



## PLANNING COMMISSION AGENDA

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**May 6, 2019**  
**7:00 pm**

- 1. CALL TO ORDER -**
- 2. PLEDGE OF ALLEGIANCE –**
- 3. OATH OF OFFICE – Kuchen Hale**
- 4. ROLL CALL -**
  - a) Scott Patten
  - b) Sally Doherty
  - c) Kris Kopitzke (Chair)
  - d) Jim Langan
  - e) Roger Bowman
  - f) Justin Sykora
  - g) Christian Dawson
  - h) Doug Parker
  - i) Kuchen Hale
- 5. APPROVAL OF AGENDA –**
- 6. APPROVAL OF MINUTES –**
  - A. February 4, 2019 Meeting Minutes
  - B. April 1, 2019 Meeting Minutes
- 7. REPORTS AND PRESENTATIONS – None**
- 8. PUBLIC HEARINGS – None**
- 9. NEW BUSINESS –**
  - A. City of Lake St. Croix Beach Draft 2040 Comprehensive Plan
- 10. OLD BUSINESS -**
  - A. Election of Officers - Secretary
  - B. Review and Clarification of Elements of the PLCD Ordinance Language
  - C. Pervious Pavers
  - D. Update on City Council Actions – Council Highlights from the April 16, 2019 Council meeting - attached.
- 11. ADJOURN –**

**A quorum of the City Council or Other Commissions may be present to receive information.**

CITY OF AFTON  
DRAFT PLANNING COMMISSION MINUTES  
February 4, 2019

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1. **CALL TO ORDER** – Chair Kris Kopitzke called the meeting to order at 7:00 PM
  2. **PLEDGE OF ALLEGIANCE** – was recited.
  3. **ROLL CALL** – Present: Chair Kris Kopitzke, Roger Bowman, Mark Nelson, Justin Sykora. A Quorum was present. Absent were Scott Patten, Sally Doherty (excused), & James Langan (excused).  
**ALSO IN ATTENDANCE** – City Council member Lucia Wroblewski, City Administrator Ron Moore
  4. **APPROVAL OF AGENDA** –  
Motion/Second Bowman/Nelson to approve the agenda for the February 4, 2019 Planning Commission meeting. Passed 4-0.
  5. **APPROVAL OF MINUTES** –  
A. January 7, 2019  
Motion/Second Nelson/Bowman to approve minutes of the January 7, 2019 Planning Commission meeting. Passed 4-0.
  6. **REPORTS AND PRESENTATIONS** - None
  7. **PUBLIC HEARINGS** – none
  8. **NEW BUSINESS** -  
A. Planning Commission comments regarding the Denmark Township Draft 2040 Comprehensive Plan  
Bowman stated that Afton be a part of planning development in the north-west corner which is shared with Cottage Grove and Woodbury.  
Nelson pointed out that the well numbers listed are incorrect as the DNR has changed them, also there is more current well data available from the DNR.  
Bowman stated that Afton has a strong concern over the future of drinking water and perhaps could assist Denmark Township in obtaining current well data.  
Motion/Second Kopitzke/Nelson To forward the following comments to the City Council regarding Denmark Township's Draft 2040 Comprehensive Plan:
    - Both the City of Afton and Denmark Township are planning to retain Agricultural zoning with rural land uses through 2040 and beyond. The City of Afton has provided comments regarding the Cottage Grove Draft 2040 Comprehensive Plan focused on the northeast corner of Cottage Grove that is also currently planned for Agricultural zoning and rural land uses through 2040. The City of Afton has concerns related to the impact which ultimate urbanization of this area may have upon the City of Afton, and requested to be included in any future planning efforts by the City of Cottage Grove to provide City sewer and water services to this area. Afton would like Denmark Township to also be involved in these future planning efforts to support the protection of the rural land uses of our cities.
    - As Afton has reviewed the Draft Comprehensive Plans of adjacent fast-growing cities, Afton has become very concerned about future drinking water supply and would like to work more closely with Denmark Township in collaborative efforts to protect and preserve the supply of drinking water.
 Passed 4-0.
  - B. Review and clarification of elements of the PLCD Ordinance language  
Discussion was held on the best way to review the ordinance. Administrator Moore provided a list of Ordinance elements that need to be reviewed. It was decided to divide the list into 3 segments and to review a segment each month.

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C. Planning Commission 2019 meeting schedule

The meeting schedule was reviewed.

D. Planning commission dinner gathering

A dinner/workshop will be planned for May 6, 2019.

**9. OLD BUSINESS –**

A. Update on City Council actions

Council member Wroblewski provided a summary of the January City Council meeting.

**10. ADJOURN**

**Motion/Second Bowman/Nelson To adjourn. Passed 4-0.**

Meeting adjourned at 8:08 PM

Respectfully submitted by:

\_\_\_\_\_  
Julie Yoho, City Clerk

To be approved on March 4, 2019 as (check one): Presented: \_\_\_\_\_ or Amended: \_\_\_\_\_

CITY OF AFTON  
DRAFT PLANNING COMMISSION MINUTES  
April 1, 2019

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5 1. **CALL TO ORDER** – Chair Kris Kopitzke called the meeting to order at 7:00 PM  
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7 2. **PLEDGE OF ALLEGIANCE** – was recited.  
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9 3. **ROLL CALL** – Present: Kris Kopitzke, James Langan, Christian Dawson, Doug Parker, Roger Bowman,  
10 Justin Sykora. A Quorum was present. Absent were Scott Patten & Sally Doherty (excused).  
11 **ALSO IN ATTENDANCE** – Mayor Palmquist, City Administrator Ron Moorse  
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13 4. **APPROVAL OF AGENDA** –  
14 **Motion/Second Parker/Dawson To approve the agenda for the April 1, 2019 Planning Commission**  
15 **meeting. Passed 6-0.**  
16  
17 5. **APPROVAL OF MINUTES** –  
18 A. March 4, 2019  
19 **Motion/Second Parker/Bowman To approve the minutes of March 4, 2019 with corrections noted.**  
20 **Passed 6-0.**  
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22 6. **REPORTS AND PRESENTATIONS** - None  
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24 7. **PUBLIC HEARINGS** –  
25 A. Gary Swanson application for a Minor Subdivision and Variance at 5550 Neal Ave  
26 Chair Kopitzke opened the public hearing at 7:08 PM.  
27 Administrator Moorse provided the following summary: The applicant owns an 80 acre parcel at 5468  
28 Neal Avenue that includes a house and accessory buildings, and an adjacent 1-acre parcel to the south on  
29 which are located a number of accessory buildings. The applicant also owns the 79 acre parcel at 5550  
30 Neal Avenue, on which are also located a house and multiple accessory buildings. The applicant operates  
31 a farm using all three parcels. The applicant has applied for a minor subdivision at 5550 Neal Avenue to  
32 divide a 5-acre parcel that includes a house and 3 accessory buildings, from the existing 79-acre parcel.  
33 The proposed 5-acre parcel has 300 feet of frontage on Neal Avenue and has direct access to Neal  
34 Avenue. The variance is to allow the existing agricultural building to remain for use as part of the farm  
35 operation on the remaining large parcel.  
36  
37 No other comments were received  
38 **Motion/Second Sykora/Parker To close the public hearing. Passed 6-0.**  
39 Public hearing closed at 7:15 PM.  
40  
41 Bowman asked about the setbacks on the other remaining buildings? (Moorse replied that they are fine)  
42 Bowman asked about the access to the property? (Mr Swanson replied that the access is located south of  
43 the pole barn, do not need another access)  
44 Sykora asked if the variance is needed due to the 59.8' setback? (Yes, can't move the lot line north because  
45 of other buildings).  
46 Kopitzke stated that a variance requires uniqueness that is not created by applicant. Have to explain in  
47 findings why this is unique and this is the only solution.  
48 Moorse stated that if a 10 acre lot was created, all of the Ag buildings would be on a small, non-agricultural  
49 parcel.  
50 Bowman asked about the purpose of the subdivision? (to sell the house)  
51 Moorse stated that there are a large number of existing ag buildings in the homestead area. Having 4 large  
52 Ag buildings on a small non Ag use lot would be substantially non-conforming. The 2 large buildings to  
53 the south are beneficial to the Ag use on the large parcel.  
54 Sykora stated that uniqueness does apply in this respect.  
55 Dawson stated that the buildings will be Ag use on an Ag lot.

56 **Motion/Second Sykora/Bowman to recommend approval of the Gary Swanson application for a**  
57 **subdivision and variance at 5550 Neal Avenue, with findings and conditions including additional**  
58 **finding regarding the uniqueness of the variance (11 findings, 3 conditions):**

59 **Findings**

- 60 1. The subject property is located in the Ag zone, as are the surrounding properties.
- 61 2. The Ag zone allows single-family residential use with a 5-acre minimum lot size
- 62 3. The applicant owns the 80-acre parcel at 5468 Neal Avenue immediately north of
- 63 5550 Neal Avenue
- 64 4. There are a house and 3 accessory buildings on the area proposed as a 5-acre lot,
- 65 one of which does not meet the side yard setback requirement
- 66 5. The applicant has agreed to remove the accessory building on the 5-acre lot that
- 67 does not meet the side yard setback requirement
- 68 6. The total square footage of the two accessory buildings to remain on the 5-acre lot is
- 69 2,200
- 70 7. While the zoning code limits the number of accessory buildings on a 5-acre lot to a
- 71 maximum of two with a total square footage of 2,000 sq. ft., Sec. 12-187 of the code
- 72 also exempts agricultural buildings that are existing at the time of a subdivision
- 73 from the limits on maximum square footage and total number of accessory
- 74 buildings.
- 75 8. There is an existing agricultural building greater than 1500 sq. ft., located south of
- 76 the proposed 5-acre lot, that would be located 59.8 feet from the proposed south side
- 77 yard property line vs. the required 100 feet. The building is proposed to remain for
- 78 use as part of the farm operation on the remaining large parcel.
- 79 9. The applicant has agreed to combine the three parcels under common ownership
- 80 into one parcel, which would result in an overall reduction in the number of parcels
- 81 from three to two.
- 82 10. The proposed 5-acre lot meets the requirements of 300 feet of frontage on a public
- 83 road and direct access to the public road.
- 84 11. The uniqueness of the proposed 5-acre lot is that it creates a viable lot while
- 85 maintaining the viability of agricultural uses on the remaining large parcel.

86 **Conditions**

- 87 1. Easements as required by the City Engineer shall be granted
- 88 2. The three lots under common ownership shall be combined at the time the subdivision is
- 89 recorded.
- 90 3. The applicant shall remove the pole barn located on the 5-acre lot near the south property
- 91 line prior to the recording of the subdivision

92 **Motion Vote: Passed 6-0.**

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95 **8. NEW BUSINESS – none**

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98 **10. OLD BUSINESS –**

99 **A. Election of Officers**

100 **Motion/Second Bowman/Parker To nominate the three current officers – Kopitzke Chair, Doherty**  
101 **Vice-Chair, Patten Secretary to continue in their roles.**

102 Langan stated he would prefer to table until all of the nominees have been talked too.

103 Sykora stated that Patten has been absent a lot, we should be sure he wants to do it.

104 **Langan offered Friendly Amendment (accepted) To nominate Kopitzke as Chair and Doherty as Vice**  
105 **Chair. Passed 5-0-1 (Kopitzke abstain).**

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107 **Motion/Second Sykora/Langan To table Secretary vote until next month. Passed 6-0.**

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**B. Review & clarification of elements of PLCD ordinance language**

**c. Clarify the maximum density allowed in a PLCD**

1) Clarify how to determine density when a portion of a qtr-qtr section extends beyond the PLCD

Kopitzke stated that the intent of the languages was to protect people there, not make it first-come, first-served.

Parker stated that dividable land should not be determined just by size; land that is not buildable shouldn't count

Moorse stated it could be left at 4 lots per qtr-qtr and require the neighbors to work with each other

Sykora stated that the qtr-qtr language could encourage a developer to purchase a larger tract and result in more protected land.

Sykora stated it will become more difficult to work with qtr-qtr sections over time. Go by total amount of land.

Dawson stated that the comprehensive plan says we discourage land prospecting, this language does that.

Kopitzke stated that the PLCD is a way to conserve land and way for landowners to sell land.

Bowman suggested if a development was to deprive other owners in the qtr-qtr their right to subdivide in the future, then the application could require a signature from others

**d. Clarify definition of a cul de sac**

Discussion was held on why the language is unclear and what needs to be clarified

Bowman stated that any road that is the only egress from an area can only serve 9 homes.

Parker suggested language to clarify prohibiting cul de sacs branching from cul de sacs

Bowman asked about the separation of driveways in a PLCD? (Moorse replied that in the Ag zone it is 300').

It was decided the current language is sufficient

**e. Clarify maximum cul de sac length**

Length is variable in a PLCD, there will be cases where it can be lengthened under PLCD language

Langan suggested stating a cul de sac can't exceed 1320' without a certain amount of property (large minimum)

Kopitzke suggested adding cross references in the PLCD language.

Langan suggested adding terms that imply intent.

**f. Clarify the number of lots allowed on a cul de sac**

Kopitzke stated that this version of the language gave the city council the opportunity to be flexible.

Moorse stated the general language limiting to 9 lots applies to PLCD and everywhere.

Mayor Palmquist stated that a PLCD is an exception.

PLCD can only occur in Ag

The concept of having loop roads as an unintended consequence needs to be considered.

Sykora noted it is very site specific.

**C. Pervious Pavers**

**Motion/Second Sykora/Bowman to table item "pervious pavers" until next meeting. Passed 6-0.**

**D. Planning Commission Dinner gathering**

It was decided Bowman will grill and others will bring items for potluck. Plan for 18 people. Start at 6:00, May 6.

**E. Update on City Council actions**

Mayor Palmquist provided a summary of the March city council meeting. He noted that the river crested at 688.48'.

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**11. ADJOURN**  
**Motion/Second Sykora/Dawson To adjourn. Passed 6-0.**

Meeting adjourned at 9:31 PM.

Respectfully submitted by:

\_\_\_\_\_  
Julie Yoho, City Clerk

To be approved on May 6, 2019 as (check one): Presented: \_\_\_\_\_ or Amended: \_\_\_\_\_

DRAFT

<p><b>City of Afton</b>  <b>3033 St. Croix Trl, P.O. Box 219</b>  <b>Afton, MN 55001</b></p>
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# Planning Commission Memo

## Meeting: May 6, 2019

To: Chair Kopitzke and members of the Planning Commission

From: Ron Moorse, City Administrator

Date: April 30, 2019

Re: Comments Regarding the City of Lake St. Croix Beach Draft 2040 Comprehensive Plan

The City of Lake St. Croix Beach has provided its draft 2040 Comprehensive Plan for Afton's review and comment. The Plan is posted on the City's website as part of the Planning Commission meeting packet.

### Attachments

- Goals and Policies
- 2016 General Land Use Map
- Surface Water Management Plan

### Comprehensive Plan Review Process

The City's review of the Draft 2040 Comprehensive Plan involves providing comments to the City of Lake St. Croix Beach. The first step is the Planning Commission providing a set of recommended comments to the Council. The Council then reviews the Draft 2040 Comprehensive Plan, along with the Planning Commission's recommended comments, and determines final comments to be provided to the City of Lake St. Croix Beach.

### Comprehensive Plan Overview

Staff has attached materials to provide an overview of the Lake St. Croix Beach Comprehensive Plan. Lake St. Croix Beach is developed with individual private septic systems on small lots, and is served by a municipal water system. Because Lake St. Croix Beach is almost fully developed, there is not a significant opportunity for additional development. The western border of Lake St. Croix Beach is directly adjacent to the City of Afton's rural residential development. The eastern border of Lake St. Croix Beach is adjacent to the St. Croix River. It is important that the land use along the western border continue to be single family detached housing, which is most compatible with Afton's rural development. It is also important that the septic systems in Lake St. Croix Beach be maintained in compliance with the state and county septic system regulations, in order to protect the groundwater and to protect the water quality of the St. Croix River.

### Planning Commission Comments

Based on the Planning Commission's review and discussion regarding the Comprehensive Plan, the Planning Commission may provide a set of recommended comments regarding the Plan to the City Council.

### Planning Commission Recommendation Requested

**Motion regarding a set of recommended comments regarding the City of Lake St. Croix Beach Draft 2040 Comprehensive Plan.**

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## PREFACE

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### Goals and Policies

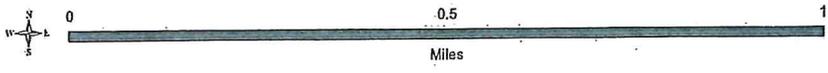
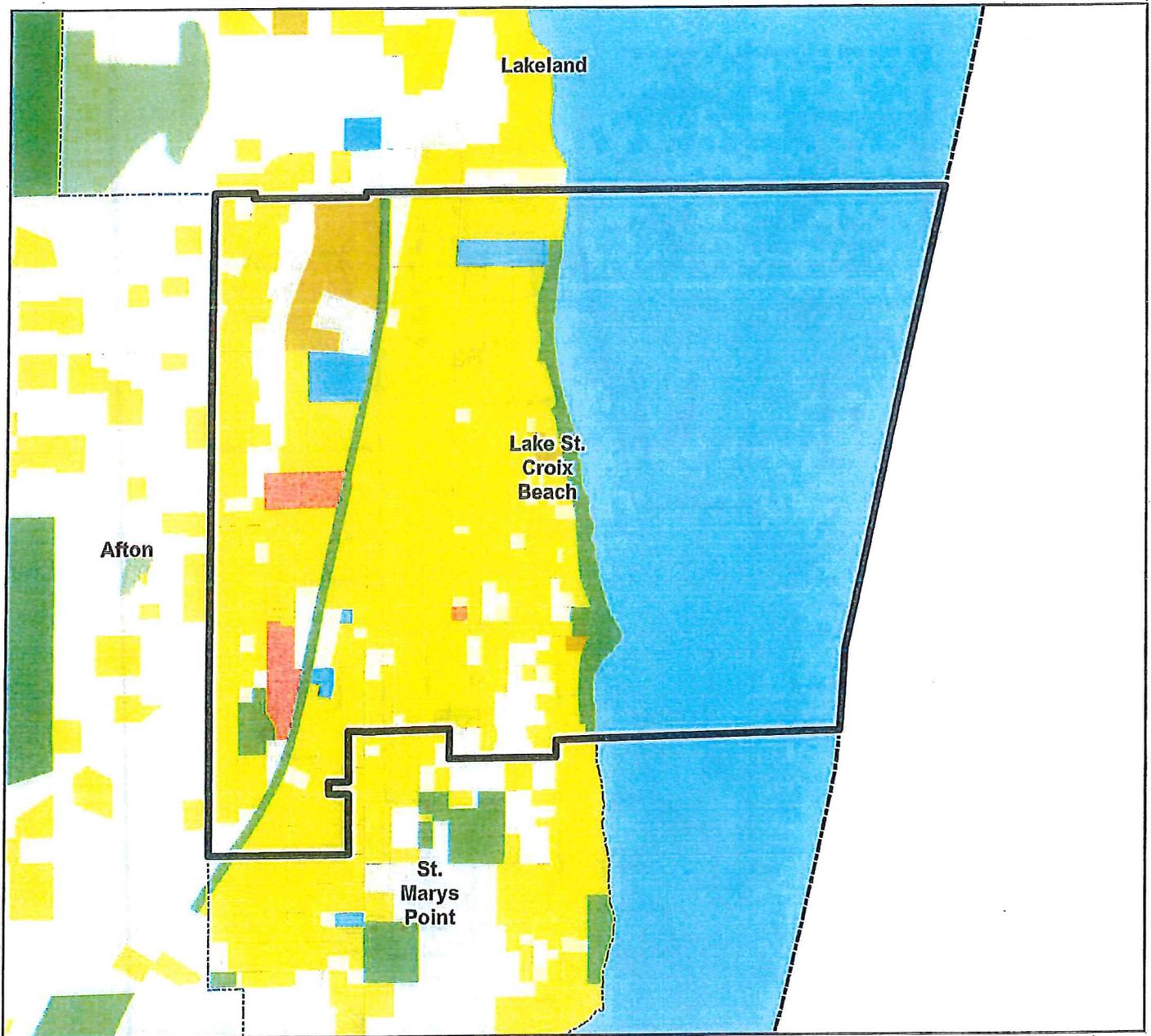
The following goals are established:

1. To develop our city in accordance with a plan developed by the community and coordinated with Washington County, Metropolitan Council and adjacent governmental units.
2. To develop our city consistent with the aesthetics of the St. Croix River Valley.
3. To provide an orderly and efficient program for capital expenditures.
4. To keep the need for public expenditures at the lowest level possible consistent with providing essential services.
5. To maintain on-site sewer systems recognizing that central sewer systems will not be available for the foreseeable future.
6. To assure a strong line of communication between the citizens, governing and regulatory bodies to assure maximum cooperation and citizen effort in the development of our city.
7. To minimize the adverse impact of the city on water resources and the environment.
8. To assure safe and orderly traffic circulation on the streets and highways within the city.
9. To satisfy the recreational facility needs of our citizens and to honor the historic dedication of St. Croix River uses to residents of the city.
10. To promote conditions favorable to meet the housing needs of our citizens.
11. To cooperate with other communities in the St. Croix Valley to provide consistency, economy and uniformity in the development and maintenance of the communities of the Valley.
12. To encourage the sharing of municipal services.

The City will adopt the following policies to achieve these goals:

1. Complete and implement this plan in accordance with the standards of the County and Metropolitan Council and in cooperation with adjacent governmental units.
2. Zone for lot sizes and establish conditions for obtaining permits that assure consistency with a city in its non-sewered setting.
3. Establish a capital improvement plan.
4. Take advantage of volunteer help and monetary grants that are available from public and private sources.
5. Continue to require permits for septic systems. Establish a system of maintenance for such septic systems. Require substandard systems causing problems to be brought to code. Inspect and monitor building and maintenance of on-site sewer and improve water systems.
6. Continue to inform citizens through the use of monthly newsletters. Encourage citizen attendance at Commission, Committee and Council meetings, public hearings and City activities.
7. Encourage builders to protect and preserve existing trees and to plant new ones. Inspect and monitor building and maintenance of on-site sewer and municipal water systems.
8. Maintain roads in a safe and orderly fashion, minimize entries to County State Aid Highway (CSAH) 18 and discourage blind corners, vegetative overgrowth affecting line of sight and/or road narrowing and other dangerous conditions. Provide a uniform program of street lighting and proper signs.
9. Establish a plan for the orderly and safe development and maintenance of the parklands and recreational facilities and manage recreational boat use along the city's shoreland park.
10. Encourage and assist homeowners to upgrade houses and keep them in good repair and to monitor impact to floodplain neighborhood from high water events.
11. Maintain the present program of joint planning and joint powers agreements with other communities in the Valley, and take advantage of all opportunities for further joint efforts.

# 2016 Generalized Land Use City of Lake St. Croix Beach, Washington County



## 2016 Generalized Land Use

- |                             |                                |                              |
|-----------------------------|--------------------------------|------------------------------|
| Farmstead                   | Mixed Use Residential          | Major Highway                |
| Seasonal/Vacation           | Mixed Use Industrial           | Railway                      |
| Single Family Detached      | Mixed Use Commercial and Other | Airport                      |
| Manufactured Housing Park   | Industrial and Utility         | Agricultural                 |
| Single Family Attached      | Extractive                     | Undeveloped                  |
| Multifamily                 | Institutional                  | Water                        |
| Retail and Other Commercial | Park, Recreational or Preserve | County Boundaries            |
| Office                      | Golf Course                    | City and Township Boundaries |
|                             |                                | NCompass Street Centerlines  |

**Local Surface Water Management Plan**  
City of Lake St. Croix Beach, Minnesota

**DRAFT**  
**May 9, 2009**

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## **Local Surface Water Management Plan**

### **Purpose**

The City of Lake St. Croix Beach has prepared this Surface Water Management Plan to consolidate information on the City's overall surface water management objectives, implementation and funding. The City has adopted the Middle St. Croix Watershed Management Organization Water Management Plan by reference along with elements of the Metropolitan Council Water Resources Management Plan. It is the City's goal to protect valuable natural resources and to have no adverse impact on the water quality of the St. Croix River as it passes through our city.

The City of Lake St. Croix Beach's Plan is intended to support the goals and policies of the Middle St. Croix Watershed Management Organization (MSCWMO). The MSCWMO is a Joint Powers Watershed Management Organization composed of ten St. Croix Valley communities that was established under State Statute 103B to cooperatively manage water resources within the watershed. The ten member communities of the MSCWMO are Afton, Bayport, Baytown Township, Lakeland, Lakeland Shores, Lake St. Croix Beach, Oak Park Heights, St. Mary's Point, Stillwater, and West Lakeland Township. Lake St. Croix Beach appoints one manager and one alternate to serve on the ten member WMO Board. Lake St. Croix Beach represents about 3 percent of the 19.8 square mile MSCWMO Watershed area.

The purpose of the WMO and of this Plan, is to conserve natural resources through land use planning, flood control, and other conservation projects in order to ensure continued public health and welfare. The specific purposes for the Plan and the WMO Plan are:

- 1) Cooperatively manage water resources in the watershed.
- 2) Inventory and assess the resources of the watershed.
- 3) Monitor the water quality of lakes and streams in the watershed.
- 4) Provide education on water related issues in the watershed.
- 5) Review development plans for stormwater management, erosion and sediment control, and provide wetland and shoreland protection.
- 6) Plan and implement capital improvement projects that enhance the water resources of the watershed.

## Land and Surface Water Features

The Middle St. Croix Watershed is unique when compared to other watersheds in Washington County in that it has many small, parallel sub watersheds that all flow into the St. Croix River, whereas the other watersheds generally have one major drainage with a headwaters and outlet.

Generally speaking the drainage pattern in Lake St. Croix Beach is from west to east; however there are a number of isolated low areas within the City which prevent discharge directly into the St. Croix River. Most of the City drains internally, with very little area draining directly into the River. There are two concentrated discharge sites which flow into the River.

The MSCWMO Plan includes a detailed assessment of the land and water resources found within the MSCWMO and reference is made to the WMO Plan for this information. The MPCA's online mapping tool identifies the special and impaired waters information for the waters listed in Table C -1.

**Table C -1. Special and Impaired Waters in Lake St. Croix Beach**

Water Body	Designation	Requirements
St. Croix River	Outstanding Resources Value Water (ORVW) Restricted Discharge	NPDES Construction Permit requires additional measures for construction activities; water quality volume and buffer zones
St. Croix River	Impaired for Mercury (Hg)	Approved TMDL. Statewide implementation. No direct local requirements.
	Impaired for PCB	TMDL not yet completed. No current local requirements.  Fish consumption advisories apply to both impairments
	Phosphorus	20% phosphorus load reduction goal set

Protected waters are shown in Figure 2.11 of the MSCWMO Plan and the wetlands within the City are illustrated in Figure 2.7 of the MSCWMO Plan. The St. Croix River is the only Protected Water that is within or that borders Lake St. Croix Beach. Four wetlands are identified in the City. Three of these wetlands are located along the St. Croix River and the fourth is located near the intersection of Ramada Ave. and 20<sup>th</sup> St.

## Stormwater Management System

The City has no formal storm sewer or ditch system. The City has installed drainage structures at strategic locations along roadways to address periodic street flooding. There are two concentrated discharge points from the City to the St. Croix River located at Upper 17<sup>th</sup> St. and Riviera Ave and on Riviera Ave near 16<sup>th</sup> St. Several Planned Unit Developments located in the City have stormwater facilities which include ponds. The City has a policy for inspection and maintenance on these facilities. The City also inspects mandated stormwater facilities at private residences and businesses each year as part of the CUP renewal process.

X/15TH

## Surface Water Management Requirements and Standards

The City will carry out sound stormwater management practices which are consistent with the City's ordinances and the policies of the MSCWMO Plan. The City will update their current ordinances listed in Table C-2 to match the standards identified in these MSCWMO Watershed Management Plans for stormwater treatment and volume control, erosion and sediment control and groundwater management. AND VALLEY BRANCH

The City will follow a process to review proposed development for potential wetland impacts. The City will support the administration of the Minnesota Wetland Conservation Act by the MSCWMO. The City will require treatment of stormwater runoff for new projects and encourage treatment of existing discharges prior to discharge to wetlands and the maintenance of a natural buffer around wetlands. The City shall support the restoration of disturbed wetlands within the city.

**Table C-2. Ordinances Relating to Surface Water Management**

Ordinance Chapter	Description
301.10	Adoption of Model Zoning Code. Land coverage and Drainage Component.
302.	Adoption of Lower St. Croix Bluffland and Shoreland Management Ordinance
402.	Adoption of Model Floodplain Regulation
403.	Soil Erosion
404.	Restrictive Soils
506.	Individual Sewage Treatment System Code
507.	Water Drainage Code
509.	Water Supply System Code

The City has adopted the State Wild and Scenic Rivers Management Program (SWSRMP) which includes special shoreland and bluffland management provisions for the St. Croix River Corridor. The City also participates in the National Flood Insurance

Program and has adopted the Washington County Model Floodplain Regulation which regulates any development or redevelopment in the floodplain. The Minnesota DNR reviews and approves all development requiring variances or special uses in the St. Croix Riverway District and floodplain.

*VALLEY BRANCH*

The City will incorporate the MSCWMO performance standards into its existing practices, and will refer projects to the MSCWMO for full review when deemed necessary based on the activities listed below. Projects that require full review by MSCWMO will be subject to a \$250.00 fee, which shall be paid to the City of Lake St. Croix Beach. The MSCWMO will then invoice the City in the amount of \$250.00 for full review. Lake St. Croix Beach will adopt the MSCWMO review comments into its commentary for each project.

- 1) Any project undertaking grading, filling, or other land alteration activities which involve movement of earth or removal of vegetation on greater than 10,000 square feet of land.
- 2) All major subdivisions. Major Subdivisions are defined as subdivisions with 4 or more lots.
- 3) Any project with wetland impacts.
- 4) Any project with grading within the public waters.
- 5) Any project with grading within the wetland buffer as identified in the MSCWMO Plan.
- 6) Any project with grading within 40 feet of the bluff line.
- 7) Redevelopment on a site of 5 acres or more, where pervious surface is disturbed and final impervious surface, in aggregate, exceeds 1 acre or 5% of a site, which causes a change in runoff characteristics of removal of vegetation.
- 8) Development projects that impact 2 or more of the member communities.

Projects that do not trigger full review may still require staff level review by the MSCWMO as follows:

*VALLEY BRANCH*

Performance Standards in Section 5 of the WMP will apply to development within the Middle St. Croix watershed and focus on stormwater management, erosion and sediment control, and wetland protection. The Performance Standards will apply to all projects that trigger the MSCWMO review process. In addition, whenever a project requires a building permit that adds five hundred square feet of additional impervious surface, or a project requires a variance from the current local impervious surface zoning requirements for the property, the Performance

Standards will apply. Building permits for new construction in an approved major subdivision that meets the requirements of the Performance Standards are exempt from the water quantity and quality standards as long as the individual property does not exceed the impervious surface percentage approved for the given parcel in that subdivision. All projects regardless of whether public or private can be reviewed.

The erosion and sediment goal of the MSCWMO and the City is to prevent erosion and subsequent sedimentation from surface runoff within the watershed on construction sites, agricultural lands, and along stream banks, lakeshores and roadsides. To achieve this, the City supports the MSCWMO goals and policies to:

- 1) Promote methods that prevent erosion;
- 2) Intercept eroded material before it leaves the site; and
- 3) Require sedimentation basins or other areas for sediment to be safely controlled.

## **Groundwater Management**

2014-2024  
Groundwater provides all of the drinking water and the majority of water for commercial, industrial, and irrigation needs in Washington County. The protection and conservation of groundwater is critical to safe drinking water, a healthy ecosystem and economic vigor. The City supports the goals and policies within the Washington County Groundwater Plan 2003-2013 which covers the protection and conservation of groundwater resources by coordinating with other governmental bodies, writing policies, regulation and education. Groundwater quality and quantity are the two main focuses of the plan.

Groundwater recharge in Lake St. Croix Beach occurs both vertically and horizontally. Most of the City is an important groundwater recharge area given the granular soils. With coarse soils over shallow bedrock, septic tank effluent passing through existing drywells could have a high probability to contaminate groundwater. The existence of many shallow private wells located in the City may also be a potential risk to groundwater. The entire City is served by a water system operated by the City of Lakeland. The Lakeland Water Utility has a Wellhead Protection Plan and only a small portion of Lake St. Croix Beach is located within the wellhead protection area.

In 1987 the Minnesota Department of Health issued a Well Advisory for Lakeland, Lakeland Shores, Afton and West Lakeland Township located adjacent to and north of Lake St. Croix Beach. Wells were identified with higher than average volatile organic compounds (VOCs). At least two sources of plumes were identified in the area, one with fluorocarbons and petroleum products (Ray's Truck Stop Plume) and the other with solvents. As a result of VOCs detected in nearly 200 wells, the communities of Lakeland and Lakeland Shores were connected to a municipal water system installed in 1991. Lake

St. Croix Beach connected to the system in 1991-1994 due to concerns over nitrates found in private wells. Well sampling continues to be conducted by the Minnesota Pollution Control Agency (MPCA) and well monitoring collected by the MPCA to date indicates that the plumes are fully contained.

### **Water Based Recreation**

The beautiful St. Croix River is one of Lake St. Croix Beach's key assets. Water based recreation is plentiful on the St. Croix River. Residents and visitors enjoy the 0.7 miles of beach which makes up the City's Riverfront parks. Activities include but are not limited to swimming, fishing, sailing, and pleasure boating.

### **Fish and Wildlife Habitat**

The St. Croix River contains many species of fish and attracts many types of waterfowl. Upland game animals such as deer are not uncommon along the River and in the wooded areas of the City. The City has wetland areas including a wooded wetland and seasonally flooded shoreland areas which attract birds and other wetland wildlife.

## **Assessment of Problems Goals and Corrective Actions**

### **Water Quantity**

**St. Croix River Flooding.** Property owners in the flood plain experience property damage, expenses and inconvenience associated with periodic flooding of the St. Croix River. Major flood events have occurred in 1965, 1969, 1993, 1997 and 2001. 8.55% of the land located in the City is within the 1% annual chance flood boundary (100 year floodplain.)

**Goal:** To minimize property damage and threats to public health and safety associated with flooding of the St. Croix River.

**Action:**

- The City maintains a levee system and participates in the Non-Federal Flood Control Works (NFFCW) inspection and rehabilitation program through the U.S Army Corps of Engineers. The levees are inspected annually by the City and biannually by the Army Corps of Engineers.
- The City has prepared a Flood Management Manual and during a flood event property owners in the flood plain, with the assistance of City Officials and other residents sandbag and pump to protect public and private properties within the floodplain.
- The City encourages property owners in the floodplain to consider elevating existing structures above the 100 year flood level, to flood proof

to an elevation above the 100 year floodplain, or to participate in federal buyouts. A number of homes have been elevated or removed since the 2001 flood.

- The City will enforce existing codes related to development and redevelopment in the floodplain. The lowest level of any new structures shall be built 2 feet above the 100 year flood elevation.

**Stormwater Runoff.** The volume, rate and quality of stormwater runoff is directly related to surface coverage. Increased stormwater runoff is a result of increased impervious surfaces. Impervious surfaces have a larger impact on water quality as they provide less detention storage and deliver water faster downstream. Periodic flooding is caused by large stormwater events and snowmelt. With no formal storm sewer or ditch system to drain streets periodic ponding occurs in areas along roadways and in low areas of the City.

**Goal:** To reduce stormwater runoff volume to prevent flooding and infiltrate stormwater to promote groundwater recharge and to protect the water quality of receiving bodies.

**Action:**

- The City will require that development and redevelopment include facilities to provide water quality treatment and control runoff at or below existing rates and as required by the MSCWMO. Examples include swales, detention areas, raingardens, etc.
- Sump drainage structures and raingardens will be installed to alleviate local flooding problems when identified.
- The City will explore expanding limitation of impervious surfaces to areas outside of the Riverway District.

**Water Quality**

Stormwater runoff is considered the leading source of water pollution in the United States. Water runoff from impervious surfaces and lawns introduces pollutants that can be transported by the runoff into receiving water bodies. Nonpoint source pollution from animal wastes, construction sites, leaves, grass clippings, failing septic systems, automobile wear, emissions, waste oils, pesticides, fertilizers and road salting cause pollution loading of local waters.

**Goal:** To minimize impact of current and future development on water quality of wetlands and the St. Croix River.

**Action:**

- Reduce nonpoint sources of pollution through the support and use of low impact development practices and Best Management Practices aimed at protecting water quality and maintaining stormwater runoff rates and volumes at or below predevelopment conditions.
- Runoff will be prevented through reduction in impervious surfaces.
- Efforts will be made to infiltrate stormwater to promote groundwater recharge and to protect the water quality of receiving bodies.

Areas of implementation will include the following:

**Construction Project Management**

- The City will control erosion from construction sites through enforcement of existing codes and referral of qualifying projects to MSCWMO for review.

**Street Repair and Maintenance**

- The City will establish a program for Best Practices for use of sand and de-icing products to balance groundwater, surface water, budget, and transportation safety and educate contractors involved in these activities. The Minnesota Snow and Ice Control Field Handbook for Snowplow Operators will be made a term of contracts and provided to contractors.
- The City will sweep the streets during the spring of each year to remove sand and salt deposited by winter street sanding. The City will also sweep the streets in late fall to remove leaves and sediment.
- New road and road improvement projects shall be completed in a manner that incorporates performance standards as set forth by the MSCWMO.

**Park and Landscape Maintenance**

- The city will investigate and assess existing park and landscape maintenance activities and implement pollution prevention practices. The City will educate contractors involved in these activities.

**Residential Stewardship**

- The City will educate and encourage residents to minimize fertilizer and pesticide use, and to implement modified lawn care practices.

- Installation of raingardens to infiltrate stormwater runoff and use of rain barrels to capture and reuse runoff will be encouraged.

#### **Best Management Practices**

- When considering applications for new construction and reconstruction the City will require onsite treatment devices such as swales, raingardens and drainage structures be used whenever possible or as required by the MSCWMO.
- The City will lead by example and manage its properties in accordance with the appropriate Best Management Practices.

#### **Erosion**

Contaminants and nutrients are generally associated with sediment runoff. High phosphorus concentrations contribute to algae growth and poor water quality. Phosphorus in stormwater runoff bonds with soil particles and limiting the movement of soil particles will benefit downstream water bodies. Soil erosion can also cause problems for drainage conveyance systems and deposition of eroded material can reduce the effectiveness of these systems. Soil erosion can create pond and detention basin performance and maintenance issues. The shoreline bluffs and levees located in the City have experienced serious sloughing and erosion caused by high water and stormwater runoff.

**Goal:** To prevent erosion and the movement of sediment.

#### **Action:**

- The City will prevent soil erosion through public education and enforcement of existing City and MSCWMO policies and performance standards.
- The City will continue to partner with agencies including but not limited to the MSCWMO, Washington Conservation District (WCD), the MN Board of Water and Soil Resources (BWSR) and organizations such as Great River Greening to repair and protect publicly owned shoreline and bluff land along the St. Croix River from erosion.
- The City will control erosion from construction sites through enforcement of existing codes and referral of qualifying projects to MSCWMO for review.
- Construction will be prohibited on slopes greater than 12%.

## **Groundwater**

There is a need to prevent contamination of aquifers and to promote groundwater recharge. The City is an important groundwater recharge area given the granular soils. Private wells and individual sewage treatment systems (ISTS) within the City may be a potential risk to groundwater.

**Goal:** To prevent contamination of aquifers and promote groundwater recharge.

### **Action:**

- Groundwater protection will be a goal when making land use decisions in the City.
- The City will encourage homeowners with private wells to hook up to city water system and require proper well abandonment when wells are taken out of service.
- The City will encourage the use of water conservation techniques and landscape alternatives such as the use of low maintenance native plants to reduce dependency on groundwater supplies.
- The City has adopted and will enforce the ISTS regulations of Washington County which regulates design, use and maintenance of ISTS.
- The City will continue its Memorandum of Agreement with Washington County to enforce the maintenance and inspection portion of the ISTS ordinance.
- The City will be proactive in the elimination of drywells in the community.
- The City will provide education to residents and public officials on the inter-relation of surface and groundwater quality and quantity, the value and need to protect recharge areas and wetlands and implementation of BMPs to protect groundwater resources.
- The City will require a groundwater monitoring or protection plan as part of the CUP application for businesses that store, use or transplant hazardous materials.

## **Public Participation/Education**

There is a need to increase public participation and knowledge of water resources to gain public support for implementation of this Plan.

**Goal:** Increase public knowledge of the cumulative effects of individual actions and increase participation in stormwater management and protection of water resources.

### **Action:**

- The City will increase public participation and knowledge in management of water resources of the community by providing information in City newsletters, and by offering classes, hands on training and technical assistance to residents regarding BMPs.
- The City will educate public officials about managing community water resources.
- When practical the City will use our public spaces to display BMPs.
- The City will support the efforts of the MSCWMO, the WCD and other water resource management organizations in their public information efforts.

## **Wetlands**

There is a need to protect wetlands within the City for their valuable functions of stormwater quality treatment, groundwater recharge, open space and wildlife habitat.

**Goal:** To maintain and protect the quality and quantity of wetlands within the City

### **Action:**

- The City will support the policies and performance standards of the MSCWMO regarding wetlands.
- The City will require treatment of stormwater runoff for new projects and encourage treatment of existing discharges prior to discharge to wetlands and the maintenance of a natural buffer around wetlands.
- The City will maintain buffer zones of un-mowed natural vegetation on public properties along the St. Croix River. ?

- The City shall support the restoration of disturbed wetlands within the city.

### **Recreation, Fish and Wildlife**

Water based recreation is plentiful on the St. Croix River and these activities may be threatened by reduced water quality. Despite federal protection as a wild and scenic river Lake St. Croix was listed as impaired by the MPCA in 2008 because of high levels of phosphorus. Flooding and stormwater runoff has caused erosion on the bluffs and shore land of the St. Croix River located in the City. Non-native invasive plants such as buckthorn are found throughout the City and can reduce native plant diversity, can reduce tree seedling regeneration, degrade habitat for wildlife, and increase erosion.

**Goal:** To protect the natural and scenic qualities of the St. Croix River, manage water recreation activities, and improve fish and wildlife habitat.

#### **Action:**

- The City will maintain the scenic beauty of the St. Croix River by enforcing the adopted SWSRMP shoreland and bluffland management provisions.
- The parks and open spaces located on public property will be managed in a way that sets the best example for stewardship of natural resources in the community.
- The City will control sediment and nutrient loading of the St. Croix River by reducing stormwater runoff.
- The City will control erosion by stabilizing slopes and make efforts to maintain the ecological health of the bluffland ecosystems.
- The City will remove invasive plants from public property and replace them with native plants and encourage residents to remove buckthorn and other invasive species from private property.

### **Maintenance/Inspection**

The function of water resource facilities can deteriorate without regular maintenance.

**Goal:** Preserve the function of surface water management facilities.

**Action:**

- Routine inspection and maintenance of drainage systems will be completed to assure that the facilities are functioning adequately and to maximize system performance.
- The City will develop standards to insure consistency and documentation of maintenance and inspections.
- Public drainage structures will be cleaned on an annual basis by the City. Surface water management structures on private property will be inspected regularly and the maintenance will be the responsibility of the property owner.
- The City will sweep streets in the early spring and fall to remove sediment and organic materials.

**Implementation Plan**

This City intends to cooperate with the MSCWMO in implementing their 2006 Watershed Management Plan. The City recognizes that the MSCWMO Plan is intended to be in effect until 2014 and this Plan will be updated within 2 years of the WMO Plan update. This implementation plan is intended to provide guidance in carrying out the Plan goals and objectives. Capital improvement projects, studies and ongoing maintenance, inspection, monitoring and other management activities are summarized. These items were developed by assessing and prioritizing the current problem areas and issues of concern in the city. The key implementation activities and projects are summarized and prioritized in Table C-3 along with planning level cost estimates.

**Table C-3. Implementation Program Priority Projects and Activities**

<b>ID</b>	<b>Project Name</b>	<b>Description</b>	<b>Year</b>	<b>Cost/Funding Source</b>
1	Update City Codes and Ordinances related to water management	Incorporate MSCWMO Standards, Washington County Groundwater Plan, NPDES Standards, and Wetland Conservation Act.	2009-2010	\$500
2	City Hall Raingardens and Native Plant Display	Installation of raingarden adjacent to City Hall including a native plant display garden and a second raingarden N of 20 <sup>th</sup> St to address street ponding.	2009	\$3000 50% MSCWMO Cost-share grant
3	Shoreline Buffer and Erosion Control Between 20 <sup>th</sup> St. and 21 <sup>st</sup> St.	Remove invasive species, stabilize area of active erosion and create native buffer to protect St. Croix River	2009-2010	\$25,000. BWSR Native Buffer Cost Share Grant: \$18,750. City share: \$6250.

UPDATE

4	Inspection and maintenance of stormwater facilities	Regular inspection and maintenance of stormwater facilities on public and private property.	2009-2016	Undetermined maintenance cost. Inspection by trained volunteers.
5	Street Sweeping	Sweep streets in spring and early fall.	2009-2016	\$6700 per year
6	Surface Water Management	Installation of Drainage Structures, BMPs and flood protection.	2009-2016	\$5000 annually. Pursue grants to increase installation of BMPs and reduce costs to residents
7	Levee inspection, maintenance and repair	Annual inspection of levee, removal of woody vegetation and erosion control. Repair as needed.	2009-2016	2009: \$1500 Future needs undetermined. Flood damage repair costs covered by NFFCW
8	Water Samples and Testing	Collect grab samples at 2 existing stormwater discharge sites and test for pollutants and set standards to improve quality of water discharging to River.	2009-2010	\$700
8	Public Education and Participation	Provide information in monthly City newsletters, offer classes training and technical assistance to residents regarding BMPs.	2009-2016	\$200 per year
9	Stormwater Facilities Inspection and Maintenance Policy	Review current policies and update. Create chart for use in inspections and for documentation. Train volunteers to complete inspections.	2009-2010	\$500
9	Parks/Public Space Management	Review existing practices and implement standards and policies incorporating best practices.	2009	\$100
10	Snowplowing Policy	Review and update existing policy to incorporate best practices for use of sand and salt on roadways.	2009	\$100
11	Invasive Species Removal	Remove invasive species from public properties.	2009-2016	\$500 per year
12	Bluff Erosion Control Plan	Evaluate condition and prioritize sections for erosion repair and protection.	2009	\$400
13	Bluff Erosion Protection and Repair	Repair and protect City owned bluffs from erosion.	2009-2016 as needed	Undetermined. Pursue grants to reduce residents cost burden.

## **Plan Amendments**

The Community is dynamic as people move in and out, businesses come and go, and neighborhoods are developed and redeveloped. This plan will be evaluated, maintained, updated and enhanced over time. Amendment proposals can be requested by persons either residing in or having business with the City. Proposed amendments are reviewed by staff and if determined to be reasonable and necessary, the need for a public hearing shall be measured, and the amendment shall be considered at a regular or special City Council meeting. The City Council and the MSCWMO will determine whether or not to approve proposed amendments.

City of Afton  
3033 St. Croix Trl, P.O. Box 219  
Afton, MN 55001

# Planning Commission Memo

## Meeting: May 6, 2019

To: Chair Kopitzke and members of the Planning Commission  
From: Ron Moorse, City Administrator  
Date: May 1, 2019  
Re: Election of Officers

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At its April 6, 2019 meeting, the Planning Commission re-elected Kris Kopitzke as Chair and Sally Doherty as Vice-Chair. The Commission continued action on the election of Secretary because Scott Patten, the current Secretary, was not at the meeting.

The election process includes the nomination of members and a vote regarding those nominated, for each position.

### **PLANNING COMMISSION ACTION REQUESTED:**

**Election of Secretary.**

**City of Afton**  
**3033 St. Croix Trl, P.O. Box 219**  
**Afton, MN 55001**

# Planning Commission Memo

## Meeting: May 6, 2019

To: Chair Kopitzke and members of the Planning Commission

From: Ron Moorse, City Administrator

Date: May 1, 2019

Re: Review and Clarification of Elements of the Preservation and Land Conservation Development (PLCD) Ordinance

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The Planning Commission has completed its review of the first of three groups of PLCD ordinance elements. The following is an outline regarding the elements of Review Group 2.

### Review Group 2 – Prohibition of Further Subdivision of PLCD Lots and Conservation Easement and the Open Space Parcel

#### A. Discuss approaches to prohibit further subdivision of PLCD lots.

The PLCD ordinance does not itself specifically prohibit further subdivision of the PLCD lots. As required by the conditions of approval of the Afton Creek PLCD, the Home Owners Association (HOA) restrictive covenants prohibit the subdivision of lots without the prior approval of the HOA Board, the approval of the owners in the Association at an Association meeting, and the approval of any government agencies having jurisdiction over the property. If, at some point in the future, the City would change its ordinances to allow smaller lots, any subdivision would still require approval of the HOA Board and the owners in the Association. The Planning Commission may want to consider whether similar language should be added to the PLCD ordinance.

#### B. Clarify the purpose and language of the conservation easement requirements in view of the statutory limitation on holders of conservation easements

##### Sec. 12-2380. Final development plan.

E. The applicant(s) shall grant a Conservation Easement which shall run with the land in perpetuity to the City of Afton, all of the owners of the lots and parcels to be created in the PLCD, all land owners of property within Afton abutting the PLCD and the Minnesota Land Trust (or similar independent third party approved by the City of Afton), which restricts the lots and parcels, as well as the development rights on the undeveloped parcel(s), within the PLCD to the number of dwelling units approved for the PLCD and the land cover and use approved by the City of Afton as a part of this PLCD.

Based on the PLCD ordinance language, it appears the conservation easement language was to serve two main purposes: One was to protect the open space parcel. The other was to prevent the number of lots approved for the PLCD from being increased in the future. State Statute strictly limits the holders of conservation easements. Conservation easements cannot be held by individual property owners. The ordinance language needs to be revised to reflect the statutory limitations. Regarding the preservation of the open space outlots, the

conservation easement co-held by the Minnesota Land Trust and the City provides a very strong mechanism for protecting and preserving the open space in perpetuity.

Because, the Minnesota Land Trust and other agencies that hold conservation easements are only interested in holding a conservation easement over the open space parcel, and not developed parcels, the conservation easement is not a viable option for restricting the developed lots. As indicated in paragraph A above, language regarding restrictive covenants is an option for restricting the future subdivision of the lots in the PLCD.

C. Constraints on the open space parcel.

The Planning Commission requested that this item be added to the PLCD ordinance discussion.

**Planning Commission Direction Requested:**

**Motion regarding the review and clarification of elements of the Preservation and Land Conservation Development (PLCD) Ordinance**

**City of Afton**  
**3033 St. Croix Trl, P.O. Box 219**  
**Afton, MN 55001**

# Planning Commission Memo

## Meeting: May 6, 2019

To: Chair Kopitzke and members of the Planning Commission

From: Ron Moorse, City Administrator

Date: April 30, 2019

Re: Pervious Pavers and Impervious Coverage Regulations

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The Council referred the topic of how pervious pavers are treated in relation to the City's impervious coverage requirements, particularly in the Village Historic Site District, to the Planning Commission for review and recommendations.

### Background

If properly maintained, pervious pavers can serve as a significant element of a stormwater management system. As part of the Downtown Village Improvement Project, pervious pavers were installed in the Town Square Park parking lot and in the on-street parking areas along 33<sup>rd</sup> Street, to enable stormwater to infiltrate rather than run off the parking areas.

Most or all commercial properties in the Downtown Village area are at or beyond the maximum allowed amount of impervious coverage, which means these properties do not have any flexibility in relation to improvements that require additional impervious coverage. If pervious pavers were not treated as impervious coverage, they could provide the flexibility to allow additional options for improvements to meet the needs of the commercial properties. This could include items such as additional parking spaces or patios.

Pervious pavers are currently treated as impervious coverage. A main reason for this is the concern that pervious pavers will not be properly maintained and, over time, will become impervious. To address this concern, an option to consider in relation to the development of new ordinance language would be to allow the pervious pavers exception to the impervious coverage requirement only through a Conditional Use Permit. A key condition of the Conditional Use Permit could be an on-going maintenance plan that would include periodic maintenance, reporting and inspections, including the requirement that the property owner demonstrate that the pavers are being properly maintained, and that they are continuing to allow the infiltration of stormwater at an acceptable rate.

### Additional Information

At its March 4 meeting, the Planning Commission had a short discussion regarding pervious pavers and requested additional information from staff. Staff provided additional information for the April 1 Planning Commission meeting, but the Commission continued the pervious pavers discussion to its May 6 meeting. The following additional information is attached:

- Impervious coverage and pervious paver information from other cities
- Pervious paver maintenance information
- Standards for pervious paving systems (which includes pervious pavers as well as porous pavement)

**Planning Commission Recommendation Requested**

Motion regarding how pervious pavers should be treated in relation to the City's impervious coverage regulations.

## Impervious Coverage and Pervious Paver Information from other Cities

### City of Orono

**Pervious paver** means concrete, asphalt or similar blocks with holes of some kind that allow water to go through the surface into a specialized aggregate base—consistent of an open-graded aggregate—and into the soils below.

**Pervious surface** means naturally occurring groundcover or a variety of types of pavement, **pavers** and other devices that provide stormwater infiltration while serving as a structural surface.

### Sec. 78-1684. - **Standard hardcover exclusions.**

Landscaping with permeable lining shall not be considered hardcover. Additionally, the following hardcover items shall be excluded from hardcover calculations:

(1)  
Roads, trails, sidewalks, utilities and other hardcover encroachments intended for the public's benefit;

(2)  
Hardcover encroachments created by improvements on adjacent property not owned by the subject landowner;

a.  
In such cases of encroachment, the square footage of all encroaching hardcover shall not be added to the overall hardcover counting against the subject lot;

b.  
The land area upon which the encroachment rests shall count towards the overall lot area for the subject lot.

(3)  
Retaining walls;

(4)  
Handicapped ramps with a pervious surface below; and

(5)  
The first 100 square feet of pervious paver patios/walkways or the first 100 square feet of deck with a minimum one-fourth-inch spacing between boards and a pervious surface below the decking.

**Hardcover** means a hard surface that prevents or retards entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. **Hardcover** shall include but not be limited to the following: all building footprints, driveways, sidewalks, stepping stones, retaining walls, patios, courts (sport, tennis, etc.), decks, pools, areas used for the extended outdoor storage of vehicles or equipment, and all other similar features or surfaces as determined by the city engineer or city planner.

## City of Minnetrista

Lot coverage means **the area of the lot occupied by impervious material**, including but not limited to, decks with one-fourth inch spacing or less; decks with surface underneath that is impervious; concrete or paver patios; bituminous patios; rocks with plastic liner; courts (sport and tennis); sand boxes with liners; roofs; structures; paved driveways; driveway surfaces (crushed bituminous, concrete, gravel, pavers, or other rock); landscape beds with linings; and concrete or paver sidewalks. **Exceptions include** the following topics: wood decks with one-fourth inch spacing or more with pervious material underneath the deck, wood chip sidewalks; retaining walls; and swimming pools, excluding any and all necessary aprons, provided that an engineered rain garden is installed. The specifications, size and location of the rain garden will be subject to the review and approval of the City Engineer. **Pavers that are specifically engineered to be pervious will receive a 50 percent exemption from any hardcover/impervious surface lot coverage calculation, subject to the review and approval of the City Engineer.** Pavers will not be incorporated into the impervious lot coverage calculations for projects on properties with existing homes so long as they are completed no later than May 1, 2010. At that time, pavers will be incorporated into the impervious lot coverage calculations.

## City of Shorewood

**IMPERVIOUS SURFACE.** An artificial or natural surface through which water, air or roots cannot penetrate.

## City of Scandia

**Impervious Surface.** A constructed hard surface that either prevents or retards the entry of water into the soil and causes water to run off the surface in greater quantities and at an increased rate of flow than prior to development. Examples include rooftops, sidewalks, patios, driveways, parking lots, storage areas, and concrete, asphalt, or gravel roads.

Where directed by the City and based on site suitability, the developer or applicant shall consider reducing the need for stormwater controls and Best Management Practices (BMP's) by minimizing impervious surface and incorporating the use of natural topography. The following design options should be considered, consistent with the zoning and subdivision requirements:

1. Preserving natural vegetation;
2. Preserving and utilizing natural upland swales, depressions and storage areas in the post development conditions to the degree that they can convey, store, filter and retain stormwater runoff before discharge without becoming a public nuisance or hazard. Preservation requires that no grading or other construction activity occur in these areas;
3. **Installing semi-permeable/permeable or porous paving;**

Below are definitions provided in an American Planning Association document entitled *A Planner's Dictionary* (2004).

**Impervious Surface:**

**(Lake County, Ill.)** Any hard-surfaced, man-made area that does not readily absorb or retain water, including but not limited to building roofs, parking and driveway areas, graveled areas, sidewalks, and paved recreation areas.

**(King County, Wash.)** Any nonvertical surface artificially covered or hardened so as to prevent or impede the percolation of water into the soil mantle, including but not limited to roof tops excepting eaves, swimming pools, paved or graveled roads, and walkways or parking areas and excluding landscaping, surface water retention/detention facilities, access easements serving neighboring property, and driveways to the extent that they extend beyond the street setback due to location within an access panhandle or due to the application of [county] requirements to site features over which the applicant has no control.

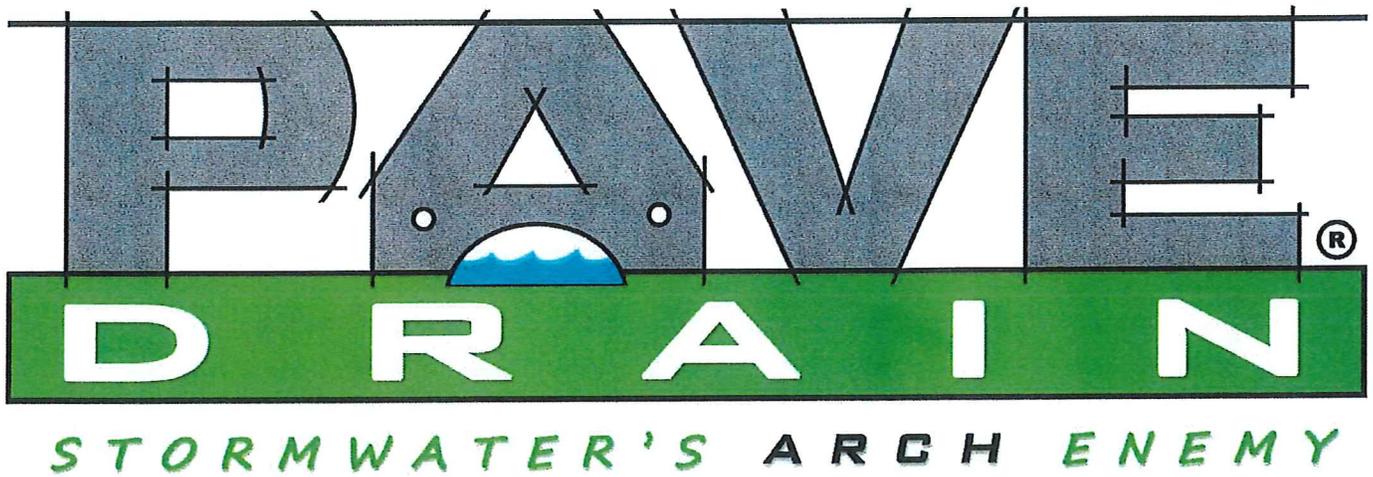
**(Traverse City, Mich.)** Any material that substantially reduces or prevents the infiltration of stormwater into previously undeveloped land. "Impervious area" shall include graveled driveways and parking areas. **(Sandy, Ore.)** A surface consisting of asphalt, concrete, roofing material, brick, paving block, plastic, or other similar material which does not readily absorb water. **(Bayfield County, Wisc.)** Any material which prevents, impedes, or slows infiltration or absorption of storm water directly into the ground at the rate of absorption of vegetation-bearing soils, including building, asphalt, concrete, gravel, and other surfaces.

**Pervious Surface:**

**(New Castle County, Del.)** A surface that presents an opportunity for precipitation to infiltrate into the ground.

**(Temple Terrace, Fla.)** Any surface which allows a minimum of 90 percent precipitation from any source to infiltrate directly into the ground. **(Dewey Beach, Del.)** Area maintained in its natural condition, or covered by a material that permits infiltration or percolation of water into the ground.

**(Huntington, Ind.)** Any material that permits full or partial absorption of storm water into previously unimproved land.



# MAINTENANCE MANUAL

*The PaveDrain® System is a one of a kind paving surface that takes all of the positive attributes of traditional paving surfaces and puts them together into one single permeable paving surface.*

## **FLEXIBLE PERMEABLE PAVING SURFACE**

- Open joint concept between the blocks. No costly re-filling of the joints with sand, rock or harmful tar sealant.

## **MAINTENANCE QUESTIONS & ANSWERS**

- The PaveDrain Vac Head - Safe, economical & effective.
- Vacuum Trucks - Minimal manual labor.
- SALT & SNOW PLOWING RECOMMENDATIONS.
- Sealing of the PaveDrain System.

## **REPLACEABLE UNITS**

- Minimal labor with minimal equipment = Quick & cheap repairs.

## Questions & Answers

**Q: How often should the PaveDrain System be completely cleaned or maintained?**

*A: This will depend on the project. Following the initial installation, the PaveDrain System should be checked monthly to assess the amount of infiltration still occurring. Ideally, the visual inspection should occur during a rain event. A residential or urban street setting with a significant amount of debris may need to be checked more frequently in order to properly determine an appropriate maintenance schedule.*

**The TWO BEST maintenance options to clean the PaveDrain System are to use either the PaveDrain VAC Head or an Elgin Whirlwind or Megawind vacuum truck.**

*The PaveDrain VAC Heads are available from local distribution.  
<https://www.pavedrain.com/sales-distribution/>*

*A video of the PaveDrain VAC Head in action is available online.  
<http://www.youtube.com/watch?v=I2U-4xsy3wo>*

**Unlike other permeable systems, even if maintenance is not regularly carried out, the PaveDrain System can be back in working order with the use of the VAC Head or Elgin Whirlwind or Megawind Vacuum Trucks.**



Combination Sewer Truck with 1,500 gallon water tank

## Q: How do I know when to clean the PaveDrain System?

A: The PaveDrain® system is unlike any other permeable system. The PaveDrain system can “tell” you when it needs maintenance even when it is NOT raining. A simple visual inspection can be accomplished by walking on it and determining if the joints are filled with debris.

### 1. Visual inspection to see if the joints between the PaveDrain Blocks are filled with debris (see photo 1 & 2 below).

*NOTE: If you have a 5,000 square foot installation and if 50% (approx. 2,500 SF) of the joints between the PaveDrain blocks are filled with debris. It is time to schedule a cleaning.*

**Photo 1** – PaveDrain needs to be maintained



**Photo 2** – PaveDrain following maintenance



### 2. Inserting a ruler between the joints of the PaveDrain system can help determine the depth of debris between the PaveDrain blocks.



**NOTE:** A PaveDrain block is 5.65” thick. If the ruler only goes down 2” in 50% of the area covered with the PaveDrain System. It is time for a cleaning. Checking various spots within a PaveDrain installation is always recommended.



# New Jersey Stormwater Best Management Practices Manual

February 2004

## C H A P T E R 9 . 7

# Standard for Pervious Paving Systems

### Definition

Pervious paving systems are paved areas that produce less stormwater runoff than areas paved with conventional paving. This reduction is achieved primarily through the infiltration of a greater portion of the rain falling on the area than would occur with conventional paving. This increased infiltration occurs either through the paving material itself or through void spaces between individual paving blocks known as pavers.

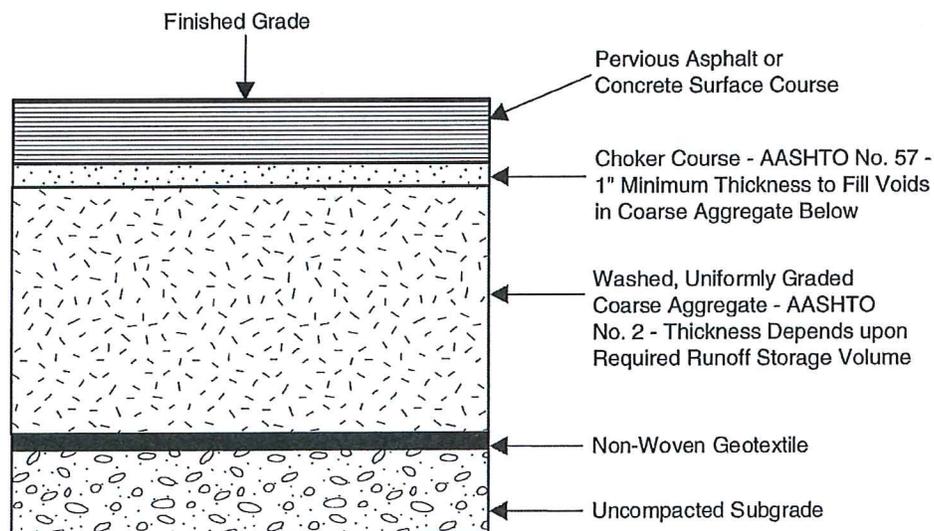
Pervious paving systems are divided into three general types. Each type depends primarily upon the nature of the pervious paving surface course and the presence or absence of a runoff storage bed beneath the surface course. These three types are summarized in Table 9.7-1 and discussed below. Porous paving and permeable paver with storage bed systems treat the stormwater quality design storm runoff through storage and infiltration. Therefore, these systems have adopted TSS removal rates similar to infiltration structures. The adopted TSS removal rate for each type of pervious paving system is presented in Table 9.7-1.

**Table 9.7-1: Types of Pervious Paving Systems**

Type of Paving System	General Description of Paving System	Adopted TSS Removal Rate
Porous paving	Porous asphalt or concrete paving constructed over runoff storage bed of uniformly graded broken stone	80%
Permeable pavers with storage bed	Impervious concrete pavers with surface voids constructed over runoff storage bed of uniformly graded broken stone	80%
Permeable pavers without storage bed	Impervious concrete pavers with surface voids constructed over structural bed of sand and crushed stone	Volume reduction only

Porous paving systems consist of a porous asphalt or concrete surface course placed over a bed of uniformly graded broken stone. The broken stone bed is placed on an uncompacted earthen subgrade and is used to temporarily store the runoff that moves vertically through the porous asphalt or concrete into the bed. The high rate of infiltration through the porous paving is achieved through the elimination of the finer aggregates that are typically used in conventional paving. The remaining aggregates are bound together with an asphalt or Portland cement binder. The lack of the finer aggregate sizes creates voids in the normally dense paving that allow runoff occurring on the paving to move vertically through the paving and into the void spaces of the broken stone storage bed below. From there, the stored runoff then infiltrates over time into the uncompacted subgrade soils similar to an Infiltration Basin. The depth of the bed, which also provides structural support to the porous surface course, depends upon the volume and rate of rainfall that the porous paving system has been designed to store and infiltrate and the void ratio of the broken stone. A typical detail of a porous paving system is shown in Figure 9.7-1.

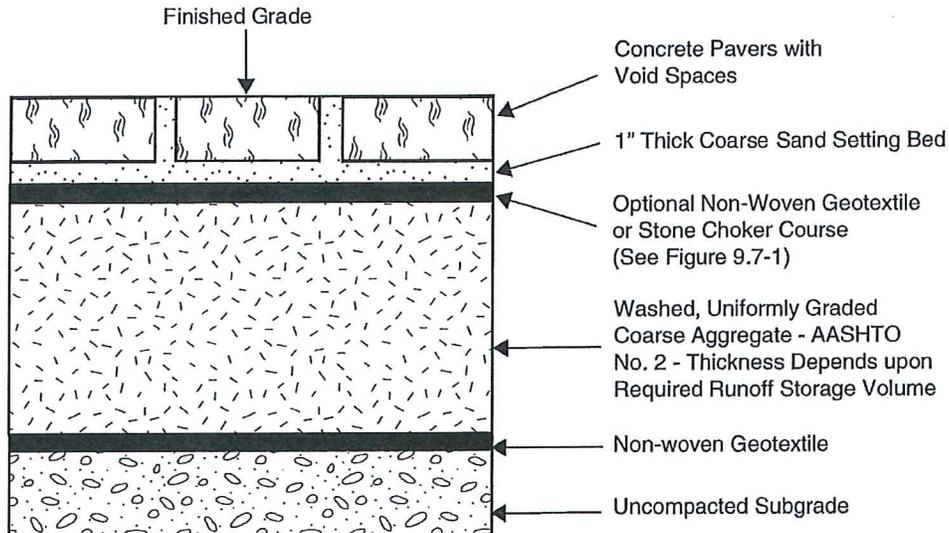
**Figure 9.7-1: Porous Paving Details**



Source: Cahill Associates.

A permeable paver with storage bed system also has a subsurface storage bed and functions in a similar manner to a porous paving system. However, instead of a continuous porous asphalt or concrete surface course, the system's surface consists of impervious concrete blocks known as pavers that either have void spaces cast into their surfaces or interlock in such a way as to create such void spaces. These void spaces allow runoff from the impervious paver surface to collect and move vertically past the individual pavers into the broken stone storage bed below. Similar to a porous paving system, the runoff stored in the broken stone storage bed, which also provides structural support to the pavers, then infiltrates over time into the uncompacted subgrade soils. A typical detail of a permeable paver with storage bed system is shown in Figure 9.7-2.

**Figure 9.7-2: Permeable Pavers with Storage Base**

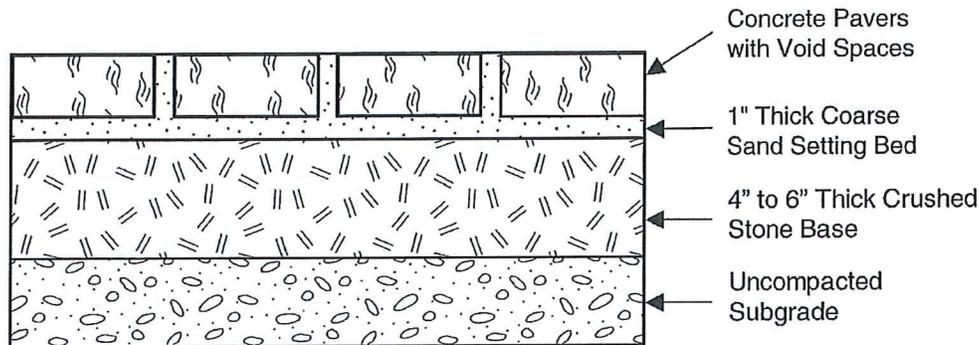


It is important to note that both a porous paving system and a permeable paver with storage bed system function in the same manner as any other infiltration-based BMP such as an infiltration basin or dry well. That is, the fundamental means of runoff quantity control is into and through the subgrade soils below the BMP. Therefore, in terms of runoff quantity control, the porous paving or permeable paver surface course acts solely as a conveyance measure that delivers the surface course runoff to the subgrade soils. In addition, the broken stone storage bed serves only to temporarily store the runoff transmitted through the surface course. For these reasons, the design and use of porous paving and permeable paver with storage bed systems are generally subject to the same design, operation, and maintenance requirements of all other infiltration-based BMPs. Details of these requirements are presented in *Design Criteria* below.

In addition to runoff volume control, porous paving and permeable paver with storage bed systems also provide stormwater quality control through the infiltration process when designed to store and infiltrate the stormwater quality design storm runoff volume. This is again similar to other infiltration-based BMPs such as infiltration basins. In addition, the porous or permeable paver surface course in such systems can be considered to provide pretreatment of the runoff to their respective subsurface storage beds.

Permeable pavers without a storage bed is the third type of pervious paving system. As described by its name, this type of system does not have a broken stone runoff storage bed beneath it. Instead, the permeable pavers are placed on a generally thinner bed of sand and crushed stone that provides only structural support to the paver surface course and has no significant runoff storage volume. This lack of storage volume prevents the system from storing and infiltrating the relatively larger volumes of runoff typically achieved by a porous paving or permeable paver with storage bed system. However, because of the void spaces in the paver surface, a portion of the runoff from the pavers, albeit smaller than the storage bed systems, can still collect in the surface voids spaces and infiltrate through the sand and crushed stone bed and into the subgrade soils. A typical detail of a permeable paver without storage bed system is shown in Figure 9.7-3.

**Figure 9.7-3: Permeable Paver without Storage Base**



## Purpose

In general, pervious paving systems are used to reduce runoff rates and volumes from paved, on-grade surfaces such as patios, walkways, driveways, fire lanes, and parking spaces. Pervious paving systems with runoff storage beds below them achieve these reductions through the delivery and storage of runoff and eventual infiltration into the subgrade soils. Through this infiltration process, these types of pervious paving systems also achieve stormwater quality treatment.

Porous paving and permeable paver with storage bed systems may also be used to meet the groundwater recharge requirements of the NJDEP Stormwater Management Rules. See *Recharge BMP Design Guidelines* in Chapter 6: *Groundwater Recharge* for a complete discussion of these requirements and the use of pervious paving and other groundwater recharge facilities to meet them.

Permeable pavers without storage bed systems also achieve reductions in runoff rates and volumes, primarily by generating less surface runoff than conventional paving. However, due to the lack of a runoff storage bed and significant runoff infiltration, these types of pervious paving systems achieve less runoff reductions than systems with storage beds. For similar reasons, they also do not provide any significant stormwater quality treatment. However, the reduction in runoff rates and volumes they do achieve may reduce the volume of stormwater quality design storm runoff to be treated by other, downstream stormwater management facilities.

## Conditions Where Practice Applies

As noted above, porous paving and permeable pavers with storage bed systems function as infiltration facilities. As such, the use of such pervious paving systems is applicable only where their subgrade soils have the required permeability rates. Specific soil permeability requirements are presented below in *Design Criteria*.

Like other BMPs that rely on infiltration, porous paving and permeable pavers with storage bed systems are not appropriate for areas where high pollutant or sediment loading is anticipated due to the potential for groundwater contamination. Specifically, such systems must not be used in the following locations:

- Industrial and commercial areas where solvents and/or petroleum products are loaded, unloaded, stored, or applied or pesticides are loaded, unloaded, or stored.

- Areas where hazardous materials are expected to be present in greater than “reportable quantities” as defined by the U.S. Environmental Protection Agency in the Code of Federal Regulations at 40 CFR 302.4.
- Areas where system use would be inconsistent with an NJDEP-approved remedial action work plan or landfill closure plan.
- Areas with high risks for spills of toxic materials such as gas stations and vehicle maintenance facilities.
- Areas where industrial stormwater runoff is exposed to “source material.” “Source material” means any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing, or other industrial activities, that could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to raw materials, intermediate products, final products, waste materials, by-products, industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

In addition, as required by the Stormwater Management Rules, porous paving and permeable pavers with storage bed systems must not be used where their installation would create a significant risk for basement seepage or flooding, cause surficial flooding of groundwater, or interfere with the operation of subsurface sewage disposal systems and other subsurface structures. Such adverse impacts must be assessed and avoided by the design engineer.

Porous paving and permeable pavers with storage bed systems must be configured and located where their construction will not compact the soils below the system. In addition, such systems must not be placed into operation until the contributing drainage area is completely stabilized. System construction must either be delayed until such stabilization is achieved, or upstream runoff must be diverted around the system. Such diversions must continue until stabilization is achieved.

Due to the reduced shear strength of the surface course, all pervious paving systems are limited to areas of relatively infrequent use by light vehicles. This includes parking lot spaces and secondary aisles, single family residential driveways, sidewalks and walkways, golf cart paths, fire and emergency access lanes, and overflow parking areas. In general, they should not be used in high traffic areas such as roadways, multiple family and nonresidential driveways, and primary parking lot aisles or in any area subject to use by heavy vehicles and other equipment.

One pervious paving use strategy is to alternate areas with impervious and pervious paving. In these instances, conventional paving would be reserved for the heavily trafficked corridors. A wide variety of concrete and brick permeable paving systems are available. These can be combined with conventional and porous paving systems to achieve functional and aesthetically pleasing designs.

Finally, all three types of pervious paving systems must have a maintenance plan and, if privately owned, should be protected by easement, deed restriction, ordinance, or other legal measures that prevent its neglect, adverse alteration, and removal.

## Design Criteria

The design criteria for pervious paving systems will depend upon the type of system to be used. Details of each system type are presented in Figures 9.7-1, 9.7-2, and 9.7-3 above. Design criteria for each type are presented below.

### A. Storage Volume, Depth, and Duration

Porous paving and permeable paver with storage bed systems must be designed to treat the total runoff volume generated by the system's maximum design storm. This may be either the groundwater recharge or stormwater quality design storm depending upon the system's proposed use. Techniques to compute these volumes are discussed in *Chapter 6: Groundwater Recharge* and *Chapter 5: Computing Stormwater Runoff Rates and Volumes*. Such systems must also all fully drain this runoff volume within 72 hours. Runoff storage for greater times can render the systems ineffective and may result in anaerobic conditions and water quality problems. The bottom of these types of pervious paving systems must be at least 2 feet above seasonal high water table or bedrock. This distance must be measured from the bottom of the storage bed as shown in Figures 9.7-1 and 9.7-2. The system bottom must be as level as possible to uniformly distribute runoff infiltration over the subgrade soils.

As discussed in *Considerations* below, construction of all pervious paving systems must be done without compacting the system's subgrade soils. As such, all excavation must be performed by equipment placed outside the system's limits whenever possible. This requirement should be considered when designing the dimensions and total volume of a system's broken stone storage bed or crushed stone base.

It is important to note that the use of both porous paving and permeable pavers with storage bed systems is recommended in this manual only for the stormwater quality design storm and smaller storm events. Use of such systems for larger storm events and the requirements by which such systems are to be designed, constructed, and maintained should be reviewed and approved by all applicable reviewing agencies.

Since permeable paver without storage bed systems do not rely on significant runoff infiltration, they may be used for all frequency storm events.

### B. Permeability Rates

The minimum design permeability rate of the soils below porous and permeable paving systems with storage beds will depend upon the pervious paving system's location and maximum design storm. The use of storage beds for stormwater quality control is feasible only where the soil is sufficiently permeable to allow a reasonable rate of infiltration. Therefore, porous paving and permeable paver with storage bed systems can be constructed only in areas with Hydrologic Soil Group A and B soils.

For porous paving and permeable paver with storage bed systems, the minimum design permeability rate of the subgrade soils below a system's runoff storage bed is 0.5 inches per hour. In addition, the design permeability rate of the soils must be sufficient to fully drain the system's maximum design storm runoff volume within 72 hours. This design permeability rate must be determined by field or laboratory testing. See *A. Soil Characteristics* in *Considerations* below for more information. Since the actual permeability rate may vary from test results and may also decrease over time due to soil bed consolidation or the accumulation of sediments removed from the treated stormwater, a factor of safety of two must be applied to the tested permeability rate to determine the design permeability rate. Therefore, if the tested permeability rate of the soils is 4 inches/hour, the design rate would be 2 inches/hour (i.e., 4 inches per hour/2). This design rate would then be used to compute the system's maximum design storm drain time.

Due to its role as a runoff conveyance measure to the storage bed below, the porous surface course of a porous paving system must have a minimum permeability rate at least twice the maximum intensity of the

system's design storm. In the case of systems designed for the stormwater quality design storm, this permeability rate would be 6.4 inches per hour (i.e., 2 X 3.2 inches per hour, which is the stormwater quality design storm's maximum intensity). Similarly, the minimum permeability of the material used to fill the void spaces of a permeable paver with storage bed system must also meet this requirement. However, since the void spaces in a permeable paver system comprise only a portion of the entire system surface, this minimum rate must be multiplied by the ratio of the entire system surface area to the area of the void spaces. Therefore, the void space material in a permeable paver with storage bed system comprised of 20 percent void space must have a minimum permeability of 2 X (1.0/0.2) or 10 times the maximum design storm intensity. For such systems designed for the stormwater quality design storm, this rate would be 3.2 X 10 or 32 inches per hour.

Since a permeable paver without storage bed system does not rely on significant runoff infiltration, its use does not require a minimum subgrade soil or void space material permeability rate. However, as described below, its ability to reduce runoff rates and volumes below those produced by conventional paving will depend upon both of these system characteristics.

To allow pervious paving surface courses to achieve their design permeability rates, the maximum surface course slope of all pervious paving systems is 5 percent.

### **C. Pretreatment**

As with all other best management practices, pretreatment can extend the functional life and increase the pollutant removal capability of a pervious paving system that receives runoff from areas other than its own surface course. Pretreatment can reduce incoming velocities and capture coarser sediments, which will extend the life and reduce the required maintenance of the system. This is usually accomplished through the use of a vegetative filter immediately upstream of the pervious paving system. Steps can also be taken during the system's design to limit the amount of runoff from upstream areas that will flow to the system.

Runoff collected from parking lots, driveway, roads, and other on-grade surfaces that is conveyed directly to a porous paving or permeable paver storage bed without passing through the system's surface course must be pretreated in order to prevent the loss of storage volume and/or recharge capacity due to sedimentation and clogging. Such pretreatment must provide 80 percent removal of TSS for the system's maximum design storm runoff. This treatment can also be used to meet the site's overall TSS removal requirements.

This pretreatment requirement does not apply to roofs and other above-grade surfaces. However, roof gutter guards and/or sumps or traps (equipped with clean-outs) in the conduits to the system's storage bed should be included wherever practical to minimize the amount of sediment and other particulates that can enter the storage bed.

### **D. Computing Runoff Rates**

In general, runoff to downstream areas from porous paving and permeable paver with storage bed systems will need to be computed under two circumstances. The first occurs when the capacity of the runoff storage bed is exceeded and the water level in the bed rises to the system's surface course. The second circumstance occurs when the intensity of precipitation exceeds the minimum permeability of the system's surface course. See *B. Permeability Rates* above for a discussion of these rates for each type of storage bed system. Once either or both of these circumstances occurs, the resultant system runoff rate to downstream areas for the remainder of the storm can be determined by subtracting the minimum system permeability rate from the rainfall rate. In the case of variable rate storm events such as the stormwater quality design storm or the NRCS Type III Storm, this must be done in a series of appropriate-length time increments over the remaining storm duration.

Runoff from permeable paver without storage bed systems must be computed for all storm events and can be performed by two methods. The first method is based upon a weighted average runoff coefficient (C) for the Rational or Modified Rational Methods or a weighted average Curve Number (CN) for the NRCS methodology. These values should be based upon the relative areas of the impervious pavers and pervious void spaces in the system's surface. The C or CN value for the paver area should be based upon an impervious surface, while the C or CN value for the void space should be based upon the type of material or surface cover in the void space and the Hydrologic Soil Group of the subgrade soil. In selecting this void space coefficient, all void spaces with vegetated covers should be assumed to be in poor hydrologic condition and all void spaces with bare soil or gravel fill should be based upon soil or gravel roadways.

The second method of computing runoff from permeable paver without storage bed systems considers the pavers to be unconnected impervious areas that drain onto the pervious void spaces. The resultant runoff from the system can then be based upon the unconnected impervious surface methods described in *Chapter 5*. In doing so, the criteria for selecting the appropriate CN for the void space must be based upon the criteria described in the preceding paragraph. In addition, it should be noted that the TR-55 method for unconnected impervious areas as described in *Chapter 5* cannot be used if the void space area is less than 70 percent of the total system area (i.e., the impervious portion of the entire system area exceeds 30 percent).

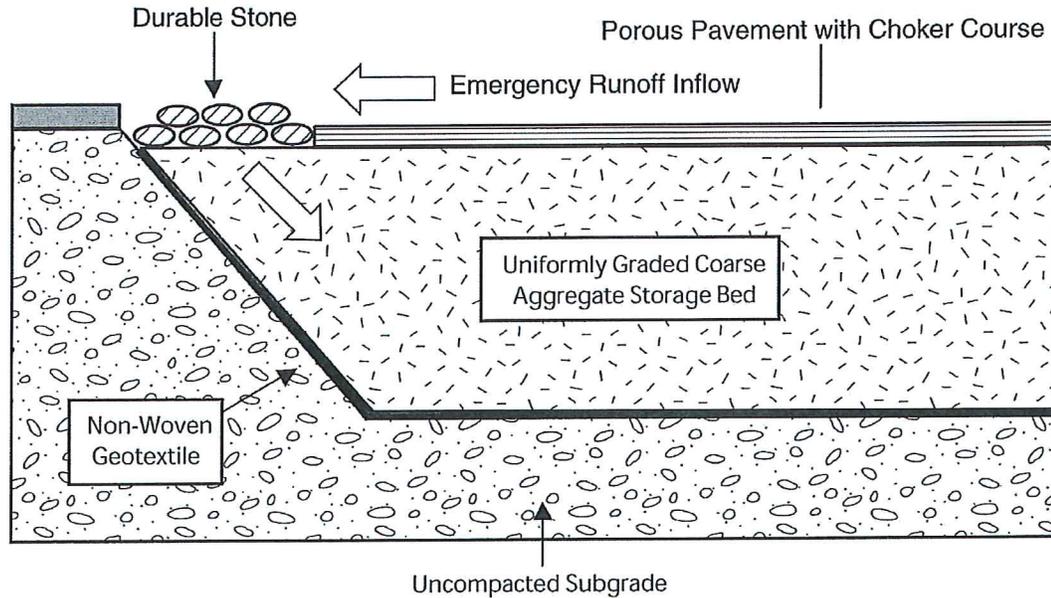
### **E. Overflows**

All porous paving and permeable paver with storage bed systems must be able to safely convey system overflows to downstream drainage systems. The capacity of the overflow must be consistent with the remainder of the site's drainage system and sufficient to provide safe, stable discharge of stormwater in the event of an overflow. The downstream drainage system must have sufficient capacity to convey the overflow from the pervious paving system.

### **F. Emergency Inflows**

All porous paving and permeable paver with storage bed systems must have measures that will allow runoff from the maximum design storm to enter the runoff storage bed in the event that the porous or permeable paver surface course becomes clogged or otherwise incapable of conveying the maximum design storm runoff to the bed. This may be accomplished in different ways, including surface drain inlets connected to a series of perforated pipes laid throughout the storage bed or by extending the storage bed beyond the edge of the surface course and connecting it to the surface as shown in Figure 9.7-4.

Figure 9.7-4: Example of Porous Paving Emergency Inflow



Note: Emergency inflow may also be provided by surface drain inlets and perforated pipes in the storage bed. See text for details.

Source: Cahill Associates.

### G. System Components

The typical components of each type of pervious paving system are shown in Figures 9.7-1, 9.7-2 and 9.7-3. While variations are permissible based upon specific site conditions, the typical system components shown in these figures should be included in all system designs. This includes the sand and crushed stone base below a permeable paver without storage bed system shown in Figure 9.7-3. All such systems constructed without these components must be treated as conventional paved surfaces for the purpose of all runoff and pollutant load computations.

The recommended aggregate for porous asphalt and concrete paving systems are shown in Table 9.7-2. For porous asphalt systems, the recommended amount of asphalt binder is 5.75 to 6.00 percent by weight. Lower amounts of binder have resulted in inadequate surface course shear strength and durability. As shown in Figures 9.7-1 and 9.7-2, the runoff storage beds in both porous paving and permeable paver with storage bed systems should be clean washed, uniformly graded AASHTO No. 2 broken stone. It is particularly important that this stone be washed to keep stone dust and other fine particles that can clog the surface of the subgrade soils from entering the storage bed. The interface between the porous or permeable paver surface course and the storage bed stone should be leveled with a choker course of AASHTO No. 57 broken stone with a minimum thickness of 1 inch. Finally, as shown in Figures 9.7-1 and 9.7-2, the interface between the storage bed stone and the subgrade soil should be lined with a non-woven geotextile. Additional system details are shown in the figures.

**Table 9.7-2 – Porous Asphalt Paving Mix**

U.S. Standard Sieve Size	Percent Passing
1/2 inch	100%
3/8 inch	95%
#4	35%
#8	15%
#16	10%
#30	2%

Source: Cahill Associates

## **Maintenance**

Effective pervious paving system performance requires regular and effective maintenance. *Chapter 8: Maintenance and Retrofit of Stormwater Management Measures* contains information and requirements for preparing a maintenance plan for stormwater management facilities, including pervious paving systems. Specific maintenance requirements for all system types are presented below. These requirements must be included in the system's maintenance plan.

### **General Maintenance**

The surface course of all pervious paving systems must be inspected for cracking, subsidence, spalling, deterioration, erosion, and the growth of unwanted vegetation at least once a year. Remedial measures must be taken as soon as practical.

Care must be taken when removing snow from the pervious paving surface courses. Pervious paving surface courses can be damaged by snow plows or loader buckets that are set too low to the ground. This is particularly true at permeable paver systems where differential settlement of pavers has occurred. Sand, grit, or cinders should not be used on pervious paving surface courses for snow or ice control.

If mud or sediment is tracked onto the surface course of a pervious paving system, it must be removed as soon as possible. Removal should take place when the surface course is thoroughly dry. Disposal of debris, trash, sediment, and other waste matter removed from pervious paving surface courses should be done at suitable disposal/recycling sites and in compliance with local, state, and federal waste regulations.

### **B. Porous Paving Systems**

The surface course of a porous paving system must be vacuum swept at least four times a year. This should be followed by a high pressure hosing. All dislodged sediment and other particulate matter must be removed and properly disposed.

### **C. Permeable Paver Systems**

Maintenance of permeable pavers should be consistent with the manufacturer's recommendations.

### **D. Vegetation**

Mowing and/or trimming of turf grass used with permeable pavers must be performed on a regular schedule based on specific site conditions. Grass should be mowed at least once a month during the growing season. All vegetated areas must be inspected at least annually for erosion and scour. Vegetated areas should also be inspected at least annually for unwanted growth, which should be removed with minimum disruption to the paver and remaining vegetation.

When establishing or restoring vegetation, biweekly inspections of vegetation health should be performed during the first growing season or until the vegetation is established. Once established, inspections of vegetation health, density, and diversity should be performed at least twice annually during both the growing and non-growing seasons. The vegetative cover should be maintained at 85 percent. If vegetation has greater than 50 percent damage, the area should be reestablished in accordance with the original specifications and the inspection requirements presented above.

All use of fertilizers, pesticides and other means to assure optimum vegetation health should not compromise the intended purpose of a pervious paving system. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible.

### **E. Other Maintenance Criteria**

The maintenance plan must indicate the approximate time it would normally take to drain the maximum design storm runoff volume below the pervious paving system's surface course. This normal drain time should then be used to evaluate the system's actual performance. If significant increases or decreases in the normal drain time are observed or if the 72 hour maximum is exceeded, the various system components and groundwater levels must be evaluated and appropriate measures taken to comply with the maximum drain time requirements and maintain the proper functioning of the system.

## **Considerations**

Pervious paving systems can present some practical design problems, particularly those with subsurface runoff storage beds that rely on infiltration to discharge the stored runoff. When planning such systems, consideration should be given to soil characteristics, depth to the seasonal high groundwater table, sensitivity of the region, and runoff quality. Particular care must be taken when constructing all pervious paving systems in areas underlain by carbonate rocks known as Karst landscapes. See Appendix A10 of the Standards for Soil Erosion and Sediment Control in New Jersey for further guidance in Karst areas. Further considerations are presented below.

### **A. Soil Characteristics**

Soils are perhaps the most important consideration for site suitability. In general, County Soil Surveys can be used to obtain necessary soil data for system planning purposes, the preliminary design of all pervious paving systems, and the final design of permeable paver without storage bed systems. However, for the final design and construction of porous paving and permeable paver with storage bed systems, soil tests are required at the exact location of a proposed system in order to confirm its ability to function properly without failure.

Such tests should include a determination of the textural classification and permeability of the subgrade soil at and below the bottom of the proposed system's storage bed. The recommended minimum depth for subgrade soil analysis is 5 feet below the bottom of the storage bed or to the groundwater table. Soil permeability testing can be conducted in accordance with the Standards for Individual Subsurface Sewage Disposal Systems at N.J.A.C. 7:9A. See *Design Criteria* above for further subgrade soil requirements.

In addition, the results of a system's soil testing should be compared with the County Soil Survey data used in the computation of development site runoff and the design of specific site BMPs, including the proposed pervious paving system, to ensure reasonable data consistency. If significant differences exist between the system's soil test results and the County Soil Survey data, additional development site soil tests are recommended to determine and evaluate the extent of the data inconsistency and the need for revised site runoff and BMP design computations. All significant inconsistencies should be discussed with the local Soil Conservation District prior to proceeding with such redesign to help ensure that the final site soil data is accurate.

## **B. Construction**

Similar to other infiltration facilities, the construction of all pervious paver systems must follow certain procedures and sequences. Additional construction requirements are also required for specific systems due to their particular nature and components. Details are provided below.

### **1. All Pervious Paving Systems**

For all pervious paving systems, protection of the subgrade soils from compaction by construction equipment and contamination and clogging by sediment are vital. Prior to its construction, the area to be used for the pervious paving system should be cordoned off to prevent construction equipment and stockpiled materials from compacting the subgrade soils. During system construction, precautions should be taken to prevent both subgrade soil compaction and sediment contamination. All excavation should be performed with the lightest practical excavation equipment. All excavation equipment should be placed outside the limits of the system's storage bed or base.

To help prevent subgrade soil contamination and clogging by sediment, system construction should be delayed until all other construction within its drainage area is completed and the drainage area stabilized. This delayed construction emphasizes the need, as described above, to cordon off the system area to prevent compaction by construction equipment and material storage during other site construction activities. Similarly, use of a pervious paving system area as a sediment basin is strongly discouraged. Where unavoidable, excavation for the sediment basin should be a minimum of 2 feet above the final design elevation of the system's storage bed or base. Accumulated sediment can then be removed without disturbing the subgrade soils at the system's bottom, which should be established only after all construction within the system's drainage area is completed and the drainage area stabilized.

If system construction cannot be delayed until its drainage area is stabilized, diversion berms or other suitable measures should be placed around the system's perimeter during all phases of construction to divert all runoff and sediment away from the system. These diversion measures should not be removed until all construction within the system's drainage area is completed and the drainage area stabilized.

A preconstruction meeting should be held to review the specific construction requirements and restrictions of all pervious paving systems with the contractor.

## 2. Porous Paving Systems

Broken stone in runoff storage beds should be placed in lifts and compacted using plate compactors. A maximum loose lift thickness of 12 inches is recommended. In addition, the following construction requirements for porous asphalt paving systems are recommended by the USEPA:

- Paving temperature = 240° to 260° F.
- Minimum air temperature for paving = 50° F.
- Compact paving with one to two passes with 10-ton roller.
- No vehicular use for a minimum of two days after paving completed.

## 3. Permeable Paver Systems

Broken stone in runoff storage beds should be placed in lifts and compacted using plate compactors. A maximum loose lift thickness of 12 inches is recommended. In order to provide the runoff quantity and quality benefits described above in *Definition*, the subgrade soils below all permeable paver systems cannot be stabilized through compaction or with cement or other stabilizing agents that reduce the soils' permeability. All permeable paver systems constructed with such stabilization must be treated as conventional paved surfaces for the purpose of all runoff and pollutant load computations.

### C. Runoff Quality

The quality of the runoff entering a porous paving or permeable paver with storage bed system is a primary consideration in determining whether such systems are advisable and, if so, in designing the systems themselves. The planning of such systems must consider which pollutants will be present in the runoff and whether these pollutants will degrade groundwater quality. Certain soils can have a limited capacity for the treatment of bacteria and the soluble forms of nitrogen, phosphorus, and other pollutants like road salts and pesticides. Such pollutants are either attenuated in the soil column or go directly to the water table. Unfortunately, the soils that normally have the highest and, therefore, most suitable permeability rates also have the least ability to treat such pollutants. As a result, pretreatment of soluble pollutants prior to entry into a pervious paving system's storage bed may be necessary in these soils. Pretreatment measures may include vegetated filter strips, bioretention systems (where the infiltration basin takes the place of the standard underdrain), and certain sand filters. Alternatively, the existing soil below the infiltration basin bottom may be augmented or replaced by soils with greater soluble pollutant removal rates.

## Recommendations

### A. Sensitivity of the Area

Since they rely on runoff infiltration, the planning of porous paving or permeable paver with storage bed systems should consider the geologic and ecological sensitivity of the proposed site. Sensitive areas include FWI streams, areas near drinking water supply wells, and areas of high aquifer recharge. Such pervious paving systems should be sited at least 100 feet from a drinking water supply well. They should also be sited away from foundations to avoid seepage problems. Measures should be taken in areas of aquifer recharge to ensure good quality water is being infiltrated to protect groundwater supplies. Porous paving and permeable paver with storage bed systems should also be located away from septic systems to help prevent septic system failure and other adverse system interference.

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## **April 16, 2019 City Council Meeting Highlights**

### ***The Council:***

- Approved the Gary Swanson application for minor subdivision and variance at 5550 Neal Ave S.
- Approved road coring for improvements in 2020
- Discussed drainage improvements at Town Square Park.
- Approved purchase of a mower for public works use.
- Approved removal of trees at Rinta community garden.
- Reviewed draft language regarding discharge of firearms.
- Approved contribution for eco friendly designed light pole banners.
- Re-appointed James Langan and Roger Bowman to the Planning Commission.
- Appointed Grant Jenson to the Parks Committee.
- Appointed Cole Cernohous to seasonal maintenance employee position.
- Requested the Sheriff add extra patrols for speed enforcement over Memorial Day weekend.