Preliminary Stormwater Management Plan

MAHLER PARK FILTER STRIP

Prepared For The
TOWN OF NEENAH
WINNEBAGO COUNTY, WISCONSIN

DECEMBER 21, 2012
PTK

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I. INTRODUCTION

The Town of Neenah's Mahler Park has been identified as a site that contains a grass filter strip that treats stormwater runoff. Grass filter strips remove pollutants from stormwater runoff by filtration through the grass and infiltration into the soil. The water quality benefits of a grass filter strip are largely determined by the infiltrating capacity of underlying soils. A grass filter strip located in sandy soil has a higher pollutant removal as compared to a grass filter strip located in clay soil. Mahler Park is generally located east of S. Park Ave, north of Poplar Ct (private), south of Maple Ln and west of Hidden Acres Ct within the Town of Neenah, Winnebago County, Wisconsin (SE ¼ of NW ¼ of Section 3, T19N, R17E). Pursuant to NR 216, the Town was required by the EPA and State of Wisconsin to obtain a WPDES Municipal Storm Water Discharge Permit. The purpose of the permit is to control urban non-point source pollution by regulating discharges from municipal separate storm sewer systems (MS4). The Mahler Park filter strip will improve water quality and assist the Town in complying with their WPDES MS4 stormwater permit. The Town currently owns, operates and maintains the Mahler Park filter strip.

Specific goals for the Mahler Park filter strip and this Storm Water Management Plan include the following:

A. Satisfy the requirements of NR 151.12 by reducing average annual Total Suspended Solids (TSS) by 40% for a re-development project within the filter strip's drainage basin.

B. Reduce average annual Total Suspended Solids (TSS) and Total Phosphorus (TP) loads in runoff to the Lake Winnebago, a 303 (d) listed water body.

C. Assist the Town in complying with their WPDES MS4 Stormwater Permit.

II. STUDY AREA

The study area is depicted in Figure 1 within Appendix A. The study area is approximately 40 acres in size and is fully developed. Land uses within the study area are primarily park and residential. Mahler Park has extensive open grass areas that are used for softball and/or soccer. There are minimal impervious surfaces within the park, primarily the parking lot, tennis courts and pavilion. The study area generally drains from north to south, generally as sheet flow. The Mahler Park filter strip is located along the south end of the park and treats stormwater runoff from a majority of the study area.

III. HYDROLOGIC & HYDRAULIC ANALYSIS

Since the study area is fully developed, any future development within the study area would be considered a redevelopment. Per NR 151.12(5)(b)(2a), a redevelopment post-construction site is exempt from the peak discharge requirement. As such, no hydrologic & hydraulic analysis was completed as part of this Stormwater Management Plan.

IV. WATER QUALITY ANALYSIS

A. Methodology

The water quality analysis for the study area was prepared using the Source Loading and Management Model (SLAMM) (v10.0). SLAMM is an urban water quality model that predicts runoff volumes and non-point source pollution within a watershed. SLAMM calculates mass balances for both particulate and filterable pollutants. SLAMM also calculates the amount of pollutant removal provided by Best Management Practices (BMP), including wet detention ponds.

No historical water quality information was available for the study area. As such, water quality within the study area was predicted using historical data collected during the National Urban Runoff Project (NURP).

B. Rainfall

SLAMM computes pollutant loads from one or more rainfall events. For this study, the series of small rainfall events that occurred between March 29, 1969 and November 25, 1969 in Green Bay, Wisconsin were used to compute pollutant loads. The 1969 historic rainfall series was determined to represent an average year of rainfall within northeast Wisconsin by the WDNR.

C. Drainage Area

The 40 acre study area was used to prepare the SLAMM water quality model. It is of note that this drainage area may need to be modified in the future, if and when redevelopment of the site would occur.

D. Soils

Soil information was obtained from the U.S. Department of Agriculture (USDA) *Soil Survey of Winnebago County, Wisconsin*. The USDA has classified soil types into four hydrologic soil groups (HSG). The four hydrologic soil groups (i.e. A, B, C and D) are classified according to the minimum infiltration rate of the soil column. Group A soils have the highest permeability rate or lowest runoff potential, whereas Group D soils have the lowest permeability rate or highest runoff potential. The predominant soil types within the study area are Type B soils.

E. Land Use

Since the study area is fully developed, the current land uses were used to prepare the SLAMM water quality model. In general, the current land uses include park and residential. For reference, the area of each land use can be found in the SLAMM input provided in Appendix B.

F. Infiltration Rates

As part of the Town-Wide Stormwater Management Plan, infiltrometer tests were performed along various grass swales within the Town. Based on the results from the infiltrometer tests, infiltration rates were determined for each HSG. Figure 2 within Appendix A depicts the infiltration rates based on each of the four HSG's. It is of note that a composite infiltration rate (1.38 in/hr) was determined and used to prepare the SLAMM water quality model.

G. Filter Strip Parameters

The location of the Mahler Park filter strip is depicted on Figure 1 within Appendix A. The filter strip is approximately 1,416 feet in length and 100 feet wide. A longitudinal slope of 0.50% and grass height of 2.5 inches were used to prepare the SLAMM water quality model.

H. Water Quality Results

NR 151.12 storm water regulations require 80 percent total suspended solids (TSS) removal for new development and 40 percent removal for re-development, as compared to no water quality controls. Furthermore, NR 151.122(1) states that the 40% TSS reduction is only required for parking areas and roads. Since the study area is currently developed, it is likely that any future development will be considered redevelopment and will require the 40% TSS reduction from parking areas and roads.

The total suspended solids (TSS) reduction provided by the Mahler Park filter strip is summarized below in Table #1. The removal rate provided by the Mahler Park filter strip is 83.7 percent or 12,698 pounds of TSS.

Table #1
Total Suspended Solids (TSS)
Reduction Provided

	Drainage Area (acres)	TSS Inflow (lbs.)	TSS Removed (lbs.)	TSS Outflow (lbs.)	Removal Rate (%)
Mahler Park Filter Strip	39.7	15,175	12,698	2,477	83.7

In addition to TSS removal, the Mahler Park filter strip also provides a reduction of total phosphorous (TP). The removal rate provided by the South Cloverleaf Pond is 83.7 percent or 89.18 pounds of total phosphorous. The total phosphorous reduction provided is summarized in Table #2.

Table #2
Total Phosphorus (TP)
Reduction Provided

	Drainage Area (acres)	TP Inflow (lbs.)	TP Removed (lbs.)	TP Outflow (lbs.)	Removal Rate (%)
Mahler Park Filter Strip	39.7	108.2	89.18	19.02	82.4

No street sweeping, catch basin cleaning or other Best Management Practices (BMP) are included in the SLAMM water quality model. The only Best Management Practices within the study area is the Mahler Park filter strip. For reference, the results of the SLAMM water quality analysis are provided in Appendix B.

V. INFILTRATION

The NR 151 stormwater regulations require that 25 percent and 10 percent of the 2-year, 24-hour post development runoff volume be infiltrated for residential land uses and non-residential land uses, respectively. Since the Mahler Park filter strip study area is fully developed, any future development would be considered redevelopment. Per NR 151.12(5)(c)(6c), redevelopment post-construction sites are exempt from the infiltration requirements.

VI. PROTECTIVE AREAS

Per NR 151.12(5)(d)(4a), redevelopment post-construction sites are exempt from the protective area requirements. As such, the Mahler Park filter strip is exempt from the post-construction protective areas performance standards in NR 151.

VII. FUELING & VEHICLE MAINTENANCE

The Mahler Park filter strip does not satisfy NR 151 petroleum sheen requirements for fueling and vehicle maintenance areas located within the 40 acre study area. Currently, there are no fueling and vehicle maintenance areas within the study area. As such, each property owner will need to satisfy petroleum sheen requirements for their site at the time of redevelopment.

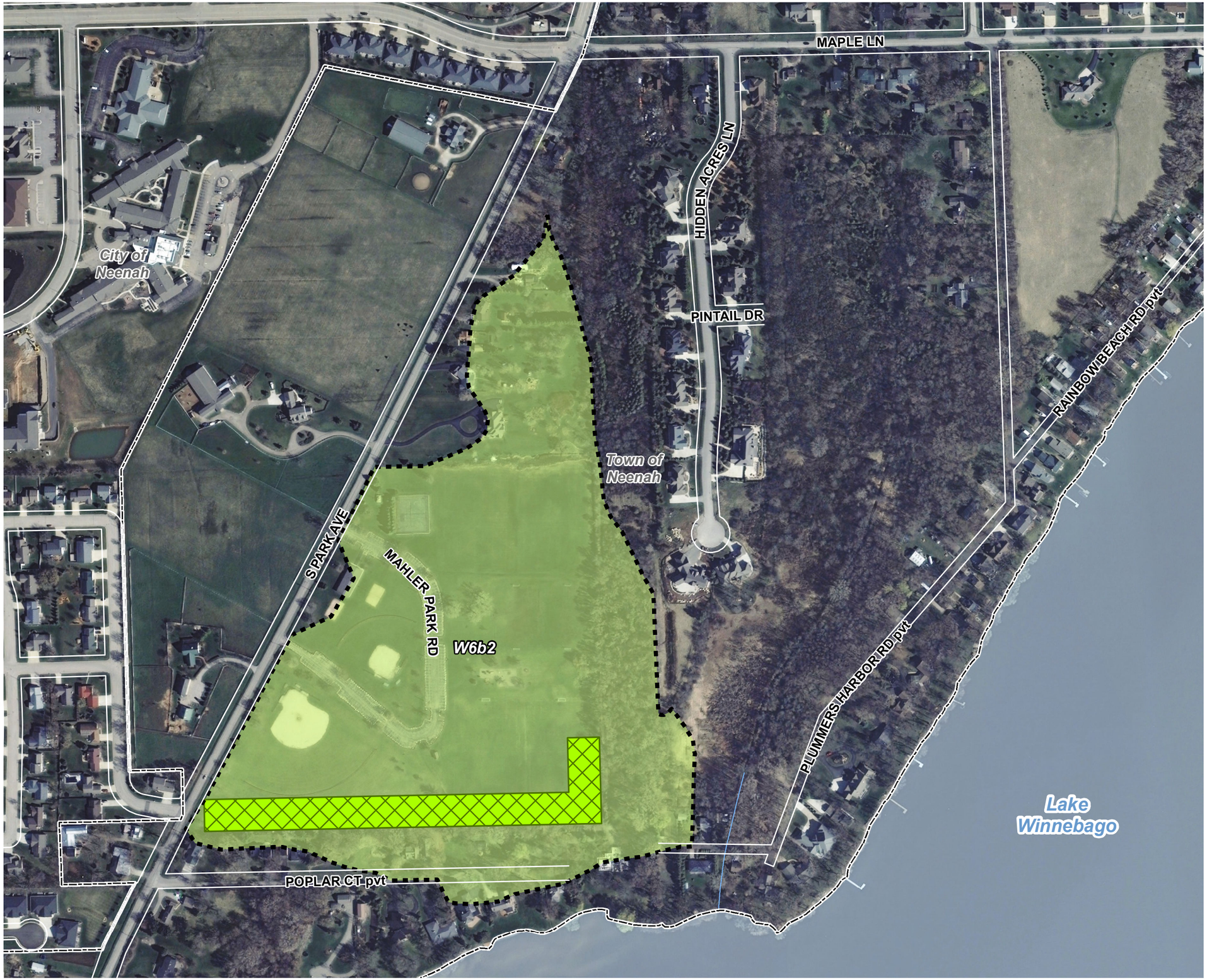
VIII. SUMMARY

In summary, the Mahler Park filter strip satisfies the storm water management goals for the 40 acre study area. The intent of this Storm Water Management Plan is not to provide erosion and sediment control for construction sites within the watershed.

The Town of Neenah currently owns the Mahler Park filter strip property and are responsible for its operation and maintenance.

APPENDIX A

FIGURES



TOWN OF NEENAH

Mapped Features

- Study Area
- Filter Strip
- Right-of-Way
- Municipal Boundary
- Stream
- Lake Winnebago

Sources: Winnebago County, 2010-2012; WROC (Aerial), 2010.

Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMAHON does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site-specific uses. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

N

0 300 600

Feet

McMAHON ENGINEERS ARCHITECTS

FIGURE 1
STUDY AREA
MAHLER PARK
STORMWATER MANAGEMENT PLAN
TOWN OF NEENAH
WINNEBAGO COUNTY, WISCONSIN

w:\PROJECTS\N0003\00379 2010 UNPS & Stormwater Planning Grant\00\Mahler Park SWMP\GIS\Figure1_B.mxd May 9, 2013 kpk

MAPLE LN

HIDDEN ACRES LN

PINTAIL DR

RAINBOW BEACH RD pvt

City of Neenah

Town of Neenah

S PARK AVE

MAHLER PARK RD

W6b2

PLUMMERS HARBOR RD pvt

POPLAR CT pvt

Lake Winnebago

TOWN OF NEENAH

Dynamic Infiltration Rates (Inches Per Hour)

- 0.48
- 0.96
- 1.69 (NA)
- 1.94

Other Mapped Features

- Study Area Boundary
- Right-of-Way
- Municipal Boundary
- Stream
- Lake Winnebago

Sources: Winnebago County, 2010-2012; WROC (Aerial), 2010.

Disclaimer: The property lines, right-of-way lines, and other property information on this drawing were developed or obtained as part of the County Geographic Information System or through the County property tax mapping function. McMAHON does not guarantee this information to be correct, current, or complete. The property and right-of-way information are only intended for use as a general reference and are not intended or suitable for site-specific uses. Any use to the contrary of the above stated uses is the responsibility of the user and such use is at the user's own risk.

N

0 300 600

Feet

McMAHON ENGINEERS ARCHITECTS

FIGURE 2
DYNAMIC INFILTRATION RATES
MAHLER PARK
STORMWATER MANAGEMENT PLAN
TOWN OF NEENAH
WINNEBAGO COUNTY, WISCONSIN

w:\PROJECTS\N0003\900379 2010 UNPS & Stormwater Planning Grant\00\Mahler Park SWMP\GIS\Figure1_B.mxd May 9, 2013 kpk

APPENDIX B

SLAMM WATER QUALITY ANALYSIS

Filter-W6b2 - Output Summary

SLAMM for Windows Version 10.0.0

Data file name: W:\PROJECTS\N0003\900379 2010 UNPS & Stormwater Planning Grant\00\Stormwater Quality\SLAMM\Filter Strips\Filter-W6b2.mdb
Data file description:
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Green Bay Five Year Rainfall.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO02.ppdx
Start of Winter Season: 11/25 End of Winter Season: 03/29
Model Run Start Date: 01/01/68 Model Run End Date: 12/30/72
Date of run: 12-18-2012 Time of run: 09:22:15
Total Area Modeled (acres): 39.710
Years in Model Run: 5.00

	Runoff Volume (cu ft)	Percent Runoff Volume Reduction	Particulate Solids Conc. (mg/L)	Particulate Solids Yield (lbs)	Percent Particulate Solids Reduction
Total of all Land Uses without Controls:	2.255E+06	-	107.8	15175	-
Outfall Total with Controls:	369426	83.62%	107.4	2477	83.68%
Annualized Total After Outfall Controls:	73926			495.6	

Pollutant	Concentration - No Controls	Concentration - With Controls	Conc. Units	Pollutant Yield No Controls	Pollutant Yield With Controls	Units	Pol. Yield Percent Reduction
Total Phosphorus	0.7687	0.8247	mg/L	108.2	19.02	lbs	82.42 %

Filter-W6b2 - InputData
Data file name: W:\PROJECTS\N0003\900379 2010 UNPS & Stormwater Planning Grant\00\Stormwater Quality\SLAMM\Filter Strips\Filter-W6b2.mdb
WinSLAMM Version 10.0.0
Rain file name: C:\WinSLAMM Files\Rain Files\WisReg - Green Bay Five Year Rainfall.ran
Particulate Solids Concentration file name: C:\WinSLAMM Files\WI_AVG01.pscx
Runoff Coefficient file name: C:\WinSLAMM Files\v10 WI_SL06 Dec06.rsv
Residential Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Institutional Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Commercial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Industrial Street Delivery file name: C:\WinSLAMM Files\WI_Com Inst Indust Dec06.std
Other Urban Street Delivery file name: C:\WinSLAMM Files\WI_Res and Other Urban Dec06.std
Freeway Street Delivery file name: C:\WinSLAMM Files\Freeway Dec06.std
Apply Street Delivery Files to Adjust the After Event Load Street Dirt Mass Balance: False
Pollutant Relative Concentration file name: C:\WinSLAMM Files\WI_GEO02.ppdx
Cost Data file name:
Seed for random number generator: -42
Study period starting date: 01/01/68 Study period ending date: 12/30/72
Start of Winter Season: 11/25 End of Winter Season: 03/29
Date: 05-09-2013 Time: 10:20:04
Site information:

LU# 1 - Residential: Low Density Residential_Non ROW Total area (ac): 4.100
  3 - Roofs 3: 0.092 ac. Pitched Connected
  6 - Roofs 6: 0.257 ac. Pitched Disconnected Silty
  8 - Roofs 8: 0.037 ac. Pitched Disconnected Clayey Low Density
  13 - Paved Parking 1: 0.005 ac. Connected
  25 - Driveways 1: 0.116 ac. Connected
  27 - Driveways 3: 0.055 ac. Disconnected Silty
  28 - Driveways 4: 0.008 ac. Disconnected Clayey Low Density
  31 - Sidewalks 1: 0.008 ac. Connected
  33 - Sidewalks 3: 0.015 ac. Disconnected Silty
  34 - Sidewalks 4: 0.002 ac. Disconnected Clayey Medium/High Density No Alleys
  52 - Small Landscaped Areas 2: 2.853 ac. Silty
  53 - Small Landscaped Areas 3: 0.414 ac. Clayey Medium/High Density No Alleys
  58 - Undeveloped Areas 2: 0.186 ac. Silty
  59 - Undeveloped Areas 3: 0.027 ac. Clayey Medium/High Density No Alleys
  69 - Isolated Areas: 0.010 ac.
  72 - Other Pervious Areas 2: 0.008 ac. Silty
  73 - Other Pervious Areas 3: 0.001 ac. Clayey Medium/High Density No Alleys
  79 - Other Part Con Imp Areas 2: 0.004 ac. Disconnected Silty
  80 - Other Part Con Imp Areas 3: 0.001 ac. Disconnected Clayey Low Density

LU# 2 - Residential: Medium Density Res. No Alleys_Non ROW Total area (ac): 1.190
  3 - Roofs 3: 0.072 ac. Pitched Connected
  6 - Roofs 6: 0.079 ac. Pitched Disconnected Silty
  8 - Roofs 8: 0.088 ac. Pitched Disconnected Clayey Medium/High Density No Alleys
  13 - Paved Parking 1: 0.003 ac. Connected
  25 - Driveways 1: 0.067 ac. Connected

27 - Driveways 3: 0.014 ac. Disconnected Silty
28 - Driveways 4: 0.016 ac. Disconnected Clayey Medium/High Density No Alleys
31 - Sidewalks 1: 0.009 ac. Connected
33 - Sidewalks 3: 0.008 ac. Disconnected Silty
34 - Sidewalks 4: 0.009 ac. Disconnected Clayey Medium/High Density No Alleys
46 - Large Landscaped Areas 2: 0.001 ac. Silty
47 - Large Landscaped Areas 3: 0.002 ac. Clayey
52 - Small Landscaped Areas 2: 0.352 ac. Silty
53 - Small Landscaped Areas 3: 0.396 ac. Clayey
58 - Undeveloped Areas 2: 0.003 ac. Silty
59 - Undeveloped Areas 3: 0.003 ac. Clayey
69 - Isolated Areas: 0.003 ac.
72 - Other Pervious Areas 2: 0.030 ac. Silty
73 - Other Pervious Areas 3: 0.034 ac. Clayey

LU# 3 - Residential: Low Density Residential_ROW Total area (ac): 0.180
25 - Driveways 1: 0.009 ac. Connected
31 - Sidewalks 1: 0.002 ac. Connected
37 - Streets1: 0.026 ac. Smooth Street Length = 0.0166245 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs
38 - Streets 2: 0.050 ac. Intermediate Street Length = 3.196838E-02 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs
39 - Streets 3: 0.007 ac. Rough Street Length = 4.731225E-03 curb-mi Default St. Dirt Accum. Annual Winter Load = 2750 lbs
52 - Small Landscaped Areas 2: 0.014 ac. Silty
53 - Small Landscaped Areas 3: 0.071 ac. Clayey

LU# 4 - Other Urban: Wetland Total area (ac): 2.010
70 - Water Body Areas: 2.010 ac.

LU# 5 - Other Urban: Parks_Non ROW Total area (ac): 25.760
1 - Roofs 1: 0.028 ac. Flat Connected
3 - Roofs 3: 0.030 ac. Pitched Connected
6 - Roofs 6: 0.054 ac. Pitched Disconnected Silty
8 - Roofs 8: 0.016 ac. Pitched Disconnected Clayey Low Density
13 - Paved Parking 1: 1.159 ac. Connected
21 - Unpaved Parking 3: 0.047 ac. Disconnected Silty
22 - Unpaved Parking 4: 0.014 ac. Disconnected Clayey Low Density
25 - Driveways 1: 0.252 ac. Connected
31 - Sidewalks 1: 0.066 ac. Connected
46 - Large Landscaped Areas 2: 16.051 ac. Silty
47 - Large Landscaped Areas 3: 4.664 ac. Clayey Low Density
52 - Small Landscaped Areas 2: 0.182 ac. Silty
53 - Small Landscaped Areas 3: 0.053 ac. Clayey
63 - Paved Playgrounds 1: 0.249 ac. Connected
65 - Paved Playgrounds 3: 0.193 ac. Disconnected Silty
66 - Paved Playgrounds 4: 0.056 ac. Disconnected Clayey Low Density
69 - Isolated Areas: 1.959 ac.
79 - Other Part Con Imp Areas 2: 0.532 ac. Disconnected Silty
80 - Other Part Con Imp Areas 3: 0.155 ac. Disconnected Clayey Low Density

LU# 6 - Residential: Medium Density Res. No Alleys_ROW Total area (ac): 0.210
25 - Driveways 1: 0.012 ac. Connected
31 - Sidewalks 1: 0.005 ac. Connected
37 - : 0.031 ac. Smooth Street Length = 1.670986E-02 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs

38 - Streets 2: 0.063 ac. Intermediate Street Length = 3.333625E-02 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs
39 - : 0.013 ac. Rough Street Length = 6.685612E-03 curb-mi Default St. Dirt Accum. Annual Winter Load = 2750 lbs
53 - Small Landscaped Areas 3: 0.087 ac. Clayey

LU# 7 - Other Urban: Parks_ROW Total area (ac): 0.050
25 - Driveways 1: 0.002 ac. Connected
31 - Sidewalks 1: 0.002 ac. Connected
37 - : 0.007 ac. Smooth Street Length = 4.486252E-03 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs
38 - Streets 2: 0.016 ac. Intermediate Street Length = 0.01 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs
47 - Large Landscaped Areas 3: 0.022 ac. Clayey Low Density

LU# 8 - Residential: Suburban Residential_ROW Total area (ac): 0.210
25 - Driveways 1: 0.010 ac. Connected
37 - : 0.017 ac. Smooth Street Length = 9.824562E-03 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs
38 - Streets 2: 0.081 ac. Intermediate Street Length = 5.162807E-02 curb-mi Default St. Dirt Accum. Annual Winter Load = 2500 lbs
53 - Small Landscaped Areas 3: 0.102 ac. Clayey

LU# 9 - Residential: Suburban Residential_Non ROW Total area (ac): 3.820
6 - Roofs 6: 0.049 ac. Pitched Disconnected Silty
8 - Roofs 8: 0.059 ac. Pitched Disconnected Clayey Low Density
15 - Paved Parking 3: 0.002 ac. Disconnected Silty
16 - Paved Parking 4: 0.002 ac. Disconnected Clayey Low Density
25 - Driveways 1: 0.050 ac. Connected
27 - Driveways 3: 0.023 ac. Disconnected Silty
28 - Driveways 4: 0.027 ac. Disconnected Clayey Low Density
33 - Sidewalks 3: 0.002 ac. Disconnected Silty
34 - Sidewalks 4: 0.002 ac. Disconnected Clayey Low Density
52 - Small Landscaped Areas 2: 1.526 ac. Silty
53 - Small Landscaped Areas 3: 1.843 ac. Clayey
58 - Undeveloped Areas 2: 0.104 ac. Silty
59 - Undeveloped Areas 3: 0.126 ac. Clayey
69 - Isolated Areas: 0.004 ac.

LU# 10 - Other Urban: Woods Total area (ac): 2.180
57 - Undeveloped Areas 1: 2.180 ac. Silty

Control Practice 1: Filter Strip CP# 1 (DS)
Total drainage area (acres)= 39.710
Fraction of drainage area served by filter strips (ac) = 1.00
Total filter strip width (ft) = 1416.0
Effective flow length (ft) = 100
Infiltration rate (in/hr)= 1.190
Typical longitudinal slope (ft.H/ft.V) = 0.005
Typical grass height (in) = 2.5
Swale retardance factor = D
Use stochastic analysis to determine infiltration rate: False
Infiltration rate coeficient of variation (COV) = 0.00
Particle size distribution file name: C:\WinSLAMM Files\NURP.CPZ
Surface Clogging Load (lbs/sf) = 3.50