Section 3
Project Setting

3.1 Study Area

The study area incorporates 37 square miles within Waukesha County, Wisconsin including the entire City of New Berlin. The study area is located within five major watersheds: Upper Fox River watershed, the Middle Fox River watershed, the Root River watershed, the Muskego - Wind Lakes watershed, and the Menomonee River watershed.

The study area is generally bordered to the south by College Avenue, to the west by Springdale Road, to the north by Greenfield Avenue, and to the east by 124th Street. The study area is shown on Figure 1-1.

3.2 Land Use

Land use affects both the quantity and quality of storm water runoff. Imperviousness, materials exposed to storm water, and traffic patterns are a few examples of land use characteristics which affect the hydraulics and potential pollutant loading from an area.

The study area is developed in urban and rural land uses. Existing land use conditions (1995) are based on the City of New Berlin Land Use Map. Future land use conditions within the City of New Berlin are based on the City of New Berlin Zoning Map, as directed by City staff.

A breakdown of the existing and anticipated future land use within the study area is presented in Figures 3-1 and 3-2. Agricultural land comprises about 30 percent, or 7,152 acres, of the study area under existing land use. The future land use

Figure 3-1: Existing Land Use within the New Berlin Study Area

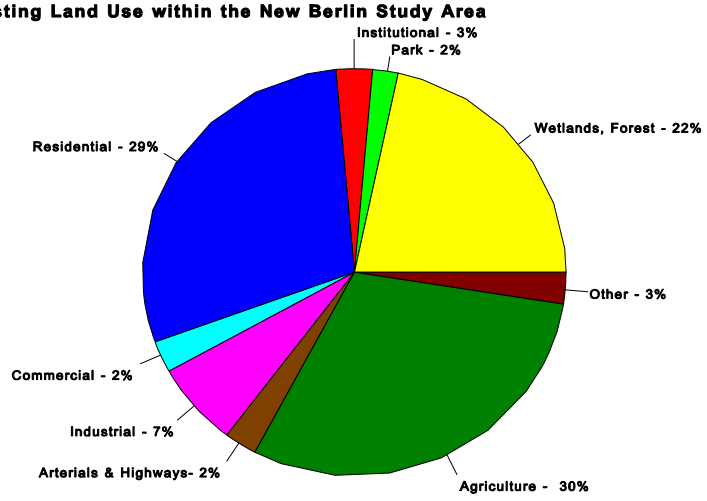
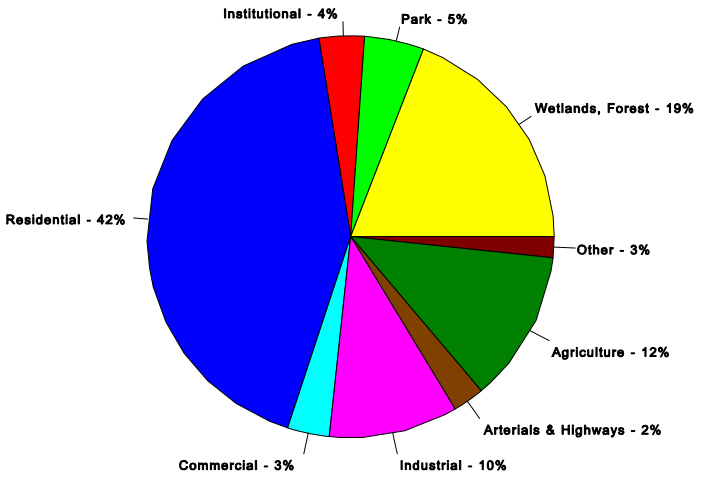


Figure 3-2: Future Land Use within the New Berlin Study Area



conditions indicate that about 4,200 acres, or 59 percent, of the current agricultural land will be developed into urban land uses. A majority of the future development within the study area is planned to be residential. Residential land use is divided into low, medium, and high density. The residential density level relationship to the City of New Berlin zoning rank is presented on Table 3-1.

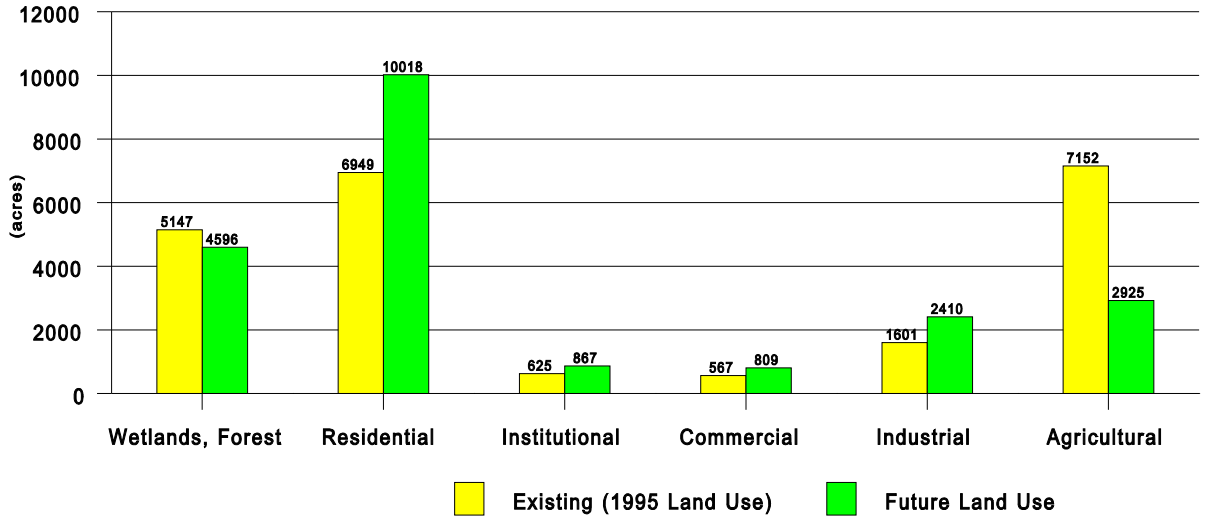
Table 3-1: Summary of Residential Density Level and City of New Berlin Zoning Rank System

Residential Land Use Description	City of New Berlin Zoning Rank	Average Number of Dwelling Units per Net Residential Acre[1]
Low Density	R1, R2, R3, R4	< 2.2
Medium Density	R4.5, R5, Rd1	2.3 to 6.9
High Density	Rm1	>7

[1] *as defined Southeastern Wisconsin Regional Planning Commission*

A majority of the current agricultural land is located in the north and west portions of the study area. Urban land uses, such as residential, commercial, industrial, and institutional are generally located within the areas bounded by Calhoun Road, Greenfield Road, 124th Street, and Grange Road. The future land use conditions indicate that a significant increase in residential, industrial, and other urban land use is anticipated. Figure 3-3 shows a comparison between the existing and future land use conditions within the study area. The hydrologic-hydraulic and water quality analysis were conducted under both the existing and anticipated future land use conditions.

Figure 3-3: Comparison of Existing and Future Land Use

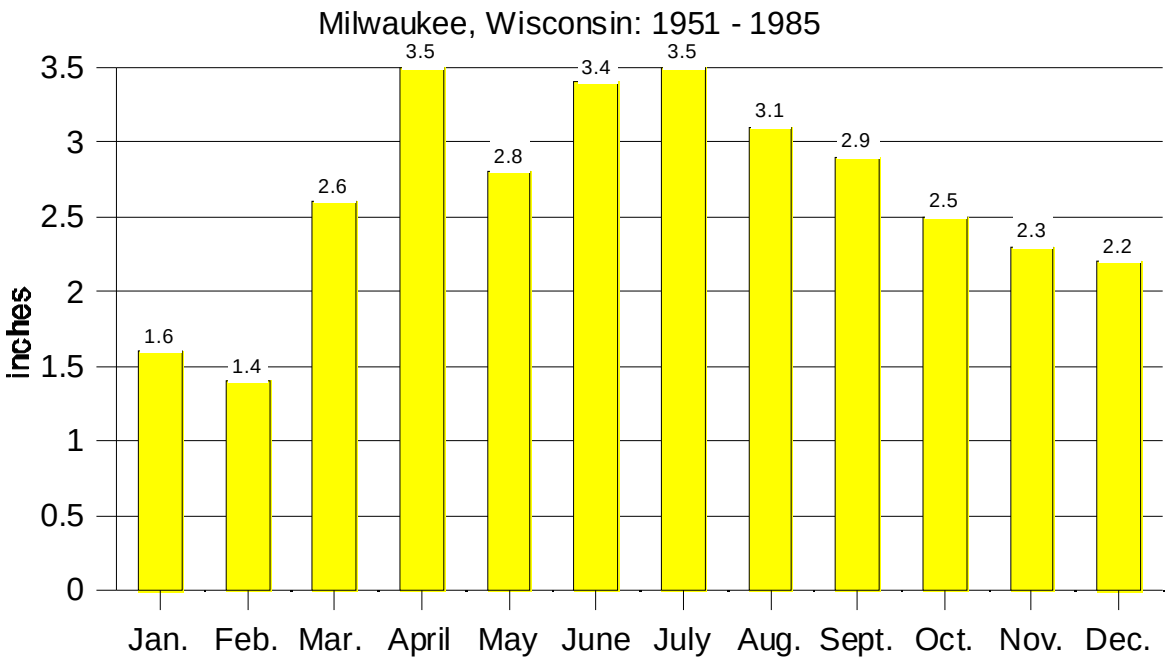


3.3 Climate

Climate affects the quantity and quality of storm water runoff from any given area. Variations in temperature, type of precipitation, and seasonal freezing and thawing all effect the runoff and drainage conditions. Flooding potential and pollutant delivery rates increase when spring thaws combine with rain events or major thaws occur when the ground is frozen. Freezing conditions may also affect the performance of certain types of storm water management best management practices (BMPs).

The Milwaukee area has a wide range of seasonal variation with average temperatures ranging from approximately 19 degrees Fahrenheit in January to 70 degrees Fahrenheit in July. The average annual precipitation (rain, snow, sleet, and/or hail) in the Milwaukee area is 31 inches. Average precipitation amounts vary from 1.4 inches in February to 3.5 inches in April and July. Approximately 50 storm events with at least 0.1 inches of precipitation occur each year. The average monthly temperature and precipitation amounts based on data collected by SEWRPC from 1951 through 1985 are presented in Figures 3-4 and 3-5, respectively.

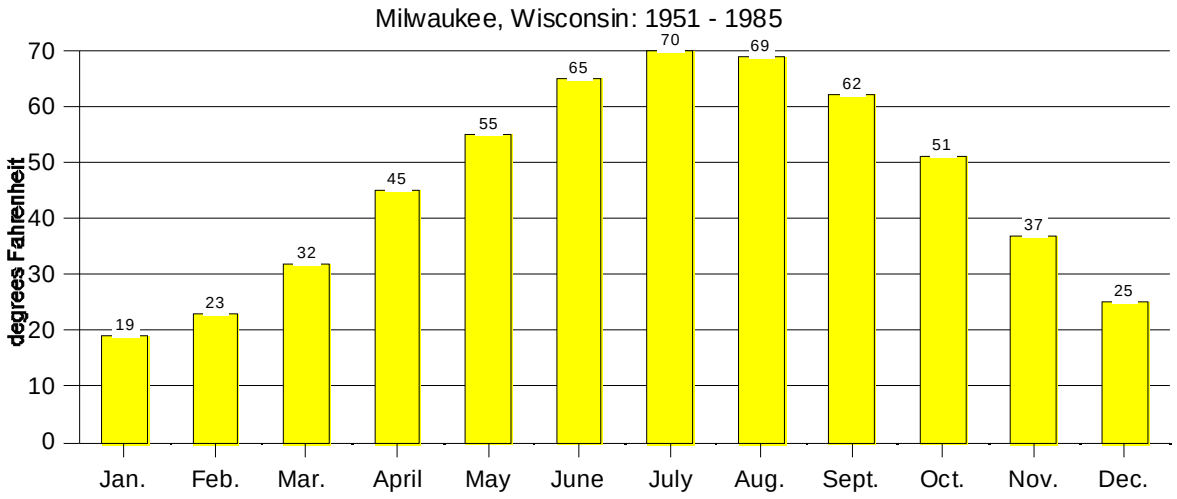
Figure 3-4: Average Monthly Precipitation



3.4 Topography

The ground surface within the study area has gently rolling topography which generally slopes downward toward the east. The ground surface elevations range from a maximum of 1070 feet above mean sea level, within the Mill Creek subwatershed, to a minimum of 746 feet above mean sea level, within the Upper Root River subwatershed. Approximately one-fourth of the study area lies east of the

Figure 3-5: Average Monthly Temperature



subcontinental divide and drains to Lake Michigan. The subwatersheds that drain to the east include Underwood Creek, Upper Root River, and Tess Corners Creek. The remaining three-fourths of the study area drains west to the Mississippi River. A summary of the topography within each major subwatershed is presented in Table 3-2.

Table 3-2: Summary of Subwatershed Topography

Subwatershed	Area (acres)	Maximum Elevation (feet above mean sea level)	Minimum Elevation (feet above mean sea level)	Maximum Change in Elevation (feet)
Underwood Creek	667	925.0	780.0	145.0
Upper Root River	4,107	957.0	746.0	211.0
Tess Corners Creek	1,701	957.1	810.0	147.1
Deer Creek	2,771	930.2	834.0	96.2
Calhoun Creek	4,821	1010.8	808.0	203.8
Poplar Creek	8,992	1044.2	822.0	222.2
Mill Creek	2,393	1070.0	861.5	208.5
		Maximum Elevation in Study Area = 1070 feet	*Minimum Elevation in Study Area = 746 feet*	*Maximum Elevation Change in Study Area = 324 feet*

3.5 Soils

Soil type influences the storm water infiltration capacity and erosion potential. Infiltration capacity and erosion potential are based on the soil texture, structure, content, permeability, slope, and position on the landscape.

Soils are classified hydrologically by the U.S. Department of Agricultural (USDA) Soil Conservation Service (SCS) as A, B, C, or D. Group A soils are generally well drained and have a low runoff potential; Group B soils are generally moderately drained and have a moderate runoff potential; Group C soils are somewhat poorly drained and have a moderate to high runoff potential; and Group D soils are very poorly drained and have a high runoff potential.

According to the *Soil Survey of Milwaukee and Waukesha Counties, Wisconsin* (USDA, 1971) the soils in the project area are typically silt loam in either the Hochheim - Theresa or Ozaukee-Mequon associations. The characteristics of the soils are presented in Table 3-3. Approximately 25 percent of the soils within the study area are classified as SCS Soil Group B which indicates water infiltration into the soils is fair and water runoff is moderately low. These areas are located in the southwest quarter of the study area and are valuable for storm water infiltration techniques described in Section 8. The general soil texture across the city of New Berlin is shown on Figure 3-6.

Table 3-3: Soil Characteristics within the New Berlin Study Area

Soil Association	Texture	Drainage	Runoff Rate	Erodibility	SCS Hydrologic Soil Group	Percent of Study Area
Montgomery-Martinton-Hebron – Saylesville	Clay to Clay Loam	Poor to Well	High Runoff Potential	Moderate	D	10
Ozaukee-Morley-Mequon	Silt Clay Loam to Silty Clay	Poor to Well	Moderately High Runoff Potential	Slight	C	50
Houghton - Palms-Adrian	Organic	Very Poor	High Runoff Potential	Moderate	D	10
Hochheim-Theresa	Clay Loam to Silty Clay Loam	Well	Low Runoff Potential	Slight to High	B	25
Other	Includes mucky peat, silt loam,	Varies	Varies	Varies	-----	5

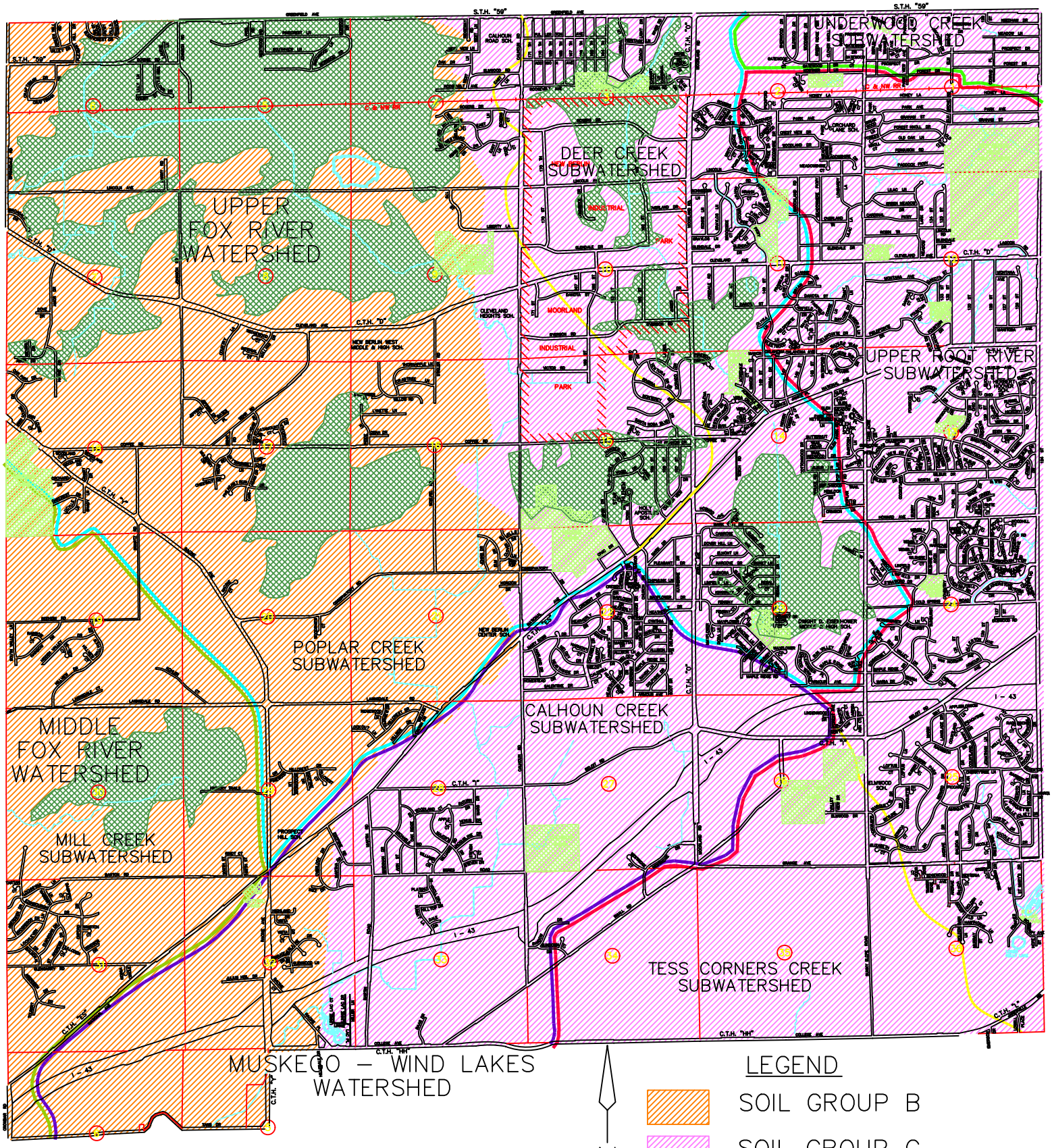


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Figure No. 3–6
CITY OF NEW BERLIN
SOIL TEXTURES MAP

	and alluvial land					

3.6 Surface Water Resources

Predominant surface water resources within the study area include perennial streams, intermittent streams, and lakes. More than 30 miles of perennial stream channels are located within the study area. Numerous intermittent streams, which flow when runoff or groundwater discharge is high, discharge into the perennial streams. Named lakes include Upper Kelly Lake and Lower Kelly Lake located in the southeast portion of the study area. Linnie Lac is located the southwest portion of the study area. Numerous unnamed lakes exist throughout the study area and are typically water-filled quarries. Major streams located within the study area are identified in Table 3-4. Surface water resources are shown on Plate 1 in Appendix A.

3.7 Wetlands

Wetlands are an important feature of the study area due to their value in supporting wildlife habitats, ability to stabilize storm water runoff and flood flows, and their ability to remove sediment and nutrients from surface waters. Approximately 82 wetland areas, incorporating more than 2,800 acres, were identified within the City of New Berlin study area.

Table 3-4: Major Streams within the New Berlin Study Area

Stream Name	Approximate Stream Subwatershed Area within the Study Area (square miles)
Upper Fox River Watershed	
Deer Creek	4.7
Poplar Creek	12.5
Middle Fox River Watershed	
Mill Creek	3.6
Root River Watershed	
Upper Root River	6.4
Tess Corners Creek	2.8
Muskego Wind – Lakes Watershed	
Calhoun Creek	6.2
Menomonee River Watershed	
Underwood Creek	0.6

3.8 Natural Areas

Natural areas are defined by the Wisconsin Natural Areas Preservation Council as tracts of land or water so little modified by human activity, or sufficiently recovered from the effects of such activity, that they contain intact native plant and animal communities believed to be representative of the pre-European settlement landscape. One natural area has been designated within the study area. This natural area is summarized in Table 3-5.

Table 3-5: Designated and Known Natural Areas within the New Berlin Study Area

Area Name	Location	Ownership	Size (acres)	Description
New Berlin Woods	T6N, R20E Sections 11,14 City of New Berlin	Private	35	Small dry-mesic hardwoods with shallow depressions that retain water in spring. Dominant trees include white and red oaks and sugar maple. Rare species habitat, natural area with county or regional significance.

Source: *A Regional Natural Areas and Critical Species Habitat Protection and Management Plan for Southeastern Wisconsin* (SEWRPC, 1997)

In addition to the natural area designated by Natural Areas Preservation Council, one nature preserve, Stigler Nature Preserve, is located within the study area.

3.9 Wisconsin Storm Water Regulations

Wisconsin Administrative Code NR 216, which contains the storm water regulations, was promulgated on November 1, 1994. These regulations establish criteria for permitting storm water discharges from certain municipalities, industries, and construction sites. Most industries which are covered by the permit are required to prepare a storm water pollution prevention plan, while construction sites which disturb more than five acres are required to prepare a construction site erosion control plan. Municipalities that are covered by the Permit may be required to prepare a storm water pollution prevention plan for certain industrial facilities. Subchapter 1 of NR 216 contains the specific storm water permit requirements for municipalities and requires that the following municipal dischargers of storm water obtain a storm water discharge permit:

- Municipal separate storm sewer systems serving incorporated areas with a population of 100,000 or more:
    - Cities of Madison and Milwaukee
- Municipalities in the Great Lakes Areas of Concern:

  - Cities of Green Bay, Allouez, Ashwaubenon, DePere, Marinette, Sheboygan, and Superior

- Municipalities in priority watersheds with a population of 50,000 or more:

  - Cities of Eau Claire, Racine, West Allis, and Waukesha

- Discharges from a municipal separate storm sewer system which either contribute to a violation of a water quality standard or are a significant contributor of pollutants to waters of the state. Municipalities may either be identified by the WDNR or by a municipality previously listed.

The City of Milwaukee has been under a storm water discharge permit since October 1994. During the permitting process, 29 surrounding municipalities were identified as potential significant contributors of storm water pollution to Wisconsin waters.

The WDNR evaluated all of the designated municipalities using the criteria listed below to determine which municipalities will be required to obtain storm water discharge permits:

- Physical connection between the municipal separate storm sewer system and the City of Milwaukee system.

- Location of the separate storm sewer system discharge relative to the City of Milwaukee=s discharge

- The quantity and nature of pollutants discharged to waters of the state

- The nature of the receiving waters

- Protection of the watershed or basin drainage area receiving the discharge

- Population of the municipality

On August 2, 1996 the WDNR notified 21 municipalities that they will be required to obtain a Municipal Storm Water Discharge Permit. The City of New Berlin was not among the municipalities notified to obtain a storm water discharge permit at that time. However, the City was recently notified by the WDNR that New Berlin will be required to obtain a municipal storm water discharge permit. The permit application requirements include the following items.

- A demonstration that the applicant has legal authority established by statue, ordinance, or series of contract to:

- < control the contribution of pollutants to the municipal separate storm sewer from industrial storm water discharges.
- < prohibit illicit discharges to the storm sewer system.
- < control the discharge of spills, dumping, or disposal of materials to the storm sewer system.
- < control through inter-municipal agreements between co-applicants the contribution of pollutants from one municipal storm sewer system to another.
- < require compliance with conditions in ordinances, permits, contracts, or orders.
- < carry out all inspections, surveillance, and monitoring procedures necessary.

- A storm sewer system map including:

  - < identification and outline of the storm water drainage basins, the watersheds, and the municipal separate storm sewer systems.
  - < boundary defining the final Urban Storm Water Planning Area and all municipal borders within the area.
  - < listing and location of all known municipal separate storm sewer outfalls discharging to waters of the state with pipe size and consideration of Amajor.@
  - < location and description of each currently operating or closed municipal landfill or other treatment, disposal, or storage facility for municipal waste
  - < the location of major structural controls for storm water discharges.
  - < identification of publicly owned parks, recreational areas, and other open lands.

- A description of existing management practices to control pollutants from municipal separate storm sewer systems including the following:

  - < existing source area controls and structural Best Management Practices, including operation and maintenance measures.
  - < existing programs to identify illicit connections to the municipal separate storm sewer including inspection procedures, methods for detecting and preventing illicit discharges, areas where this program has been implemented, and summary of the results.

- An inventory, by watershed, of the industrial facilities which likely discharge storm water to the municipal separate storm sewer system including:

  - < name and address of each facility
  - < Standard Industrial Classification (SIC) or other description of products or services provided by the industry.

- A characterization of the quality and quantity of storm water runoff and the effects on the receiving waters including:

- < monthly mean rainfall and snow fall estimates, or summary of weather bureau data, and monthly average number of storm events.
- < location and description of land use activities, including estimated average runoff coefficient, population densities, and projected growth for a ten-year period within the drainage area.
- < if available, quantitative data describing the volume and quality of discharges including a description of the outfalls, sampling procedures, and analytical methods.
- < listing of water bodies that receive discharges from the municipal separate storm sewer system, locations in these water bodies where pollutants from storm water discharges may accumulate and cause water quality degradation, and known water quality impacts.

- A proposed schedule to provide pollutant loadings to receiving water bodies and the event mean concentrations.

- A proposed monitoring program for data collection for the term of the permit.

- A schedule to provide a proposed storm water management program that will be developed and initiated during the term of the permit.

- A fiscal analysis of the estimated capital and operation and maintenance expenditure necessary to implement the proposed management programs, including a description for the source of funds, incorporating any restrictions on the use of the funds.

Permit application requirements will be partially completed as part of this Storm Water Management Plan. The WDNR will review the Permit application submitted by New Berlin, and issue a Storm Water Permit. The Permit conditions will likely include requirements for best management practices, pilot studies, ordinance, and monitoring.

3.10 Other Storm Water Management Related Regulations

In addition to the Wisconsin Storm Water Regulations, contained in NR 216 and described in the previous section, there are several federal, state, and local regulations which affect storm water management. A summary of the current regulations and requirements is provided in Table 3-6. It should be noted that regulatory requirements will likely change over time.

Table 3-6: Summary of Storm Water Management Related Regulations

Regulating Authority	Regulation	Description	Regulated Community/Activity
US EPA	Clean Water Act 40 CFR Part 122	40 CFR Part 122 directs regulated municipalities, most industries, and construction sites over 5 acres to obtain and comply with a storm water discharge permit. The WDNR has permitting authority for this regulation and administers the program through NR 216.	X Municipalities X Industries X Construction sites disturbing over 5 acres
US Army Corps of Engineers	Clean Water Act Section 404	Section 404 provides the federal government with the federal authority to administer activities which may impact navigable waters of the United States.	X Dredging within a navigable waterway or wetland X Placing fill within a navigable waterway or wetland X Other activities which may impact a navigable water of the United States
WDNR	NR 216 - Wisconsin Storm Water Regulations	NR 216 requires regulated municipalities, most industries, and construction sites over 5 acres to obtain and comply with a storm water discharge permit. Section 3.9 of this report describes NR 216 more completely.	X Municipalities X Industries X Construction sites over 5 acres
WDNR	NR 120 - Wisconsin Non-point Source Pollution Abatement Program	NR 120 establishes the administrative framework for the implementation of the State=s Non-point Source Pollution Program.	X Governmental units, state agencies, landowners and land operators that receive grants of cost sharing monies from the WDNR
WDNR	NR 116 - Wisconsin Floodplain Management Program	NR 116 requires municipalities to adopt reasonable and effective floodplain zoning ordinances.	X Regulates the type of land use, site design, and structural design of development in floodplains
WDNR	NR 117 - Wisconsin Shoreland - Wetland Protection Program	NR 117 establishes minimum standards for city and village shoreland-wetland zoning ordinances.	X Projects which effect wetlands five acres or larger within shoreland areas of cities and villages

Table 3-6: Summary of Storm Water Management Related Regulations

Regulating Authority	Regulation	Description	Regulated Community/Activity
WDNR	NR 103 - State Wetland Permit	NR 103 describes the review process used by WDNR to determine the impacts of projects which may affect delineated wetlands. The review criteria include dependancy on the wetland, potential practical alternatives, impacts on the wetland water quality standard, cumulative wetland impacts, and secondary wetland impacts.	X Projects which effect delineated wetlands
WDNR	Chapter 30 - State Water Regulation Permit	Chapter 30 regulates activities which affect navigable waterways within Wisconsin.	X streambank stabilization X dredging of navigable waterway X filling of navigable waterway X channel improvements X other activities which affect a Wisconsin navigable waterway
City of New Berlin	Erosion Control Requirements	The erosion control ordinance regulates land disturbing and land developing activities within the City of New Berlin.	projects which: X disturb greater that 4,000 square feet X excavate or fill 400 cubic yards X disturb greater that 300 linear feet of trenching X involve any road or waterway
City of New Berlin	Zoning Ordinance	The Zoning Ordinance promotes the health, safety, morals, comfort, prosperity, and general welfare of the City of New Berlin.	X regulates and restricts the use of all structures, lands, and waters within the City of New Berlin