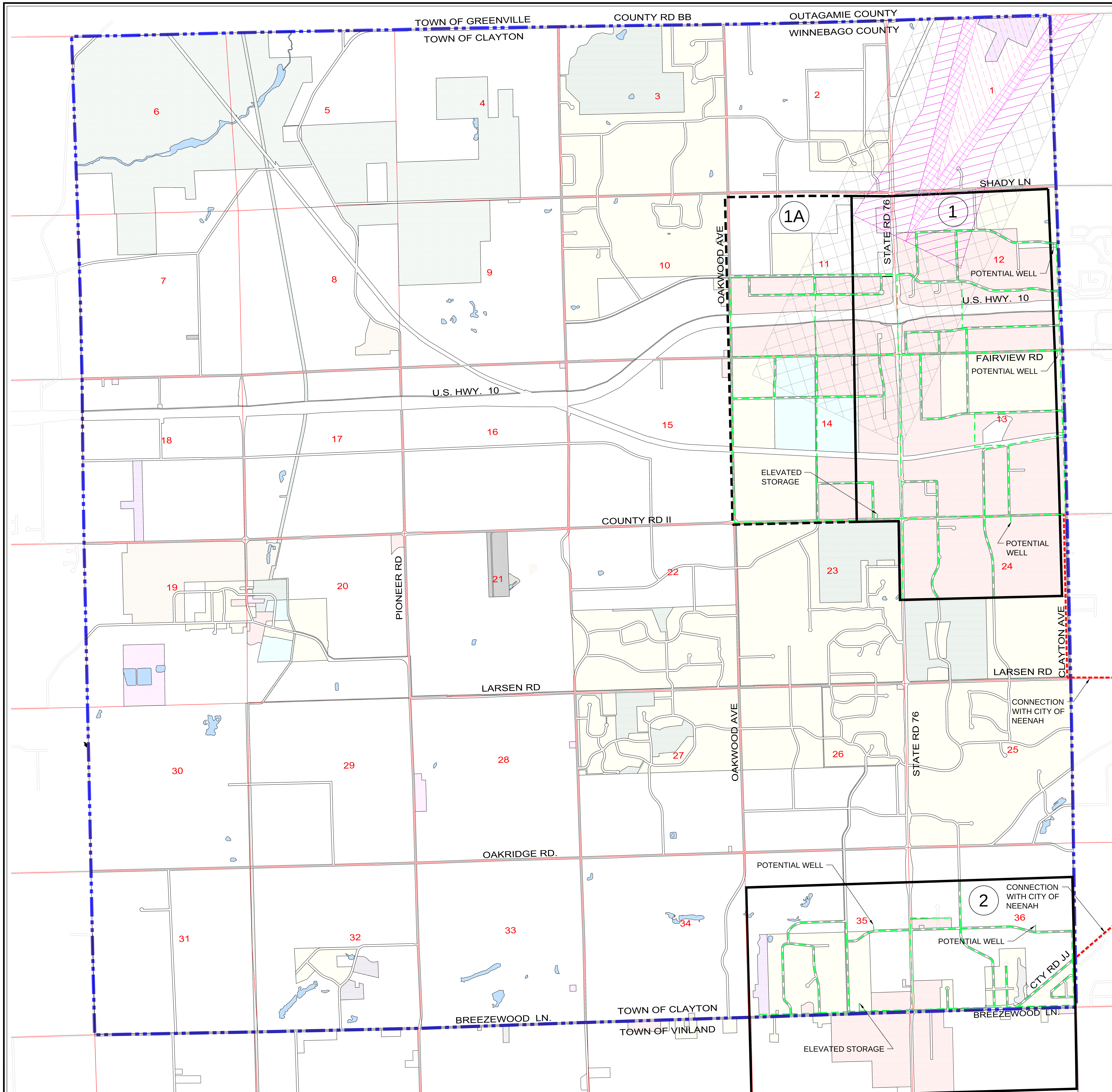


Winnebago County

Effective Date: October 1, 2004

Wisconsin Department of Natural Resources
Bureau of Drinking Water & Groundwater

Figure 5-3, 5-4: Water Distribution System: Planning Areas 1, 1A & 2



TOWN OF CLAYTON

WATER DISTRIBUTION SYSTEM PLANNING AREA 1, 1A AND 2

FIGURE 5-3 AND 5-4

LEGEND:

- STUDY AREA BOUNDARY 1
- STUDY AREA BOUNDARY 1A
- STUDY AREA BOUNDARY 2
- TOWN OF CLAYTON BOUNDARY
- CONNECTION TO CITY OF NEENAH
- PROPOSED WATER LINES

ZONING:

- AGRICULTURAL/RURAL RESIDENTIAL
- RESIDENTIAL-SINGLE & TWO FAMILY
- MULTI-FAMILY RESIDENTIAL
- MANUFACTURED HOUSING COMMUNITY
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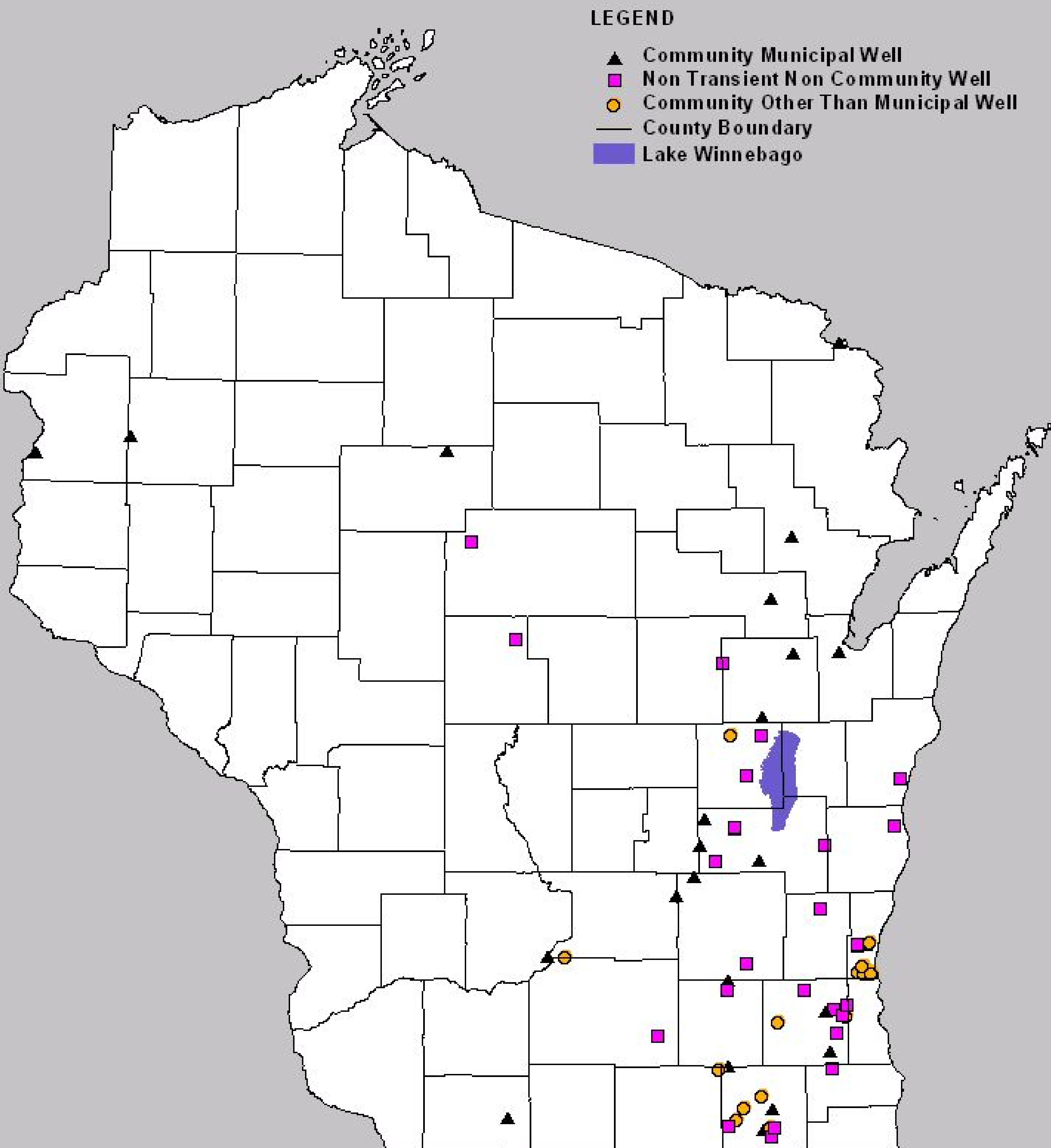
Figure 5-5: WDNR Map of Public Wells with Arsenic Detects Greater Than or Equal to 10 ppb

Public Wells with Arsenic Detects Greater Than or Equal to 10 ppb

Figure 5-5:



Wisconsin Department of Natural Resources
Water Division
Bureau of Drinking Water & Groundwater
December 2001

Figure 5-6: WDNR Map of Private Drinking Water Wells with Arsenic Detects Greater Than 10 ppb

Private Drinking Water Wells with Arsenic Detects > 10 ppb

Figure 5-6:

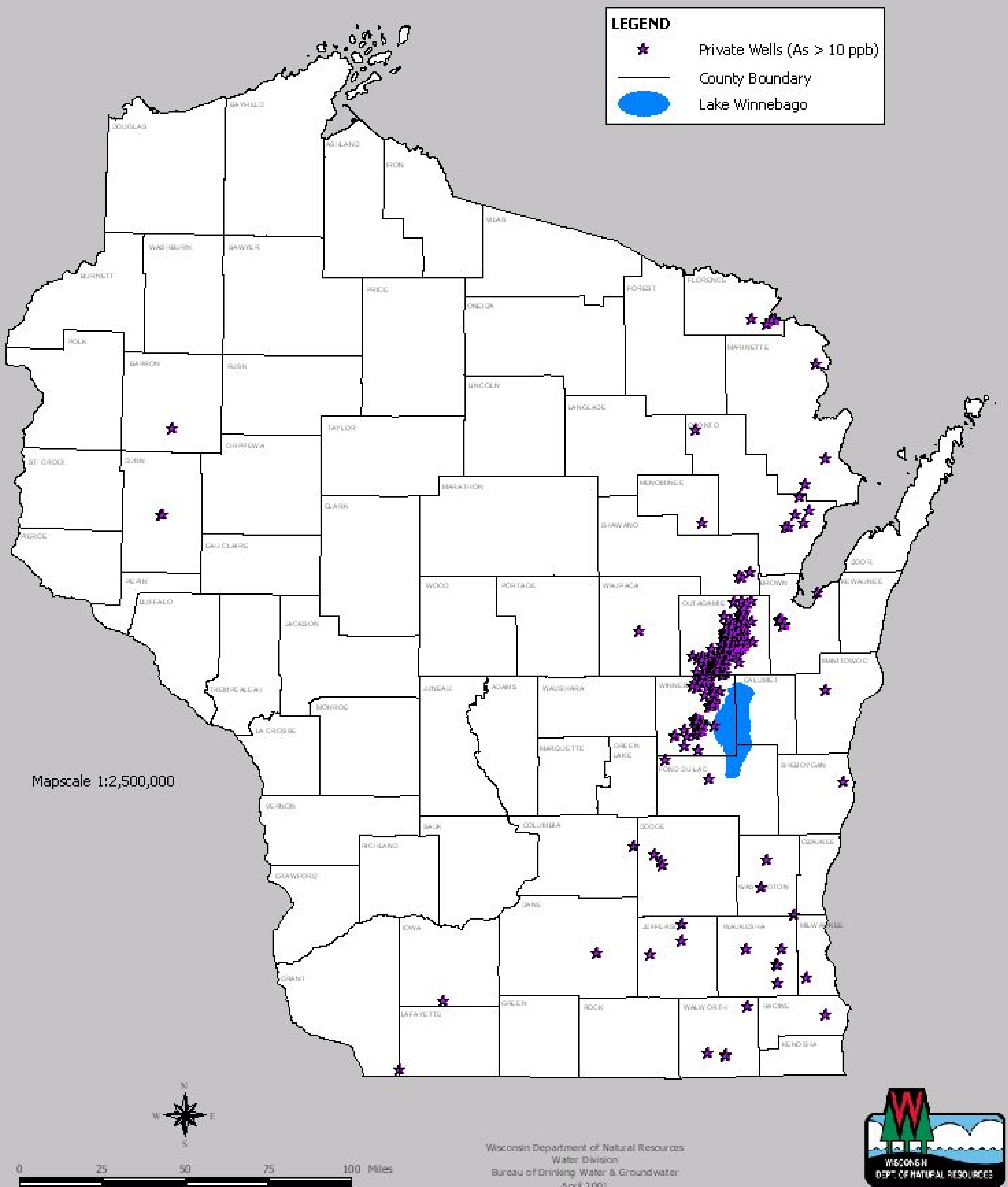
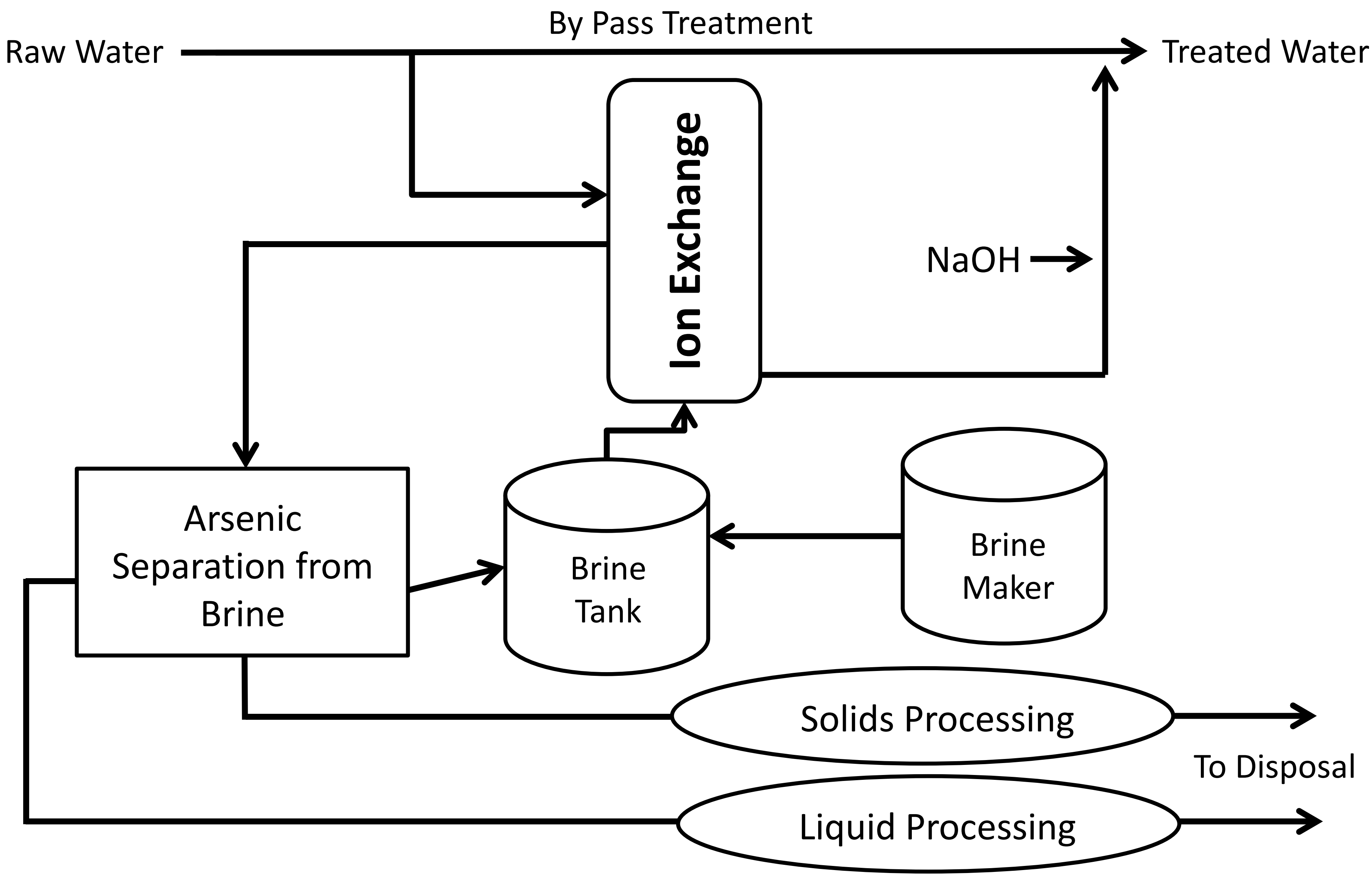


Figure 5-7: Schematic of Ion Exchange Process

Figure 5-7:
Schematic of Ion Exchange Process



APPENDICES

APPENDIX A: National Primary and Secondary Drinking Water Regulations

National Primary Drinking Water Regulations

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
OC	Acrylamide	TT[4]	Nervous system or blood problems; increased risk of cancer	Added to water during sewage/ wastewater treatment	zero
OC	Alachlor	0.002	Eye, liver, kidney or spleen problems; anemia; increased risk of cancer	Runoff from herbicide used on row crops	zero
R	Alpha/photon emitters	15 picocuries per Liter (pCi/L)	Increased risk of cancer	Erosion of natural deposits of certain minerals that are radioactive and may emit a form of radiation known as alpha radiation	zero
IOC	Antimony	0.006	Increase in blood cholesterol; decrease in blood sugar	Discharge from petroleum refineries; fire retardants; ceramics; electronics; solder	0.006
IOC	Arsenic	0.010	Skin damage or problems with circulatory systems, and may have increased risk of getting cancer	Erosion of natural deposits; runoff from orchards; runoff from glass & electronics production wastes	0
IOC	Asbestos (fibers >10 micrometers)	7 million fibers per Liter (MFL)	Increased risk of developing benign intestinal polyps	Decay of asbestos cement in water mains; erosion of natural deposits	7 MFL
OC	Atrazine	0.003	Cardiovascular system or reproductive problems	Runoff from herbicide used on row crops	0.003
IOC	Barium	2	Increase in blood pressure	Discharge of drilling wastes; discharge from metal refineries; erosion of natural deposits	2
OC	Benzene	0.005	Anemia; decrease in blood platelets; increased risk of cancer	Discharge from factories; leaching from gas storage tanks and landfills	zero
OC	Benzo(a)pyrene (PAHs)	0.0002	Reproductive difficulties; increased risk of cancer	Leaching from linings of water storage tanks and distribution lines	zero
IOC	Beryllium	0.004	Intestinal lesions	Discharge from metal refineries and coal-burning factories; discharge from electrical, aerospace, and defense industries	0.004
R	Beta photon emitters	4 millirems per year	Increased risk of cancer	Decay of natural and man-made deposits of certain minerals that are radioactive and may emit forms of radiation known as photons and beta radiation	zero
DBP	Bromate	0.010	Increased risk of cancer	Byproduct of drinking water disinfection	zero
IOC	Cadmium	0.005	Kidney damage	Corrosion of galvanized pipes; erosion of natural deposits; discharge from metal refineries; runoff from waste batteries and paints	0.005
OC	Carbofuran	0.04	Problems with blood, nervous system, or reproductive system	Leaching of soil fumigant used on rice and alfalfa	0.04
OC	Carbon tetrachloride	0.005	Liver problems; increased risk of cancer	Discharge from chemical plants and other industrial activities	zero
D	Chloramines (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort; anemia	Water additive used to control microbes	MRDLG=4[1]
OC	Chlordane	0.002	Liver or nervous system problems; increased risk of cancer	Residue of banned termiticide	zero
D	Chlorine (as Cl_2)	MRDL=4.0[1]	Eye/nose irritation; stomach discomfort	Water additive used to control microbes	MRDLG=4[1]
D	Chlorine dioxide (as ClO_2)	MRDL=0.8[1]	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Water additive used to control microbes	MRDLG=0.8[1]
DBP	Chlorite	1.0	Anemia; infants, young children, and fetuses of pregnant women: nervous system effects	Byproduct of drinking water disinfection	0.8
OC	Chlorobenzene	0.1	Liver or kidney problems	Discharge from chemical and agricultural chemical factories	0.1
IOC	Chromium (total)	0.1	Allergic dermatitis	Discharge from steel and pulp mills; erosion of natural deposits	0.1
IOC	Copper	TT[5]; Action Level = 1.3	Short-term exposure: Gastrointestinal distress. Long-term exposure: Liver or kidney damage. People with Wilson's Disease should consult their personal doctor if the amount of copper in their water exceeds the action level	Corrosion of household plumbing systems; erosion of natural deposits	1.3
M	*Cryptosporidium*	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero

LEGEND

- D Disinfectant
- DBP Disinfection Byproduct
- IOC Inorganic Chemical
- M Microorganism
- OC Organic Chemical
- R Radionuclides

Contaminant		MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
IOC	Cyanide (as free cyanide)	0.2	Nerve damage or thyroid problems	Discharge from steel/metal factories; discharge from plastic and fertilizer factories	0.2
OC	2,4-D	0.07	Kidney, liver, or adrenal gland problems	Runoff from herbicide used on row crops	0.07
OC	Dalapon	0.2	Minor kidney changes	Runoff from herbicide used on rights of way	0.2
OC	1,2-Dibromo-3-chloropropane (DBCP)	0.0002	Reproductive difficulties; increased risk of cancer	Runoff/leaching from soil fumigant used on soybeans, cotton, pineapples, and orchards	zero
OC	o-Dichlorobenzene	0.6	Liver, kidney, or circulatory system problems	Discharge from industrial chemical factories	0.6
OC	p-Dichlorobenzene	0.075	Anemia; liver, kidney or spleen damage; changes in blood	Discharge from industrial chemical factories	0.075
OC	1,2-Dichloroethane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	1,1-Dichloroethylene	0.007	Liver problems	Discharge from industrial chemical factories	0.007
OC	cis-1,2-Dichloroethylene	0.07	Liver problems	Discharge from industrial chemical factories	0.07
OC	trans-1,2-Dichloroethylene	0.1	Liver problems	Discharge from industrial chemical factories	0.1
OC	Dichloromethane	0.005	Liver problems; increased risk of cancer	Discharge from drug and chemical factories	zero
OC	1,2-Dichloropropane	0.005	Increased risk of cancer	Discharge from industrial chemical factories	zero
OC	Di(2-ethylhexyl) adipate	0.4	Weight loss, liver problems, or possible reproductive difficulties	Discharge from chemical factories	0.4
OC	Di(2-ethylhexyl) phthalate	0.006	Reproductive difficulties; liver problems; increased risk of cancer	Discharge from rubber and chemical factories	zero
OC	Dinoseb	0.007	Reproductive difficulties	Runoff from herbicide used on soybeans and vegetables	0.007
OC	Dioxin (2,3,7,8-TCDD)	0.00000003	Reproductive difficulties; increased risk of cancer	Emissions from waste incineration and other combustion; discharge from chemical factories	zero
OC	Diquat	0.02	Cataracts	Runoff from herbicide use	0.02
OC	Endothall	0.1	Stomach and intestinal problems	Runoff from herbicide use	0.1
OC	Endrin	0.002	Liver problems	Residue of banned insecticide	0.002
OC	Epichlorohydrin	TT[4]	Increased cancer risk; stomach problems	Discharge from industrial chemical factories; an impurity of some water treatment chemicals	zero
OC	Ethylbenzene	0.7	Liver or kidney problems	Discharge from petroleum refineries	0.7
OC	Ethylene dibromide	0.00005	Problems with liver, stomach, reproductive system, or kidneys; increased risk of cancer	Discharge from petroleum refineries	zero
M	Fecal coliform and *E. coli*	MCL[6]	Fecal coliforms and *E. coli* are bacteria whose presence indicates that the water may be contaminated with human or animal wastes. Microbes in these wastes may cause short term effects, such as diarrhea, cramps, nausea, headaches, or other symptoms. They may pose a special health risk for infants, young children, and people with severely compromised immune systems.	Human and animal fecal waste	zero[6]
IOC	Fluoride	4.0	Bone disease (pain and tenderness of the bones); children may get mottled teeth	Water additive which promotes strong teeth; erosion of natural deposits; discharge from fertilizer and aluminum factories	4.0
M	*Giardia lamblia*	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Glyphosate	0.7	Kidney problems; reproductive difficulties	Runoff from herbicide use	0.7
DBP	Haloacetic acids (HAA5)	0.060	Increased risk of cancer	Byproduct of drinking water disinfection	n/a[9]
OC	Heptachlor	0.0004	Liver damage; increased risk of cancer	Residue of banned termiticide	zero
OC	Heptachlor epoxide	0.0002	Liver damage; increased risk of cancer	Breakdown of heptachlor	zero
M	Heterotrophic plate count (HPC)	TT[7]	HPC has no health effects; it is an analytic method used to measure the variety of bacteria that are common in water. The lower the concentration of bacteria in drinking water, the better maintained the water system is.	HPC measures a range of bacteria that are naturally present in the environment	n/a

LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

	Contaminant	MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
OC	Hexachlorobenzene	0.001	Liver or kidney problems; reproductive difficulties; increased risk of cancer	Discharge from metal refineries and agricultural chemical factories	zero
OC	Hexachlorocyclopentadiene	0.05	Kidney or stomach problems	Discharge from chemical factories	0.05
IOC	Lead	TT5; Action Level=0.015	Infants and children: Delays in physical or or mental development; children could show slight deficits in attention span and learning abilities; Adults: Kidney problems; high blood pressure	Corrosion of household plumbing systems; erosion of natural deposits	zero
M	*Legionella*	TT7	Legionnaire's Disease, a type of pneumonia	Found naturally in water; multiplies in heating systems	zero
OC	Lindane	0.0002	Liver or kidney problems	Runoff/leaching from insecticide used on cattle, lumber, gardens	0.0002
IOC	Mercury (inorganic)	0.002	Kidney damage	Erosion of natural deposits; discharge from refineries and factories; runoff from landfills and croplands	0.002
OC	Methoxychlor	0.04	Reproductive difficulties	Runoff/leaching from insecticide used on fruits, vegetables, alfalfa, livestock	0.04
IOC	Nitrate (measured as Nitrogen)	10	Infants below the age of six months who drink water containing nitrate in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	10
IOC	Nitrite (measured as Nitrogen)	1	Infants below the age of six months who drink water containing nitrite in excess of the MCL could become seriously ill and, if untreated, may die. Symptoms include shortness of breath and blue-baby syndrome.	Runoff from fertilizer use; leaching from septic tanks, sewage; erosion of natural deposits	1
OC	Oxamyl (Vydate)	0.2	Slight nervous system effects	Runoff/leaching from insecticide used on apples, potatoes, and tomatoes	0.2
OC	Pentachlorophenol	0.001	Liver or kidney problems; increased cancer risk	Discharge from wood-preserving factories	zero
OC	Picloram	0.5	Liver problems	Herbicide runoff	0.5
OC	Polychlorinated biphenyls (PCBs)	0.0005	Skin changes; thymus gland problems; immune deficiencies; reproductive or nervous system difficulties; increased risk of cancer	Runoff from landfills; discharge of waste chemicals	zero
R	Radium 226 and Radium 228 (combined)	5 pCi/L	Increased risk of cancer	Erosion of natural deposits	zero
IOC	Selenium	0.05	Hair or fingernail loss; numbness in fingers or toes; circulatory problems	Discharge from petroleum and metal refineries; erosion of natural deposits; discharge from mines	0.05
OC	Simazine	0.004	Problems with blood	Herbicide runoff	0.004
OC	Styrene	0.1	Liver, kidney, or circulatory system problems	Discharge from rubber and plastic factories; leaching from landfills	0.1
OC	Tetrachloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from factories and dry cleaners	zero
IOC	Thallium	0.002	Hair loss; changes in blood; kidney, intestine, or liver problems	Leaching from ore-processing sites; discharge from electronics, glass, and drug factories	0.0005
OC	Toluene	1	Nervous system, kidney, or liver problems	Discharge from petroleum factories	1
M	Total Coliforms	5.0 percent[8]	Coliforms are bacteria that indicate that other, potentially harmful bacteria may be present. See fecal coliforms and *E. coli*	Naturally present in the environment	zero
DBP	Total Trihalomethanes (TTHMs)	0.080	Liver, kidney or central nervous system problems; increased risk of cancer	Byproduct of drinking water disinfection	n/a[9]
OC	Toxaphene	0.003	Kidney, liver, or thyroid problems; increased risk of cancer	Runoff/leaching from insecticide used on cotton and cattle	zero
OC	2,4,5-TP (Silvex)	0.05	Liver problems	Residue of banned herbicide	0.05
OC	1,2,4-Trichlorobenzene	0.07	Changes in adrenal glands	Discharge from textile finishing factories	0.07
OC	1,1,1-Trichloroethane	0.2	Liver, nervous system, or circulatory problems	Discharge from metal degreasing sites and other factories	0.2
OC	1,1,2-Trichloroethane	0.005	Liver, kidney, or immune system problems	Discharge from industrial chemical factories	0.003
OC	Trichloroethylene	0.005	Liver problems; increased risk of cancer	Discharge from metal degreasing sites and other factories	zero

LEGEND

- D — Disinfectant
- DBP — Disinfection Byproduct
- IOC — Inorganic Chemical
- M — Microorganism
- OC — Organic Chemical
- R — Radionuclides

Contaminant		MCL or TT[1] (mg/L)[2]	Potential health effects from long-term[3] exposure above the MCL	Common sources of contaminant in drinking water	Public Health Goal (mg/L)[2]
M	Turbidity	TT[7]	Turbidity is a measure of the cloudiness of water. It is used to indicate water quality and filtration effectiveness (e.g., whether disease-causing organisms are present). Higher turbidity levels are often associated with higher levels of disease-causing microorganisms such as viruses, parasites and some bacteria. These organisms can cause short term symptoms such as nausea, cramps, diarrhea, and associated headaches.	Soil runoff	n/a
R	Uranium	30µg/L	Increased risk of cancer, kidney toxicity	Erosion of natural deposits	zero
OC	Vinyl chloride	0.002	Increased risk of cancer	Leaching from PVC pipes; discharge from plastic factories	zero
M	Viruses (enteric)	TT[7]	Short-term exposure: Gastrointestinal illness (e.g., diarrhea, vomiting, cramps)	Human and animal fecal waste	zero
OC	Xylenes (total)	10	Nervous system damage	Discharge from petroleum factories; discharge from chemical factories	10

LEGEND

D	Disinfectant	IOC	Inorganic Chemical	OC	Organic Chemical
DBP	Disinfection Byproduct	M	Microorganism	R	Radionuclides

NOTES

1 Definitions

- Maximum Contaminant Level Goal (MCLG)—The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.
- Maximum Contaminant Level (MCL)—The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available treatment technology and taking cost into consideration. MCLs are enforceable standards.
- Maximum Residual Disinfectant Level Goal (MRDLG)—The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.
- Maximum Residual Disinfectant Level (MRDL)—The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.
- Treatment Technique (TT)—A required process intended to reduce the level of a contaminant in drinking water.

2 Units are in milligrams per liter (mg/L) unless otherwise noted. Milligrams per liter are equivalent to parts per million (ppm).

3 Health effects are from long-term exposure unless specified as short-term exposure.

4 Each water system must certify annually, in writing, to the state (using third-party or manufacturers certification) that when it uses acrylamide and/or epichlorohydrin to treat water, the combination (or product) of dose and monomer level does not exceed the levels specified, as follows: Acrylamide = 0.05 percent dosed at 1 mg/L (or equivalent); Epichlorohydrin = 0.01 percent dosed at 20 mg/L (or equivalent).

5 Lead and copper are regulated by a Treatment Technique that requires systems to control the corrosiveness of their water. If more than 10 percent of tap water samples exceed the action level, water systems must take additional steps. For copper, the action level is 1.3 mg/L, and for lead is 0.015 mg/L.

6 A routine sample that is fecal coliform-positive or *E. coli*-positive triggers repeat samples--if any repeat sample is total coliform-positive, the system has an acute MCL violation. A routine sample that is total coliform-positive and fecal coliform-negative or *E. coli*-negative triggers repeat samples--if any repeat sample is fecal coliform-positive or *E. coli*-positive, the system has an acute MCL violation. See also Total Coliforms.

7 EPA's surface water treatment rules require systems using surface water or ground water under the direct influence of surface water to (1) disinfect their water, and (2) filter their water or meet criteria for avoiding filtration so that the following contaminants are controlled at the following levels:

- *Cryptosporidium*: 99 percent removal for systems that filter. Unfiltered systems are required to include Cryptosporidium in their existing watershed control provisions.
- Giardia lamblia: 99.9 percent removal/inactivation
- Viruses: 99.99 percent removal/inactivation
- *Legionella*: No limit, but EPA believes that if *Giardia* and viruses are removed/inactivated according to the treatment techniques in the surface water treatment rule, *Legionella* will also be controlled.
- Turbidity: For systems that use conventional or direct filtration, at no time can turbidity (cloudiness of water) go higher than 1 nephelolometric turbidity unit (NTU), and samples for turbidity must be less than or equal to 0.3 NTU in at least 95 percent of the samples in any month. Systems that use filtration other than conventional or direct filtration must follow state limits, which must include turbidity at no time exceeding 5 NTU.
- HPC: No more than 500 bacterial colonies per milliliter
- Long Term 1 Enhanced Surface Water Treatment; Surface water systems or ground water systems under the direct influence of surface water serving fewer than 10,000 people must comply with the applicable Long Term 1 Enhanced Surface Water Treatment Rule provisions (e.g. turbidity standards, individual filter monitoring, *Cryptosporidium* removal requirements, updated watershed control requirements for unfiltered systems).
- Long Term 2 Enhanced Surface Water Treatment; This rule applies to all surface water systems or ground water systems under the direct influence of surface water. The rule targets additional *Cryptosporidium* treatment requirements for higher risk systems and includes provisions to reduce risks from uncovered finished water storages facilities and to ensure that the systems maintain microbial protection as they take steps to reduce the formation of disinfection byproducts. (Monitoring start dates are staggered by system size. The largest systems (serving at least 100,000 people) will begin monitoring in October 2006 and the smallest systems (serving fewer than 10,000 people) will not begin monitoring until October 2008. After completing monitoring and determining their treatment bin, systems generally have three years to comply with any additional treatment requirements.)
- Filter Backwash Recycling: The Filter Backwash Recycling Rule requires systems that recycle to return specific recycle flows through all processes of the system's existing conventional or direct filtration system or at an alternate location approved by the state.

8 No more than 5.0 percent samples total coliform-positive in a month. (For water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month.) Every sample that has total coliform must be analyzed for either fecal coliforms or *E. coli*. If two consecutive TC-positive samples, and one is also positive for *E. coli* or fecal coliforms, system has an acute MCL violation.

9 Although there is no collective MCLG for this contaminant group, there are individual MCLGs for some of the individual contaminants:

- Haloacetic acids: dichloroacetic acid (zero); trichloroacetic acid (0.3 mg/L)
- Trihalomethanes: bromodichloromethane (zero); bromoform (zero); dibromochloromethane (0.06 mg/L)

National Secondary Drinking Water Regulation

National Secondary Drinking Water Regulations are non-enforceable guidelines regarding contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. However, some states may choose to adopt them as enforceable standards.

Contaminant	Secondary Maximum Contaminant Level
Aluminum	0.05 to 0.2 mg/L
Chloride	250 mg/L
Color	15 (color units)
Copper	1.0 mg/L
Corrosivity	noncorrosive
Fluoride	2.0 mg/L
Foaming Agents	0.5 mg/L
Iron	0.3 mg/L
Manganese	0.05 mg/L
Odor	3 threshold odor number
pH	6.5-8.5
Silver	0.10 mg/L
Sulfate	250 mg/L
Total Dissolved Solids	500 mg/L
Zinc	5 mg/L

For More Information

EPA's Safe Drinking Water Web site:
http://www.epa.gov/safewater/

EPA's Safe Drinking Water Hotline:
(800) 426-4791

To order additional posters or other ground water and drinking water publications, please contact the National Service Center for Environmental Publications at :
(800) 490-9198, or
email: nscep@bps-lmit.com.

EPA United States Environmental Protection Agency

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APPENDIX B: Estimate of Probable Project Costs – Sanitary Sewer, Lift Stations, and Interceptor Sewer

Estimate of Probable Project Costs-Sanitary Sewer
Planning Area 1, Drainage Area 1

Estimates do not include sewer service laterals

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
LS 1 to MH 9 - Clayton Avenue				
8" PVC Sanitary Sewer	3900	L.F.	$40	$156,000
4' dia. Manholes	182	V.F.	$225	$40,950
16" Steel Casing Bored	200	L.F.	$400	$80,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	390	L.F.	$3	$1,170
Crushed Aggregate Base Course	144	C.Y.	$18	$2,592
Asphalt Road Replacement	433	S.Y.	$30	$12,990
Landscape Restoration	10833	S.Y	$2	$21,666
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$315,000
Contingency				$32,000
Engineering, Adm. and Legal				$79,000
TOTAL ESTIMATED PROJECT COST				$426,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 1 to MH 1-17 - Smoke Tree Road Extended				
8" PVC Sanitary Sewer	5630	L.F.	$40	$225,200
4' dia. Manholes	206	V.F.	$225	$46,350
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	563	L.F.	$3	$1,689
Crushed Aggregate Base Course	0	C.Y.	$18	$0
Asphalt Road Replacement	0	S.Y.	$30	$0
Landscape Restoration	31278	S.Y	$2	$62,556
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$336,000
Contingency				$34,000
Engineering, Adm. and Legal				$84,000
TOTAL ESTIMATED PROJECT COST				$454,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 1-4 to MH 1-4-2 - Future Road				
8" PVC Sanitary Sewer	800	L.F.	$40	$32,000
4' dia. Manholes	24	V.F.	$225	$5,400
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	80	L.F.	$3	$240
Crushed Aggregate Base Course	0	C.Y.	$18	$0
Asphalt Road Replacement	0	S.Y.	$30	$0
Landscape Restoration	4444	S.Y	$2	$8,888
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$47,000
Contingency				$5,000
Engineering, Adm. and Legal				$12,000
TOTAL ESTIMATED PROJECT COST				$64,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 1-10 to MH 1-10-4 - Future Road				
8" PVC Sanitary Sewer	1350	L.F.	$40	$54,000
4' dia. Manholes	52	V.F.	$225	$11,700
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	135	L.F.	$3	$405
Crushed Aggregate Base Course	0	C.Y.	$18	$0
Asphalt Road Replacement	0	S.Y.	$30	$0
Landscape Restoration	7500	S.Y	$2	$15,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$81,000
Contingency				$8,000
Engineering, Adm. and Legal				$20,000
TOTAL ESTIMATED PROJECT COST				$109,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 5 to MH 5-21 - American Drive				
8" PVC Sanitary Sewer	7290	L.F.	$40	$291,600
4' dia. Manholes	343	V.F.	$225	$77,175
16" Steel Casing Bored	200	L.F.	$400	$80,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	729	L.F.	$3	$2,187
Crushed Aggregate Base Course	67	C.Y.	$18	$1,206
Asphalt Road Replacement	200	S.Y.	$30	$6,000
Landscape Restoration	29139	S.Y	$2	$58,278
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$516,000
Contingency				$52,000
Engineering, Adm. and Legal				$129,000
TOTAL ESTIMATED PROJECT COST				$697,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 5-17 to MH 5-17-4 - Westphal Lane				
8" PVC Sanitary Sewer	1200	L.F.	$40	$48,000
4' dia. Manholes	52	V.F.	$225	$11,700
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	120	L.F.	$3	$360
Crushed Aggregate Base Course	22	C.Y.	$18	$396
Asphalt Surface Replacement	67	S.Y.	$30	$2,010
Landscape Restoration	5000	S.Y	$2	$10,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$72,000
Contingency				$7,000
Engineering, Adm. and Legal				$18,000
TOTAL ESTIMATED PROJECT COST				$97,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 8 to MH 8-17- Future Road North of Fairview Road				
8" PVC Sanitary Sewer	6210	L.F.	$40	$248,400
4' dia. Manholes	238	V.F.	$225	$53,550
16" Steel Casing Bored	200	L.F.	$400	$80,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	23.8	L.F.	$3	$71
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y.	$30	$0
Landscape Restoration	34500	S.Y	$2	$69,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$451,000
Contingency				$45,000
Engineering, Adm. and Legal				$113,000
TOTAL ESTIMATED PROJECT COST				$609,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 8-8 to MH 8-8-2 Future Road				
8" PVC Sanitary Sewer	550	L.F.	$40	$22,000
4' dia. Manholes	25	V.F.	$225	$5,625
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	55	L.F.	$3	$165
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y.	$30	$0
Landscape Restoration	3056	S.Y	$2	$6,112
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$34,000
Contingency				$3,000
Engineering, Adm. and Legal				$9,000
TOTAL ESTIMATED PROJECT COST				$46,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 8-13 to MH 8-13-1 Future Road				
8" PVC Sanitary Sewer	400	L.F.	$40	$16,000
4' dia. Manholes	12	V.F.	$225	$2,700
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	40	L.F.	$3	$120
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y.	$30	$0
Landscape Restoration	2222	S.Y	$2	$4,444
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$23,000
Contingency				$2,000
Engineering, Adm. and Legal				$6,000
TOTAL ESTIMATED PROJECT COST				$31,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Total Planning Area 1, Drainage Area 1				
8" PVC Sanitary Sewer	27330	L.F.	$40	$1,093,200
4' dia. Manholes	1134	V.F.	$225	$255,150
16" Steel Casing Bored	600	L.F.	$400	$240,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	2135.8	L.F.	$3	$6,407
12" Crushed Aggregate Base	233	C.Y.	$18	$4,194
4" Asphalt Pavement	700	S.Y.	$30	$21,000
Landscape Restoration	127972	S.Y	$2	$255,944
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,876,000
Contingency				$188,000
Engineering, Adm. and Legal				$469,000
TOTAL ESTIMATED PROJECT COST				$2,533,000

Estimate of Probable Project Costs-Sanitary Sewer
Planning Area 1, Drainage Area 10

Estimates do not include laterals

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 10 to MH 19 - Clayton Avenue				
8" PVC Sanitary Sewer	3210	L.F.	$40	$128,400
4' dia. Manholes	147	V.F.	$225	$33,075
16" Steel Casing Bored	100	L.F.	$400	$40,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	321	L.F.	$3	$963
12" Crushed Aggregate Base	100	C.Y.	$18	$1,800
4" Asphalt Pavement	300	S.Y.	$30	$9,000
Landscape Restoration	8917	S.Y	$2	$17,834
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$231,000
Contingency				$23,000
Engineering, Adm. and Legal				$58,000
TOTAL ESTIMATED PROJECT COST				$312,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 10 to MH 10-15 - Fairview Road				
8" PVC Sanitary Sewer	5170	L.F.	$40	$206,800
4' dia. Manholes	197	V.F.	$225	$44,325
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	517	L.F.	$3	$1,551
12" Crushed Aggregate Base	289	C.Y.	$18	$5,202
4" Asphalt Pavement	867	S.Y	$30	$26,010
Landscaping	14361	S.Y	$2	$28,722
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$313,000
Contingency				$31,000
Engineering, Adm. and Legal				$78,000
TOTAL ESTIMATED PROJECT COST				$422,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 10-8 to MH 10-8-4 Future Road				
8" PVC Sanitary Sewer	1600	L.F.	$40	$64,000
4' dia. Manholes	51	V.F.	$225	$11,475
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	160	L.F.	$3	$480
12" Crushed Aggregate Base	19	C.Y.	$18	$342
4" Asphalt Pavement	43	S.Y	$30	$1,290
Landscaping	8889	S.Y	$2	$17,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$98,000
Contingency				$10,000
Engineering, Adm. and Legal				$25,000
TOTAL ESTIMATED PROJECT COST				$133,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 10-11 to MH 10-11-1 - Future Road				
8" PVC Sanitary Sewer	400	L.F.	$40	$16,000
4' dia. Manholes	12	V.F.	$225	$2,700
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	40	L.F.	$3	$120
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	2222	S.Y	$2	$4,444
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$23,000
Contingency				$2,000
Engineering, Adm. and Legal				$6,000
TOTAL ESTIMATED PROJECT COST				$31,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 10-13 to MH 10-13-5 - Future Road				
8" PVC Sanitary Sewer	2000	L.F.	$40	$80,000
4' dia. Manholes	64	V.F.	$225	$14,400
Select Backfill Material	116	C.Y.	$17	$1,972
Erosion Control	200	L.F.	$3	$600
12" Crushed Aggregate Base	17	C.Y.	$18	$306
4" Asphalt Pavement	37	S.Y	$30	$1,110
Landscaping	11111	S.Y	$2	$22,222
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$121,000
Contingency				$12,000
Engineering, Adm. and Legal				$30,000
TOTAL ESTIMATED PROJECT COST				$163,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 15 to MH 15-12 - Future Road				
8" PVC Sanitary Sewer	2000	L.F.	$40	$80,000
4' dia. Manholes	64	V.F.	$225	$14,400
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	200	L.F.	$3	$600
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	11111	S.Y	$2	$22,222
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$117,000
Contingency				$12,000
Engineering, Adm. and Legal				$29,000
TOTAL ESTIMATED PROJECT COST				$158,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Total Planning Area 1, Drainage Area 10				
8" PVC Sanitary Sewer	14380	L.F.	$40	$575,200
4' dia. Manholes	535	V.F.	$225	$120,375
16" Steel Casing Bored	100	L.F.	$400	$40,000
Select Backfill Material	268	C.Y.	$17	$4,556
Erosion Control	1438	L.F.	$3	$4,314
12" Crushed Aggregate Base	425	C.Y.	$18	$7,650
4" Asphalt Pavement	1247	S.Y.	$30	$37,410
Landscape Restoration	56611	S.Y	$2	$113,222
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$903,000
Contingency				$90,000
Engineering, Adm. and Legal				$226,000
TOTAL ESTIMATED PROJECT COST				$1,219,000

Estimate of Probable Project Costs-Sanitary Sewer
Planning Area 1, Drainage Area 20

Estimates do not include laterals

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 20 to MH 36 - CTH II				
8" PVC Sanitary Sewer	5680	L.F.	$40	$227,200
4' dia. Manholes	270	V.F.	$225	$60,750
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	568	L.F.	$3	$1,704
12" Crushed Aggregate Base	152	C.Y.	$18	$2,736
4" Asphalt Pavement	443	S.Y	$30	$13,290
Landscape Restoration	15778	S.Y	$2	$31,556
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$340,000
Contingency				$34,000
Engineering, Adm. and Legal				$85,000
TOTAL ESTIMATED PROJECT COST				$459,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 20 to MH 20-5 - Clayton Ave.				
8" PVC Sanitary Sewer	2000	L.F.	$40	$80,000
4' dia. Manholes	83	V.F.	$225	$18,675
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	200	L.F.	$3	$600
12" Crushed Aggregate Base	44	C.Y.	$18	$792
4" Asphalt Pavement	133	S.Y	$30	$3,990
Landscape Restoration	5556	S.Y	$2	$11,112
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$115,000
Contingency				$12,000
Engineering, Adm. and Legal				$29,000
TOTAL ESTIMATED PROJECT COST				$156,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 20 to MH 20-8 - Clayton Ave.				
8" PVC Sanitary Sewer	1100	L.F.	$40	$44,000
4' dia. Manholes	44	V.F.	$225	$9,900
Select Backfill Material	85	C.Y.	$17	$1,445
Erosion Control	110	L.F.	$3	$330
12" Crushed Aggregate Base	25	C.Y.	$18	$450
4" Asphalt Pavement	65	S.Y	$30	$1,950
Landscape Restoration	3056	S.Y	$2	$6,112
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$64,000
Contingency				$6,000
Engineering, Adm. and Legal				$16,000
TOTAL ESTIMATED PROJECT COST				$86,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 20-6 to MH 20-6-8 - Off Road				
8" PVC Sanitary Sewer	3040	L.F.	$40	$121,600
4' dia. Manholes	119	V.F.	$225	$26,775
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	304	L.F.	$3	$912
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscape Restoration	16889	S.Y	$2	$33,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$183,000
Contingency				$18,000
Engineering, Adm. and Legal				$46,000
TOTAL ESTIMATED PROJECT COST				$247,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 20-6-8 to MH 20-6-8 -4 Janssen Rd Extended South				
8" PVC Sanitary Sewer	1600	L.F.	$40	$64,000
4' dia. Manholes	59	V.F.	$225	$13,275
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	160	L.F.	$3	$480
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscape Restoration	8889	S.Y	$2	$17,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$96,000
Contingency				$10,000
Engineering, Adm. and Legal				$24,000
TOTAL ESTIMATED PROJECT COST				$130,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 25 to MH 25-5 Martin Dr.				
8" PVC Sanitary Sewer	1970	L.F.	$40	$78,800
4' dia. Manholes	37	V.F.	$225	$8,325
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	197	L.F.	$3	$591
12" Crushed Aggregate Base	2335	C.Y.	$18	$42,030
4" Asphalt Pavement	5253	S.Y	$30	$157,590
Landscape Restoration	1094	S.Y	$2	$2,188
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$290,000
Contingency				$29,000
Engineering, Adm. and Legal				$73,000
TOTAL ESTIMATED PROJECT COST				$392,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 25-1 to MH 25-1-12 Serves Janssen Drive and Winncrest Rd.				
8" PVC Sanitary Sewer	4030	L.F.	$40	$161,200
4' dia. Manholes	270	V.F.	$225	$60,750
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	403	L.F.	$3	$1,209
12" Crushed Aggregate Base	4776	C.Y.	$18	$85,968
4" Asphalt Pavement	10747	S.Y	$30	$322,410
Landscape Restoration	2239	S.Y	$2	$4,478
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$636,000
Contingency				$64,000
Engineering, Adm. and Legal				$159,000
TOTAL ESTIMATED PROJECT COST				$859,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 25-1-4 to MH 25-1-4-2 Janssen Drive				
8" PVC Sanitary Sewer	700	L.F.	$40	$28,000
4' dia. Manholes	21	V.F.	$225	$4,725
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	70	L.F.	$3	$210
12" Crushed Aggregate Base	830	C.Y.	$18	$14,940
4" Asphalt Pavement	1867	S.Y	$30	$56,010
Landscape Restoration	389	S.Y	$2	$778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$105,000
Contingency				$11,000
Engineering, Adm. and Legal				$26,000
TOTAL ESTIMATED PROJECT COST				$142,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 25-1-7 to MH 25-1-7-12 Off Road				
8" PVC Sanitary Sewer	4400	L.F.	$40	$176,000
4' dia. Manholes	183	V.F.	$225	$41,175
16" Steel Casing Bored	80	L.F.	$400	$32,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	18.3	L.F.	$3	$55
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscape Restoration	1017	S.Y	$2	$2,034
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$251,000
Contingency				$25,000
Engineering, Adm. and Legal				$63,000
TOTAL ESTIMATED PROJECT COST				$339,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 25-1-7-7 to MH 25-1-7-7-9 Off Road				
8" PVC Sanitary Sewer	3400	L.F.	$40	$136,000
4' dia. Manholes	135	V.F.	$225	$30,375
16" Steel Casing Bored	50	L.F.	$400	$20,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	13.5	L.F.	$3	$41
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscape Restoration	750	S.Y	$2	$1,500
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$188,000
Contingency				$19,000
Engineering, Adm. and Legal				$47,000
TOTAL ESTIMATED PROJECT COST				$254,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 31 to MH 31-8 - Winncrest Road				
8" PVC Sanitary Sewer	2660	L.F.	$40	$106,400
4' dia. Manholes	93	V.F.	$225	$20,925
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	266	L.F.	$3	$798
12" Crushed Aggregate Base	1600	C.Y.	$18	$28,800
4" Asphalt Pavement	3600	S.Y	$30	$108,000
Landscape Restoration	8028	S.Y	$2	$16,056
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$284,000
Contingency				$28,000
Engineering, Adm. and Legal				$71,000
TOTAL ESTIMATED PROJECT COST				$383,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 31-4 to MH 31-4-6 - To STH 76				
8" PVC Sanitary Sewer	2020	L.F.	$40	$80,800
4' dia. Manholes	76	V.F.	$225	$17,100
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	202	L.F.	$3	$606
12" Crushed Aggregate Base	44	C.Y.	$18	$792
4" Asphalt Pavement	133	S.Y	$30	$3,990
Landscape Restoration	8389	S.Y	$2	$16,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$120,000
Contingency				$12,000
Engineering, Adm. and Legal				$30,000
TOTAL ESTIMATED PROJECT COST				$162,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
MH 34 to MH 34-2 - STH 76				
8" PVC Sanitary Sewer	670	L.F.	$40	$26,800
4' dia. Manholes	34	V.F.	$225	$7,650
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	67	L.F.	$3	$201
12" Crushed Aggregate Base	22	C.Y.	$18	$396
4" Asphalt Pavement	67	S.Y	$30	$2,010
Landscape Restoration	1861	S.Y	$2	$3,722
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$41,000
Contingency				$4,000
Engineering, Adm. and Legal				$10,000
TOTAL ESTIMATED PROJECT COST				$55,000

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Total Planning Area 1, Drainage Area 20				
8" PVC Sanitary Sewer	33270	L.F.	$40	$1,330,800
4' dia. Manholes	1424	V.F.	$225	$320,400
16" Steel Casing Bored	130	L.F.	$400	$52,000
Select Backfill Material	389	C.Y.	$17	$6,613
Erosion Control	2578.8	L.F.	$3	$7,736
12" Crushed Aggregate Base	9828	C.Y.	$18	$176,904
4" Asphalt Pavement	22308	S.Y.	$30	$669,240
Landscape Restoration	73935	S.Y	$2	$147,870
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$2,712,000
Contingency				$271,000
Engineering, Adm. and Legal				$678,000
TOTAL ESTIMATED PROJECT COST				$3,661,000

Estimate of Probable Project Costs-Sanitary Sewer
Total Planning Area 1

DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	74980	L.F.	$40	$2,999,200
4' dia. Manholes	3093	V.F.	$225	$695,925
16" Steel Casing Bored	830	L.F.	$400	$332,000
Select Backfill Material	657	C.Y.	$17	$11,169
Erosion Control	6152.6	L.F.	$3	$18,458
12" Crushed Aggregate Base	10486	C.Y.	$18	$188,748
4" Asphalt Pavement	24255	S.Y.	$30	$727,650
Landscape Restoration	258518	S.Y	$2	$517,036
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$5,490,000
Contingency				$549,000
Engineering, Adm. and Legal				$1,373,000
TOTAL ESTIMATED PROJECT COST				$7,412,000

Estimate of Probable Project Costs- Wastewater Conveyed to Town of Menasha and City of Neenah Interceptor Sewers

Sanitary Sewer, Lift Stations and Connections to Interceptor Sewers

Total Planning Area 1 - Sanitary Sewer

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	74480	L.F.	$40	$2,979,200
10" PVC Sanitary Sewer	500	L.F.	$45	$22,500
4' dia. Manholes	3093	V.F.	$225	$695,925
16" Steel Casing Bored	830	L.F.	$400	$332,000
Select Backfill Material	657	C.Y.	$17	$11,169
Erosion Control	6102.8	L.F.	$3	$18,308
12" Crushed Aggregate Base	10486	C.Y.	$18	$188,748
4" Asphalt Pavement	24255	S.Y.	$30	$727,650
Landscape Restoration	257129	S.Y	$2	$514,258
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$5,490,000
Contingency				$549,000
Engineering, Adm. and Legal				$1,373,000
TOTAL ESTIMATED PROJECT COST				$7,412,000

Total Planning Area 1, Drainage Area 1 - Lift Station No. 1 and Force Main

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 1, 23' deep, 410 gpm to MH 1	1	L.S.	$100,000	$100,000
6" PVC Force Main	900	L.F.	$40	$36,000
Landscaping	417	S.Y	$2	$834
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$137,000
Contingency				$14,000
Engineering, Adm. and Legal				$34,000
TOTAL ESTIMATED PROJECT COST				$185,000

Total Planning Area 1, Drainage Area 1 - Connections to Exisiting Interceptor Sewer				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
12" Interceptor Sewer MH 1 to 18" Interceptor Sewer	100	L.F.	$65	$6,500
Select Backfill Material	450	C.Y.	$17	$7,650
Erosion Control	30	L.F.	$3	$90
12" Crushed Aggregate Base	24	C.Y.	$18	$432
4" Asphalt Pavement	53	S.Y	$30	$1,590
Landscaping	417	S.Y	$2	$834
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$17,000
Contingency				$2,000
Engineering, Adm. and Legal				$4,000
TOTAL ESTIMATED PROJECT COST				$23,000

Total Planning Area 1,Drainage Area 10 - Connections to Exisiting Interceptor Sewers				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
18" Interceptor Sewer MH 10 to 21" Interceptor Sewer	100	L.F.	$80	$8,000
Select Backfill Material	450	C.Y.	$17	$7,650
Erosion Control	30	L.F.	$3	$90
12" Crushed Aggregate Base	24	C.Y.	$18	$432
4" Asphalt Pavement	53	S.Y	$30	$1,590
Landscaping	417	S.Y	$2	$834
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$19,000
Contingency				$2,000
Engineering, Adm. and Legal				$5,000
TOTAL ESTIMATED PROJECT COST				$26,000

Total Planning Area 1, Drainage Area 10 - Increased Sewer Size for Lift Station Discharge				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Increase Sanitary Sewer from 8" to 10" MH 10-7 to 10-11	1170	L.F.	$5	$5,850
Increase Sanitary Sewer from 8" to 12" MH 10-5 to 10-7	800	L.F.	$10	$8,000
Increase Sanitary Sewer from 8" to 15" MH 10 to 10-5	2000	L.F.	$20	$40,000
Increase Sanitary Sewer From 8" to 10" MH 10 to 16	2330	L.F.	$5	$11,650
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$60,000
Contingency				$6,000
Engineering, Adm. and Legal				$15,000
TOTAL ESTIMATED PROJECT COST				$81,000

Total Planning Area 1, Drainage Area 20 - Lift Station No. 20 and Force Main				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 20, 23' deep, 410 gpm to Drainage Area 10	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
6" PVC Force Main	2000	L.F.	$40	$80,000
Landscaping	417	S.Y	$2	$834
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$196,000
Contingency				$20,000
Engineering, Adm. and Legal				$49,000
TOTAL ESTIMATED PROJECT COST				$265,000

Total Planning Area 1 - Connections to Existing Interceptor Sewers				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
10" Interceptor Sewer MH 1 to 18" Interceptor Sewer	100	L.F.	$60	$6,000
18" Interceptor Sewer MH 10 to 21" Interceptor Sewer	100	L.F.	$80	$8,000
Select Backfill Material	901	C.Y.	$17	$15,317
Erosion Control	60	L.F.	$3	$180
12" Crushed Aggregate Base	47	C.Y.	$18	$846
4" Asphalt Pavement	107	S.Y	$30	$3,210
Landscaping	833	S.Y	$2	$1,666
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$35,000
Contingency				$4,000
Engineering, Adm. and Legal				$9,000
TOTAL ESTIMATED PROJECT COST				$48,000

Estimate of Probable Project Costs-Wastewater Conveyed to Larsen-Winchester WWTP
Sanitary Sewer, Lift Stations

Total Planning Area 1 - Sanitary Sewer				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	74080	L.F.	$40	$2,963,200
4' dia. Manholes	3048	V.F.	$225	$685,800
16" Steel Casing Bored	830	L.F.	$400	$332,000
Select Backfill Material	657	C.Y.	$17	$11,169
Erosion Control	6062.6	L.F.	$3	$18,188
12" Crushed Aggregate Base	10486	C.Y.	$18	$188,748
4" Asphalt Pavement	24255	S.Y.	$30	$727,650
Landscape Restoration	256018	S.Y	$2	$512,036
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$5,439,000
Contingency				$544,000
Engineering, Adm. and Legal				$1,360,000
TOTAL ESTIMATED PROJECT COST				$7,343,000

Planning Area 1 - Lift Stations and Force Main				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 1, 23' deep, 495 gpm to Drainage Area 50	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
8" PVC Force Main	8400	L.F.	$45	$378,000
16" Steel Casing Bored	100	L.F.	$400	$40,000
Lift Station 20, 23' deep, 410 gpm to Drainage Area 70	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
6" PVC Force Main	7000	L.F.	$40	$280,000
16" Steel Casing Bored	80	L.F.	$400	$32,000
Select Backfill Material	450	C.Y.	$17	$7,650
Landscaping	834	S.Y	$2	$1,668
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$969,000
Contingency				$97,000
Engineering, Adm. and Legal				$242,000
TOTAL ESTIMATED PROJECT COST				$1,308,000

Estimate of Probable Project Costs-Sanitary Sewer

Planning Area 1A, Drainage Area 50

Estimates do not include laterals

MH 50 to MH 64 - Fairview Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	5100	L.F.	$40	$204,000
4' dia. Manholes	267	V.F.	$225	$60,075
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	510	L.F.	$3	$1,530
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	14167	S.Y	$2	$28,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$294,000
Contingency				$29,000
Engineering, Adm. and Legal				$74,000
TOTAL ESTIMATED PROJECT COST				$397,000

MH 50 to MH 50-17 - Oakwood Ave. and West American Drive				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	5980	L.F.	$40	$239,200
4' dia. Manholes	188	V.F.	$225	$42,300
16" Steel Casing Bored	100	L.F.	$400	$40,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	598	L.F.	$3	$1,794
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	33222	S.Y	$2	$66,444
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$390,000
Contingency				$39,000
Engineering, Adm. and Legal				$98,000
TOTAL ESTIMATED PROJECT COST				$527,000

MH 50-5 to MH 50-5-11 - Future Road South of West American Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	4030	L.F.	$40	$161,200
4' dia. Manholes	120	V.F.	$225	$27,000
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	403	L.F.	$3	$1,209
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	22389	S.Y	$2	$44,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$234,000
Contingency				$23,000
Engineering, Adm. and Legal				$59,000
TOTAL ESTIMATED PROJECT COST				$316,000

MH 50 to MH 50-22 - Oakwood Avenue				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	1740	L.F.	$40	$69,600
4' dia. Manholes	68	V.F.	$225	$15,300
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	174	L.F.	$3	$522
12" Crushed Aggregate Base	133	C.Y.	$18	$2,394
4" Asphalt Pavement	400	S.Y	$30	$12,000
Landscaping	4833	S.Y	$2	$9,666
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$112,000
Contingency				$11,000
Engineering, Adm. and Legal				$28,000
TOTAL ESTIMATED PROJECT COST				$151,000

MH 50-21 to MH 50-21-10 - Future Road South of Fairview Rd.				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	3740	L.F.	$40	$149,600
4' dia. Manholes	126	V.F.	$225	$28,350
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	374	L.F.	$3	$1,122
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	20778	S.Y	$2	$41,556
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$221,000
Contingency				$22,000
Engineering, Adm. and Legal				$55,000
TOTAL ESTIMATED PROJECT COST				$298,000

Total Planning Area 1A, Drainage Area 50				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	20590	L.F.	$40	$823,600
4' dia. Manholes	769	V.F.	$225	$173,025
16" Steel Casing Bored	100	L.F.	$400	$40,000
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	2059	L.F.	$3	$6,177
12" Crushed Aggregate Base	133	C.Y.	$18	$2,394
4" Asphalt Pavement	400	S.Y.	$30	$12,000
Landscape Restoration	95389	S.Y	$2	$190,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,251,000
Contingency				$125,000
Engineering, Adm. and Legal				$313,000
TOTAL ESTIMATED PROJECT COST				$1,689,000

Estimate of Probable Project Costs-Sanitary Sewer

Planning Area 1A, Drainage Area 70

Estimates do not include laterals

MH 70 to MH 77 - Off-Road

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	2800	L.F.	$40	$112,000
4' dia. Manholes	87	V.F.	$225	$19,575
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	280	L.F.	$3	$840
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	15556	S.Y	$2	$31,112
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$164,000
Contingency				$16,000
Engineering, Adm. and Legal				$41,000
TOTAL ESTIMATED PROJECT COST				$221,000

MH 77 to MH 77-5 - Future Road North of CTH II

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	1650	L.F.	$40	$66,000
4' dia. Manholes	80	V.F.	$225	$18,000
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	165	L.F.	$3	$495
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	9167	S.Y	$2	$18,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$103,000
Contingency				$10,000
Engineering, Adm. and Legal				$26,000
TOTAL ESTIMATED PROJECT COST				$139,000

MH 70 to MH 70-14 - Oakwood Avenue and CTH II

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	4920	L.F.	$40	$196,800
4' dia. Manholes	190	V.F.	$225	$42,750
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	492	L.F.	$3	$1,476
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	13667	S.Y	$2	$27,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$268,000
Contingency				$27,000
Engineering, Adm. and Legal				$67,000
TOTAL ESTIMATED PROJECT COST				$362,000

MH 70 to MH 70-24 - Oakwood Avenue

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	1600	L.F.	$40	$64,000
4' dia. Manholes	48	V.F.	$225	$10,800
16" Steel Casing Bored	100	L.F.	$400	$40,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	160	L.F.	$3	$480
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	4444	S.Y	$2	$8,888
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$124,000
Contingency				$12,000
Engineering, Adm. and Legal				$31,000
TOTAL ESTIMATED PROJECT COST				$167,000

Total Planning Area 1A, Drainage Area 70				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	10970	L.F.	$40	$438,800
4' dia. Manholes	405	V.F.	$225	$91,125
16" Steel Casing Bored	100	L.F.	$400	$40,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	1097	L.F.	$3	$3,291
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y.	$30	$0
Landscape Restoration	42834	S.Y	$2	$85,668
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$659,000
Contingency				$66,000
Engineering, Adm. and Legal				$165,000
TOTAL ESTIMATED PROJECT COST				$890,000

Estimate of Probable Project Costs-Sanitary Sewer

Total Planning Area 1A

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	31560	L.F.	$40	$1,262,400
4' dia. Manholes	1174	V.F.	$225	$264,150
16" Steel Casing Bored	200	L.F.	$400	$80,000
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	3156	L.F.	$3	$9,468
12" Crushed Aggregate Base	133	C.Y.	$18	$2,394
4" Asphalt Pavement	400	S.Y.	$30	$12,000
Landscape Restoration	138223	S.Y	$2	$276,446
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,909,000
Contingency				$191,000
Engineering, Adm. and Legal				$477,000
TOTAL ESTIMATED PROJECT COST				$2,577,000

Estimate of Probable Project Costs
Wastewater Conveyed to Town of Menasha and City of Neenah Interceptor Sewers
Sanitary Sewer, Lift Stations and Connections to Interceptor Sewers
Planning Area 1A, Drainage Areas 50 and 70

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 50, 26' deep, 815 gpm to Drainage Area 10	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
10" PVC Force Main	5450	L.F.	$55	$299,750
16" Steel Casing Bored	80	L.F.	$400	$32,000
Lift Station 70, 23' deep, 445 gpm to Drainage Area 50	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
8" PVC Force Main	2000	L.F.	$45	$90,000
16" Steel Casing Bored	80	L.F.	$400	$32,000
Landscaping	1667	S.Y	$2	$3,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$687,000
Contingency				$69,000
Engineering, Adm. and Legal				$172,000
TOTAL ESTIMATED PROJECT COST				$928,000

Estimate of Probable Project Costs
Wastewater Conveyed to Larsen-Winchester WWTP
Sanitary Sewer, Lift Stations

Planning Area 1A - Lift Stations and Force Main				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 50, 26' deep, 870 gpm	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
10" PVC Force Main	1950	L.F.	$55	$107,250
16" Steel Casing Bored	80	L.F.	$400	$32,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$254,000
Contingency				$25,000
Engineering, Adm. and Legal				$64,000
TOTAL ESTIMATED PROJECT COST				$343,000

Planning Area 1A - Interceptor Sewer to Larsen-Winchester WWTP				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
18" Interceptor Sewer MH 70 to New WWTP	23000	L.F.	$60	$1,380,000
4' dia. Manholes	700	V.F.	$225	$157,500
Select Backfill Material	2702	C.Y.	$17	$45,934
Erosion Control	2300	L.F.	$3	$6,900
12" Crushed Aggregate Base	142	C.Y.	$18	$2,556
4" Asphalt Pavement	320	S.Y	$30	$9,600
Landscaping	63889	S.Y	$2	$127,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,730,000
Contingency				$173,000
Engineering, Adm. and Legal				$433,000
TOTAL ESTIMATED PROJECT COST				$2,336,000

Estimate of Probable Project Costs-Sanitary Sewer
Planning Area 2, Drainage Area 1

Estimates do not include laterals

MH 1 to MH 26 - Breezewood Lane and STH 76

Description	Quantity	Units	Unit Cost	Total Cost
8" PVC Sanitary Sewer	8820	L.F.	$40	$352,800
4' dia. Manholes	383	V.F.	$225	$86,175
16" Steel Casing Bored	80	L.F.	$400	$32,000
Select Backfill Material	169	C.Y.	$17	$2,873
Erosion Control	882	L.F.	$3	$2,646
12" Crushed Aggregate Base	167	C.Y.	$18	$3,006
4" Asphalt Pavement	500	S.Y	$30	$15,000
Landscaping	24500	S.Y	$2	$49,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$544,000
Contingency				$54,000
Engineering, Adm. and Legal				$136,000
TOTAL ESTIMATED PROJECT COST				$734,000

MH 24 to MH 24-3 - Fox Valley Drive

Description	Quantity	Units	Unit Cost	Total Cost
8" PVC Sanitary Sewer	1200	L.F.	$40	$48,000
4' dia. Manholes	36	V.F.	$225	$8,100
16" Steel Casing Bored	80	L.F.	$400	$32,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	120	L.F.	$3	$360
12" Crushed Aggregate Base	1422	C.Y.	$18	$25,596
4" Asphalt Pavement	3200	S.Y	$30	$96,000
Landscaping	667	S.Y	$2	$1,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$211,000
Contingency				$21,000
Engineering, Adm. and Legal				$53,000
TOTAL ESTIMATED PROJECT COST				$285,000

MH 1 to MH 1-12 - Woodenshoe Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	4040	L.F.	$40	$161,600
4' dia. Manholes	136	V.F.	$225	$30,600
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	169	C.Y.	$17	$2,873
Erosion Control	404	L.F.	$3	$1,212
12" Crushed Aggregate Base	79	C.Y.	$18	$1,422
4" Asphalt Pavement	220	S.Y	$30	$6,600
Landscaping	18167	S.Y	$2	$36,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$241,000
Contingency				$24,000
Engineering, Adm. and Legal				$60,000
TOTAL ESTIMATED PROJECT COST				$325,000

MH 1-1 to MH 1-1-2 - Oakcrest Drive				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	740	L.F.	$40	$29,600
4' dia. Manholes	29	V.F.	$225	$6,525
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	74	L.F.	$3	$222
12" Crushed Aggregate Base	877	C.Y.	$18	$15,786
4" Asphalt Pavement	1973	S.Y	$30	$59,190
Landscaping	411	S.Y	$2	$822
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$112,000
Contingency				$11,000
Engineering, Adm. and Legal				$28,000
TOTAL ESTIMATED PROJECT COST				$151,000

MH 1-3 to MH 1-3-4 - Oakcrest Drive				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	950	L.F.	$40	$38,000
4' dia. Manholes	43	V.F.	$225	$9,675
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	95	L.F.	$3	$285
12" Crushed Aggregate Base	1126	C.Y.	$18	$20,268
4" Asphalt Pavement	2533	S.Y	$30	$75,990
Landscaping	528	S.Y	$2	$1,056
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$145,000
Contingency				$15,000
Engineering, Adm. and Legal				$36,000
TOTAL ESTIMATED PROJECT COST				$196,000

MH 1-5 to MH 1-5-5 - CTH JJ				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	2000	L.F.	$40	$80,000
4' dia. Manholes	53	V.F.	$225	$11,925
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	200	L.F.	$3	$600
12" Crushed Aggregate Base	122	C.Y.	$18	$2,196
4" Asphalt Pavement	367	S.Y	$30	$11,010
Landscaping	4278	S.Y	$2	$8,556
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$114,000
Contingency				$11,000
Engineering, Adm. and Legal				$29,000
TOTAL ESTIMATED PROJECT COST				$154,000

MH 1-8 to MH 1-8-11 - Future Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	4100	L.F.	$40	$164,000
4' dia. Manholes	143	V.F.	$225	$32,175
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	410	L.F.	$3	$1,230
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	22778	S.Y	$2	$45,556
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$243,000
Contingency				$24,000
Engineering, Adm. and Legal				$61,000
TOTAL ESTIMATED PROJECT COST				$328,000

MH 1-10 to MH 1-10-10 - Off Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	2000	L.F.	$40	$80,000
4' dia. Manholes	53	V.F.	$225	$11,925
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	200	L.F.	$3	$600
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	11111	S.Y	$2	$22,222
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$115,000
Contingency				$12,000
Engineering, Adm. and Legal				$29,000
TOTAL ESTIMATED PROJECT COST				$156,000

MH 7 to MH 7-4 - Murray Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	1360	L.F.	$40	$54,400
4' dia. Manholes	59	V.F.	$225	$13,275
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	136	L.F.	$3	$408
12" Crushed Aggregate Base	1612	C.Y.	$18	$29,016
4" Asphalt Pavement	3627	S.Y	$30	$108,810
Landscaping	756	S.Y	$2	$1,512
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$207,000
Contingency				$21,000
Engineering, Adm. and Legal				$52,000
TOTAL ESTIMATED PROJECT COST				$280,000

MH 8 to MH 8-9 - Darrow Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	2950	L.F.	$40	$118,000
4' dia. Manholes	114	V.F.	$225	$25,650
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	295	L.F.	$3	$885
12" Crushed Aggregate Base	1541	C.Y.	$18	$27,738
4" Asphalt Pavement	3467	S.Y	$30	$104,010
Landscaping	9889	S.Y	$2	$19,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$296,000
Contingency				$30,000
Engineering, Adm. and Legal				$74,000
TOTAL ESTIMATED PROJECT COST				$400,000

MH 12 to MH 12-2 - Garden Drive				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	670	L.F.	$40	$26,800
4' dia. Manholes	22	V.F.	$225	$4,950
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	67	L.F.	$3	$201
12" Crushed Aggregate Base	794	C.Y.	$18	$14,292
4" Asphalt Pavement	1787	S.Y	$30	$53,610
Landscaping	372	S.Y	$2	$744
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$101,000
Contingency				$10,000
Engineering, Adm. and Legal				$25,000
TOTAL ESTIMATED PROJECT COST				$136,000

MH 14 to MH 14-2 - Commerce Plaza Drive				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	600	L.F.	$40	$24,000
4' dia. Manholes	19	V.F.	$225	$4,275
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	60	L.F.	$3	$180
12" Crushed Aggregate Base	57	C.Y.	$18	$1,026
4" Asphalt Pavement	153	S.Y	$30	$4,590
Landscaping	1667	S.Y	$2	$3,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$40,000
Contingency				$4,000
Engineering, Adm. and Legal				$10,000
TOTAL ESTIMATED PROJECT COST				$54,000

MH 16 to MH 16-5 - Breezewood Lane				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	2000	L.F.	$40	$80,000
4' dia. Manholes	68	V.F.	$225	$15,300
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	200	L.F.	$3	$600
12" Crushed Aggregate Base	22	C.Y.	$18	$396
4" Asphalt Pavement	67	S.Y	$30	$2,010
Landscaping	1667	S.Y	$2	$3,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$102,000
Contingency				$10,000
Engineering, Adm. and Legal				$26,000
TOTAL ESTIMATED PROJECT COST				$138,000

MH 16 to MH 16s-2 - STH 76				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	2000	L.F.	$40	$80,000
4' dia. Manholes	68	V.F.	$225	$15,300
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	152	C.Y.	$17	$2,584
Erosion Control	200	L.F.	$3	$600
12" Crushed Aggregate Base	68	C.Y.	$18	$1,224
4" Asphalt Pavement	187	S.Y	$30	$5,610
Landscaping	1667	S.Y	$2	$3,334
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$109,000
Contingency				$11,000
Engineering, Adm. and Legal				$27,000
TOTAL ESTIMATED PROJECT COST				$147,000

Total Planning Area 2, Drainage Area 1				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	33430	L.F.	$40	$1,337,200
4' dia. Manholes	1226	V.F.	$225	$275,850
16" Steel Casing Bored	160	L.F.	$400	$64,000
Select Backfill Material	642	C.Y.	$17	$10,914
Erosion Control	3343	L.F.	$3	$10,029
12" Crushed Aggregate Base	7887	C.Y.	$18	$141,966
4" Asphalt Pavement	18081	S.Y.	$30	$542,430
Landscape Restoration	98458	S.Y	$2	$196,916
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$2,579,000
Contingency				$258,000
Engineering, Adm. and Legal				$645,000
TOTAL ESTIMATED PROJECT COST				$3,482,000

Estimate of Probable Project Costs-Sanitary Sewer
Planning Area 2, Drainage Area 30

Estimates do not include laterals

MH 30 to MH 35 - Breezewood Lane				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	1830	L.F.	$40	$73,200
4' dia. Manholes	68	V.F.	$225	$15,300
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	183	L.F.	$3	$549
12" Crushed Aggregate Base	44	C.Y.	$18	$792
4" Asphalt Pavement	133	S.Y	$30	$3,990
Landscaping	5083	S.Y	$2	$10,166
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$104,000
Contingency				$10,000
Engineering, Adm. and Legal				$26,000
TOTAL ESTIMATED PROJECT COST				$140,000

Estimate of Probable Project Costs-Sanitary Sewer
Planning Area 2, Drainage Area 40

Estimates do not include laterals

MH 40 to MH 52 - Corona Way Extended and Future Road

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	4390	L.F.	$40	$175,600
4' dia. Manholes	204	V.F.	$225	$45,900
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	439	L.F.	$3	$1,317
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	24389	S.Y	$2	$48,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$272,000
Contingency				$27,000
Engineering, Adm. and Legal				$68,000
TOTAL ESTIMATED PROJECT COST				$367,000

MH 40 to MH 40-10 - Corona Way, Sunburst Lane, Sunwood Drive

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	3230	L.F.	$40	$129,200
4' dia. Manholes	142	V.F.	$225	$31,950
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	323	L.F.	$3	$969
12" Crushed Aggregate Base	89	C.Y.	$18	$1,602
4" Asphalt Pavement	267	S.Y	$30	$8,010
Landscaping	8972	S.Y	$2	$17,944
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$190,000
Contingency				$19,000
Engineering, Adm. and Legal				$48,000
TOTAL ESTIMATED PROJECT COST				$257,000

MH 40-2 to MH 40-2-5 - Sunburst Lane				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	1760	L.F.	$40	$70,400
4' dia. Manholes	51	V.F.	$225	$11,475
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	176	L.F.	$3	$528
12" Crushed Aggregate Base	100	C.Y.	$18	$1,800
4" Asphalt Pavement	300	S.Y	$30	$9,000
Landscaping	4889	S.Y	$2	$9,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$103,000
Contingency				$10,000
Engineering, Adm. and Legal				$26,000
TOTAL ESTIMATED PROJECT COST				$139,000

Total Planning Area 2, Drainage Area 40				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	9380	L.F.	$40	$375,200
4' dia. Manholes	397	V.F.	$225	$89,325
16" Steel Casing Bored	0	L.F.	$400	$0
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	938	L.F.	$3	$2,814
12" Crushed Aggregate Base	189	C.Y.	$18	$3,402
4" Asphalt Pavement	567	S.Y.	$30	$17,010
Landscape Restoration	38250	S.Y	$2	$76,500
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$564,000
Contingency				$56,000
Engineering, Adm. and Legal				$141,000
TOTAL ESTIMATED PROJECT COST				$761,000

Estimate of Probable Project Costs-Sanitary Sewer
Total Planning Area 2

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" PVC Sanitary Sewer	44640	L.F.	$40	$1,785,600
4' dia. Manholes	1691	V.F.	$225	$380,475
16" Steel Casing Bored	160	L.F.	$400	$64,000
Select Backfill Material	642	C.Y.	$17	$10,914
Erosion Control	4464	L.F.	$3	$13,392
12" Crushed Aggregate Base	8120	C.Y.	$18	$146,160
4" Asphalt Pavement	18781	S.Y.	$30	$563,430
Landscape Restoration	141791	S.Y	$2	$283,582
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$3,248,000
Contingency				$325,000
Engineering, Adm. and Legal				$812,000
TOTAL ESTIMATED PROJECT COST				$4,385,000

Estimate of Probable Project Costs
Wastewater Conveyed to Existing Interceptor Sewer
Lift Stations and Connecting Interceptor Sewer

Planning Area 2, Drainage Area 1 - Interceptor Sewer to Existing Interceptor Sewer

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
10" Interceptor Sewer MH 1 to 21" Interceptor Sewer	5000	L.F.	$45	$225,000
4' dia. Manholes	154	V.F.	$225	$34,650
Select Backfill Material	901	C.Y.	$17	$15,317
Erosion Control	500	L.F.	$3	$1,500
12" Crushed Aggregate Base	47	C.Y.	$18	$846
4" Asphalt Pavement	107	S.Y	$30	$3,210
Landscaping	1667	S.Y	$2	$3,334
TOTAL ESTIMATED CONSTRUCTION COST				$284,000
Contingency				$28,000
Engineering, Adm. and Legal				$71,000
TOTAL ESTIMATED PROJECT COST				$383,000

Planning Area 2, Drainage Area 30 - Lift Station No. 30 and Force Main

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 30 (Grinder Pump), 23' deep, 20 gpm	1	L.S.	$45,000	$45,000
2" PE Force Main	3000	L.F.	$20	$60,000
Select Backfill Material	901	C.Y.	$17	$15,317
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$120,000
Contingency				$12,000
Engineering, Adm. and Legal				$30,000
TOTAL ESTIMATED PROJECT COST				$162,000

Planning Area 2, Drainage Area 40 - Lift Station No. 40 and Force Main

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 40, 23' deep, 115 gpm to Drainage Area 1	1	L.S.	$100,000	$100,000
4" PVC Force Main	2000	L.F.	$35	$70,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$170,000
Contingency				$17,000
Engineering, Adm. and Legal				$43,000
TOTAL ESTIMATED PROJECT COST				$230,000

Estimate of Probable Project Costs
Wastewater Conveyed to Larsen-Winchester WWTP – Lift Stations

Planning Area 2, Drainage Area 1 - Lift Station No. 1 and Force Main				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 1, 23' deep, 520 gpm	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
6" PVC Force Main	7680	L.F.	$40	$307,200
16" Steel Casing Bored	80	L.F.	$400	$32,000
Select Backfill Material	1161	C.Y.	$17	$19,737
Erosion Control	768	L.F.	$3	$2,304
12" Crushed Aggregate Base	166	C.Y.	$18	$2,988
4" Asphalt Pavement	373	S.Y	$30	$11,190
Landscaping	21333	S.Y	$2	$42,666
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$533,000
Contingency				$53,000
Engineering, Adm. and Legal				$133,000
TOTAL ESTIMATED PROJECT COST				$719,000

Planning Area 2, Drainage Area 30 - Lift Station No. 30 and Force Main				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
Lift Station 30 (Grinder Pump), 23' deep, 20 gpm	1	L.S.	$40,000	$40,000
2" PE Force Main	1800	L.F.	$15	$27,000
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	180	L.F.	$3	$540
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	5000	S.Y	$2	$10,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$78,000
Contingency				$8,000
Engineering, Adm. and Legal				$20,000
TOTAL ESTIMATED PROJECT COST				$106,000

Planning Area 2, Drainage Area 40 - Lift Station No. 40 and Force Main				
DESCRIPTION	QTY.	UNITS	UNIT COST	TOTAL COST
Lift Station 40, 23' deep, 655 gpm	1	L.S.	$100,000	$100,000
Lift Station Sewage Odor and Corrosion Control	1	L.S.	$15,000	$15,000
6" PVC Force Main	13610	L.F.	$40	$544,400
Select Backfill Material	0	C.Y.	$17	$0
Erosion Control	1361	L.F.	$3	$4,083
12" Crushed Aggregate Base	0	C.Y.	$18	$0
4" Asphalt Pavement	0	S.Y	$30	$0
Landscaping	37806	S.Y	$2	$75,612
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$739,000
Contingency				$74,000
Engineering, Adm. and Legal				$185,000
TOTAL ESTIMATED PROJECT COST				$998,000

APPENDIX C: Estimates of Probable Project Costs – Wastewater Treatment

Estimate of Probable Project Costs
Recirculating Textile Filter Wastewater Treatment Pods – Existing Flows

			Planning Area 1		Planning Area 1		Planning Area 1		Planning Area 2		Planning Area 2	
			Drainage Area 1		Drainage Area 10		Drainage Area 20		Drainage Area 1		Drainage Area 40	
Description	Unit Price	Unit	Qty.	Total Price	Qty.	Total Price	Qty.	Total Price	Qty.	Total Price	Qty.	Total Price
Primary Tank	$2.5	Gal.	36000	$90,000	94000	$235,000	153000	$382,500	262000	$655,000	85000	$212,500
Recirculation Tank	$2	Gal.	9000	$18,000	24000	$48,000	38000	$76,000	66000	$132,000	21000	$42,000
Tank Access Equipment	$600	L.S.	2	$1,200	2	$1,200	2	$1,200	3	$1,800	2	$1,200
Pumping Equipment	$4,000	EA.	2	$8,000	2	$8,000	2	$8,000	3	$12,000	2	$8,000
Control Panel	$8,000	L.S.	1	$8,000	1	$8,000	1	$8,000	1	$8,000	1	$8,000
Miscellaneous Equipment	$1,000	L.S.	2	$2,000	2	$2,000	2	$2,000	3	$3,000	2	$2,000
Recirculating Splitter Valve	$500	EA.	1	$500	1	$500	1	$500	1	$500	1	$500
Ventilation Fan Assembly	$2,500	EA.	1	$2,500	1	$2,500	1	$2,500	1	$2,500	1	$2,500
Textile Filter Equipment	$17,000	EA.	2	$34,000	5	$85,000	8	$136,000	14	$238,000	5	$85,000
UV Disinfection Equipment		EA.	1	$1,500	1	$1,500	1	$4,000	1	$6,000	1	$2,000
Electrical Power to Site	$3,000	EA.	1	$3,000	1	$3,000	1	$3,000	1	$3,000	1	$3,000
Discharge to Stream	$6,000	L.S.	1	$6,000	1	$6,000	1	$6,000	1	$6,000	1	$6,000
Labor, Equipment, Materials		L.S.	1	$87,000	1	$200,000	1	$315,000	1	$534,000	1	$186,000
Total Estimated Construction Cost (Rounded)						$262,000		$601,000		$945,000		$1,602,000
Contingency				$26,200		$60,100		$94,500		$160,200		$55,870
Land Purchase				$40,000		$40,000		$40,000		$40,000		$40,000
Engineering, Adm. and Legal				$65,500		$150,250		$236,250		$400,500		$139,675
Total Estimated Project Cost				$393,700		$851,350		$1,315,750		$2,202,700		$794,245

Estimate of Probable Project Costs
Recirculating Textile Filter Wastewater Treatment Pods - Year 2025

			Planning Area 1 Drainage Area 1		Planning Area 1 Drainage Area 10		Planning Area 1 Drainage Area 20		Planning Area 2 Drainage Area 1		Planning Area 2 Drainage Area 40	
Description	Unit Price	Unit	Qty.	Total Price	Qty.	Total Price	Qty.	Total Price	Qty.	Total Price	Qty.	Total Price
Primary Tank	$2.5	Gal.	50000	$125,000	118000	$295,000	228000	$570,000	337000	$842,500	99000	$247,500
Recirculation Tank	$2	Gal.	13000	$26,000	30000	$60,000	57000	$114,000	85000	$170,000	25000	$50,000
Tank Access Equipment	$600	L.S.	2	$1,200	2	$1,200	2	$1,200	3	$1,800	2	$1,200
Pumping Equipment	$4,000	EA.	2	$8,000	2	$8,000	2	$8,000	3	$12,000	2	$8,000
Control Panel	$8,000	L.S.	1	$8,000	1	$8,000	1	$8,000	1	$8,000	1	$8,000
Miscellaneous Equipment	$1,000	L.S.	2	$2,000	2	$2,000	2	$2,000	3	$3,000	2	$2,000
Recirculating Splitter Valve	$500	EA.	1	$500	1	$500	1	$500	1	$500	1	$500
Ventilation Fan Assembly	$2,500	EA.	1	$2,500	1	$2,500	1	$2,500	1	$2,500	1	$2,500
Textile Filter Equipment	$17,000	EA.	3	$51,000	6	$102,000	12	$204,000	17	$289,000	6	$102,000
UV Disinfection Equipment		EA.	1	$1,500	1	$1,500	1	$4,000	1	$6,000	1	$2,000
Electrical Power to Site	$3,000	EA.	1	$3,000	1	$3,000	1	$3,000	1	$3,000	1	$3,000
Discharge to Stream	$6,000	L.S.	1	$6,000	1	$6,000	1	$6,000	1	$6,000	1	$6,000
Labor, Equipment, Materials		L.S.	1	$117,000	1	$245,000	1	$462,000	1	$672,000	1	$216,000
Total Estimated Construction Cost (Rounded)				**$352,000**		**$735,000**		**$1,385,000**		**$2,016,000**		**$649,000**
Contingency				$35,000		$74,000		$139,000		$202,000		$65,000
Land Purchase				$40,000		$45,000		$60,000		$70,000		$45,000
Engineering, Adm. and Legal				$88,000		$184,000		$346,000		$504,000		$162,000
Total Estimated Project Cost				**$515,000**		**$1,038,000**		**$1,930,000**		**$2,792,000**		**$921,000**

APPENDIX D: Estimates of Probable Project Costs – Water Distribution System

Estimate of Probable Project Costs-Water Distribution System
Planning Area 1, Drainage Area 1

Estimate does not include water services

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" Water Main	0	L.F.	$26	$0
10" Water Main	0	L.F.	$35	$0
12" Water Main	15036	L.F.	$41	$616,476
16" Water Main	13436	L.F.	$48	$644,928
8" Valve	0	EA.	$1,700	$0
10" Valve	0	EA.	$2,500	$0
12" Valve	17	EA.	$3,400	$57,800
16" Valve	9	EA.	$4,400	$39,600
16" Steel Casing Bored	0	L.F.	$400	$0
Fire Hydrant	71	EA.	$3,400	$241,400
Erosion Control	2847	L.F.	$3	$8,541
12" Crushed Aggregate Base	1222	C.Y	$18	$21,996
4" Asphalt Pavement	3667	S.Y	$30	$110,010
Landscaping	83533	S.Y	$2	$167,066
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,908,000
Contingency				$191,000
Engineering, Adm. and Legal				$477,000
TOTAL ESTIMATED PROJECT COST				$2,576,000

Estimate of Probable Project Costs-Water Distribution System
Planning Area 1, Drainage Area 10

Estimate does not include water services

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" Water Main	0	L.F.	$26	$0
10" Water Main	1948	L.F.	$35	$68,180
12" Water Main	9259	L.F.	$41	$379,619
16" Water Main	12746	L.F.	$48	$611,808
8" Valve	0	EA.	$1,700	$0
10" Valve	2	EA.	$2,500	$5,000
12" Valve	5	EA.	$3,400	$17,000
16" Valve	9	EA.	$4,400	$39,600
16" Steel Casing Bored	80	L.F.	$400	$32,000
Fire Hydrant	60	EA.	$3,400	$204,000
Erosion Control	2395	L.F.	$3	$7,185
12" Crushed Aggregate Base	422	C.Y	$18	$7,596
4" Asphalt Pavement	1267	S.Y	$30	$38,010
Landscaping	62261	S.Y	$2	$124,522
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,535,000
Contingency				$154,000
Engineering, Adm. and Legal				$384,000
TOTAL ESTIMATED PROJECT COST				$2,073,000

Estimate of Probable Project Costs-Water Distribution System

Planning Area 1, Drainage Area 20

Estimate does not include water services

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" Water Main	9144	L.F.	$26	$237,744
10" Water Main	7672	L.F.	$35	$268,520
12" Water Main	2904	L.F.	$41	$119,064
16" Water Main	12726	L.F.	$48	$610,848
8" Valve	8	EA.	$1,700	$13,600
10" Valve	8	EA.	$2,500	$20,000
12" Valve	3	EA.	$3,400	$10,200
16" Valve	15	EA.	$4,400	$66,000
16" Steel Casing Bored	100	L.F.	$400	$40,000
Fire Hydrant	81	EA.	$3,400	$275,400
Erosion Control	3245	L.F.	$3	$9,735
12" Crushed Aggregate Base	3352.185	C.Y	$18	$60,339
4" Asphalt Pavement	10055.56	S.Y	$30	$301,667
Landscaping	109556	S.Y	$2	$219,112
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$2,252,000
Contingency				$225,000
Engineering, Adm. and Legal				$563,000
TOTAL ESTIMATED PROJECT COST				$3,040,000

Estimate of Probable Project Costs-Water Distribution System
Planning Area 1A, Drainage Area 50

Estimate does not include water services

Description	Quantity	Units	Unit Cost	Total Cost
8" Water Main	5896	L.F.	$26	$153,296
10" Water Main	0	L.F.	$35	$0
12" Water Main	6906	L.F.	$41	$283,146
16" Water Main	13553	L.F.	$48	$650,544
8" Valve	8	EA.	$1,700	$13,600
10" Valve	0	EA.	$2,500	$0
12" Valve	8	EA.	$3,400	$27,200
16" Valve	15	EA.	$4,400	$66,000
16" Steel Casing Bored	0	L.F.	$400	$0
Fire Hydrant	66	EA.	$3,400	$224,400
Erosion Control	2636	L.F.	$3	$7,908
12" Crushed Aggregate Base	167	C.Y	$18	$3,006
4" Asphalt Pavement	500	S.Y	$30	$15,000
Landscaping	71122	S.Y	$2	$142,244
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,586,000
Contingency				$159,000
Engineering, Adm. and Legal				$397,000
TOTAL ESTIMATED PROJECT COST				$2,142,000

Estimate of Probable Project Costs – Water Distribution System
Planning Area 1A, Drainage Area 70

Estimate does not include water services

Description	Quantity	Units	Unit Cost	Total Cost
8" Water Main	3889	L.F.	$26	$101,114
10" Water Main	0	L.F.	$35	$0
12" Water Main	4026	L.F.	$41	$165,066
16" Water Main	8485	L.F.	$48	$407,280
8" Valve	6	EA.	$1,700	$10,200
10" Valve	0	EA.	$2,500	$0
12" Valve	4	EA.	$3,400	$13,600
16" Valve	10	EA.	$4,400	$44,000
16" Steel Casing Bored	80	L.F.	$400	$32,000
Fire Hydrant	41	EA.	$3,400	$139,400
Erosion Control	1640	L.F.	$3	$4,920
12" Crushed Aggregate Base	167	C.Y	$18	$3,006
4" Asphalt Pavement	500	S.Y	$30	$15,000
Landscaping	43972	S.Y	$2	$87,944
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$1,024,000
Contingency				$102,000
Engineering, Adm. and Legal				$256,000
TOTAL ESTIMATED PROJECT COST				$1,382,000

Estimate of Probable Project Costs – Water Distribution System
Planning Area 2, Drainage Area 1

Estimate does not include water services

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" Water Main	7065	L.F.	$26	$183,690
10" Water Main	5519	L.F.	$35	$193,165
12" Water Main	20490	L.F.	$41	$840,090
16" Water Main	0	L.F.	$48	$0
8" Valve	11	EA.	$1,700	$18,700
10" Valve	4	EA.	$2,500	$10,000
12" Valve	29	EA.	$3,400	$98,600
16" Valve	0	EA.	$4,400	$0
16" Steel Casing Bored	240	L.F.	$400	$96,000
Fire Hydrant	83	EA.	$3,400	$282,200
Erosion Control	3307	L.F.	$3	$9,921
12" Crushed Aggregate Base	667	C.Y	$18	$12,006
4" Asphalt Pavement	2000	S.Y	$30	$60,000
Landscaping	183744	S.Y	$2	$367,488
Total Estimated Construction Cost (Rounded)				$2,172,000
Contingency				$217,000
Engineering, Adm. and Legal				$543,000
Total Estimated Project Cost				$2,932,000

Estimate of Probable Project Costs – Water Distribution System
Planning Area 2, Drainage Area 30

Estimate does not include water services

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" Water Main	991	L.F.	$26	$25,766
10" Water Main	936	L.F.	$35	$32,760
12" Water Main	941	L.F.	$41	$38,581
16" Water Main	0	L.F.	$48	$0
8" Valve	1	EA.	$1,700	$1,700
10" Valve	1	EA.	$2,500	$2,500
12" Valve	1	EA.	$3,400	$3,400
16" Valve	0	EA.	$4,400	$0
16" Steel Casing Bored	0	L.F.	$400	$0
Fire Hydrant	7	EA.	$3,400	$23,800
Erosion Control	287	L.F.	$3	$861
12" Crushed Aggregate Base	44	C.Y	$18	$792
4" Asphalt Pavement	133	S.Y	$30	$3,990
Landscaping	15933	S.Y	$2	$31,866
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$166,000
Contingency				$17,000
Engineering, Adm. and Legal				$42,000
TOTAL ESTIMATED PROJECT COST				$225,000

Estimate of Probable Project Costs –Water Distribution System
Planning Area 2, Drainage Area 40

Estimate does not include water services

DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" Water Main	13208	L.F.	$26	$343,408
10" Water Main	0	L.F.	$35	$0
12" Water Main	0	L.F.	$41	$0
16" Water Main	0	L.F.	$48	$0
8" Valve	13	EA.	$1,700	$22,100
10" Valve	0	EA.	$2,500	$0
12" Valve	0	EA.	$3,400	$0
16" Valve	0	EA.	$4,400	$0
16" Steel Casing Bored	0	L.F.	$400	$0
Fire Hydrant	33	EA.	$3,400	$112,200
Erosion Control	1321	L.F.	$3	$3,963
12" Crushed Aggregate Base	222	C.Y	$18	$3,996
4" Asphalt Pavement	667	S.Y	$30	$20,010
Landscaping	73378	S.Y	$2	$146,756
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$652,000
Contingency				$65,000
Engineering, Adm. and Legal				$163,000
TOTAL ESTIMATED PROJECT COST				$880,000

APPENDIX E: Estimates of Probable Project Costs – Water Supply, Treatment and Storage

Estimate of Probable Project Costs – Water Supply from the City of Neenah

From Main Street at Highway 41 to Clayton Avenue at CTH II				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
12" Water Main	14900	L.F.	$41	$610,900
12" Valve	30	Each	$3,400	$102,000
Fire Hydrant	1	Each	$3,400	$3,400
Erosion Control	1490	L.F.	$3	$4,470
12" Crushed Aggregate Base	222	C.Y	$18	$3,996
4" Asphalt Pavement	667	S.Y	$30	$20,010
Landscaping	41389	S.Y	$2	$82,778
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$828,000
Contingency				$83,000
Engineering, Adm. and Legal				$207,000
TOTAL ESTIMATED PROJECT COST				$1,118,000

From CTH JJ at Pendleton Road to CTH JJ at Woodenshoe Road				
DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
8" Water Main	6336	L.F.	$26	$164,736
8" Valve	13	Each	$1,700	$22,100
Fire Hydrant	1	Each	$3,400	$3,400
Erosion Control	634	L.F.	$3	$1,902
12" Crushed Aggregate Base	111	C.Y	$18	$1,998
4" Asphalt Pavement	333	S.Y	$30	$9,990
Landscaping	17600	S.Y	$2	$35,200
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$239,000
Contingency				$24,000
Engineering, Adm. and Legal				$60,000
TOTAL ESTIMATED PROJECT COST				$323,000

Estimate of Probable Project Costs – Water Booster Station

DESCRIPTION	TOTAL PRICE
Building 12x 20	$80,000
Well Pumps and Controls	$100,000
Piping	$25,000
Site Work	$10,000
Generator	$100,000
3-Phase Power by Power Company	$30,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)	$345,000
Contingency	$35,000
Land Purchase	$35,000
Engineering, Adm. and Legal	$86,000
TOTAL ESTIMATED PROJECT COST	$501,000

Estimate of Probable Project Costs – Water Supply Wells

	QUANTITY	UNITS	UNIT PRICE	TOTAL PRICE
Mobilization	1	L.S.	$20,000	$20,000
20" Drill Hole	290	L.F.	$140	$40,600
14" Steel Casing	294	L.F.	$125	$36,750
Cement Grout	210	C.F.	$110	$23,100
13.5" Drill Hole	210	L.F.	$90	$18,900
Pump Test	1	L.S.	$15,000	$15,000
Water Sample and Testing	1	L.S.	$7,000	$7,000
Well Site Investigation Report	1	L.S.	$12,000	$12,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)				$173,000
Contingency				$17,000
Engineering, Adm. and Legal				$43,000
TOTAL ESTIMATED PROJECT COST				$233,000

Estimate of Probable Project Costs – Well House

DESCRIPTION	TOTAL PRICE
Building 12x 20	$80,000
Well Pump and Controls	$70,000
Chlorination	$12,000
Site Work	$15,000
Generator	$100,000
3-Phase Power by Power Company	$30,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)	$307,000
Contingency	$31,000
Land Purchase	$35,000
Engineering, Adm. and Legal	$77,000
TOTAL ESTIMATED PROJECT COST	$450,000

Estimate of Probable Project Costs – Elevated Water Storage Tank

DESCRIPTION	500,000 GALLON	750,000 GALLON	1,000,000 GALLON
Foundation, Erect, Paint Steel Elevated Tank	$900,000	$1,500,000	$2,000,000
Site Work	$20,000	$20,000	$20,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)	$920,000	$1,520,000	$2,020,000
Contingency	$92,000	$152,000	$202,000
Land Purchase	$35,000	$35,000	$35,000
Engineering, Adm. and Legal	$230,000	$380,000	$505,000
TOTAL ESTIMATED PROJECT COST	$1,277,000	$2,087,000	$2,762,000

Estimate of Probable Project Costs –Water Treatment for Arsenic Removal

DESCRIPTION	TOTAL PRICE
Building	$500,000
Site Work	$20,000
Electrical Power and Controls Including Generator	$175,000
Pressure Filter and Ion Exchange System	$600,000
Chlorination and pH Adjustment	$25,000
Connecting Water Main	$50,000
3-Phase Power by Power Company	$15,000
TOTAL ESTIMATED CONSTRUCTION COST (ROUNDED)	$1,385,000
Contingency	$139,000
Land Purchase	$35,000
Engineering, Adm. and Legal	$346,000
TOTAL ESTIMATED PROJECT COST	$1,905,000