Title
Rainwater in the Urban Landscape: The Garrison Creek Demonstration Project [Infrastructure as Landscape, Landscape as Infrastructure]

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The connection between city and nature is often made by the human intervention of infrastructure. The manner in which we lay this framework for the support of our daily lives (water, movement, energy, waste removal) can leave a disjointed gap in our environment — or it can intensify and enrich a community landscape of public space.

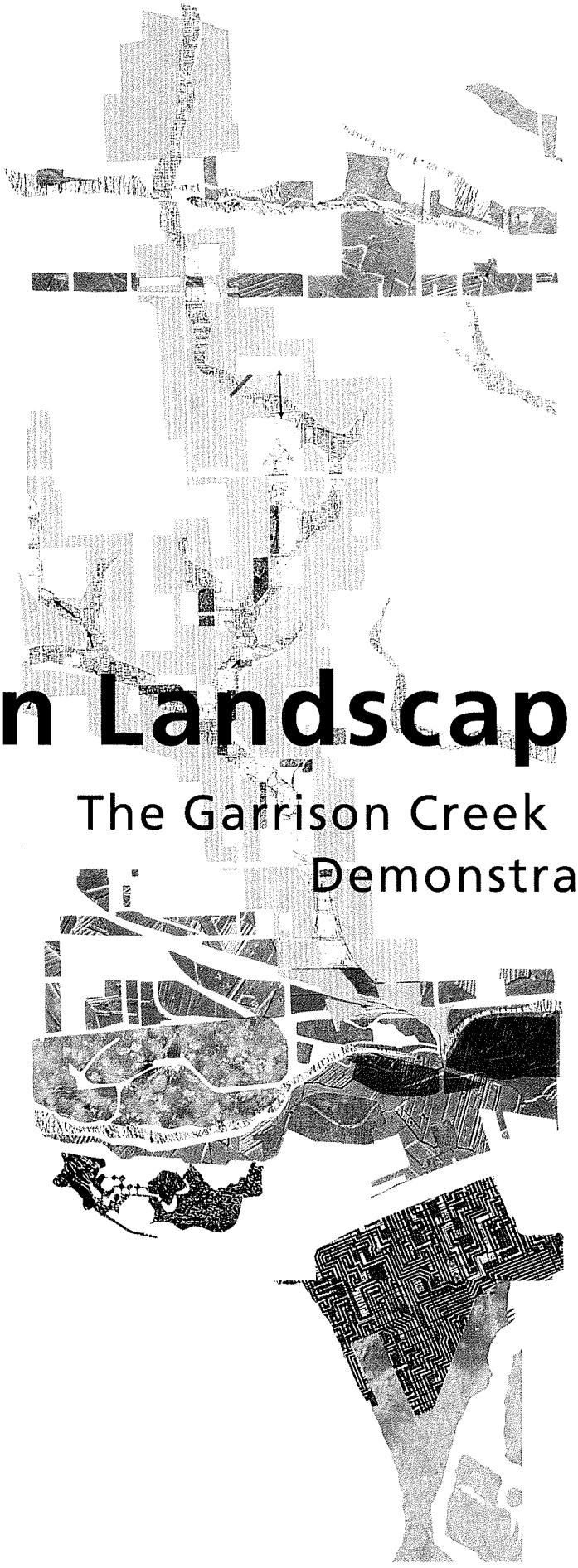
Toronto's Garrison Creek is a typical example of the disconnection between the city and its landscape. Today the creek flows through an elaborate, Victorian brick sewer buried beneath dense urban neighborhoods and parks just west of

Rainwater in the

downtown. Much of the ravine through which the creek once coursed has been filled, and some of it has been built over.

The "connected pond system" proposed here for the Garrison watershed could reverse this century-old trend of disconnection. The pond system would divert stormwater from the city's underground sewers into a community park system where it would be collected, stored, cleaned and reused. The pond system would be built in phases through a currently disconnected set of city parks that trace the original path of the creek and ravine to the shore of Lake Ontario — regenerating the open and hidden landscapes of Toronto into a vital and living part of people's experience of the city.

The Garrison Creek Project has been partially funded by the Canada Council and the Waterfront Regeneration Trust.



Urban Landscape

The Garrison Creek Demonstration Project

Co-evolving systems: Toronto's Garrison Creek Ravine, city structure and water infrastructure. Graphics courtesy James Brown and Kim Storey.

A swimming hole made by the excavation of Christie Pits, a quarry in the Garrison Creek Ravine, c. 1915. Courtesy City of Toronto Archives.

Our examination of the open spaces that trace the Garrison Ravine has included many layers of information: actual physical data about the open spaces and original landform (sizes, characteristics, topography, soil composition, etc.), built form patterns, local economic development, archaeological and buried artifacts, present water collection systems, night lighting, how people (and cyclists and cars) move through the system and so on.

This broad approach enables us to propose an integrated and sustainable infrastructure solution that responds to more than one issue. The money spent on wastewater treatment infrastructure, traditionally perceived as a single-purpose system, would have the additional public benefit of regenerating the city's parks and creating a connected public open space system.

Co-Evolving Systems

The history of Garrison Creek is a story of exchange between the evolving urban and environmental landscapes of Toronto. When the first British Governor, Lord Simcoe, arrived in 1792 to establish a military outpost, Garrison Creek had been flowing for thousands of years, meandering through a ravine cut into the vast, sloping plain by the receding waters of an ancient glacial lake. In the eyes of army engineers, the creek provided a secure natural water resource for Fort York.

The balance between town and ravine first shifted with the laying out of "Park Lots" by Lord Simcoe's engineers. This system of orthogonal land division created large estates that were offered as enticements to prospective gentlemen settlers. Although the boundaries of these lots ignored the influence of the ravine, the first villas that were constructed did not – they typically were sited on the banks of the ravine, at the highest point, and formally addressing Lake Ontario.

Early in Toronto's history, many industries located along Garrison Creek, particularly close to the lake. As industry and settlement increased, the Garrison was used for discarding waste. It quickly became polluted and its status changed from water resource to health hazard due to its noxious fumes.

In the late 1880s, the creek was buried in a ten-foot diameter brick sewer built to provide predictable, safe and serviceable stormwater and wastewater management. If infrastructure can be considered as the connection between the city and the natural landscape, then the burial of the creek reflected the attitude that nature was to be found in the wilderness and open space within the city limits was better managed as predictable land parcels.

During Toronto's rapid growth in the early twentieth century, the Garrison Creek ravine, though partially filled by the brick sewer, persisted as a continuous open space network. The ravine's use as a site for local industry established it as a vital part of the city's economy; certain locations, such as Christie Pits and Shaw Pits, became gravel quarries and others, such as Bickford Vale and the present College-Crawford intersection, were developed as brickyards.

At the same time, park lot owners began to subdivide and sell their large estates, and most of the ravine lands were designated for filling and new residential development. However, up until the 1920s, the City of Toronto followed a policy of acquiring Garrison ravine lands (including Trinity Bellwoods Park, Christie Pits, Bickford Ravine and Prittie Ravine) to create and maintain a publicly owned connected open space system. Where streets intersected with the ravine, the city built an elaborate system of bridges (at first wood, then concrete) that ensured the city and the ravine could coexist as continuous paths for movement.

A certain balance was possible at this point: the city could co-exist with the ravine, its natural host. The neighborhoods of the watershed were conceived around the continuous open space of the

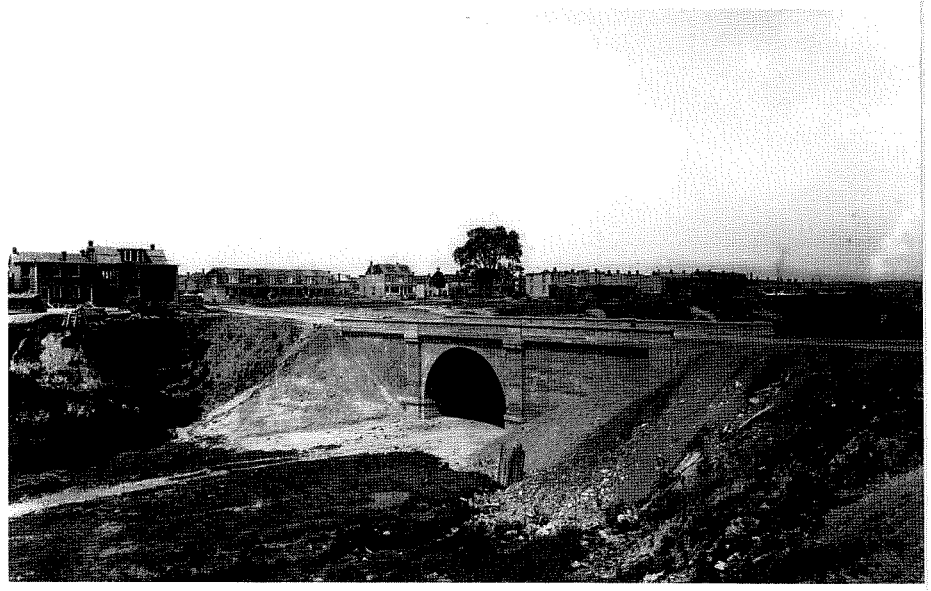
ravine. Major institutions sited along the ravine, like the original Trinity College, brought vitality and prestige as central monuments. The bridges were landmarks that made direct connections between the city grid and the natural ravine course.

In the 1930s and '40s, however, city politicians lost interest in the Garrison lands. Both public parks and private property designated for housing development were treated as inexpensive landfill sites, available for dumping garbage and construction debris. Only vestigial traces of the ravine profile remain, and many of the bridges, which had been instrumental in preserving the continuity of the ravine through the grid, were buried intact.

This third wave of settlement reflected a break in the relationship between city and nature – they were no longer regarded as integrated, co-existing, harmonious elements, but as very separate and non-compatible entities. The parceling of the ravine lands into separate parks divided by city streets allowed the piecemeal disintegration of the Garrison system. As one piece of the ravine was filled, another maintained a ghost of the ravine profile, and another was sold off for new housing, a new school or a shopping center. The central, sustaining core of the Garrison community had been lost.

The Combined Sewer System and CSOs

In an urban setting, rainfall washes over street pavements, roofs, gardens, yards and trees, capturing both bacterial and metal contaminants in the process. The sewer system that was built in the Garrison watershed (and still essentially in place today) was a typical "combined sewer system," which channels both stormwater and sanitary sewage in a single pipe. The combined volume of rainwater runoff and sanitary sewage is carried to a treatment plant, where it is cleaned and discharged to the receiving waters – Lake Ontario.



Harbord Street Bridge, c. 1915, connecting Bickford Vale and Montrose schoolyard. This bridge was buried intact during the 1930s or '40s when the south part of Bickford Ravine was filled. Courtesy City of Toronto Archives.

In heavy rainfalls, the amount of stormwater suddenly increases and exceeds the sewer system's design capacity. The excess mix of stormwater and raw sewage escapes from the sewers directly into the lake through what are called "CSOs" – combined sewer overflows. These discharges are considered to be the prime cause of local bacterial pollution, so after heavy rainfalls Toronto's beaches are typically closed to swimmers. This has made the elimination of CSOs a common environmental, political and community goal.

As Toronto's sewer infrastructure ages, the city is planning to rehabilitate and rebuild many of the original lines. The Public Works Department has also proposed a large, new storage tunnel that would collect and store CSOs until the excess water can be treated later. This tunnel would be located beneath the waterfront at a cost of $60 million.

We believe the city can reduce the volume and improve the quality of rainwater that drains into the sewers by collecting and treating rainfall locally within the Garrison watershed. The connected pond system is part of a fine-grained solution that could include environmentally sensitive stormwater management programs (such as downspout disconnection, rain barrels, tree canopies, French drains and porous pavements) and treatment methods (such as biofiltration systems and smaller local treatment plants). The system would enlist the resources of the community landscape – neighborhood, open space, individual and collective – to treat rainwater as a renewable, reusable resource instead of a disposable waste.

Opposite page, left: The existing context. Right, from top down: Detail of Garrison sewer, ravine, open spaces and institutions; detail of built context on landfill; detail of areas of depressions.

Toronto has generally been considered too densely developed to allow for the amount of land necessary to manage stormwater through techniques like these. However, we have traced the topography of the original watershed through a series of existing, unconnected park lands — open space that adds up to a considerable inventory of land in public ownership and suggests that alternative stormwater management techniques are not only possible but also can contribute to the regeneration of a community infrastructure.

The Christie–Bickford–Montrose Demonstration Site

To test the idea of local rainwater collection in the Garrison system, we examined a trio of once connected parks — Christie Pits, Bickford Vale and the Montrose Schoolyard. The evolution and condition of these parks are representative of many of the special areas that occur along the length of the Garrison Ravine. We sought to demonstrate how alternative stormwater management techniques could not only help the city collect, treat and reuse rainwater but also catalyze the regeneration of the ravine parks and adjacent communities — and of the Garrison ravine system as a whole.

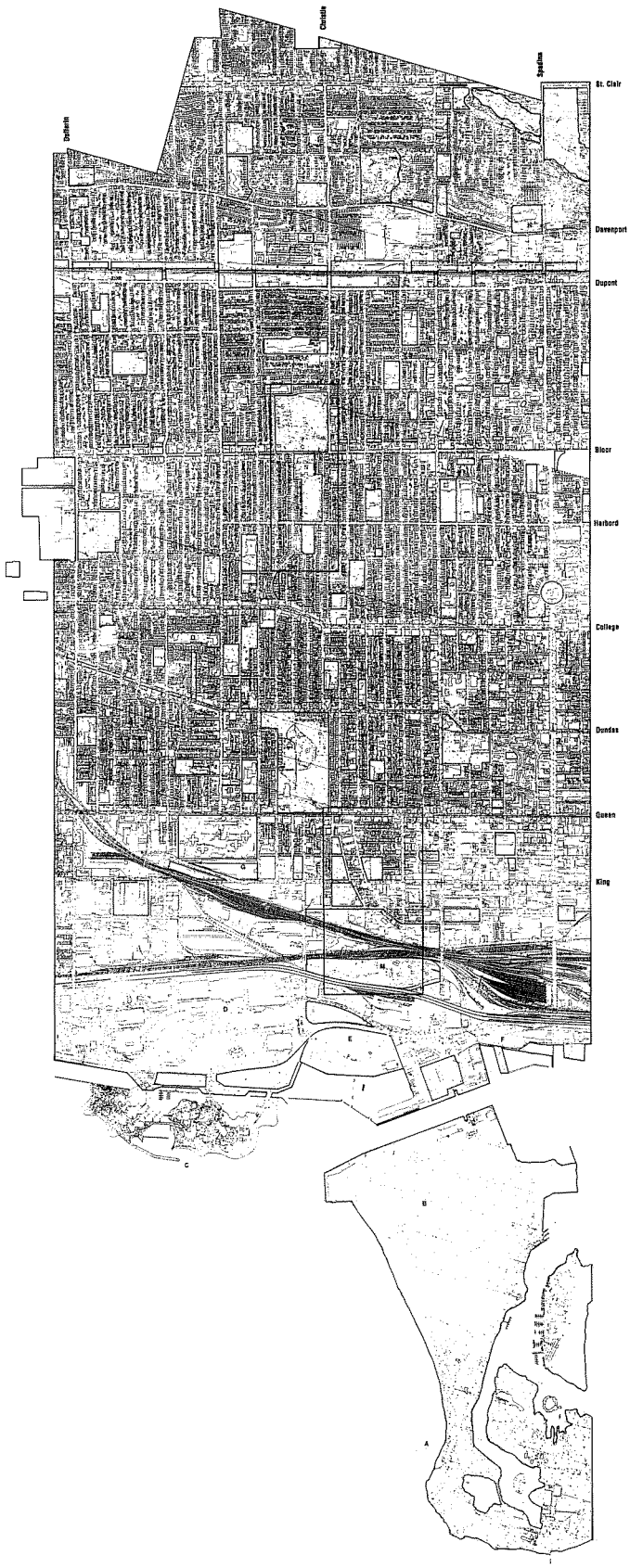
Christie Pits, Bickford Vale and Montrose Park once formed a continuous ravine. For many years, these parks remained connected because bridges at Bloor Street and Harbord Street, constructed at the turn of the century, allowed the ravine to continue through. When these bridges were filled in, the connectedness of these open spaces was lost, along with the grand scale of the ravine. After the ravine had been divided into small parcels, filling it in became simpler to accomplish through incremental steps. Today the area around these spaces is largely residential, with commercial cross streets occurring at Bloor Street and Harbord Street.

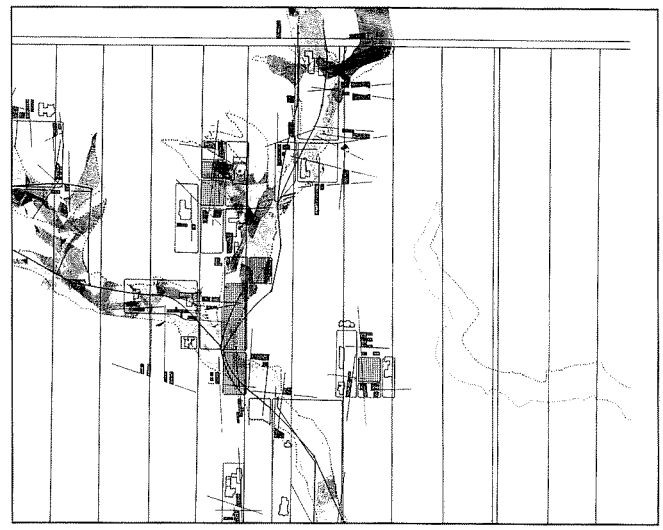
Willowvale Park (commonly called Christie Pits) began operation as a large, deep gravel quarry in the 1880s. It was acquired by the city in 1906 and partially filled in the 1910s. The present-day park is set approximately 50 to 60 feet below street level, sloping steeply up to the sidewalks on all edges. The grounds now contain recreational facilities, including an outdoor pool, changing rooms, baseball diamonds, seasonal washrooms and a children's playground. The western edge was developed as small housing lots, and a row of garages on a lane now faces the park. A sharply descending asphalt path at the northeast corner is the only path into the park from the north.

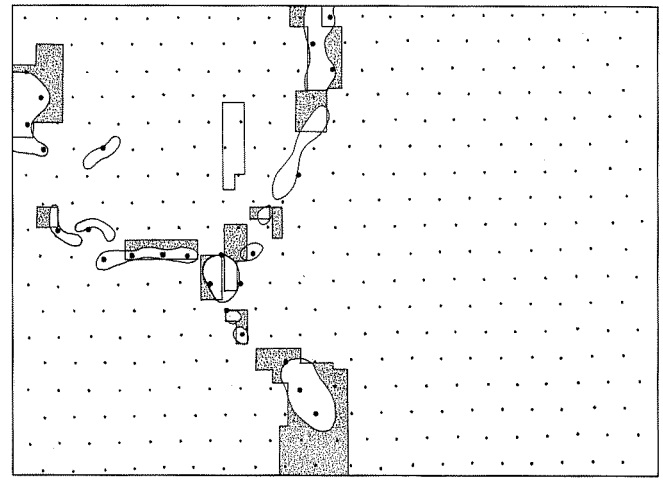
Directly south of Christie Pits lies Bickford Vale, originally known as Bickford Ravine. It was once used as a brickyard, and, like Christie Pits, the original banks of the ravine quickly disappeared through excavations for clay that gradually increased its width. This area was obtained by the city for parkland in the early 1910s. The ravine was then filled with garbage to a level of about twenty-five feet below the surrounding streets.

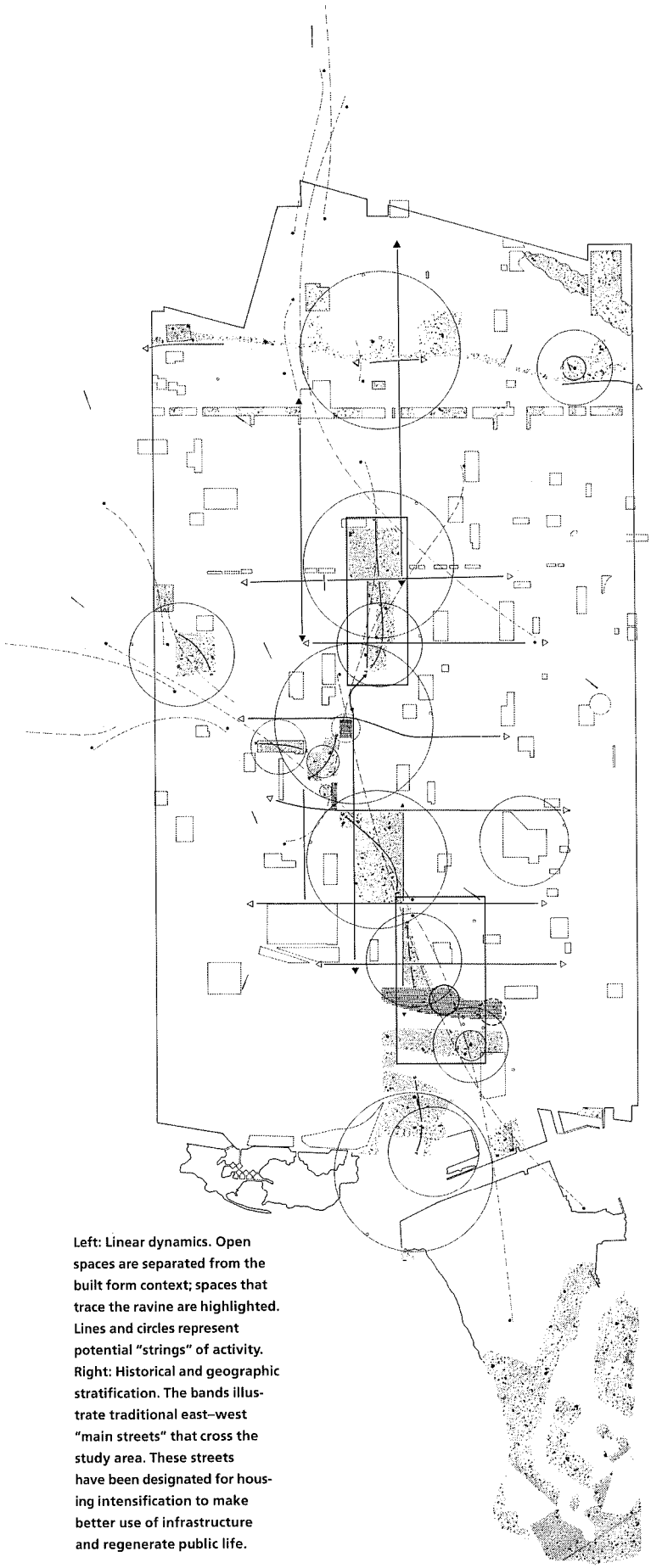
The sloping edges of Bickford Vale still recall the ravine depression, although its present depth is only a faint reflection of the original ravine. Bickford contains one baseball diamond and one bocci court, but its predominant character is that of a largely vacant green space.

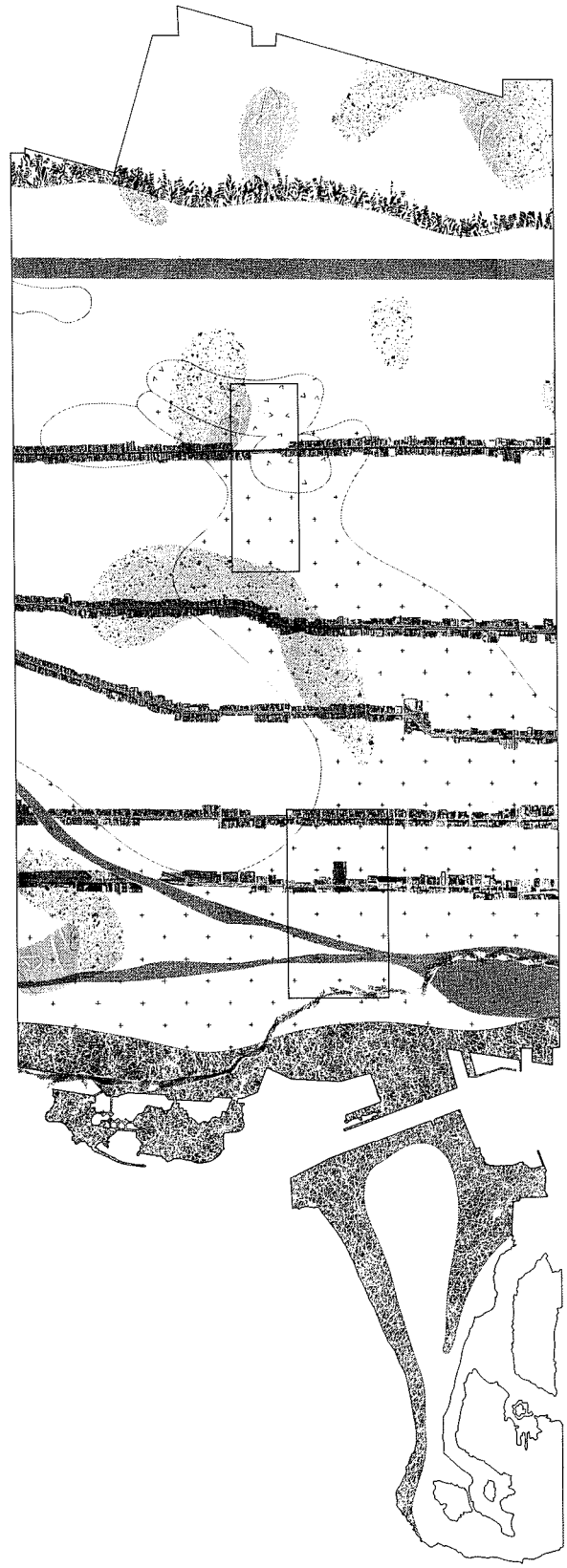
The Montrose Park and Schoolyard were once connected to Bickford Ravine by the Harbord Bridge. After the city took possession of this land, the eastern and southern edges were developed for single-family housing. Since that time, this site has been filled to the level of the surrounding streets. The filling of Montrose Park probably prompted the burial of the Harbord Street Bridge. On the western edge of the park, part of the open space became the site for Montrose Public School, built in the 1960s.


Christie
Spadina
Dufferin
St. Clair
Davenport
Dupont
Bloor
Harbord
College
Dundas
Queen
King

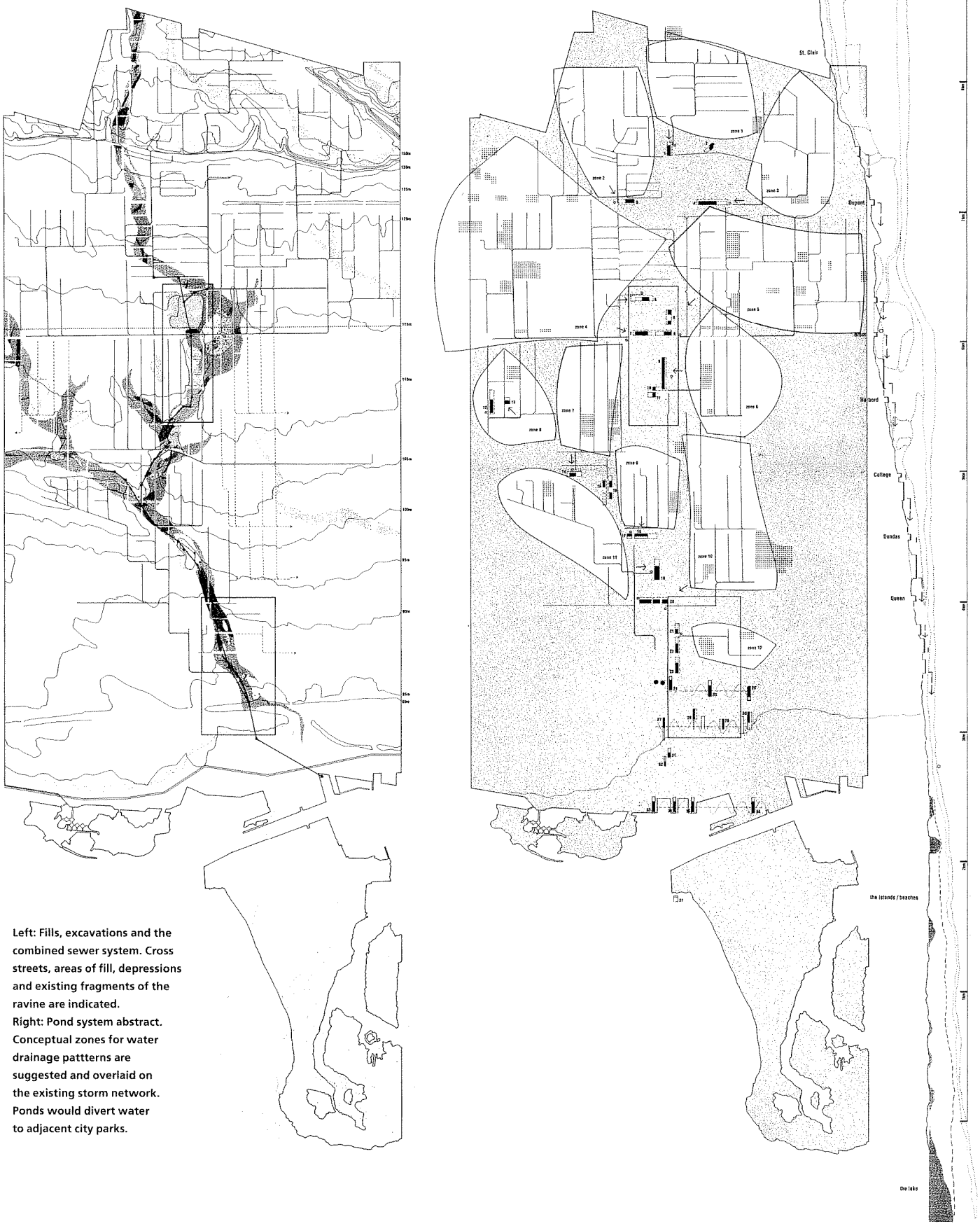








Left: Linear dynamics. Open spaces are separated from the built form context; spaces that trace the ravine are highlighted. Lines and circles represent potential "strings" of activity. Right: Historical and geographic stratification. The bands illustrate traditional east–west "main streets" that cross the study area. These streets have been designated for housing intensification to make better use of infrastructure and regenerate public life.



Left: Fills, excavations and the combined sewer system. Cross streets, areas of fill, depressions and existing fragments of the ravine are indicated.
Right: Pond system abstract. Conceptual zones for water drainage pattterns are suggested and overlaid on the existing storm network. Ponds would divert water to adjacent city parks.

Standing on a small footbridge over Garrison Creek as it passes through the northeast corner of Christie Pits, c. 1905. This area was filled by 1915. Courtesy City of Toronto Archives.

The Connected Pond System

The north-to-south progression of parks, Christie to Bickford to Montrose, corresponds to a progression from the largest space to the smallest, and from the highest elevation to the lowest. This provides a rationale for the pond locations: Christie Pits, the largest park, can accommodate larger bodies of water; Bickford's length enables a series of thin linear ponds; and the nature and scale of the Montrose schoolyard provides the best siting for a small and finite wetlands that can be part of an educational curriculum. The schoolyard also serves as the temporary terminus of the demonstration project's conveyance train.

Four stormwater drainage zones serving adjacent neighborhoods would be disconnected from the sewer system and fed into the new pond system. For this project, we have assumed the number and type of ponds that would be needed and the techniques that would be used; ultimately, the volume of the water that is tapped from each zone would determine the number of ponds required and their capacities.

The rainwater would be collected and treated through a system of filtration and detention ponds in a gravity-fed, finite system that ends in a small wetlands. After the rainwater passes through the detached autonomous system, it could travel in many different ways. It could be reused for irrigating parks, stored naturally in an urban canopy of trees, left to filter into the groundwater supply or directed back into the underground wastewater system as a smaller and cleaner volume than what was collected. Eventually the demonstration project could connect into a connected pond system that would trace the course of the ravine all the way to Lake Ontario.

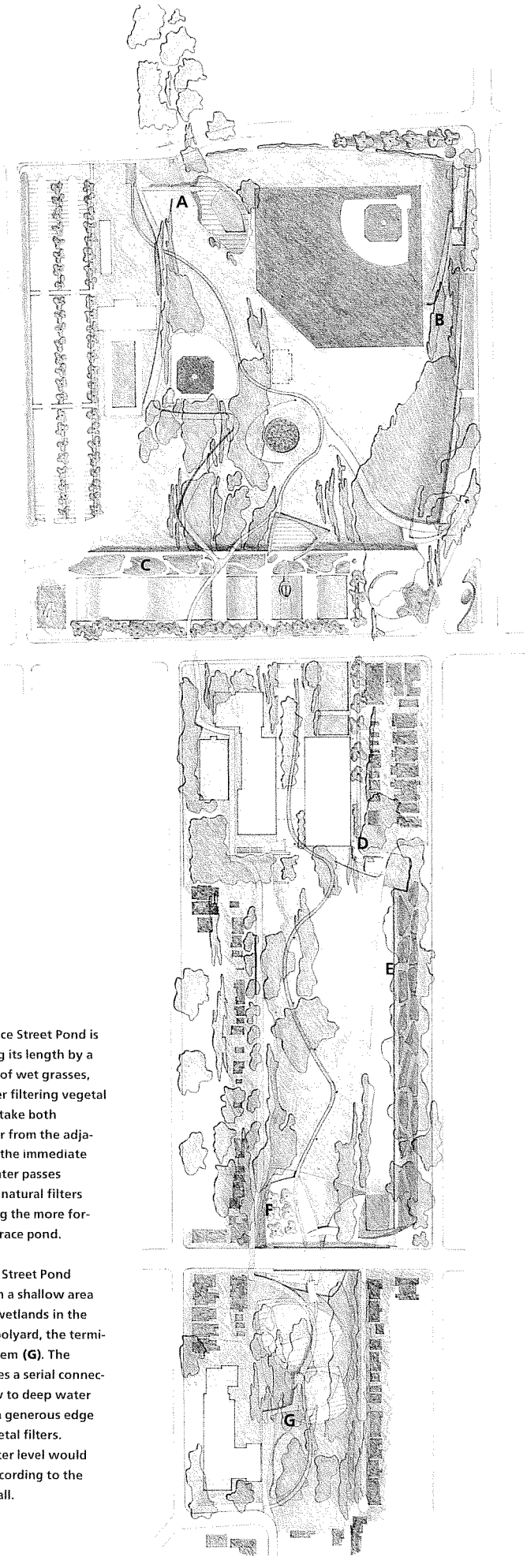
The specific elements of the demonstration project play many roles as the instruments that integrate the function of the water treatment infrastructure with urban and environmental design.

The infrastructure of the stormwater system is integrated with vegetal, urban and civic spaces to create cultural and recreational benefits from the water while functioning as a local collector of rainwater.

The Metropolitan Context

The Garrison watershed is one of twenty creek systems, intact or buried, that run down the gently sloping Toronto plain into Lake Ontario. Many of them have a set of open spaces that could support connected pond networks similar to that proposed here. This study of restoring Garrison Creek to its original function of collecting and draining rainwater can be a prototype for these other watersheds.

The Garrison Creek Connected Pond System can be seen as part of a larger movement towards more ecological methods of stormwater collection and treatment. If stormwater management ponds can act as catalysts for the regeneration of disconnected green spaces, then every creek in the region represents a significant opportunity for creating linked open space systems that knit local neighborhoods to the lakeshore, and the region to its landscape.



The Garrison Creek Project: An Autonomous Pond System

This proposal envisions a connected stormwater and park system in four of the zones depicted in the "pond system abstract" on page 21. Stormwater from adjacent neighborhoods would be diverted from the existing sewer system into a series of ponds that re-create the natural drainage pattern of the watershed.

A The Raised Standing Pool is sited on a constructed promontory, making a historical reference to the original bank of the Garrison Ravine. The pool at this raised height collects and measures rainwater directly.

B, C Linear connecting ponds are strategically located to refer to the original presence of water in the ravine, to create both formal settings and to reconfigure natural landscapes in Christie Pits and Bickford Vale.

The ponds located along Christie Street **(B)** collect water for an adjacent drainage zone and feed it (by pumping or gravity) to a larger group of ponds **(C)** along the public face of Bloor Street. These ponds are both shallow and deep and form part of the "Christie Terrace," a raised promontory that looks north across the expanse of Christie Pits. The flow of water from these ponds is pumped below grade, under Bloor Street to cascading courtyard ponds in the Bob Abate Centre.

D The gravity-fed connection from the stepped Bob Abate ponds to the long Grace Street Pond is made by a canal that acts both as a shallow filter and channel during normal periods, and allows water ponding during storms.

E The long Grace Street Pond is bordered along its length by a receiving area of wet grasses, reeds and other filtering vegetal elements that take both collected water from the adjacent zone and the immediate catchment. Water passes through these natural filters before reaching the more formally edged Grace pond.

F, G The Grace Street Pond passes through a shallow area **(F)** to a small wetlands in the Montrose schoolyard, the terminus of the system **(G)**. The marsh combines a serial connection of shallow to deep water and supports a generous edge of natural vegetal filters. The marsh water level would rise and fall according to the seasonal rainfall.