Swimming in the Hudson River Estuary

Feasibility Report on Potential Sites

Prepared for

The Hudson River Estuary Program
New York State Department of Environmental Conservation
Denise M. Sheehan, Acting Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Bernadette Castro, Commissioner

George E. Pataki, Governor
2005

Swimming in the Hudson River Estuary

Feasibility Report on Potential Sites

Prepared for

The Hudson River Estuary Program
New York State Department of Environmental Conservation
Denise M. Sheehan, Acting Commissioner

New York State Office of Parks, Recreation and Historic Preservation
Bernadette Castro, Commissioner

Prepared by

Lawler, Matusky & Skelly Engineers LLP
One Blue Hill Plaza
Pearl River, New York 10965

and

The Hudson Group LLC
245 State Street
Albany, New York 12203

George E. Pataki, Governor
2005

TABLE OF CONTENTS

Appendices for this feasibility report are available at www.dec.state.ny.us

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

BACKGROUND

In the 19th and early 20th Centuries, millions of people swam in the Hudson River every summer, from public beaches along the river's length or in floating pools located along Manhattan's shoreline. Worsening water quality conditions, increasingly stringent public health codes, liability issues and increased costs in operating beaches caused many of these facilities to close. Swimming in the Hudson River was largely abandoned, limited to a handful of public beaches.

Beginning in the 1960's the federal and state governments adopted and implemented significant environmental laws intended, in part, to restore the water quality of our rivers, streams, and lakes. This public investment – culminating in the passage of Governor Pataki's 1996 Clean Water/Clean Air Environmental Bond Act – has resulted in remarkable improvements in the cleanliness of Hudson River water. Today, water quality improvements in the Hudson River allow us to once again consider expanding opportunities for public swimming, addressing significant needs of the citizens of the Hudson Valley and the New York City metropolitan area and allowing the public to more fully enjoy the benefits of its investment in a cleaner Hudson River.

The purpose of this study was to identify feasible sites for public swimming along the Hudson River from the Troy Dam to the Battery in Manhattan. The status of existing beaches was also examined, and recommendations were made for improvements at these sites. In addition, the study identified places on the river where swimming could potentially take place in the future with continuing improvements in water quality. In locations where beaches are not physically possible, the study also examined opportunities to create alternative swimming facilities. The findings from this study should be considered as the results of a preliminary analysis rather than recommendations for site development.

This study was conducted pursuant to the 1998 Hudson River Estuary Action Plan released by Governor George E. Pataki and was undertaken as a partnership project of the New York State Department of Environmental Conservation (NYSDEC) and the New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP). The Action Plan is a blueprint for the NYSDEC and partnering state agencies to implement specific management actions along the estuary, addressing three general themes: conservation of natural resources; remediation of pollution; and public use and enjoyment of the river.

Governor Pataki, in his 2004 State of the State Address, called for plans to improve the health of the Hudson River by 2009 – the 400th anniversary of Henry Hudson's exploration of the Hudson River on the Half Moon – so that the Hudson River will be swimmable from its source in the Adirondacks to New York City.

DESCRIPTION OF THE STUDY

An initial inventory of potential beach sites was developed through mail surveys, public meetings, and site visits. This effort resulted in a list of 60 sites. Sites with insurmountable obstacles were eliminated from further review, and field surveys of the remaining sites were conducted. Each site was given a numerical score based on selected criteria, including: beachfront conditions, accessibility, hydraulic conditions, water quality, and feasibility of construction and operation of a swimming facility. The screening resulted in the selection of 17 potential swimming sites to be subjected to a more comprehensive review, which focused on health, safety and environmental considerations, and site feasibility. In addition, five existing public beaches along the river were also studied in order to identify potential improvements and to develop cost estimates of such improvements.

Following this evaluation, these sites were classified into four groups:

A. Potential Improvements to Existing Swimming Sites

B. Feasible New Sites

C. Potential New Sites Requiring Additional Action to Become Feasible

D. Potential New Sites With Substantial Barriers to Development

Additionally, options for sites not suitable for development of a typical beach were studied (i.e., floating pools at Hudson River Park and Mills Norrie State Park).

SUMMARY OF FINDINGS

I. Site Specific Studies

A. <u>Potential Improvements to Existing Swimming Sites</u>

The study determined that four of the five existing Hudson River beaches would benefit from improvement. They are:

-Saugerties Village Park (Village of Saugerties, Ulster County)
-Ulster Landing County Park (Town of Ulster, Ulster County)
-Kingston Point City Park (City of Kingston, Ulster County)
-Croton Point County Park (Village of Croton-on-Hudson, Westchester County)

The total cost of capital improvements for these four beaches was estimated to range from $1.3-2.1 million. Operating costs were not estimated for these sites, since it is not expected that the capital improvements would increase current operating costs. The fifth existing site, Port Ewen Municipal Park (Town of Esopus, Ulster County), has been

closed due to the presence of aquatic vegetation. Potential improvements to this site were not explored because no solution to the aquatic vegetation problem has been identified.

B. Feasible New Sites

Of the 17 potential sites studied, five were identified as feasible with no additional action necessary, other than the construction of a beach and related facilities and the approval of the property owner. All five of these sites are publicly owned. The cost of developing these five sites is estimated to be about $5.5 million for capital improvements and $200,000 per year for operating expenses.

The five sites are:

-Stuyvesant New York State Office of General Services (NYSOGS) property (Town of Stuyvesant, Columbia County)
-Kowawese NYSDEC Unique Area/Orange County Park (Town of New Windsor, Orange County)
-Riverfront Park (Town of Stony Point, Rockland County)
-Rockland County Park (Town of Haverstraw, Rockland County)
-Kingsland Point Westchester County Park (Village of Sleepy Hollow, Westchester County)

C. Potential New Sites Requiring Additional Action to Become Feasible

Eight sites were identified as potentially feasible but in need of significant additional action, such as land acquisition, water quality classification change or resolution of potential conflicts with other public policies. The total cost of developing beaches at these sites is estimated to be approximately $3.5 million, not including the costs of land acquisition, water quality improvements, and other needed actions. Operating costs were not estimated for all sites in this category, but can be expected to fall in the range of $25-$40,000 a year per site. These eight sites are:

-Henry Hudson Town Park (Town of Bethlehem, Albany County)
-Schodack Island State Park (Town of Schodack, Rensselaer County)
-Four Mile Point (privately owned, Town of Coxsackie, Greene County)
-Mills Norrie State Park (Town of Hyde Park, Dutchess County)
-Little Stony Point State Park (Town of Philipstown, Putnam County)
-White Beach (privately owned by Con Edison, Verplanck, Town of Cortlandt, Westchester County)
-Nyack Beach State Park (Town on Clarkstown, Rockland County)
-Hudson River Park (Borough of Manhattan, New York County)

D. Potential New Sites with Substantial Barriers to Development

Four potential sites were found to have substantial barriers to development due to sediment, water quality, or other local conditions. No costs were estimated for these sites. They are:

-Bristol Beach State Park (Town of Saugerties, Ulster County)
-Bowline Point Town Park (Town of Haverstraw, Rockland County)
-Louis Engel, Jr. Waterfront Park (Town of Ossining, Westchester County)
-Dobbs Ferry Waterfront Park and Wickers Creek (Village of Dobbs Ferry, Westchester County)

Summaries of these findings are found in Table ES-1 following this section. Further information on these sites can be found in Section 6 of this report. It should be noted that these are preliminary findings based on physical characteristics. All potential new sites would require further site-specific analysis of water quality, sediment characteristics, environmental issues and other conditions to determine actual feasibility. Furthermore, sites proposed for development as public swimming facilities would require the support of the agency, municipal government or individual owning the property. Therefore, these findings should be considered as the results of a preliminary analysis rather than recommendations for site development.

II. Alternate Swimming Facility Options

Geotextile fabrics offer an option for swimming in waters with some bacterial pollution and are currently in use at beaches on Long Island Sound at Sea Cliff Beach in Sea Cliff, N.Y. They were used for several years in Mamaroneck, N.Y., as well. These custom-designed fabrics are hung from a boom surrounding the perimeter of a swimming area. The fabrics are highly porous and allow interchange with ambient water but also act as a filter to prevent pollution from entering the area surrounded by the fabric. Bacteria counts were reduced by 62% at Mamaroneck Harbor Beach through the use of this technology. On the Hudson, use of such fabrics may make it possible to reduce swimming impacts on surrounding aquatic life and to protect swimmers from floatable debris.

Floating or barge mounted pools, a concept that is common in Europe, may offer a solution for locations where water depths or sediment conditions are not otherwise suitable for swimming. Design of floating pools for such situations may warrant further study. Historically, such pools were widely used along the shore of Manhattan; however, historic pool designs are not suitable for today's standards.

CONCLUSION

The study determined that there are several sites along the Hudson River offering both short-term and long-term promise as potential public beaches. For sites where physical barriers preclude beach development, or where local water quality precludes swimming, other options exist which may merit further exploration.

Table ES-1
Summary of Findings
Analysis of Existing and Potential Sites

A. Potential Improvements to Existing Sites (Does not include operating costs which will not change)

SITE NAME/LOCATION (North to South)	CAPACITY (persons/day)	COSTS (Construction)	INVESTMENT/ACTION NEEDED
Saugerties Village Park – Ulster County (located on Esopus Creek)	150	$125,000	Bathhouse rehabilitation
Ulster Landing County Park –Ulster County (Town of Ulster)	400	$150,000-$500,000	Beach restoration and protection
Kingston Point City Park – Ulster County (City of Kingston)	500	$500,000+	Bathhouse rehabilitation
Port Ewen Municipal Park – Ulster County (Town of Esopus) (not currently in operation)	150	Unknown	Water chestnut removal
Croton Point County Park – Westchester County (Village of Croton-on-Hudson)	700+	$600,000-$1,000,000	Bathhouse rehabilitation

Table ES-1
Summary of Findings
Analysis of Existing and Potential Sites

B. Feasible New Sites

SITE NAME/LOCATION (North to South)	CAPACITY (persons/day)	COSTS (Construction/ Annual Operation)	INVESTMENT/ACTION NEEDED
Stuyvesant NYS OGS Property – Columbia County (Town of Stuyvesant)	300	$600,000/ $30,000	Parking, bathhouse, resolution of potential siting issues to complement other planned uses, site-specific analysis of water quality, sediment characteristics
Kowawese Unique Area at Plum Point, Orange County Park – Orange County (Town of New Windsor)	350	$825,000/ $40,000	Parking, bathhouse/comfort station, grading improvements, potential water chestnut maintenance, improved bicycle and pedestrian access, site-specific analysis of water quality, sediment characteristics
Riverfront Park – Rockland County (Town of Stony Point)	250	$500,000/ $30,000	Bathhouse, possible road relocation and parking, site-specific analysis of water quality, sediment characteristics
Rockland County Park – Rockland County (Town of Haverstraw)	600	$1,000,000/ $50,000	Beach improvement, bathhouse, access, potential land acquisition, Investigate potential wetlands issues, conduct site-specific analysis of water quality, sediment characteristics
Kingsland Point Westchester County Park – Westchester County (Village of Sleepy Hollow)	600	$2,500,000/ $50,000	Bathhouse restoration, beach replenishment, parking, site-specific analysis of water quality, sediment characteristics

Table ES-1
Summary of Findings
Analysis of Existing and Potential Sites

C. Potential New Sites Requiring Additional Action to Be Established as a Beach

SITE NAME/LOCATION (North to South)	CAPACITY (persons/day)	COSTS (Construction/ Annual Operation)	INVESTMENT/ACTION NEEDED
Henry Hudson Park –Albany County (Town of Bethlehem)	250	$500,000/ $40,000	State water quality classification change, land ownership determination, bathhouse, parking, site-specific analysis of water quality, sediment characteristics
Schodack Island State Park – Rensselaer County (Town of Schodack)	300	$500,000/ $30,000	State water quality classification currently Class C would need to be upgraded to Class B. Additional investment needed includes bathhouse construction, parking, site-specific analysis of water quality, sediment characteristics.
Four Mile Point (private property) – Greene County (Town of Coxsackie)	150	$125,000/ $25,000	Land acquisition, parking, bathhouse, site-specific analysis of water quality, sediment characteristics, including ways to make parking compatible with adjacent Vosburgh Swamp habitat
Mills-Norrie State Park – Dutchess County (Town of Hyde Park)	300	$600,000/ $30,000	Further examine floating pool options at the “old town beach” in the Norrie section of the State park; further review park master plan and related policy issues for establishment of a beach within the historic core of the Mills section of the State Park; site-specific analysis of water quality, sediment characteristics

Table ES-1
Summary of Findings
Analysis of Existing and Potential Sites

C. Potential New Sites Requiring Additional Action to Become Feasible (Cont'd)

SITE NAME/LOCATION (North to South)	CAPACITY (persons/day)	COSTS (Construction/ Annual Operation)	INVESTMENT/ACTION NEEDED
Little Stony Point State Park Property – Putnam County (Town of Philipstown)	300	$600,000/ $30,000	Complete park master plan; address constraints of parking and vehicle and handicapped access, possible scenic considerations; conduct a site-specific analysis of water quality, sediment characteristics
White Beach (Verplanck) (private property) – Westchester County (Town of Cortlandt)	300	$600,000/ $30,000	Land acquisition, bathhouse, parking, site-specific analysis of water quality, sediment characteristics
Nyack Beach State Park – Rockland County (Town of Clarkstown)	300	$500,000/ unknown	Development will include removal of existing sea wall, restoration of groin, restoration at slope and observation to see if beach restores as a result. If so, address bathhouse and parking and conduct a site-specific analysis of water quality, sediment characteristics. Additional capital investment will be required for bathhouse and parking.
Hudson River Park – New York County (Borough of Manhattan)	unknown	unknown	Research geotextile fabric applicability for public beach; research floating pool potential; site specific analysis of water quality, sediment characteristics

Table ES-1
Summary of Findings
Analysis of Existing and Potential Sites

D. Potential New Sites with Substantial Barriers to Development

SITE NAME/LOCATION (North to South)	CAPACITY (persons/day)	COSTS (Construction/ Annual Operation)	INVESTMENT/ACTION NEEDED
Bristol Beach State Park – Ulster County (Town of Saugerties)	unknown	unknown	Soil conditions, wetlands, sand retention
Bowline Point Town Park – Rockland County (Town of Haverstraw)	unknown	unknown	Close proximity to fuel off-loading pier
Ossining, Louis Engel Park – Westchester County (Town of Ossining)	unknown	unknown	Small size, water quality, no available parking, proximity of wastewater treatment plant
Dobbs Ferry Village Waterfront Park and Wickers Creek – Westchester County (Village of Dobbs Ferry)	unknown	unknown	Minimal upland area for support infrastructure, unsuitable subsurface conditions (strong currents at Wickers Creek); lack of access

SECTION 1
INTRODUCTION

1.1 PURPOSE AND OBJECTIVES

The Hudson River Estuary Program was established in 1987 under the Hudson River Estuary Management Act of the New York State Environmental Conservation Law. The Act established the policy to preserve, protect, and where possible, restore and enhance the natural resources, species, habitat and commercial and recreational values of the Hudson River Estuary. Under the Act, the Hudson River Estuarine District is defined as "…the tidal waters of the Hudson River, including the tidal waters of its tributaries and wetlands from the Federal Lock and Dam at Troy to the Verrazano Narrows".

Governor George E. Pataki released New York State's first Hudson River Estuary Action Plan in May of 1996, which was updated in 1998. The Plan has served as a blueprint for the New York State Department of Environmental Conservation (NYSDEC) and partnering agencies to implement management actions along the estuary. The Hudson River Estuary Action Plan incorporates three general themes: conserving natural resources, promoting use and enjoyment of the river, and cleaning up pollution.

Under the leadership of Governor Pataki, NYSDEC serves as project manager for the estuary program. Other State partners in the program include the Office of Parks, Recreation and Historic Preservation; the State Departments of Agriculture and Markets, General Services, State, Transportation, and the Empire State Development Corporation, Metro-North Railroad, and the Hudson River Valley Greenway. Local governments along the estuary, the State of New Jersey, the U.S. Environmental Protection Agency, the U.S. Army Corps of Engineers, the U.S. Department of Interior, the U.S. Department of Commerce, and the American Heritage Rivers Program also have a stake in the plan and actively participate. Moreover, the Hudson River Estuary Action Plan has been developed with extensive input from environmental management professionals, scientists, business leaders, and citizens, including a citizens advisory committee.

New York State selected Lawler, Matusky and Skelly Engineers LLP (LMS) and its subcontractor, The Hudson Group, to conduct this feasibility study related to the development of public swimming facilities along the shores of the Hudson River Estuary. The feasibility study has been conducted pursuant to Commitment 11c of the 1998 Estuary Action Plan, under Theme II, Promoting Use and Enjoyment of the River, which states that the Hudson River Estuary Program will "study issues, opportunities and feasibility for increased use of the Hudson River for swimming".

Governor Pataki, in his 2004 State of the State Address, called for plans to improve the health of the Hudson River by 2009 – the 400th anniversary of Henry Hudson's exploration of the Hudson River on the Half Moon – so that the Hudson River will be swimmable from its source in the Adirondacks to New York City.

This study simply identifies sites that may be feasible. It does not propose that the state will undertake or fund the development of a beach at these sites.

1.2 REPORT FORMAT

This report provides an overall view of the process used for determining the feasibility of developing public swimming facilities along the Hudson River Estuary. Sections 1 and 2 provide an introduction and a brief discussion of historical and current use of the Hudson River estuary for swimming.

Section 3 provides a description of the project area, from its most northern point at the Troy Dam, south to the Battery in Manhattan. Water quality classifications, river morphometry, the proximity of hazardous waste sites and the issue of recreational need are discussed in this section. Section 4 is an overview of the regulations and safety requirements required by both New York State and New York City for the creation and operation of public swimming facilities.

Section 5 describes the two-step approach that was used to determine the most feasible swimming sites for potential development. It discusses the development of the preliminary site list, as well as the objectives, criteria, and results of the site screening processes. Section 5 also summarizes the project's environmental review and includes a summary of state and federal agency correspondence, a brief discussion of threatened and endangered species reported in the vicinity of the sites with the greatest potential for development at this time, Hudson River Estuary significant habitats, permit needs, wetlands identification, and a general impact assessment.

Specific findings regarding potential swimming facility sites, site photos, conceptual designs and general costs for swimming facility development at the feasible sites are discussed in Section 6. Sites with future potential are also included in the discussion, as well as potential actions for existing facilities. Section 7 explores alternative facility options for areas where conditions are not ideal for the development of a typical beach swimming facility.

SECTION 2
SWIMMING IN THE HUDSON RIVER

2.1 HISTORY

The first written account of swimming in the Hudson River was Henry Hudson's log from his trip up the river in the "Half Moon", noting that on September 23, 1609, natives approached and retreated, "some in their canoes, some swimming" (Juet 1609). Swimming in the river is occasionally mentioned in historic accounts, but it is usually offered as an incidental comment, such as mention of children swimming off barges and piers, which is briefly noted when boat traffic and harbor uses are being discussed (Verplanck and Collyer 1908; Ringwald 1958). These incidental notes appear in many depictions of life and commerce along the River.

Pictures and other documents depicting the Hudson River from the post Civil War era to the early 20th Century show a more formal use of the river for swimming, often including fashionable recreation sites, along with other scenes from public life. "Escaping summer heat along the city docks", "New York City's public floating pools located along the Hudson", and "Newly established beaches along the NY Harbor", depicted river swimming as well as the recently established competing oceanfront resorts (Lowey 1890). Books, journals and reports developed during the late 19th and the early 20th centuries describing life, commerce and historic land uses often included public and commercial amusement parks, which were located on waterfronts at the terminus of trolley lines or at day liner piers. These strategically located properties were scenic, cool in the summer, and often offered a dock or beach that was used for swimming. In addition, commercial floating pools were located along Manhattan's shoreline in a 1817 guide, and two "free floating marine baths" were located on the west side of Manhattan near the Battery in 1870. Sports such as rowing and sailing are also depicted in reports and photographs.

Public swimming in the Hudson River was greatly curtailed during the mid 20th century. The Palisades Interstate Park Commission (PIPC) notes that this reduction in recreational swimming was initially the result of staff reductions and travel restrictions due to World War II. Water pollution and stringent sanitary and health requirements further reduced river swimming. Increasingly, new public and backyard pools and inland lakes and ponds provided swimming alternatives.

Beginning in the 1960s, national and state programs began to address water pollution issues. The Federal Water Pollution Control Act of 1965 presents as one of its main goals the attainment of "swimmable" waters. While the quality of water in the Hudson River has improved dramatically since that time, only one new public beach, Ulster Landing, has opened.

Locations where swimming is accommodated on the River were inventoried nearly thirty years ago for the Statewide Comprehensive Recreation Plan (SCORP). This Plan also noted the need to improve Hudson River water quality. Updated SCORP documents, published every five years, all supported meeting swimming needs in the Hudson Valley and improving recreational access along the Hudson.

In the 1980s, the value of shoreline resources and waterfront lands in New York State and the Nation were recognized in federal and state programs designed to protect them and plan for their beneficial use. New York State adopted its Coastal Management Program (CMP) in 1982 and established 44 coastal policies that included public access to waterfront recreation and other goals for the Hudson River Estuary and for the other designated areas in the state. The New York State Department of State's Coastal Program also provided grants to communities in the designated areas to develop Local Waterfront Revitalization Programs (LWRP). A review of current LWRPs for the Hudson River counties found little information about swimming in the river or plans to do so in the future.

In 1999, Governor Pataki signed into law the Hudson River Marine Sanitation Act, which provides NYSDEC with the authority to regulate the no discharge zone designation. This designation prohibits the discharge of sewage from vessels in the 64 miles of the estuary that are classified "A," source of drinking water. The "A" classification area extends from Newburgh to the southern tip of Schodack/Houghtaling Island. In October 2003, New York State and the USEPA announced the designation of a No Discharge Area for the entire 153 miles of the Hudson River Estuary from Battery Park in Manhattan to the City of Troy Dam.

2.2 CURRENT HUDSON RIVER SWIMMING

2.2.1 Swimming Facilities

There are five public swimming beaches along the Hudson River estuary, four of which are currently operating. The fifth, Port Ewen, recently closed. Three of the four operating beaches are located in Ulster County and one is located in Westchester County. All are public sites, open seasonally, with successful operations. Outdated bathhouses and support facilities in poor condition are a common constraint. Each of these sites was reviewed as part of this study for purposes of evaluation and comparison with potential sites. Since these sites have been successful on their own and do not require the amount of analysis and resources of a new facility, this study simply offers potential actions that would continue their success. In addition, there is a private beach located at the Philipsburg Manor Beach Club.

Croton Point Westchester County Park, located on the east shore at river mile 36, this beach operates along the northwest shore of Croton Point. Primary concerns for the continued operation of this site include the close proximity of boaters, floating debris, and deterioration of existing infrastructure, including pipes, showers, and other necessary plumbing.

Ulster Landing County Park, located on the west shore at river mile 97, is a modest-sized facility, with excellent upland design. The primary issue related to this scenic and well-used site is the retention of sand at the beach and along the adjoining shoreline picnic area to the south. Records indicate that 30 feet of the sand beach formed in the 1930's, as well as the trees and vegetation, has been lost during the ensuing years. This problem must be addressed in the near term.

Kingston Point Park is an existing city park with swimming facilities, located on the Hudson River's west shore at river mile 92. It includes an extensive and wide sand beach with approximately 300 feet of developed shoreline, with a width of over 150 feet. Swimming at this site dates to the 19th century with many support services such as a bathhouse dating to the early 20th century. These existing facilities are in need of improvements and upgrades.

Saugerties Village Beach is a small municipal beach located on Esopus Creek, a Hudson River tributary, at river mile 102.5. This beach is located west of a dam and is therefore not affected by Hudson River tides. The beach has approximately 150 feet of shorefront, with water depths increasing gradually to nine feet. The primary issues of maintaining this site are sand management, control of aquatic vegetation, and improvements to infrastructure including the bathhouse and parking facilities.

Port Ewen is a small municipal beach located in the Town of Esopus, not currently in operation. Port Ewen's primary issue is the control of aquatic vegetation, which has made the area unswimmable. Prior attempts at weed control did not prove to be successful. As part of this study, Port Ewen was evaluated; however, no solution to the aquatic vegetation problem was found.

For more detailed information on these existing swimming facilities and findings regarding improvements, see Section 6 of this report.

2.2.2 Informal Swimming

Though there are currently only four publicly-operated swimming beaches on the Hudson River, responses to the Spring 2000 NYSDEC swimming survey of residents indicated more than a hundred informal sites where people reported swimming, and many more where they would like to swim (See Section 5.1).

This study does not focus on such informal swimming sites or the potential issues of safety and legal liability which accompany them. However, it is believed that public beaches generally offer a safer experience, and would be chosen by most people, especially families.

SECTION 3
DESCRIPTION OF THE PROJECT AREA

3.1 GENERAL DESCRIPTION OF HUDSON RIVER

The Hudson-Mohawk river basin is located in the eastern part of New York State and covers an area of 13,366 square miles. Most of the watershed lies within the east-central part of the state; small portions however, extend into Vermont, Massachusetts, Connecticut, and New Jersey (Figure 3-1). The watershed is one of five major drainage basins within New York State.

The basin can be divided into three principal sub-basins: (1) the upper Hudson and (2) Mohawk River sub-basins, which drain into (3) the lower Hudson sub-basin. The upper Hudson River and Mohawk River sub-basins are the primary sources of the freshwater which flows into the lower Hudson.

The 315-mile-long Hudson River originates at Lake Tear-of-the-Clouds on the southwest slope of Mt. Marcy in the Adirondack Mountains. Near river mile 156 the Mohawk River joins the Hudson. Two miles farther downriver is the Federal Dam at Troy, which creates a physical barrier between the upper and lower Hudson River. The Federal Dam is the northernmost extent of the tide and marks the upper limit of the Hudson River Estuary.

The lower Hudson River commences at the Federal Dam at Troy and flows south to its discharge into Upper New York Bay at the Battery. The Lower Hudson River between the Federal Dam at Troy and the Battery at the southern tip of Manhattan is classified as a tidal estuary. The lower Hudson River basin drains an area of approximately 5,277 square miles and is essentially a flooded valley with very little gradient. Over its 154-mile course from the dam to its mouth, the river drops approximately 5 feet, an average of 0.04-inch per mile. It is this lower area of the Hudson River that is the area considered in this study.

3.2 HUDSON RIVER ESTUARY – STUDY AREA

3.2.1 Channel Conditions - Tides and Currents

Channel morphometry (shape), seasonal freshwater flow patterns and tidal conditions (elevation and current velocity) are important parameters related to the development of swimming facilities along the shore of an estuary. Swimming facility development parameters affected by these three conditions are water depth changes at the site, speed and direction of water currents, sediment type and ability to maintain acceptable beach sediments at the site.

Waves and wakes are important considerations for any swimming beach. The Hudson River's relatively even tidal flows make dangerous high tide conditions improbable. Down-river currents also do not cause wave problems in the section of the Hudson River north of the Tappan Zee. The many turns, changes in riverbank height and uneven shoreline configuration limit the amount of windward open waters that might otherwise generate wind driven wave conditions. In

W804...\graphics\figures.ds1

LMS Lawler, Matusky & Skelly Engineers LLP
One Blue Hill Plaza • Pearl River, New York 10965
ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

Hudson River Basin

HUDSON RIVER BEACHES

Figure 3-1

the more developed and expansive southern sections, areas where hard bulkheads are present, wave and current conditions can be more dynamic.

With few exceptions, wind generated waves and tidal currents are not a problem along the lower Hudson. Though not really problematic, the north or south facing Hudson River beaches, and the beaches along the wider, southern reaches, are the most affected by wind driven waves. The east or west facing beaches are the most exposed to currents. In addition, the east and west facing beaches, which are located near shipping channels, are also exposed to boat generated waves. Beach managers that operate swimming areas near the Federally maintained navigation channel and its associated ship and barge traffic indicate that unlike the choppy, small waves of small motor boats, the large, long-period waves of large ships and barges build in height in the shallow waters near shore and can be a danger to small children. Also, the wake from large commercial ships tends to suck the water out of shallow areas, making it unsafe for swimmers or at least very turbulent with rock, bricks, debris being moved around and a resultant small "tidal" wave returning in to shore. This effect lasts quite a while and is applicable to Ulster County Park and Port Ewen sites. Lifeguards must be observant for this situation, and markers for "deep" swimming sections must be set with these waves in mind.

3.2.2 Water Quality

3.2.2.1 Water Quality Overview. The water quality of the Hudson River is influenced by temporal variations relating to tides and site location. Major components of water quality include salinity, temperature, dissolved oxygen, turbidity, pH, alkalinity, pollutants and nutrients (Cooper et al. 1988).

In the Albany or Upper reaches of the Hudson River estuary, biological sampling shows significant increases in water quality from the 1970s through the 1990s, moving from poor water quality indicative of sewage and industrial impacts to slightly impacted. In the most recent 10 year period, two of the four Albany area sites have slipped back to moderately impacted sites. Though the trend over 30 years is positive, this recent (and as yet not fully explained) slippage is of some concern. Water chemistry trends in this portion of the river from the 1970s through the 1990s also show significant improvement in dissolved oxygen and ammonia, reflecting treatment facility improvements.

In the Mid/Lower Hudson River reaches, water quality appears to be largely unchanged, based on biological and chemical sampling data over the past 30 years. This larger river area is controlled to a greater extent by hydrologic and tidal influences than the upstream portions of the river.

The water temperature range of the Hudson River estuary is from 0.6-2 ºC (33.1-35.6 ºF) in January to average annual highs of 22-29 ºC (71.6-84.2 ºF) in July and August. In shallow water areas, maximum summer temperatures may exceed 30 ºC (86 ºF). Water temperatures are primarily influenced by freshwater flow and ocean waters. High freshwater flows, which occur during periods of high rainfall, keep temperatures low in the downstream areas. At any one time during the year, water temperature differences between the upper and lower reaches of the river channel can reach 11 ºC (51.8 ºF) (Cooper et al. 1988). Water temperature becomes a factor in

beach site feasibility when considering projected use of the site. If water temperatures were to remain too cold through the summer, the site is likely to get very little use.

Turbidity in the Hudson River is caused primarily by silt transported by land runoff. Data on pH have shown no predictable patterns, but has been documented to vary between 6.4 and 8.2 (Cooper et al. 1988). Both turbidity and pH are important considerations for individual swimming beach locations. If the turbidity of the river is too high, lifeguards may not be able to locate distressed swimmers, causing safety hazards.

3.2.2.2 Water Quality Data and Analysis. Available water quality data for the Hudson River estuary were obtained from various agencies, compiled, and analyzed. Particular attention was paid to locate data for parameters pertinent to beach use (i.e. total/fecal coliform and turbidity data).

The New York State Department of Health (NYSDOH) sanitary code contains water quality standards for bathing beaches. The most relevant NYSDOH standards are those pertaining to bacteriological quality. NYSDOH sanitary codes are similar to NYSDEC water quality standards (Table 3-1).

The criteria for NYSDOH's bathing beach standard are as follows:

(1) The total number of organisms of the coliform group shall not exceed a logarithmic mean of 2400/100 ml for a series of five or more samples in any 30-day period, nor shall 20 percent of total samples during the period exceed 5000/100 ml. When data does not meet/satisfy standards, the permit-issuing official shall cause an investigation to be made to determine and eliminate the source of pollution.

(2) The fecal coliform density from a series of five or more samples in any 30-day period shall not exceed a logarithmic mean of 200/100 ml. When the fecal coliform density of any sample does not meet standards (1000/100 ml), consideration shall be given to closing the beach, and daily samples shall immediately be collected and analyzed for fecal coliform for at least two consecutive days.

NYSDOH's water quality standards for bathing beaches specify a numerical criterion for the clarity of the water as a safety precaution. The secchi depth, which marks the point where a 200-mm diameter disk can be seen, should be greater than or equal to 4 feet.

The availability of water quality, (particularly coliform and turbidity) data for the Hudson River estuary is very limited. More recently, NYSDEC, through the Hudson River Estuary Program funded a cooperative study with the NYS Office of Parks, Recreation and Historic Preservation to assess water quality and the suitability of the Hudson River in the Albany area (the "Albany Pool") for swimming. The results of this study confirmed some general assumptions: the highest coliform bacteria levels occur below Patroon Creek and below the Albany County and Rensselaer County wastewater treatment facilities discharges, during increased river flow (wet-

TABLE 3-1

Summary of Beach-Related Water Quality Criteria Compliance

Data Source	Appendix III	Number of Sample Locations	Time Period	Compliance with water quality criteria		
				Secchi Disk	Total Coliform	Fecal Coliform
Albany County Sewer District	A	4	June 1987 - July 1996	ND	YES	ND
Glenmont & Poughkeepsie	B	2	March 1984 - October 199	ND	ND	ND
Ulster County	C	2	July 1991 - August 1999	ND	ND	YES
Port Ewen Sewer District	D	1	April 1999 - February 2000	ND	YES	ND
USGS	E	5	April 1992 - September 1999	ND	ND	ND
Rockland County Dept. of Health	F	4	June 1990 - August 2000	ND	VARIABLE	VARIABLE
Bear Mountain Laboratory	G	5	June 1983 - August 1985	ND	YES	ND
Westchester County	H	3	June 1999 - July 1999	ND	YES	YES
NYCDEP Harbor Survey	I	7	June 1990 - September 1999	NO	YES	YES

YES = Compliance is always attained
VARIABLE = Compliance is occasionally not attained
NO = Compliance is generally not attained
ND = No Data

NYSDOH water quality standard criteria

The total number of organisms of the total coliform group shall not exceed a logarithmic mean of 2400/100 ml for a series of five or more samples in any 30 day period

20% of total coliform samples during the period shall not exceed 5000/100 ml

The fecal coliform density from a series of five or more samples in any 30-day period shall not exceed a logarithmic mean of 200/100 ml

When fecal coliform density of any sample exceeds 1000/100 ml, consideration shall be given to closing the beach

The secchi depth, which marks the point where a 200-mm diameter disk can be seen, should be greater than or equal to 4-ft

NYSDEC water quality standard criteria

Class A,B,C,SB

The total coliform monthly median value shall not exceed 2400/100 ml from a minimum of five samples

20% of total coliform samples during the period shall not exceed 5000/100 ml.

The monthly geometric mean from a minimum of five fecal coliform samples shall not exceed 200/100 ml

Class I

The total coliform geometric mean value shall not exceed 10000/100 ml from a minimum of five samples

The monthly geometric mean from a minimum of five fecal coliform samples shall not exceed 2000/100 ml

weather). Typically, coliform levels meet water quality standards at Castleton and points south. In response to the Governor's commitment to a swimmable Hudson, NYSDEC is working with the Albany Pool communities to determine if seasonal disinfection is needed at the wastewater treatment plants in this area. In addition, the Albany Pool communities were recently successful in obtaining funding from the Hudson River Estuary Program/Environmental Protection Fund to develop a Long Term Control Plan to address CSO discharges in this area.

However, at locations where bacteriological data was collected, most samples fall within NYSDEC and NYSDOH standards for total and/or fecal coliform counts. Where coliform standards are exceeded, it is generally for short periods.

Water quality data collected by the Albany County Sewer District between 1987 and 1996 show that total and fecal coliform criteria for NYSDEC and NYSDOH standards are generally not exceeded. NYSDEC through the Office of Parks, Recreation and Historic Preservation funded a study to assess water quality and the suitability of the Hudson River in the Albany area for swimming and other water-based recreational activities. A total of 15 sampling events at each of ten locations between the Federal Dam in Troy to the southern end of Houghtaling Island were collected in 2003. The results of this study confirmed some general assumptions: the highest coliform levels occur below Patroon Creek and below the Albany County and Rennselaer County wastewater treatment facilities discharges, the highest levels occur during increased river flow (wet-weather) and typically coliform levels drop to near or below water quality standards at Castleton and points south. Though not unexpected, these findings – along with questions of the most appropriate best use of the waters of the Hudson River in the Albany Pool – will be addressed as NYSDEC continues to work toward a swimmable Hudson River.

Data collected at the Glenmont and Poughkeepsie STPs are of limited use since bacteriological data were not collected. Nevertheless, data on total suspended solids and turbidity indicate relatively low levels during the summer months, when water temperature is generally between 20 and 25 °C (68 and 77 ºF).

Fecal coliform data collected by Ulster County at two existing public swimming facilities (Kingston Point Beach and Ulster Landing Beach) between 1991 and 1999 show the NYSDEC and NYSDOH standards for fecal coliform criteria are met at these locations.

Data collected by the Port Ewen Sewer District is limited but the total coliform samples collected did not exceed water quality standards. A bacteriological pathogen, *E. Coli*, was generally not found in these samples.

Total and fecal coliform data collected by the Rockland County Department of Health at four locations during June, July and August of the last several years showed that NYSDEC and NYSDOH bacteriological criteria are exceeded at times. Exceedances of NYSDOH criteria for total and fecal coliforms were found in at least one month at all four sampling stations. The results of this analysis are summarized in Table 3-1.

Westchester County collected data at Croton Point Park over a period of one month (June 1999). Analysis of this data shows that NYSDEC and NYSDOH criteria were not exceeded.

The New York City Department of Environmental Protection (NYCDEP) collected secchi disk depth, and total and fecal coliform data at six locations along the Hudson River. In addition to the NYSDEC and NYSDOH water quality standards, New York City Department of Health has a beach use criterion on total coliforms not exceeding 5,000 counts/100ml for a storm with a three-year return period. The NYCDEP data show a trend of decreasing fecal coliform concentrations through the 1990's. Total coliform concentration data, which were not collected after 1996, also exhibit a similar trend. The NYSDOH criteria are used for a comparative assessment because they apply to bathing beaches whereas the NYSDEC standards for Class I apply to non-contact recreation. Fecal coliform data collected in 1999 by NYCDEP show compliance with NYSDOH criteria. Total coliform concentration data for the last three years are not available for comparison with NYCDOH criteria.

Secchi disk depth at the seven New York City sampling stations is generally within the NYSDOH criterion of 4 feet for bathing beaches. The most upstream station (Mt. St. Vincent) and most downstream station (The Battery) have a higher percent of measurements in compliance with the state's criterion than the other stations between them. In summary, bacteriological quality along the New York City shoreline appears to be in compliance with NYSDOH criteria; however, the water clarity is not in compliance with the NYSDOH's secchi-disk depth criterion.

3.2.2.3 Proximity of Potential Beach sites to CSOs and STP Discharges. While discharges from wastewater treatment plants and combined sewer overflows are controlled by NYSDEC, it is generally recognized that locating bathing beaches close to these facilities is less desirable because of the structures themselves and the potential for operational upsets. A Geographic Information System (GIS) was used to determine the proximity of potential swimming sites to combined sewer overflows (CSO) and waste-water treatment plant (WTP) outfalls.

Charts of the Hudson River published by the National Oceanographic and Atmospheric Administration (NOAA) were used as a base map and the location of the potential swimming facilities were located and their coordinates were entered into the GIS database. Locations of CSO discharges and WTP outfalls were determined from two data sources: the EPA's Permit Compliance System (PCS) database and State Pollutant Discharge Elimination System (SPDES) permits for WTP along the Hudson River.

Each potential swimming site was given a score based on its proximity to a CSO discharge or a WTP outfall. Sites that were too close to a CSO or WTP outfall were disqualified. More information can be found in Section 5.

3.2.2.4 Possible Sources of Chemical Contaminants on Potential Beach Sites. Overall water quality in much of the Hudson River has steadily improved over the past 30 years. Wastewater treatment facilities and other water pollution control efforts have resulted in significant water quality improvement in the Capital District area. Industrial, agricultural and municipal discharges (i.e., combined sewer overflows) are also responsible for adding pollutants such as cadmium, nickel, polychlorinated biphenyls (PCBs), pesticides, and nutrients such as phosphorus, nitrogen, and ammonia to the river (Cooper et al. 1988).

The NYSDEC continues to track down sources of contaminants in the Hudson River and monitor responses to pollution reduction activities. In particular, a comprehensive, multi-million dollar project is underway to identify and quantify sources of contaminants of concern such as dioxin, PCBs, PAHs, metals, pesticides, and volatile organic compounds throughout the Hudson River and its tributaries.

Hazardous Waste Sites. Ninety-five hazardous waste sites were identified along the Hudson River, eleven of which are located within five miles of a potential swimming site (Table 3-2). Further evaluation of individual hazardous waste sites and individual swimming locations would be required to assess any potential impact related to water quality. Brownfield sites, past spills, voluntary clean-up sites, etc., are also potential sources of environmental contamination, and should also be evaluated on a case-by-case basis.

PCBs. Industries along the river used PCBs for many years until they were banned in the mid-1970s. The Hudson River from Hudson Falls to the Battery in New York City has been classified as a National Priority List site because of PCBs in the river. Although PCBs are still detected in sediments and river biota, the higher levels are mostly outside the estuary waters being considered for beaches. On the Hudson River Estuary, where PCBs are found deeper in sediments, PCB exposure is not considered a significant health risk for public swimming. The USEPA recently completed a baseline human health risk assessment for the Mid-Hudson River which evaluated both cancer and non-cancer health risks form exposure to PCBs. A major finding of the EPA risk assessment is, "Risks from being exposed to PCBs in the Mid-Hudson River through skin contact with contaminated sediments and river water, residential ingestion of river water for drinking water, incidental ingestion of sediments, and inhalation of PCBs in air are significantly below USEPA's levels of concern for cancer and non-cancer health effects" (USEPA 1999). In addition, PCBs tend to concentrate in fine, silty organic sediments, and are less likely to be found in the sands and gravel that comprise good swimming beaches (Rand 1995, Hoffman et al. 1995, Connell and Miller 1984).

Conclusions: Hazardous waste sites, other sources of environmental contamination and PCBs in the Hudson River are unlikely to have a significant impact on any potential swimming facility, due to their distance from the potential swimming sites. However, site-specific water quality data related to recreational uses on the Hudson River are limited. A comprehensive survey for potential sources of chemical contamination, including the potential for runoff, is recommended for any site designated for development as a public swimming facility. This survey could be used to identify any specific water quality or sediment data that are needed to evaluate the feasibility of developing that site.

3.2.2.5 Water Quality Testing and Re-evaluation of Existing Hudson River Water Classifications. Should new sites be determined to be feasible beach sites, the waterbody classification for the River segment where the new site is located should be consistent with the best use of primary and secondary contact recreation – Class B. If the waterbody classification is not currently Class B or higher, then a reclassification should be made prior to the development of a beach. This process starts with a decision on the part of the Department or a petition to do so by another party.

Table 3-2
CERCLIS Hazardous Waste Sites Found Within the Vicinity[1] of a Step II Potential Swimming Facility*

Columbia County
Allied Health Care Chemetron Medical Division – Stuyvesant, NY
L&B Products – Stockport, NY
Greene County
American Valve – Coxsackie, NY
Orange County
Dupont Stauffer Duramante – Newburgh, NY
Consolidated Iron & Metal – Newburgh, NY
Provan Transport Corp. – Newburgh, NY
Westchester County
Croton Point Sanitary Landfill – Croton on Hudson, NY
Stauffer Chemical/Eastern Research Center – Ardsley, NY
Rockland County
Kay-Fries Inc. – Stony Point, NY
Haverstraw Landfill – Haverstraw, NY
Haverstraw Landfill – West Haverstraw, NY

*USEPA 2000.
[1]Approximately 5 miles

The upper reach of the Hudson River estuary, from the Troy Dam to the south end of Houghtaling Island in northern Columbia County is Class C. This classification reflects the fact that no sanctioned swimming beaches had been permitted or proposed in recent generations in this area, which in turn is a response to localized dangerous conditions such as currents and shipping activity, as well as pollution in the "Albany Pool", an area of the River that is still subject to periodic combined sewer overflow problems (Hudson River Foundation and NYSDEC 1998). The best use of Class C waters is defined as fishing. Typically wastewater discharges to Class C waters are not disinfected, although they can be if needed to protect public health for swimming. Making the waters of the Hudson generally swimmable in the Albany Pool area would necessitate disinfection of some or all municipal wastewater discharges, but would not require reclassification. However, should specific new sites be determined to be feasible as a beach, the waterbody classification for the surrounding area should be consistent with the best use of primary and secondary contact recreation, which is Class B. If the waterbody classification is not currently Class B or higher then a reclassification should be made prior to the establishment of a beach. This process starts with a decision on the part of the Department or a petition to do so by another party.

Recent investments by the NYSDEC Hudson River Estuary Program with Clean Water/Clean Air Bond Act funds will substantially reduce combined sewer overflow discharges in the "Albany Pool" with likely improvements in water quality in southern Albany and Rennselaer counties. In addition, seasonal disinfection of municipal discharges into the Albany Pool waters can be expected to produce swimmable water quality in these Class C waters.

Two potential swimming sites, one at the Town of Bethlehem's Henry Hudson Town Park in Albany County, and another beach on Schodack Island State Park in Rensselaer County are in Class C waters, which would need to be reclassified to B in order for a beach to be established at these locations. This process would be initiated once a decision is made by NYSDEC or a third party to seek establishment of a beach there. A multi-year study is needed over the entire river segment, and additional information is needed on wastewater treatment facility discharges and CSOs to confirm that water quality standards are achieved.

3.3 ECONOMIC GROWTH, WATERFRONT DEVELOPMENT AND RECREATIONAL SWIMMING NEEDS

3.3.1 Economic Growth and Waterfront Development

Over the past few years, improvements in the River's water quality and the healthy economy have led to new development and redevelopment projects and plans along many waterfronts. A substantial number of the proposed projects all related to tourism and water-related recreational demands. Local Waterfront Revitalization Program (LWRP) plans, sponsored by the State under its Coastal Management Program, and projects and programs identified in the State's Estuary Action Plans, are guiding new projects to "bring the River back to the people". Seventeen communities along the River have approved LWRP Plans, with New York City submitting major

revisions to its approved Plan. Many direct State sponsored water access projects are underway or planned with several already completed.

3.3.2 Recreational Swimming Needs

Over five million people live in the counties along the River, from Manhattan to the Troy Dam, and the demand for swimming is high. In almost all counties the needs are far greater than the available facilities. In the lower Hudson from New York City to Orange and Dutchess Counties, the State Park's Index of Need is very high, as noted in its statewide Outdoor Recreation Plan.

Lack of access to swimming facilities open to the general public is a particular problem for low and moderate-income people throughout the Hudson Valley. The siting of new public swimming facilities along the Hudson, and improving those few already operating, would create unique recreational opportunities for residents of the Greater Hudson Valley. The benefits of these recreational opportunities will also advance State and local objectives to improve the economic and social well being of the people and communities in the Valley.

SECTION 4
REGULATIONS AND SAFETY REQUIREMENTS

4.1 NEW YORK STATE SANITARY CODE

Sanitary codes related to bathing beaches are contained in Subpart 6-2 of the New York State Sanitary Code. The code defines a bathing beach as:

> a bathing place, together with any buildings and appurtenances, and the water and land areas used in connection therewith, at a pond, lake, stream or other body of fresh or salt water which is used for bathing or swimming with the express or implied permission or consent of the owner or lessee of the premises or which is operated for a fee or any other consideration or which is openly advertised as a place for bathing or swimming.

The New York State code is extremely detailed in regard to all aspects of beach operations including permits and variances, injury and incident reporting, site development, site construction, maintenance, operations and supervision. Therefore, a sanitary survey and monitoring program would be necessary in any operating state run facility. The most notable regulations applicable to this Feasibility Study can be found in Table 4-1. It should be noted that certain counties may also have their own sanitary code requirements which would need to be reviewed as part of any monitoring program.

4.2 NEW YORK CITY SWIMMING BEACH REGULATIONS

New York City bathing beach regulations are covered under Article 167 of the New York City Health Code. The code defines a bathing beach as:

> any waterfront area of the City not specifically restricted by the provisions of Section 167.03, where swimming is permitted regardless of whether it is recommended in accordance with the classifications given in Section 167.13. The term does not include a bathing beach used by a family on private property for non-commercial purposes."

New York City is required to follow all New York State regulations regarding bathing beaches. The City does retain the option of enforcing a stricter version of the State requirements. The New York City Bathing Beach Code includes all aspects of bathing beach operation including, operating permits, plan approval, facilities, maintenance, lifeguards/equipment, water classification and drowning reports as well as sanitary surveys and monitoring once a beach is operational. The most notable regulations applicable to this Phase I Feasibility Study can be found in Table 4-1.

Table 4-1
Summary of Bathing Beach Regulations for New York State and New York City Beach Facilities

NYS Regulations	NYC Regulations*
Operating Permit Required	
Approval of bathing waters • Bathing area is free of sewage • Use of waters does not pollute water supply • NYS water quality standards are met • Bathing waters are equipped with float lines to designate shallow and deep areas	No bathing beaches can be located along the Hudson River from the Harlem River to the Battery
Adequate toilet and handwashing facilities are supplied (if showers are provided, tempered water must be available)	
Water Quality Standards • Total coliforms do not exceed a 30 day logarithmic average of 2400/100 ml • Fecal coliforms do not exceed a 30 day logarithmic average of 200/100ml • Algae and aquatic vegetation control	
25 square feet of water surface per bather, and 75 square feet per bather for water over 4 feet in depth	
Total water surface area equal to 1 acre**	
35 square feet of land area per bather	
Slope not to exceed 1:10 for depths up to 4 ft	
Water current not to exceed 3 ft per second	
No outfalls within 750 feet of beach	No outfalls within 500 feet of beach area
Water clarity should be at least 4 feet in depth	

*In addition to all NYS regulations, NYC also requires these standards be met by all beaches.
**Total acreage standards are primarily intended for small, enclosed water bodies, and are of less concern in a flowing river.

4.3 ENVIRONMENTAL REGULATIONS-WATER USE CLASSIFICATIONS

The NYSDEC has classified all surface waters based on their most appropriate use. NYSDEC considered past, present and future uses of the surface waters in the classification process. If other selection criteria are met and no other conditions preclude use for primary and secondary contact recreation, portions classified C should be considered for reclassification to B prior to development of a beach.

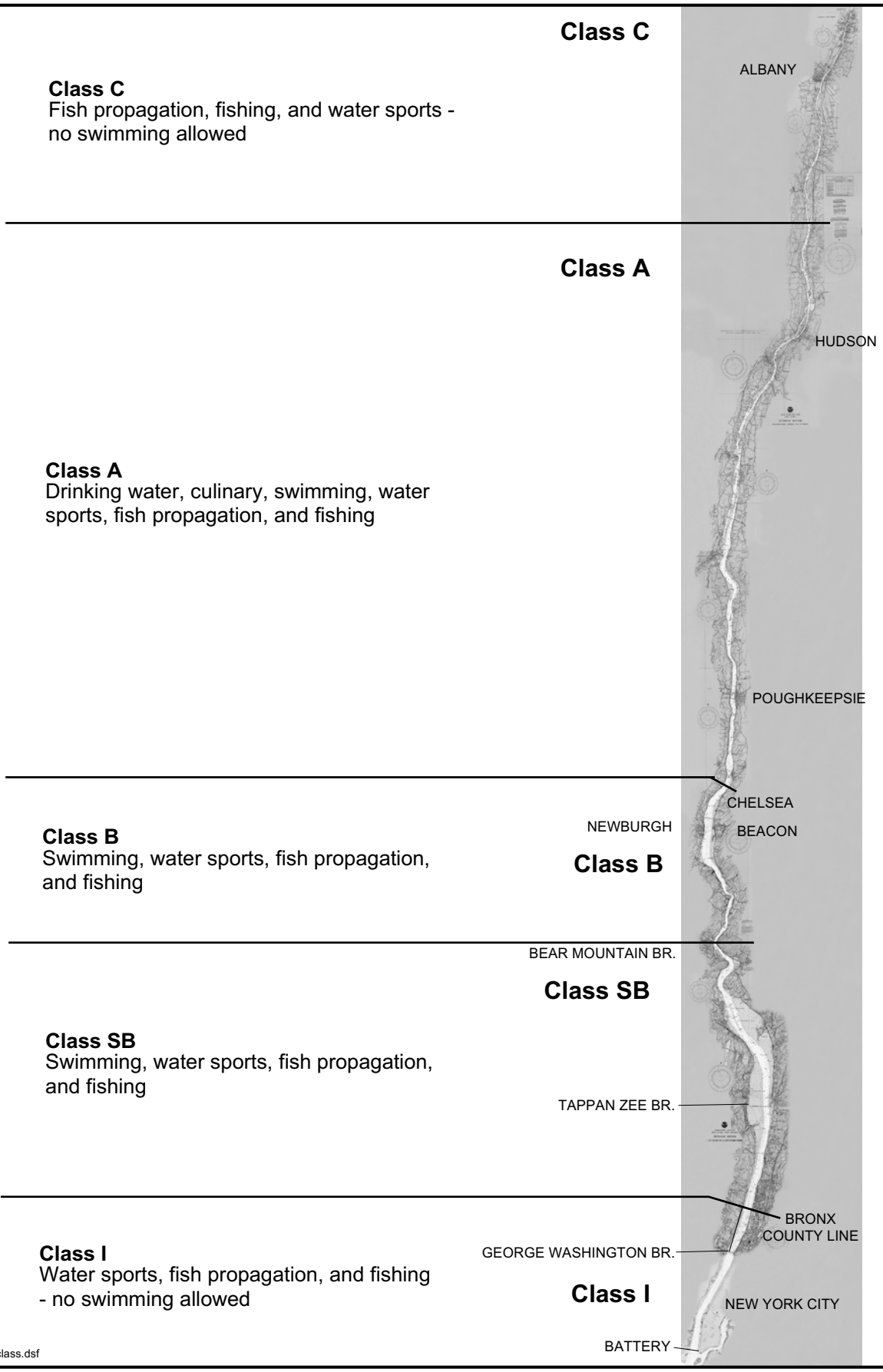
Table 4-2 lists the water quality classifications in the Hudson River, and what uses are protected (NYCRR 1996). A map showing each of these water segment classifications can be found in Figure 4-1.

Several of the sites are located in areas of the Hudson that are not presently used as public beaches. Seasonal disinfection of municipal wastewater is not always required in these areas. Capital investments may have to be made to seasonally disinfect municipal wastewater discharges. In addition, municipalities must work to further control discharges from CSOs, if other selection criteria support a beach site.

Table 4-2
Water Quality Classifications of the Hudson River

Hudson River Region	Water Class	Best Use
From the Battery to the New York-Bronx county line within boundaries of New York State	I	The best usages of Class I waters are secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival. (Swimming Not Included)
From New York-Bronx county line within boundaries of New York State to the boundary formed by Northerly Rockland County line on west shore and northerly Westchester County line on east shore (Bear Mountain Bridge)	SB	The best usages of Class SB waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival. (Swimming Included)
From boundary formed by Northerly Rockland County line on west shore and northerly Westchester County line on east shore (Bear Mountain Bridge) to boundary formed by Roseton on west shore and Low Point on east shore in general area of Chelsea.	B	The best usages of Class B waters are primary and secondary contact recreation and fishing. These waters shall be suitable for fish propagation and survival. (Swimming Included)
From boundary formed by Roseton on west shore and Low point on east shore in general area of Chelsea to boundary formed by east-west line through Aid to Navigation (ATN) light No. 28 on southern end of Esopus Island.	A	The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival. (Swimming Included)
From boundary formed by east-west line through (ATN) light No.28 on southern end of Esopus Island to boundary formed by east-west line through light no 72 off south end of Houghtaling Island.	A	The best usages of Class A waters are: a source of water supply for drinking, culinary or food processing purposes; primary and secondary contact recreation; and fishing. The waters shall be suitable for fish propagation and survival. (Swimming Included)
From boundary formed by east-west line through light no. 72 off south end of Houghtaling Island to boundary formed by east-west line through most northern confluence of Mohawk and Hudson River.	C	The best usage of Class C waters is fishing. These waters shall be suitable for fish propagation and survival. The water quality shall be suitable for primary and secondary contact recreation, although other factors may limit the use for these purposes. (Swimming Not Included)

Data compiled from NYCRR 1996.



Lawler, Matusky & Skelly Engineers LLP
One Blue Hill Plaza • Pearl River, New York 10965
ENVIRONMENTAL SCIENCE & ENGINEERING CONSULTANTS

Hudson River
Water Quality Classifications
HUDSON RIVER BEACHES

Figure 4-1