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The Future of New York City's Waterways and Movable Bridges

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HEAVY MOVABLE STRUCTURES, INC.



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The Future of New York City's Waterways and Movable Bridges

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Abstract

In the late 1800s and first half of the 20th Century New York City's waterways were some of the busiest in the United States and the bridges across them opened frequently for the intensive maritime traffic. Over the past 100 years, the role of these waterways and the movable bridges that span them have evolved as commerce has shifted away from the smaller waterways.

In response to a long-term shift in the activity on the city's waterways, the New York City Department of Transportation engaged a study of existing and future use of the waterways to determine whether the 24 city-owned movable bridges can be replaced with new movable bridges, new fixed bridges, fixed in place, or if their method of operation can be revised. Where a movable bridge is not required for navigation, a fixed bridge offers potential operating and maintenance cost savings. Rather than reviewing each bridge in isolation, the study examined the waterways and multiple movable bridges as an integrated system. The factors considered and study recommendations are discussed.

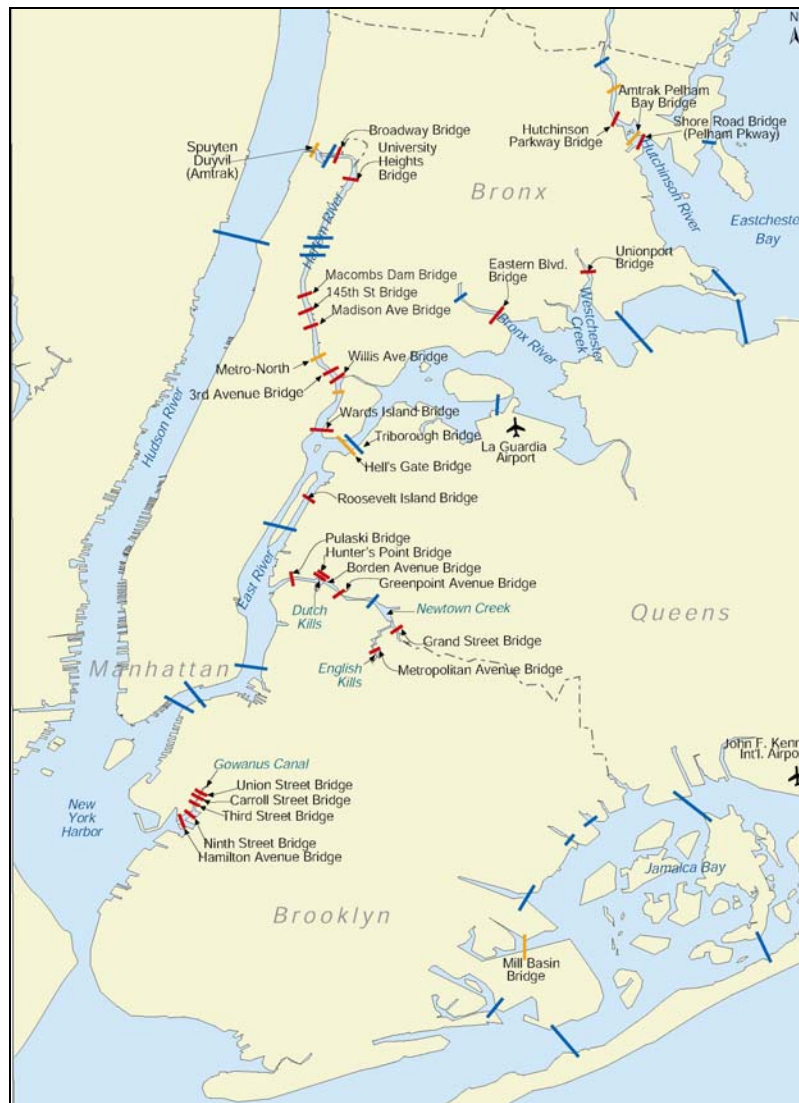


The Pulaski Bridge spans the gateway to Newtown Creek, one of New York City's most important waterways.

The Changing Character of Urban Waterways

During the late 19th and early 20th Centuries, New York City's inland waterways were among the busiest shipping routes in the nation. Many of the bridges that crossed them were movable, to accommodate both land and water transportation, and opened often to allow for the passage of maritime traffic.

Over the years, most commerce has shifted from the inland waterways to container vessels, rail and truck transport. With the lessening of waterborne traffic, the function of the waterways has changed. Yet the inventory and character of the movable bridges has stayed much the same.



The Waterways and Movable Bridges of New York City

As part of New York's turn-of-the-century infrastructure, the movable bridges were built in accordance with national maritime law that requires U.S. waterways to remain

navigable. These bridges continue to be major city assets. But movable bridges are expensive to operate, staff, monitor, and maintain and can also create impediments to vehicular traffic. With the decline in maritime traffic, it may no longer be necessary for all the bridges to remain movable.

Land use along the waterways has changed dramatically as well. Factories, warehouses, service and repair facilities were originally located on the banks and relied upon the waterways to move a wide range of products. Now, as the nature of the industries and transportation has altered, far fewer businesses depend on waterborne transport. Today, for the most part, the bridges are much more important as key elements in the street transportation system.

Taking Stock

In view of this shift, the New York City Department of Transportation decided in 1999 to investigate the current and future uses of the waterways to determine the appropriate approach to its bridges, prior to continuing with rather costly rehabilitations of the existing bridges. Parsons Brinckerhoff was selected as prime consultant for the comprehensive study of New York City's waterways and movable bridges, to evaluate which bridges should remain as they are and which could be fixed in place, replaced with new movable or fixed structures, or whether their methods of operation could be modified.

The study, which marked a change in the DOT's planning strategy, looked at seven New York City waterways and the 24 bridges that span them. In the past, the bridges were typically considered on a case-by-case basis according to their condition rating, within the context of the city's ongoing maintenance and reconstruction program. Instead, in its examination of all the bridges at once, the study signaled a move to a more holistic and broader view of the role of the movable bridges and navigable waterways in the city.



The Gowanus Canal area has potential for future mixed use development.

The study was the first long-range comprehensive investigation of the entire inventory of the city's movable bridges and also the first to consider broader land use, economic and community issues including pedestrian circulation and historic resources. It covered small waterways in four of the five boroughs and the Harlem River, but excluded the Hudson River and the southern portion of the East River, which have no movable bridges.

Methodology

The study was a multidisciplinary effort that incorporated a wide range of data from planning and land-use forecasting to the analysis of maritime operations and vehicular traffic to historical, environmental, and legal reviews. It involved surveys of property owners and businesses, coordination with various city agencies, the Long Island Railroad and Amtrak, which own bridges near some of those evaluated and therefore share common concerns, and the active participation of the Coast Guard, which has jurisdiction over all navigable waterways.



The study took a coordinated approach to multiple bridges on each waterway, including coordination with the Long Island Rail Road regarding its bridges on Dutch Kills.

The analysis included conceptual engineering, cost-benefit analysis, and the estimation of costs, including bridge operation, maintenance, rehabilitation and construction costs as well as estimating business relocation costs. A two-step evaluation

process was used to arrive at the final recommendations for each waterway and each bridge.

The structures surveyed represented a wide variety of movable bridge types, including retractile, bascule, swing, and vertical lift bridges. For each bridge, the study evaluated six alternatives for the future. The “maintain existing bridge” alternative served as a baseline for comparison; other options are replacing the existing bridge, modifying bridge operations, constructing a higher movable bridge, constructing fixed bridges of varying heights, and removing the bridge.

The study was the first of its kind to consider each bridge both individually and as part of a system. Since the bridges along a waterway are interrelated by the maritime traffic that passes through them, the analysis weighs how the alternatives at one bridge affect the options at other bridges up and down stream, as well as how they affect navigation, businesses using maritime transportation, and general land use patterns and trends along the associated waterway. Through a screening evaluation, the alternatives for each bridge were reduced to a list of one to three prime candidates, from which the recommended one was selected.

A Wide Range of Considerations

In addition to the current uses of the waterway, other considerations influenced the outcome of the study. On the Gowanus Canal, for example, although there is relatively little commercial traffic, the special characteristics of the waterway and its bridges, the opportunities for residential and commercial development in the area and the potential future uses of the canal for recreational purposes induced the investigators to favor keeping the bridges movable.



*Schoolchildren enjoy the Gowanus Canal
and Carroll Street Bridge.*

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The historic value of some of the city’s bridges as examples of engineering or design trends of a particular era was also taken into account. The Carroll Street Bridge over the Gowanus Canal and the Borden Avenue Bridge over Dutch Kill have historic significance as two of only four remaining retractile bridges in the United States. While

the study recommended retaining the Carroll Street Bridge as movable, different circumstances suggest fixing the Borden Avenue Bridge in place or replacing it. Its historic character will be a significant factor in deciding the best approach to that bridge.

Conclusions

The recommendations were influenced by subtle distinctions among the waterways that were revealed during the study. On some, there were factors that justified keeping the bridges movable; on others there was no reason to do so. Although there are no businesses conducting commercial shipping along the Harlem River, for example, the waterway is seen as a vital connection between the Hudson, East River, and Long Island Sound, and thus the entire string of bridges has strategic value. Therefore, they will be preserved as movable bridges.

To the surprise of the investigators, the busiest bridge identified in the study was the Shore Road Bridge over the Hutchinson River, which opens the most frequently. This bascule bridge, one of the oldest and most distinctive in the city, is also quite low. Recognizing the need to keep it movable, the study recommended replacing it with a higher movable structure that would allow more vessels to pass beneath and while reducing the frequency of openings.



The narrow Grand Street Bridge was identified as a potential candidate for replacement with a fixed bridge.

the original structure, which is too low and narrow to meet the needs of today's trucks and buses. The bridge replacement will not only strengthen the local transportation infrastructure, but will also contribute to the economic improvement of the surrounding area.

Along Newtown Creek, on the other hand, it was found that although the trunk of the waterway is still an active shipping corridor, upper branches crossed by some of the bridges no longer have marine activity requiring the bridges to open. It was therefore suggested that the Grand Street swing bridge, for example, be replaced with a new fixed bridge. This would also resolve problems resulting from the design of

This comprehensive analysis produced concrete and practical suggestions for the city to act upon. The study recommended that six of the 24 bridges be fixed in place or replaced with new fixed bridges. The study notes that fixing an existing bridge in place involves fewer analyses and permits and more limited engineering and construction than building a new fixed bridge but foregoes the opportunity to improve physical characteristics of a bridge, such as roadway geometry and lane widths.

In addition to the six recommendations for fixed bridges, the Shore Road Bridge was identified as a candidate for replacement by a higher bridge that was either fixed or movable, depending on height. The recommendations for the rest were that they be rehabilitated or replaced, but remain movable. The city is moving to implement the recommendations, subject to approval by the Coast Guard. The Grand Street Bridge on Newtown Creek is targeted as the first to be replaced.

Overall, the study will prove invaluable in ensuring the evolution of an efficient water and highway transportation system for the city and will lead to savings in maintenance and operating costs over the long term. It can also serve as a model for other cities, like Chicago and Milwaukee, that have movable bridges over urban waterways.