Green Infrastructure Application Best Management Practices

A Guideline for Stormwater Management

Genesee Park Historic District

FINGER LAKES INSTITUTE
HOBART AND WILLIAM SMITH COLLEGES

Acknowledgements

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About the FLI-Community Design Center (FLI-CDC)

The Finger Lakes Institute, in partnership with Hobart & William Smith Colleges has created a community design center that strives to provide Finger Lakes communities with innovative, creative, and sustainable design solutions that improve the built environment and quality of life, while protecting the natural environment.

Communities throughout the Finger Lakes region share similar economic, environmental, and social characteristics mainly as a result of the natural assets and history of the region. The current and future state of communities relies on improving quality of life for all citizens, being good stewards of natural resources, and fostering the responsible growth of the built environment. To support these efforts, we offer comprehensive sustainable community development planning and design services to communities throughout the Finger Lakes region.

It is our mission to:

- Raise awareness of the benefits and potential of sustainable community development and design for small towns, villages, cities and other entities;
- Encourage preservation and protection of natural resources and the built environment;
- Facilitate regional planning and collaboration among communities, businesses, non-profits, higher education institutions, and other entities;
- Foster community resilience by providing an active resource center for holistic community planning and design and disseminating our expertise nationally.

About this Project

Genesee/Finger Lakes Regional Planning Council (G/FLRPC) has received partial funding through the Ontario County Water Resources Council's 2013 Special Projects Fund to work on a project entitled, Green Infrastructure for Historic Districts. G/FLRPC, in cooperation with the Ontario County Soil and Water Conservation District (OC SWCD), will identify sites suitable for green infrastructure practices and techniques in the seven National Register Historic Districts in Ontario County. These districts have been identified using New York State Department of Parks, Recreation and Historic Preservation data. Soil maps prepared by the Ontario County GIS Program will assist in these recommendations. Students from the Finger Lakes Institute – Community Design Center (FLI-CDC) will then create visual representations of the recommended green infrastructure practices and techniques.

Green infrastructure uses vegetation and soil to manage rainwater where it falls instead of using pipes to dispose of it in New York State waters. As a watershed develops, more impervious cover is created. Roads, buildings, parking, sidewalks, and driveways all increase runoff from rain events and snow melt. Stormwater runoff contains pollutants such as nutrients, pathogens, sediment, toxic contaminants, and oil and grease. Water quality problems generated by these pollutants have resulted with water bodies such as lakes and streams having impaired or stressed uses. Green infrastructure reduces stormwater discharges and lowers pollutant loads.

Green and sustainable design has become increasingly popular in both the preservation and new construction industries due to public interest in energy conservation, water efficiency, and source reduction and waste management. Preservation and green goals overlap, and reconciling their differences is possible—provided that both sides strive to be as creative and flexible as possible. Preservation of natural features; permeable paving materials for parking lots, walkways, and driveways; driveway reduction; vegetated swales; rain gardens; green roofs; stormwater planters; rain barrels and cisterns; native vegetation; and downspout disconnection or extensions have been identified as green infrastructure practices and techniques that could easily be incorporated into historic districts with some guidance.

The primary goal of Green Infrastructure for Historic Districts is to provide assistance to municipalities and residents who wish to incorporate the concepts and practices of green infrastructure into their structures while maintaining the historic integrity of the individual buildings and the overall character of their community.

Introduction

Due to its close proximately to multiple bodies of freshwater, the Finger Lakes region reaps the visual aesthetic and the environmental diversity benefits of the lake ecosystem. However, like many other water bodies, there are assorted threats to the health and vitality of the Finger Lakes. One of the main sources of pollution that contributes to the Finger Lakes is stormwater run-off. Stormwater is the water from rain and melted snow that runs off into nearby water bodies, instead of soaking into the ground. The runoff collects pollutions, such as chemicals, sediments, debris, and other pollutants that flow over impervious surfaces.

One of the ways to prevent the stormwater from reaching the water bodies is through green infrastructure. In the context of stormwater management, the term green infrastructure includes a wide array of practices at multiple scales to manage and treat stormwater, maintain and restore natural hydrology and ecological function by infiltration, evapotranspiration, capture and reuse of stormwater, and establishment of natural vegetative features. Unlike traditional grey infrastructure, green infrastructure is a practice that mimics the system of the natural environment to have a sustainable method of controlling pollution. Green infrastructure can be used to treat the polluted runoff to mitigate those pollutants from running into water bodies, like the Finger Lakes.

Green Infrastructure in Historic Districts

Ontario County is made up of many different towns and villages all with their own unique histories and cultures. Within the county, there are currently six National Historic Districts, soon to be seven as Downtown Geneva is in the process of applying for designation.

1. Farmington Quaker Crossroad Historic District
2. East Bloomfield Historic District
3. Canandaigua Historic District
4. South Main Street Historic District (Geneva)
5. Genesee Park Historic District (Geneva)
6. Clifton Springs Sanitarium Historic District
7. Downtown Geneva Historic District (TBD)

Historic research conducted as part of this project found that green infrastructure practices actually existed within each of these districts in the past, as it wasn't until 20th century industrialization that modern stormwater infrastructure practices were introduced and impervious paving became commonplace. Thus, it is hoped that by re-introducing green infrastructure into each of these historic districts, not only can their historic accuracy and integrity be improved, but also protection of existing structures, regional water bodies and local habitats can be improved as well as decrease the need for traditional water management infrastructure practices.

A historic photograph of Geneva's South Main Street shoes permeable pavers, street trees and a bio-swale.

Methods

On May 8, 2013, Jayme Breschard Thomann, Senior Planner at the Genesee/Finger Lakes Regional Planning Council and P.J. Emerick, Sr., District Manager for the Ontario County Soil and Water Conservation District visited each of the seven historic districts, evaluated soils and made recommendations about appropriate green infrastructure techniques for each district.

From those findings, for each district, the green infrastructure application guidelines were created. Recommendations are based off the research from the New York State Stormwater Management Design Manual – Chapter 5. The research that was conducted also utilized historical background from the various Ontario County historical societies and online research.

EPA National Stormwater Calculator

The EPA's National Stormwater Calculator can also be used to help enhance planning and application of green infrastructure techniques. The calculator is a desktop application that estimates the annual amount of rainwater and frequency of runoff from a specific site anywhere in the United States. Estimates are based on local soil conditions, land cover, and historic rainfall records. It is designed to be used by anyone interested in reducing runoff from a property, including:

- Site developers
- Landscape architects
- Urban planners
- Homeowners

The Calculator accesses several national databases that provide soil, topography, rainfall, and evaporation information for the chosen site. The user supplies information about the site's land cover and selects the types of low impact development (LID) controls they would like to use, such as:

- Rain harvesting (cisterns, rain barrels)
- Rain gardens
- Green roofs
- Stormwater planters
- Porous pavement
- Infiltration basins (planters, swales, filter strips, rain gardens, porous pavement are all various forms of green infrastructure techniques that utilize an infiltration basin)

To better inform decisions, it is recommended that the user develop a range of results with various assumptions about model inputs such as percent of impervious surface, soil type, and sizing of green infrastructure.

Clean water is essential to keeping our families and the environment healthy. The Calculator helps protect and restore the environmental integrity of our waterways. The link to calculator can be found below.
http://www.epa.gov/nrmrl/wswrd/wq/models/swc/

About this Document

This document serves as a guide to the application of green infrastructure practices and techniques for each of the seven historic districts in Ontario County. Application details include descriptions of typical preferred locations of each practice, recommendations of the appropriate sizes and/or models of each practice, relevant products and costs, as well as any necessary site preparation and maintenance necessary.

Genesee Park Historic District in Geneva, NY contains 14 buildings, one site, and one object that total the 16 contributing properties. The district covers about 12 acres in total and include Genesee Street, Genesee Park Place, and Lewis Street. The properties encircle the actual park, which is the focal point of the historic district, created in 1849. The park was originally used as an informal green space and now is comprised of a couple benches and is bordered by an iron fence, originally built out of wood in 1871.

Green infrastructure practices recommended for Genesee Park are:

1. Porous pavement
2. Ribbon driveways
3. Shared driveways

A predominately residential area makes up the district of Genesee Park. Increased green infrastructure practices can not only help prevent pollution and run-off from running into storm drains and into our lake, but also can create a more appealing park and surrounding environment while restoring some historical integrity to the district.

It is anticipated that this information will be utilized by property owners or municipal officials to incorporate the green infrastructure practices into each district, as appropriate.

Green Innovation Grant Program (GIGP)

A grant for various entities in New York State looking to incorporate green infrastructure exists, and could be applied for. The Green Innovation Grant Program (GIGP) provides grants on a competitive basis to projects that improve water quality and demonstrate green stormwater infrastructure in New York. GIGP is administered by NYS Environmental Facilities Corporation (EFC) through the Clean Water State Revolving Fund (CWSRF) and is funded through a grant from the US Environmental Protection Agency (EPA).

Projects selected for funding go beyond providing a greener solution, they maximize opportunities to leverage the multiple benefits of green infrastructure, which include restoring habitat, protecting against flooding, providing cleaner air, and spurring economic development and community revitalization. At a time when so much of our infrastructure is in need of replacement or repair and communities are struggling to meet competing needs, we need resilient and affordable solutions like green infrastructure that can meet many objectives at once.

EFC seeks highly visible demonstration projects which:

- Create and maintain green, wet-weather infrastructure
- Spur innovation in the field of stormwater management
- Build capacity locally and beyond, to construct and maintain green infrastructure
- Facilitate the transfer of new technologies and practices to other areas of the State

GIGP 5 applicants are strongly encouraged to work with their Regional Council to align their project with regional goals and priorities. EFC reserves the right to fund all, or a portion of, an eligible proposed project. Funding will be provided to selected projects to the extent that funds are available.

ELIGIBLE TYPES OF APPLICANTS:

- Municipalities

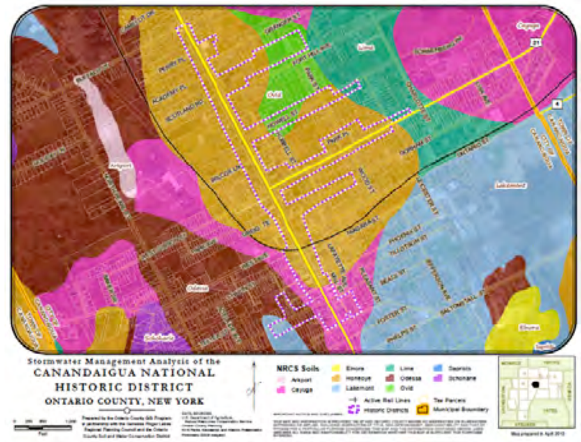
- State Agencies
- Public Benefit Corporations
- Public Authorities
- Not-for-profit Corporations
- For-profit Corporations
- Individuals
- Firms
- Partnerships
- Associations
- Soil and Water Conservation Districts

For more information about this funding opportunity, please see:

http://regionalcouncils.ny.gov/sites/default/files/documents/2013/resources_available_2013.pdf.

Soil Maps

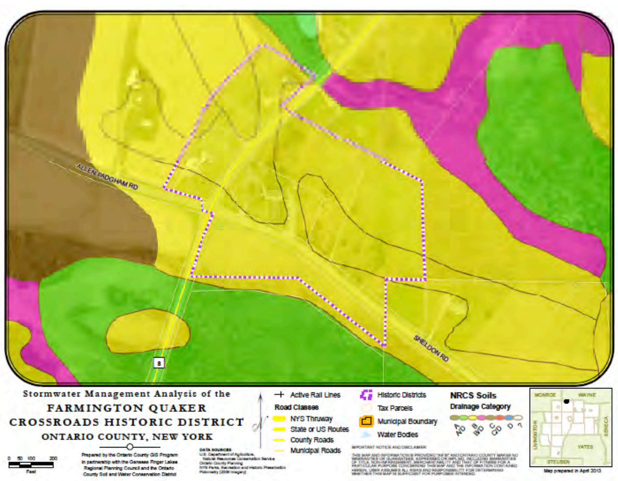
There are two types of soil maps provided within this report. The first illustrates the specific soil type present in the Historic Districts and the second shows its drainage classification. Data from these two maps was used in developing the following best management practices and if relevant, specific recommendations for dealing with the relevant soil type and drainage category for each Historic District are described for each stormwater management technique.



These maps were created by the Ontario County GIS Program in partnership with the Genesee/Finger Lakes Regional Planning Council and the Ontario County Soil and Water Conservation District.

Drainage Categories

The key provided on the Drainage Classification maps provides information about the drainage capabilities of the underlying soils in each Historic District. Definitions and descriptions of each drainage group are provided below.



Group A—Soils in this group have low runoff potential when thoroughly wet. Water is transmitted freely through the soil. Group A soils typically have less than 10 percent clay and more than 90 percent sand or gravel and have gravel or sand textures. Some soils having loamy sand, sandy loam, loam or silt loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

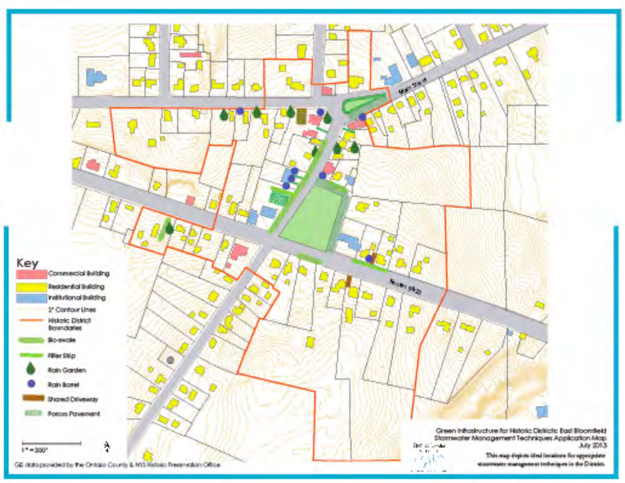
Group B—Soils in this group have moderately low runoff potential when thoroughly wet. Water transmission through the soil is unimpeded. Group B soils typically have between 10 percent and 20 percent clay and 50 percent to 90 percent sand and have loamy sand or sandy loam textures. Some soils having loam, silt loam, silt, or sandy clay loam textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

Group C—Soils in this group have moderately high runoff potential when thoroughly wet. Water transmission through the soil is somewhat restricted. Group C soils typically have between 20 percent and 40 percent clay and less than 50 percent sand and have loam, silt loam, sandy clay loam, clay loam, and silty clay loam textures. Some soils having clay, silty clay, or sandy clay textures may be placed in this group if they are well aggregated, of low bulk density, or contain greater than 35 percent rock fragments.

Group D—Soils in this group have high runoff potential when thoroughly wet. Water movement through the soil is restricted or very restricted. Group D soils typically have greater than 40 percent clay, less than 50 percent sand, and have clayey textures. In some areas, they also have high shrink-swell potential. All soils with a depth to a water impermeable layer less than 50 centimeters [20 inches] and all soils with a water table within 60 centimeters [24 inches] of the surface are in this group, although some may have a dual classification, as described in the next section, if they can be adequately drained.

Dual hydrologic soil groups—Certain wet soils are placed in group D based solely on the presence of a water table within 60 centimeters [24 inches] of the surface even though the saturated hydraulic conductivity may be favorable for water transmission. If these soils can be adequately drained, then they are assigned to dual hydrologic soil groups (A/D, B/D, and C/D) based on their saturated hydraulic conductivity and the water table depth when drained. The first letter applies to the drained condition and the second to the undrained condition. For the purpose of hydrologic soil group, adequately drained means that the seasonal high water table is kept at least 60 centimeters [24 inches] below the surface in a soil where it would be higher in a natural state.

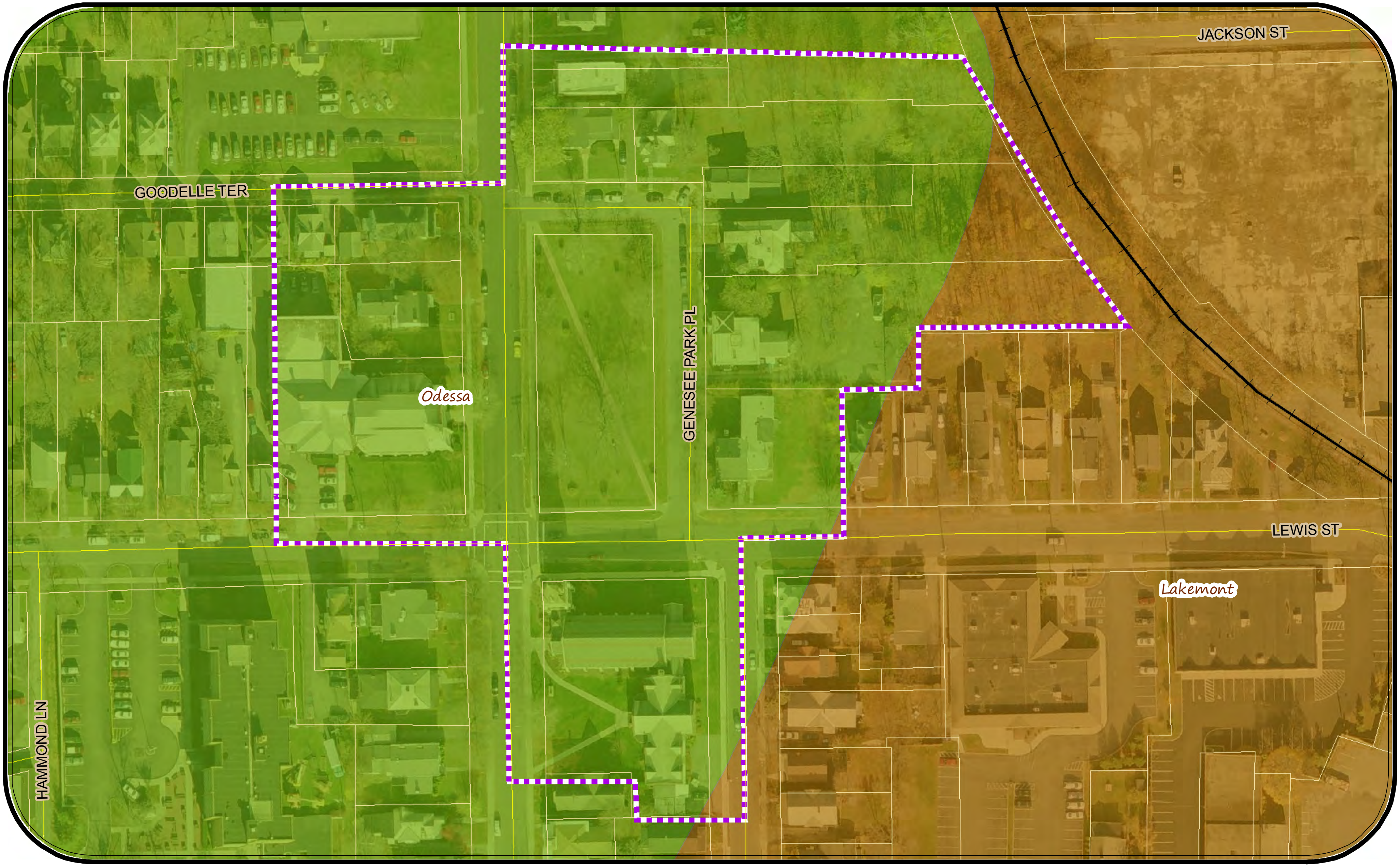
For more information about soil classification, see Part 630: Hydrology, Chapter 7 of the *National Engineering Handbook* by the United States Department of Agriculture.



Stormwater Management Techniques Map

Also included in the following pages is a map which details the ideal locations for the application of relevant stormwater management techniques for the Historic District. It is anticipated that these maps can be used by property owners and municipal officials to guide decisions regarding the location and need of green infrastructure techniques and methods within the Historic District. For further details regarding the installation of each technique, please see the following report.

These maps were created by the Finger Lakes Institute – Community Design Center using GIS data provided by Ontario County and the New York State Historic Preservation Office. Each Historic District was visited and appropriate places for green infrastructure were identified and recorded using physical observation and recommendations made by the Genesee/Finger Lakes Regional Planning Council. It should be noted that in most instances, all possible applications of the green infrastructure techniques were recorded, but each property owner should be careful to consider the specific needs and conditions of their property.



Stormwater Management Analysis of the
GENESEE PARK HISTORIC DISTRICT
ONTARIO COUNTY, NEW YORK

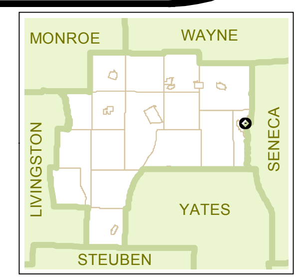
0 25 50 100
Feet

Prepared by the Ontario County GIS Program in partnership with the Genesse Finger Lakes Regional Planning Council and the Ontario County Soil and Water Conservation District

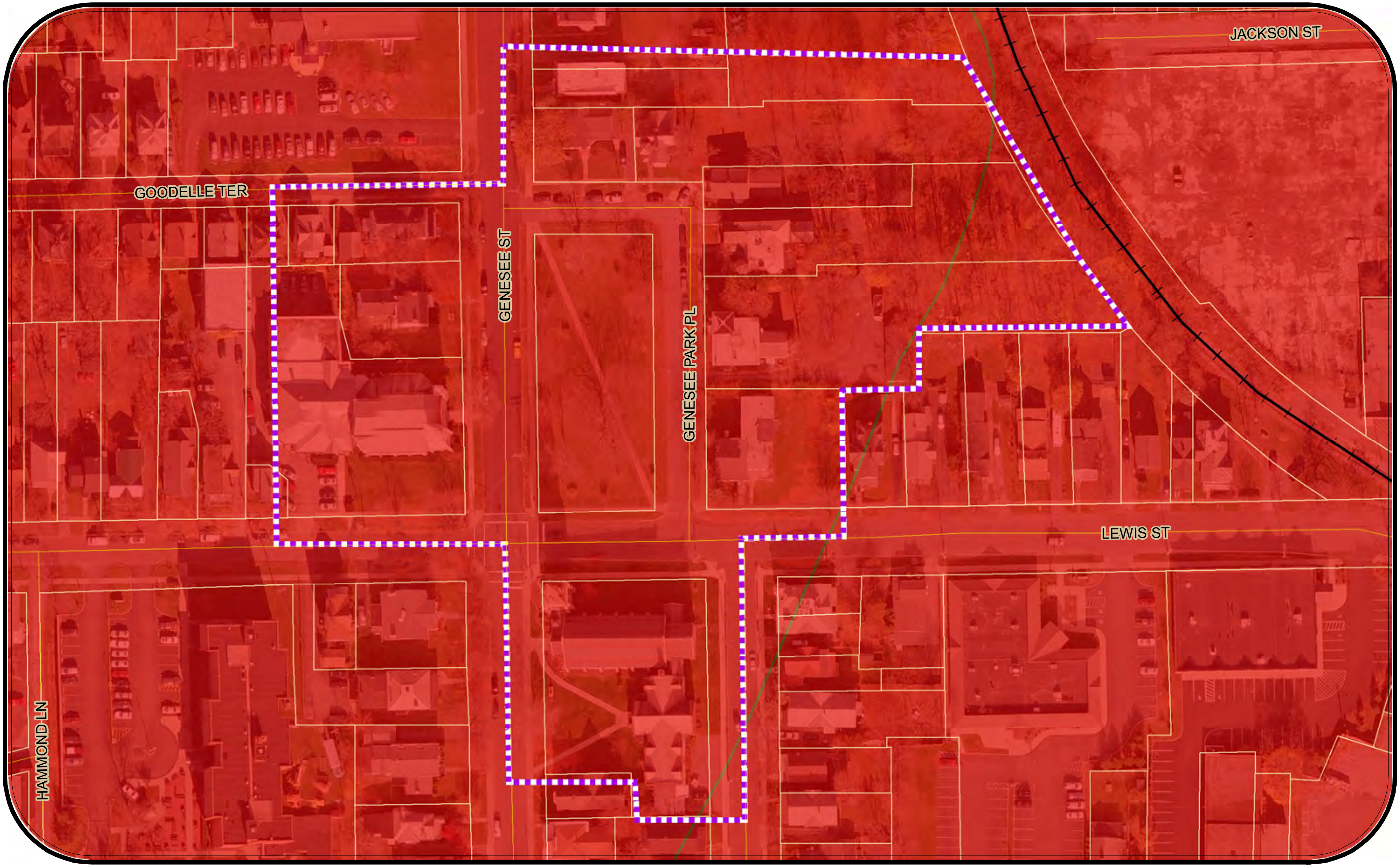
DATA SOURCES:
U.S. Department of Agriculture,
Natural Resources Conservation Service
Ontario County Planning
NYS Parks, Recreation and Historic Preservation
Pictometry (2009 Imagery)

N

NRCS Soils
- Lakemont
- Odessa
- Active Rail Lines
- Historic Districts
- Tax Parcels
- Municipal Boundary
- Water Bodies



Map prepared in April 2013



Stormwater Management Analysis of the

GENESEE PARK HISTORIC DISTRICT

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0 25 50 100

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Prepared by the Ontario County GIS Program in partnership with the Genesee Finger Lakes Regional Planning Council and the Ontario County Soil and Water Conservation District

DATA SOURCES:
U.S. Department of Agriculture,
Natural Resources Conservation Service
Ontario County Planning
NYS Parks, Recreation and Historic Preservation
Pictometry (2009 Imagery)

Active Rail Lines

Road Classes

- NYS Thruway
- State or US Routes
- County Roads
- Municipal Roads

Historic Districts

Tax Parcels

Municipal Boundary

Water Bodies

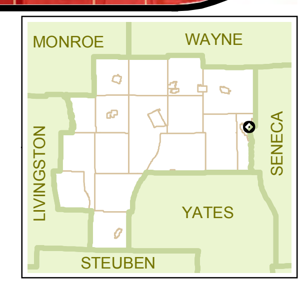
NRCS Soils

Drainage Category

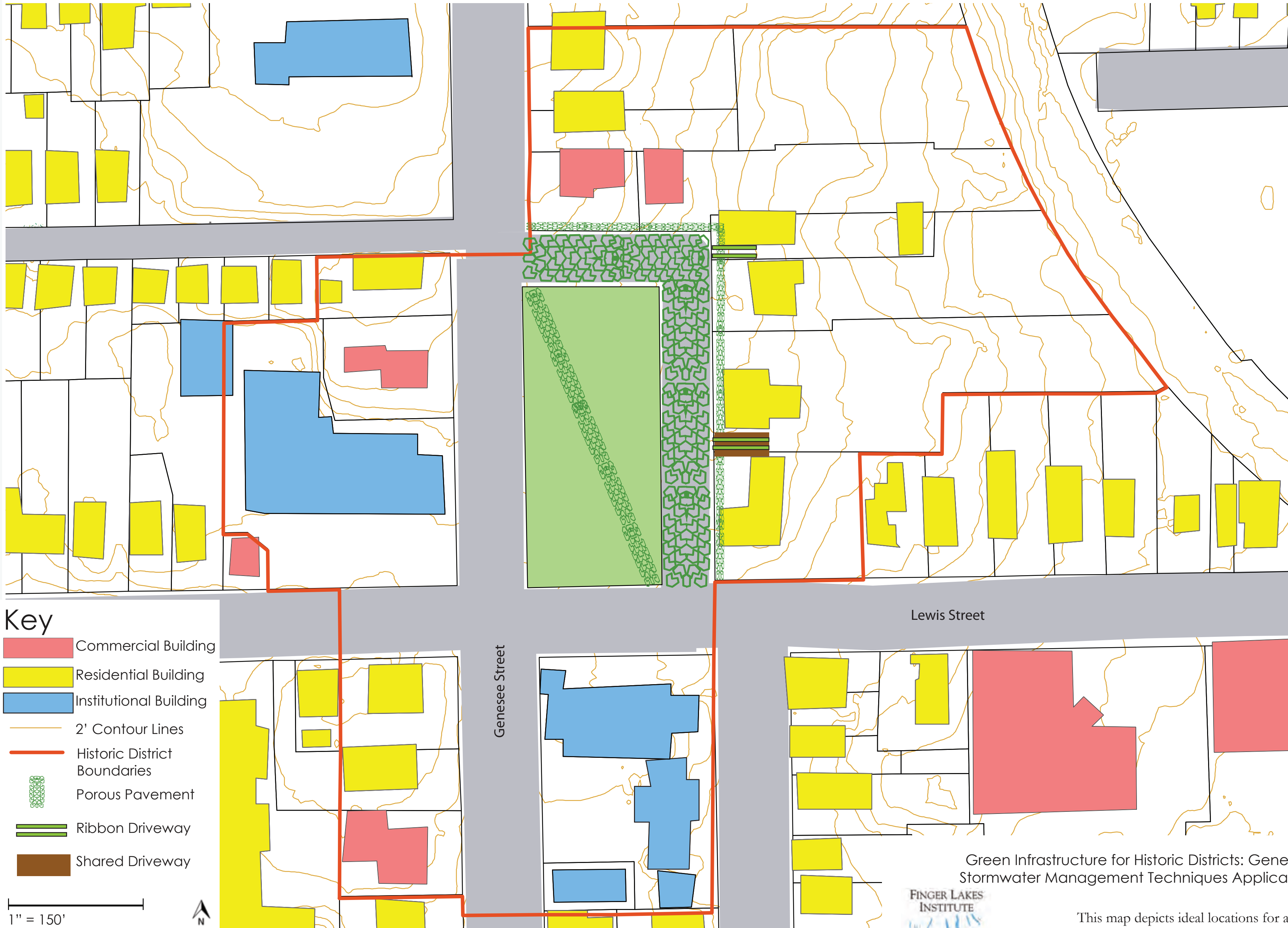
A A/D B B/D C C/D D ?

IMPORTANT NOTICE AND DISCLAIMER:

THIS MAP AND INFORMATION IS PROVIDED "AS IS" AND ONTARIO COUNTY MAKES NO WARRANTIES OR GUARANTEES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF TITLE, NON-INFRINGEMENT, MERCHANTABILITY AND THAT OF FITNESS FOR A PARTICULAR PURPOSE CONCERNING THIS MAP AND THE INFORMATION CONTAINED HEREIN. USER ASSUMES ALL RISKS AND RESPONSIBILITY FOR DETERMINING WHETHER THIS MAP IS SUFFICIENT FOR PURPOSES INTENDED.



Map prepared in April 2013



Green Infrastructure for Historic Districts: Genesee Park
Stormwater Management Techniques Application Map
July 2013

This map depicts ideal locations for appropriate stormwater management techniques in the District.

FINGER LAKES INSTITUTE

GIS data provided by Ontario County & NYS Historic Preservation Office

Porous Pavement

Porous, or permeable, pavement is material that allows stormwater to move through the surface and be absorbed rather than flow over the surface. Currently, most development uses impervious materials, such as asphalt and concrete. Rainwater cannot penetrate these materials and is directed into a storm drain off of impervious material, where it then continues to flow untreated into a waterway. Because of this during heavy rainfall sewer systems can also get overwhelmed and flood. Porous pavement is a development technique that can mutually reduce run-off and flooding, as well as minimize the spread of pollution.

Pervious pavement is widely available and can bear frequent traffic, as well as is universally accessible. Porous paving functions like a stormwater infiltration basin and allows the stormwater to infiltrate the soil over a large area, thus facilitating recharge of precious groundwater supplies locally.

Figure 1: Pebbled Path in Pulteney Park

Source: Geneva Historical Society.

Some examples of places that can utilize porous pavement include: roads, paths, lawns and lots that are subject to light vehicular traffic, such as car/parking lots, cycle-paths, service or emergency access lanes, road and airport shoulders, and residential sidewalks and driveways.

Application in a Historic District

Historic photos from Ontario County show pebble and gravel sidewalks, dirt roads and driveways, and then later cobblestone and brick pathways before being paved over with impervious materials. Many home exteriors in Historic districts had descriptions of pathways with spaced out stones framed by grass, where water could easily run off the surface and be absorbed by it's surrounding environment. Figures 1 and 2 are pictures from Geneva, Figure 1 is a pebbled pathway in Pulteney Park, and Figure 2 shows a dirt road and sidewalk in downtown Geneva. The first porous pavement to be widely used however after the industrial revolution was pervious concrete. Pervious concrete was first used in the 1800s in Europe as pavement surfacing. Cost efficiency was the main motivator due to a decreased amount of cement. Then during WWII pervious cement became popular again due to a decrease in availability of cement. Below are some further porous pavement options. By implementing porous paving in a historic district, it is likely that this will improve the historic character and integrity of the district, as well as mitigate stormwater run-off.

Figure 2: Dirt Road & Sidewalk in Downtown Geneva

Source: Geneva Historical Society

Types of Porous Pavement

Concrete & Brick Pervious Pavers

Concrete and brick pervious pavers are commonly used materials that qualify as low impact development and allow the absorption of water. Concrete or brick pavers are manufactured in many sizes and shapes and are laid with a drainage base and permeable joint material, allowing water to slowly seep into the ground. Homeowners can use them for parking areas, patios, sidewalks, and pool decks. Driveways can be paved with these; however, snow removal equipment may catch edges.

Plastic Grids

Plastic Grids allow for a 100% porous system using structural grid systems for containing and stabilizing either gravel or turf. These grids come in a variety of shapes and sizes depending on use; from pathways to commercial parking lots. These systems can be used to meet LEED requirements as well. The ideal design for this type of grid system is a closed cell system, which prevents gravel/sand/turf from migrating laterally.

Figure 3: Loose Gravel

Source: http://www.englishgardenco.co.uk/driveways.html

Porous asphalt

Porous asphalt is conventional asphalt with large, single-sized aggregate particles that leave open voids and give the material porosity and permeability. Under the porous asphalt surface is a base course of further single-sized aggregate that acts as a reservoir where water can be allowed to evaporate and/or be absorbed by underlying soils. Porous asphalt surfaces, called *open-graded friction courses* (OGFC), are being used on highways to improve driving safety by removing water from the surface. OGFCs are not full-depth porous pavements, but a porous surface course usually 3/4 to 1.5 inches thick that allows for the lateral flow of water through the pavement, improving the friction characteristics of the road and reducing road spray.

Loose Gravel

Loose gravel may be used or stone-chippings are another alternative. This form of porous paving should only be used in very low-speed, low-traffic settings like car-parks and drives.

Permeable Interlocking Concrete Pavements

Permeable interlocking concrete pavements are concrete (or stone) units with open, permeable spaces between the units. They give an architectural appearance, and can Bear light and heavy traffic, particularly interlocking concrete pavers, excepting high-volume or high-speed roads.

Figure 4: Porous Turf

Source: http://www.100khouse.com/2010/12/08/permeable-pavement-options-for-leed-projects/

Porous Turf

Porous turf, as seen in Figure 4, if properly constructed, can be used for occasional parking like that at churches and stadia. Plastic turf reinforcing grids can be used to support the increased load. Living turf transpires water, actively counteracting the "heat island" with what appears to be a green open lawn.

Figure 5: Permeable Clay Brick Pavements

Source: http://www.stixnstones.com/blog/bid/96524/Garden-Stone-Path-Ideas-and-Gallery

Permeable Clay Brick Pavements

Permeable clay brick pavements are fired clay brick units with open, permeable spaces between the units. Clay pavers provide a durable surface that allows stormwater runoff to permeate through the joints. These are ideal for incorporating porous pavement in historic districts.

Resin Bound Paving

Resin bound paving is a mixture of resin binder and aggregate. Enough resin is used to allow each particle to adhere to one another and to the base yet leave voids for water to permeate through. Resin bound paving provides a strong and durable surface that is suitable for pedestrian and vehicular traffic in applications such as pathways, driveways, car parks and access roads.

Elastomerically Bound Recycled Glass Porous Pavement

Elastomerically bound recycled glass porous pavement is made out of processed post consumer glass with a mixture of resins, pigments, and binding agents. The product trademarked as FilterPave provides a permeable paving material that also reuses materials that would otherwise be disposed in landfills. Approximately 75 % of glass in the U.S. is disposed in landfills, so increasing the use of this form of porous pavement helps reuse material and reduce waste.

Benefits

Figure 6: An Example of Porous Paving

Source: http://www.wycokck.org/InternetDept.aspx?id=23020&menu_id=1444&banner=15284

Although some porous paving materials appear nearly indistinguishable from non-porous materials; their environmental effects are qualitatively different. Whether pervious concrete, porous asphalt, paving stones or concrete or plastic-based pavers, all these pervious materials allow stormwater to percolate and infiltrate the surface areas that currently do not utilize the soil below. The goal is to control stormwater at the source, reduce runoff and improve water quality by filtering pollutants in the substrata layers.

Benefits of permeable paving include:

- recharging ground water
- run-off reduction
- decrease in capacity restraints in stormwater networks
- Effective pollutant treatment for solids, metals, nutrients, and hydrocarbons, as well as aesthetic improvement to otherwise hard urban surfaces.

Controlling Pollutants

Perhaps one of the most important benefits of porous pavement is the reduction of pollutants. Impervious pavement amplifies and spreads non-point source pollution. Non-point source pollution is caused by rainfall or snowmelt moving over the ground. As run-off moves it picks up human made pollutants and deposits them into streams, creeks, and lakes. Common examples of pollutants that fall into this category and spoil our waterways are: fertilizers, herbicides, insecticides, oil, and grease.

Porous pavement slows the velocity and momentum in which water moves over the surface, allowing sediment to drop out of the water, resulting in less erosion; and this means the water picks up less pollutants and allows the pollutants to filter into the ground. Studies have shown that porous pavements capture the heavy metals that fall on them, preventing them from washing downstream and accumulating inadvertently in the environment. In the void spaces, naturally occurring micro-organisms digest car oils, leaving little but carbon dioxide and water.

Examples

A study done in Rockville, MD reported high removal rates for zinc (99%), lead (98%), and chemical oxygen demand (82%). The University of New Hampshire Stormwater center found typical performance efficiencies for TSS, total zinc, and total phosphorous to exceed 95%, 97%, and 42% respectively. The EPA estimates that porous pavement has the ability to remove 65% of total phosphorous, 80-85% of nitrogen, and 82%-95% of suspended solids.

Site Specific Considerations
Soils

The soil should have a minimum infiltration rate of 0.5 inches per hour. Soil testing is required to maintain and ensure effective pollutant removal is taking place in the soils. Genesee Park is made up of soil classified as "Odessa". This type of soil is classified as being "somewhat poorly drained" and the potential for runoff ranges from medium to very high. Permeability is moderately slow in the surface layer and slow or very slow in the subsoil and substratum. Impervious surfaces enhance run-off and further inhibit water from being absorbed. The addition of porous pavement to the area can help reduce stormwater run-off, however, may require special modifications given the low permeability level of the soil.

Siting

Permeable pavement cannot be used in areas where there are risks for foundation damage, basement flooding, interference with subsurface sewage disposal systems, or detrimental impacts to other underground structures. Permeable pavement, like any other stormwater infiltration practice, bears the possibility of groundwater contamination. Therefore, permeable paving infiltration systems should not be used to treat stormwater hot spots. Stormwater hot spots are areas where land uses or activities have the potential to generate highly contaminated run-off. Examples of this are commercial nurseries, auto recycling and repair facilities, fleet washing, fueling stations, high use commercial parking lots, and marinas.

Figure 7:

Source: http://homeklondike.com/2010/09/29/garden-path-design-ideas/

The recommended applications of permeable paving are for low-traffic roads, single-family residential driveways, overflow parking areas, sidewalks, plazas, tennis and or basketball courts, and courtyard areas, as well as backyard patios. Many opportunities exist in larger parking lots, schools, municipal facilities, and urban hardscapes as well. Permeable paving is easily applicable to redevelopment areas as well as new development. It is indeed an ideal application for Genesee Park and the surrounding streets, which are very low-traffic and typically only accessed by residents or the infrequent park visitor who travels by car.

As mentioned, porous pavement is recommended for mostly light traffic areas, however, given the variability of products available the range of accepted applications is expanding. Some concrete paver companies have developed products specifically for industrial applications.

Zoning

The city of Geneva does not have any regulations specifically pertaining to porous pavement, however it is recommended to ask public officials before engaging in a large project. Chapter 350 article X Historic Zoning outlines regulations and procedures concerning any alteration to the appearance of a historic structure. Therefore, any driveway or front walks that may be changed to a porous pavement may need approval first.

Slopes

Permeable paving can only be used on gentle slopes (<5%); ideal surfaces should be completely flat. For all permeable paving, base course is a reservoir layer of 1”-2” crushed stone; depth to be determined by storage required and frost penetration.

Figure 8: A Terraced Application of Porous Pavement

Source: http://realestate.msn.com/garden-paths-12-easy-to-imitate-stone-walkways-1

The introduction of dirt or sand onto the paving surface, whether transported by runoff from elsewhere or carried by vehicles, will contribute to premature clogging and failure of the paving. Consequently, permeable paving should be constructed as one of the last items to be built on a development site and flat or very minimal slope. A terraced system may be used on slopes and perforated pipes can be used to help distribute run-off through the reservoir evenly. An example of a terraced system can be seen in Figure 8 above.

Drainage

Not all water will be absorbed by porous pavement; therefore drainage must be taken into consideration. Run-off should flow through and exit permeable pavements in a safe and non-erosive manner. Systems should be designed to ensure that the water surface evaluations for the 10- year 24-hour design storm do not rise into the pavement to prevent freeze/thaw damage. As a back up measure to help mitigate clogging, permeable paving practices can be designed with a perimeter trench to provide some overflow treatment.

Climate

Concerns over the resistance to the freeze-thaw cycle have limited the use of pervious concrete in cold weather environments. The rate of freezing in most applications is dictated by the local climate. Avoiding saturation during the freeze cycle is the key to the longevity of the concrete. Having a well-prepared 8 to 24 inch (200 to 600 mm) sub-base and drainage will reduce the possibility of freeze-thaw damage. The use of salt or sand during the winter should be minimized. Road salt contains chlorides that could migrate through the porous pavement into groundwater. Snow plow blades could catch block edges and damage surfaces. Sand cannot be used for snow and ice control on pervious asphalt or concrete because it will plug the pores and reduce permeability.

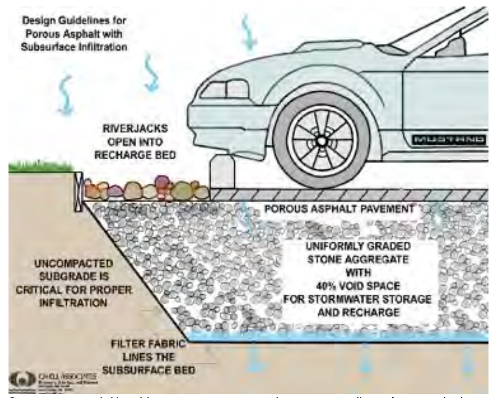
These potential problems do not mean that porous pavement cannot be used here in the Finger Lakes though. Porous pavement designed to reduce frost heave and clogging has been used successfully in Norway. Furthermore, experience suggests that rapid drainage below porous surfaces increases the rate of snow melt above. So, salting and plowing may become less necessary and severe. Sidewalks, patios, and tennis courts are a few examples of places that are not greatly affected by snow and could still easily be paved with a form of porous pavement.

Site Preparation & Design

Construction Guidelines

When installing pervious pavement projects certain precautions should be taken. Prior to installation areas for the porous pavement should be clearly marked in order to avoid compaction or disturbance of the soil. Weather conditions at the time of installation can affect the final product, as well. Extremely low or high temperatures should be avoided during construction. The pervious pavement and other infiltration practices should be installed towards the end of construction-to ensure securement and stability of upstream construction. It is recommended that filter fabric overlap a minimum of 16 inches and should be secured at least 4 feet outside of the bed to help drainage. The strip of fabric should remain in place until all bare soils contiguous to the beds are stabilized and vegetated.

Figure 9: Layers of Porous Paving



Source: http://www.mapc.org/resources/low-impact-dev-toolkit/permeable-paving

More specifically, there a few layers that should be incorporated into porous paving to ensure proper and efficient absorption and filtration. There should be a "choker course"—a single ½ inch layer of crushed granules and functions as a stabilizer for the open-graded asphalt surface for paving. A drainage layer is used to separate the underlying native soils from the filter layer with a 3 inch layer or gravel over a reservoir course. An underdrain is required to meet storage/release criteria and overflow piping is necessary to minimize the chance of clogging. It is recommended that a 4"-6" perforated PVC pipe with 3/8 inch perforations at 6 inches on center, solid connectors should be used. Each pipe should have a minimum 0.5% slope and be placed 20 feet apart. An observation well is also required-in order to observe any changes in groundwater levels that may occur over a period of time. Examples of these layers can be more clearly demonstrated in Figures 9 and 10.

Figure 10: Layers of Porous Paving

Source: http://www.dot.ca.gov/hq/LandArch/ec/lid/lid-permeable-paving-new.htm

Maintenance

If maintenance is not carried out on a regular basis, the porous pavements can begin to function more like impervious surfaces due to clogging. However, with more advanced paving systems the levels of maintenance needed can be greatly decreased. An example of this is plastic grid systems. Plastic grid systems are becoming more and more popular with local government maintenance personnel because they result in reduced gravel migration and increased weed suppression in public park settings.

Some permeable paving products are prone to damage from misuse, such as drivers who tear up patches of plastic & gravel grid systems by "joy riding" on remote parking lots at night. The damage is not difficult to repair but can look unsightly in the meantime. Grass pavers require supplemental watering in the first year to establish the vegetation; otherwise they may need to be re-seeded.

A maintenance checklist for permeable paving would include:

- Posting signs that identify porous pavement areas
- Keeping landscape areas well-maintained to help prevent soil transportation and erosion onto the pavement
- Regular cleaning with a vacuum sweeping machine, or high pressure hosing
- Regular monitoring to ensure the surface is draining properly after storms
- It should not be resealed or repaved with impermeable materials
- An annual inspection for deterioration is recommended

Basic quick fixes for each type are available and fairly easy to do. Potholes and cracks can be filled with patching mixes, as long as less than ~10% of the surface needs repairing. Spot clogging can be fixed by drilling 0.5 holes through the pavement every few feet. Displaced gavel in open celled pavers can be refilled as needed.

Feasibility & Limitations

Major limitations to this practice are suitability of the site grades, subsoils, drainage characteristics, and groundwater conditions. Proper site selection is an important criterion in reducing the failure rate of using porous paving. Ownership and maintenance also heavily influence the success of a permeable pavement. Soil should be permeable and able to support adequate infiltration. Sandy and silty soils are critical to successful application of permeable pavements. Chlorides can easily migrate into ground water, so heavily salted pavement is not ideal. The surface material must be able to tolerate undulations from frost movements, and be able to bear frost. Since the Finger Lakes experience a colder climate porous material may require more in-depth consideration.

Cost

Some estimates put the cost of permeable paving at two to three times that of conventional asphalt paving. Using permeable paving, however, can reduce the cost of providing larger or more stormwater BMPs on site, and these savings should be factored into any cost analysis. In addition, the off-site environmental impact costs of not reducing on-site stormwater volumes and pollution have historically been ignored or assigned to other groups (local government parks, public works and environmental restoration budgets, fisheries losses, etc.) The City of Olympia, Washington is studying the use of pervious concrete quite closely and finding that new stormwater regulations are making it a viable alternative to stormwater ponds. The table below shows cost estimates below for various different kinds of porous pavement options.

Table 1

	Paved Area	Quote ($)	Quote ($)	Quote ($ sq yd)	Quote ($ sq yd)
(sq ft)		Highest	Lowest	Highest	Lowest
Hot Mix Asphalt	36,225	98,600	92,620	24.50	23.01
Porous Asphalt	5,328	28,650	18,352	48,40	31.00
Porous Pavers	5,328	67,960	61,755	114.80	104.32
Porous Concrete	7,988	63,200	53,919	71.21	60.75

Conclusion

The proper utilization of pervious paving is recognized by Best Management Practice by the U.S. Environmental Protection Agency (EPA) for providing first flush pollution control and stormwater management. As regulations further limit stormwater runoff, it is becoming more expensive for property owners to develop real estate, due to the size and expense of the necessary drainage systems. Pervious concrete reduces the runoff from paved areas, which reduces the need for separate stormwater retention ponds and allows the use of smaller capacity storm sewers. This allows property owners to develop a larger area of available property at a lower cost. Pervious concrete also naturally filters stormwater and can reduce pollutant loads entering into streams, ponds and rivers; protecting our ecosystems and unique glacially made region.

Ribbon Driveways

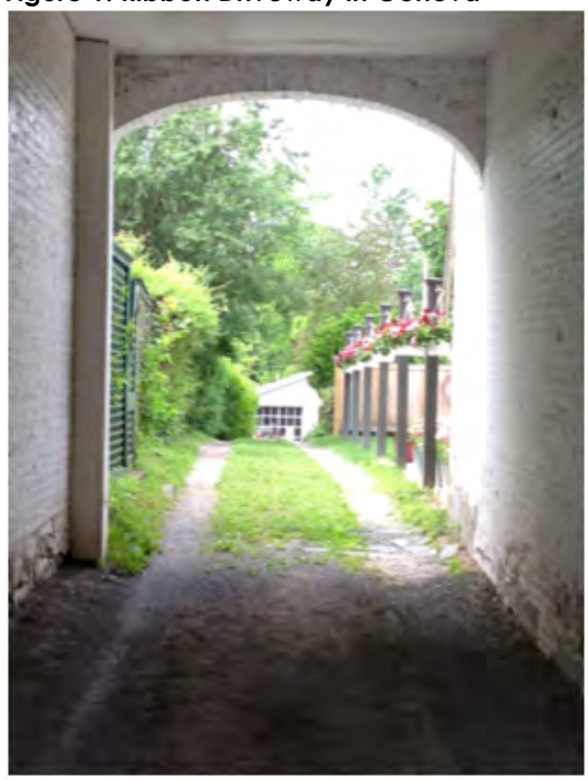
Ribbon driveways, (sometimes called Hollywood driveways), were popular in the 1920s to 1940s. Before driveways were paved ruts would form where the soil had been compacted down from the wheels continuously driving over particular areas. These ruts were then paved over with concrete, leaving the grass in the center, and the ribbon driveway was born.

Today, too many landscapes are dominated by impervious pavement. Ribbon driveways are an old school alternative to development that helps restore some green into our environments. Figure 1 to the left is an example of a ribbon driveway in the historic district of Geneva, NY on South Main Street.

Figure 1: Ribbon Driveway in Geneva

Application in a Historic District

Ribbon driveways are actually already quite common in many of the historic districts in Ontario County, such as East Bloomfield, Canandaigua and South Main Street in Geneva. Many of these ribbon driveways actually also incorporate porous pavement, as the driving surface is often small pebbles or compacted dirt. In the past, ribbon driveways were also quite common in the region. Before the days of paving, people would pull their cars into their driveways and the tires would form ruts on the grass leaving only the patch in the middle. Once paving began (originally with concrete), the ruts were filled and the grass was left to grow. Therefore, incorporating ribbon driveways into individual properties is a low-cost green infrastructure technique, which can contribute to the historic character of any district.



Source: Cari Varner, 2013.

Benefits

Because the entire surface of the driveway is not paved with a pervious material, ribbon driveways help prevent rainwater from immediately running off into stormwater sewers which runs into waterways untreated. This helps keep waterways clear of things like motor oil, fertilizers, and pesticides that often sit on driveways and contribute to non-point source pollution. Non-point source pollution is caused by rainfall or snowmelt moving over and through the ground. As run-off moves it picks up human made pollutants and deposits them into streams, creeks, and lakes. Impervious surface increases the momentum and velocity run-off has which allows the water to pick up and carry even more pollutants. A ribbon driveway would help slow the water causing sediment and pollutants to drop out or be caught by plants and soil and slowly filtered out.

Some further benefits of ribbon driveways include that they are often cheaper to install due to less surface area that needs to be paved over, and they are cooler in the summer to walk and play on due to less surface area absorbing the hot summer sun. Increased vegetation and less surface area also helps reduce the heat island affect. Ribbon driveways are now being encouraged and recommended in many historic communities and often help increase property values and the appeal of a neighborhood.

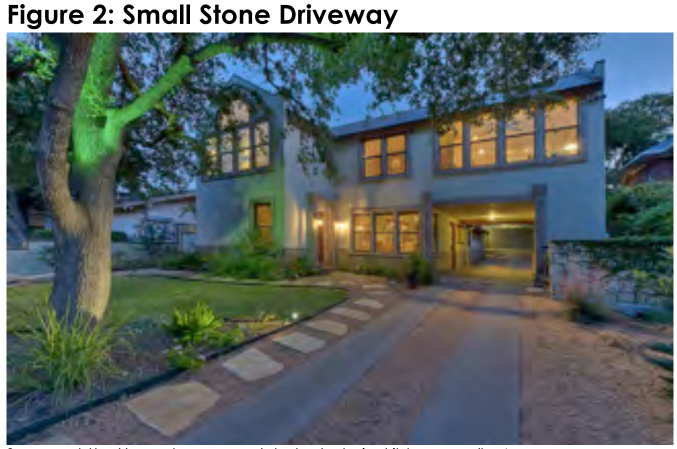
Types

There are many different styles and techniques of ribbon driveways that can be employed. The pavement surface can be traditional asphalt, but there are permeable pavement possibilities as well ranging from very inexpensive small stones to pavers and even driveways and carports made of grass that provide a greater reduction in stormwater run-off, while providing the same level of functionality for the driveway.

Small Stone Ribbon Driveways

These are the least expensive, and allow water to penetrate, but require more frequent maintenance because little stones are easily displaced. By "stones," it is imperative to use smooth stones, not crushed gravel, which lets water run off instead of down in the ground. Figure 2 is an example of how a gravel driveway can be transformed into a ribbon driveway using small stones, stone slabs, and paved strips.

Figure 2: Small Stone Driveway



Source: http://www.houzz.com/photos/exterior/ribbon-rug-/ls=4

Grass

Yes, it's possible to turn the asphalt or concrete of driveways into lawns. This is achieved by sinking a durable plastic grid into the ground and letting the grass grow in it. Vehicles can be driven on it, just like on a driveway, but if they are parked for extended periods of time, the grass won't grow. This can also be accomplished with products like PermaTURF, which are manufactured in New Hampshire and snow removal tested, and safe.

Pavers

There are good-looking interlocking pavers that fit together like puzzle pieces but that have sufficient gaps between them to allow water to seep down into the ground. It is important to research what types of pavers you would like, as some have awkward and clunky spacing. Pavers are available in permeable and impervious materials, and the spacing between them allows run-off to be absorbed rather than running into a sewer.

Figure 3: Pavers

Source: http://www.houzz.com/grass-driveway

Pervious (permeable) Concrete

Pervious (permeable) concrete is made by using less fine material in the concrete mix, allowing bigger particles to bind together and leaving more void space between them. Pervious concrete is very durable and local contractors are recommended for installation.

Porous Asphalt

This type of asphalt works on the same principle as the pervious concrete described above. It, too, is durable, but should be installed by an experienced contractor. These pavements, used mostly for parking lots, allow water to drain through the pavement surface into a stone recharge bed and infiltrate into the soils below the pavement

Site Specific Considerations

Zoning and Recommendations

Check your local building codes to see what is permissible in your location. The city of Geneva does not have any regulations specifically pertaining to ribbon driveways and many districts across the nation are starting to recommend the use of ribbon driveways, especially in historic areas. Chapter 350, article X Historic Zoning has specific procedures and regulations concerning the alteration of any historic structure. Many towns are now recommending a return to ribbon driveways in historic districts to help restore historic feel and may provide incentives.

Unless you have a very high skill level, hire a contractor, especially for permeable asphalt or concrete.

Siting and Soils

It is important that the subsurface is properly prepared and that there is a solid yet porous layer underneath. Building on heavy clay is not ideal because clay is very impermeable, therefore it's suggested to place a permeable surface on top of it to help. Consulting a local engineering firm or reliable contractor in this case is recommended. Genesee Park is made up of soil classified as "Odessa". This type of soil is classified as being "somewhat poorly drained" and the potential for runoff ranges from medium to very high. Permeability is moderately slow in the surface layer and slow or very slow in the subsoil and substratum. Impervious surfaces enhance run-off and further inhibit water from being absorbed. Extra vegetation or an added layer of porous material may be recommended or helpful in slowing and minimizing erosion and run-off in this area.

Finally, make sure ribbon driveways aren't placed too close to a well. Water that is allowed to seep deep into the ground is purified as it trickles down through layers of soil, sand, and porous rock. However, if your well is close by, you may have no choice but to allow water to drain off to avoid contamination.

Site Preparation & Design

Construction

Usually, running strips around 18 inches wide is sufficient and the extreme outer width of the two 'tracks' of concrete or asphalt would need to be the width of a typical passenger automobile. If your driveway will need to accommodate big trucks then obviously the dimensions will have to be sized up accordingly. But this can easily be done by measuring the width of your own vehicles.

In some ways and in some cases, ground preparation is a little easier compared to traditional paving of driveways because it is often quicker and less expensive because the leveling isn't as critical and you might not need to dig as deep either.

Maintenance and Weather Conditions

In the winter a ribbon driveway may seem like a hassle, but the most modern way of laying a ribbon driveway is with plastic honey-comb like bases that can be shoveled, the makers of these are based in New Hampshire, so surely they're no strangers to snow either. Figures 4 and 7 show how these pavers can be used.

Other maintenance issues that should be considered before installing or converting to a ribbon driveway that are often overlooked include taking care of the strip in the middle of the "ribbons". This can be planted, returned to grass, or filled with gravel. However, most times this needs mowing, and weeding. Pavers are not suggested for plowing because the plow can catch edges. Ribbon driveways are admittedly slightly more difficult to maintain in the Finger Lakes region due to winter conditions, however; by paving with a porous material or planting along the edges of the drive run-off and pollutant loads can still be minimized.

Costs and Considerations

The following is a rough guide to the per-square-foot costs of materials when installed professionally:

- Pervious concrete: $4 to $8
- Porous asphalt: $4.60
- Grid systems for grass: $5 to $6.50
- Pavers: $12 to $15

A traditional dark black asphalt driveway costs around $1 to $5 per square foot. So for a 12x50 foot driveway, it would cost between $600 and $3,000. A quarter mile driveway is estimated to average between $21,000 and $52000.

Stamped and colored asphalt that looks like bricks costs approximately between $1800 to $6,000 for a 12x50 foot driveway.

For a typical concrete driveway it can be expected to pay the high end of the $3.73 - $4.21 per square foot range for a licensed, bonded and insured contractor and for complex or rush projects.

Other tips to keep in mind are that concrete lasts longer than asphalt in warmer climates, but asphalt lasts longer were the weather is cold. A rougher surface, such as small stones, can make snow removal more difficult, so you may have to consider a tradeoff between cost and convenience. It should also be considered if anyone in your household uses a wheelchair, a rougher surface obviously hinders accessibility and strips of pavement may need to be closer together, or with a set of wide set and then more narrow strips.

Conclusion

Ribbon driveways are an out of the box way to restore some creativity to property as well as an attractive way to benefit yourself, your community, and the environment. This type of project produces a myriad of benefits from helping reduce the heat island effect to increasing property values. By harnessing this technique as green infrastructure stormwater and pollution can be drastically reduced, as well as minimize the risk of flooding.

Shared Parking

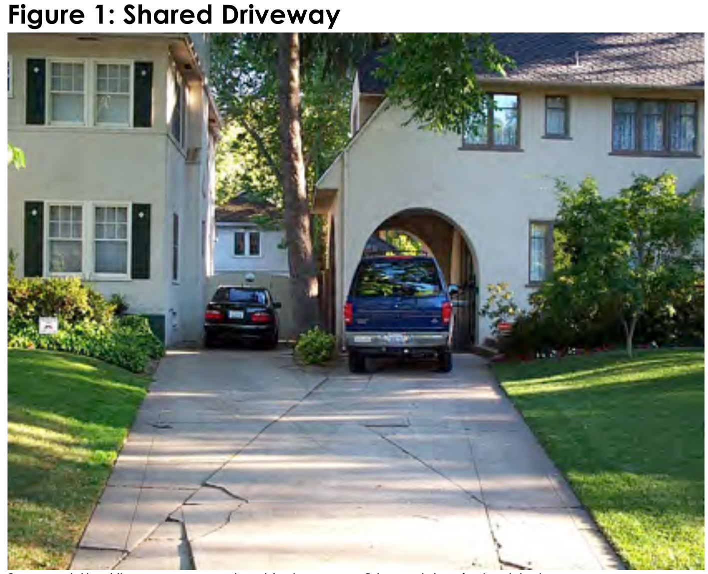
Shared parking refers to areas or spaces that are used to serve two or more individual land-uses. This is when individual land-uses, either on the same site or from nearby sites form an agreement to share available parking space and/or land developable for parking.

Shared parking may be applied when land uses have different parking demand patterns and are able to use the same parking spaces/areas throughout the day. Shared parking is most effective when these land uses have significantly different peak parking characteristics that vary by time of day, day of week, and/or season of the year. In these situations, shared parking strategies will result in fewer total parking
Spaces needed when compared to the total number of spaces needed for each land use or business separately. Figures 1 shows how shared parking can be utilized in residential neighborhoods.

Application in a Historic District

Shared driveways were actually quite common historically. In the past, prior to Zoning Codes which provided strict guidelines about the amount of parking required, many properties would share an access route, especially in downtown and urban areas where land area was limited. The benefits of shared driveways such as a lower installation price per property and the shared cost (and labor) of maintenance led to their popularity, which is apparent in historic districts such as Canandaigua. Shared driveways have no more visual impact than a traditional driveway, but the diminished paved space introduces the opportunity to increase green space, yards and gardens and of course, provide greater opportunity for stormwater to be filtered and reabsorbed into the ground. Shared driveways can even be combined with ribbon driveways and porous pavement to increase the amount of permeable surface.

Figure 1: Shared Driveway



Source: http://home.comcast.net/~dempseys3/mpark/mpindex.html

Benefits & Objectives

The direct benefits associated with this type of green infrastructure include:

- Fewer watercourse or wetland crossings

- Fewer curb cuts, especially on State Highways
- Improved sight lines
- Less re-grading
- Preservation of significant trees, or other preservation or resource protection benefits.
- Reduce total impervious surface.

- Reduce road/parking construction costs.
- Provide safe access and adequate parking.
- Minimize disturbance to natural site hydrology.
- Improve site appearance
- Create opportunities for stormwater treatment and infiltration.

The principal purpose of promoting shared parking is to reduce land devoted to parking, thereby allowing increased densities in urban areas or providing space for open spaces, walkways or other amenities. This will help communities develop better potential for transit and encourage pedestrian and bike commutes, reducing dependence on private vehicles. The overall goal of this and other growth management projects is to create a sense of community in every neighborhood and area of the region, helping individuals feel connected and establishing a sense of place.

Figure 2: Shared Alley Access

Source: http://www.forbes.com/fdc/welcome_mjx.shtml

Shared parking has the ability to not only reduce impervious landscapes, but have economic incentives such as reducing costs of developing and maintaining parking areas for businesses that agree to share parking between themselves. Shared parking increases communication and coordination between individual businesses, among business districts and neighborhood residents, and within large urban districts. By necessity, shared parking brings people together to consider how they can meet mutual needs.

Environmentally speaking, reductions in the amount of surface parking provided for each land use also means less impermeable surface. This means that there is more room for swales, vegetation, and other features that help prevent stormwater run-off from reaching storm sewers, slows the velocity in which water travels over the surfaces, and helps filter out pollutants that get picked up by stormwater such as oil, grease, pesticides, and fertilizers from lawns, driveways, and parking lots.

Residential Shared Drives

Shared driveways residentially offer shared plowing costs, and often extra parking for guests. The typical snow removal service could be between $25-$55, sharing with at least one neighbor would cut costs in half which could save a lot of money during the long winter months. The same principle applies with re-paving and re-surfacing. Some people are hesitant to share a driveway but most likely there will be no issues if you know your neighbors well. And if not, shared driveways are a way to connect to your neighbors and create more of a community feel in neighborhoods. Of course, it would be prudent to look at the deed to spell out restrictions in driveway use and maintenance, or write out a contract. It may also be useful to ask shared driveway owners how it is maintained, or when it was last paved, etc.

Site Specific Considerations & Criteria

Siting & Location

Here, in the Finger Lakes Region when tourism kicks up in the summer season this often results in busier streets, more crowded parking lots, and increased street parking. The Finger Lakes also host many different historic districts with shop lined downtown districts, and residential areas with unique architecture like row houses. Shared parking and shared driveways would help alleviate parking stress during these times without expanding existing parking areas and retaining historical integrity.

Land uses often involved in specific shared parking arrangements include:

- Offices
- Restaurants
- Retail
- Colleges
- Churches, Mosques, Temples etc
- Cinemas
- Special event situations
- Private drives
- Public parks

Figure 3: Parking

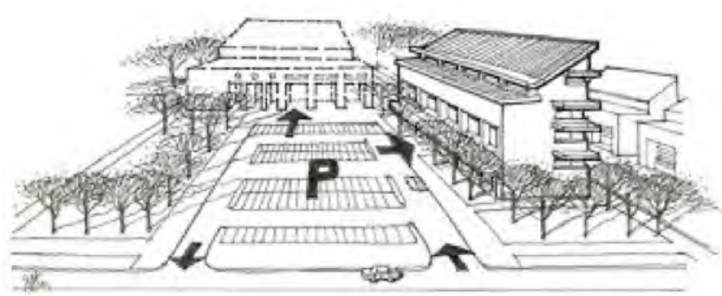
Source: http://www.wbdg.org/ccb/AF/AFSUSTTOOLKIT/Strategies/Site/Strategies_SharedParking.shtml

Shared parking is often inherent in mixed-use developments that house one or more businesses that are complementary, ancillary, or support other activities, such as a small convenience store located in the lobby of an office building. General parking lots and/or on street parking that are available for patrons of nearby businesses/commercial districts are other forms of shared parking. When applied at the district-wide level, it can produce appreciable results.

Example

An example of how the application of shared parking as a growth management strategy produces results is further explained and demonstrated by Figure 4 below. By reducing the number of parking spaces needed by 0.5 spaces per 1000 square feet of gross leasable area built, based on each parking stall being 350 square feet (including the stall and associated circulation area), one acre of land can be saved for purposes other than surface parking for every 249,000 square feet of grass leasable area built.

Figure 4: Shared Parking Between Different Uses



Source: http://mashable.com/2012/04/20/parking-panda/

Narrower roadways, smaller parking areas, and smaller stormwater management systems often result in lower site development costs. Areas that have implemented more shared drives and parking lots have experienced lower average speeds, documented more room opened up for trees and landscaping, improved aesthetics, and reduced the heat island effect by reducing total impervious surface. This is all done by designs that reduce the amount of parking in big over-sized lots and break it up into multiple smaller lots separated by vegetation create more attractive developments.

Zoning

Alternative roadway and parking designs may conflict with local codes, which often have strict requirements for road widths and drainage systems. The city of Geneva does not have any regulations specifically pertaining to shared drives. However, the City of Geneva does have strict guidelines for the amount of minimum parking by use in each zone. These regulations basically do not allow shared parking systems within the City. However, it is still recommended to contact the proper personnel; many boards may be willing to adjust their standards if developers, advocates, and neighbors support the alternative design. Chapter 350, article X Historic Zoning also outlines different recommendations and regulations concerning the alteration of any historic structure.

Overflow Parking

Respondents who are not involved in shared parking arrangements expressed concern that lack of available space will send overflow parking into adjacent neighborhoods and parking areas. People who have experience with shared parking did not typically raise this issue. Good signage and routine enforcement can address any overflow concerns, as well as providing additional assistance for special seasonal or event parking arrangements.

Safety (and Perception of Safety)

Experience has shown that patrons will only use a parking facility if they feel safe. They need to feel that their car is safe from vandalism and theft, and that they can walk freely through an area without encountering danger to themselves. Shared parking will be most successful in areas that are perceived as safe by potential patrons. If the area does not promote a high user confidence level, additional security measures ranging from lighting to security patrols, may assist the signage. Shared parking also reduces crowded street parking-often making it difficult to see pedestrians and oncoming traffic.

Signage

Since many parking facilities are designed to minimize street frontages, thereby reducing visibility, participants in shared parking agreements should provide good signage. For a shared parking area or a shared driveway to be successful, signage must be visible and understandable to people using the area. Signs should indicate clearly where parking is available for each land-use. The signs should be placed at the business, at the street access point, and inside the lot. These signs should be aesthetically pleasing, informative and conform to all appropriate municipal codes.

Maintenance

For shared projects to be a success, maintenance must be on going and thorough. Aesthetics are important. Not only should the facilities have landscaping in good condition, the facilities should be relatively free from litter. Beyond standard upkeep and appearance, the facilities need to be without serious defect (i.e. pavement in good repair, no potholes, and striping and directional arrows should be clearly visible). Maintenance concerns should be addressed though a shared parking agreement between participants. This is particularly important in Historic Districts.

Concerns & Limitations

Many interviews, surveys, and studies have revealed a number of concerns about site design and operation, though none appear to be barriers to shared parking development. Often mentioned issues are:

- Liability
- Location
- Maintenance
- Parking Overflow
- Safety (and perception of safety)
- Enforcement
- Signage

Emergency service access is a common concern with reduced street widths. Where possible, these concerns can be addressed through education or multiple points of access to a site.

Cost

Narrower streets and smaller parking lots cost less than conventional streets because less grading, base material, and pavement is required. Open section roadways cost considerably less than standard designs due to the elimination of curbs and gutters. By increasing shared parking and opening up private or previously designated spots this increases the availability and ease of certain areas making it more convenient to visit and customers more likely to stop and browse.

Conclusion

Shared parking lots and driveways are easy ways to cut down on land used for impervious surface, and ugly lots. By increasing shared parking urban areas become not only less cluttered and often times more safe, due to increased visibility, but also much more appealing to the eye, encouraging more people to visit and make use of urban areas. The Finger Lakes region has pristine waterways and forests, with plenty of historic downtowns for visitors and tourists to enjoy, as well as year –round residents. Shared drives help ensure that this doesn't change, and offers a new way to cut-back on increased urban development that disturbs the beautiful nature and landscapes in the surrounding area.