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Baywalk developing landscape memory

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BAYWALK DEVELOPING LANDSCAPE MEMORY

A thesis submitted in partial fulfillment of the

requirements for the degree of

MASTER OF LANDSCAPE ARCHITECTURE

by

Rebecca Agnes Conable

2004

To: Dean Juan Antonio Bueno
School of Architecture

This thesis, written by Rebecca Agnes Conable, and entitled Baywalk Developing Landscape Memory, having been approved in respect to style and intellectual content, is referred to you for judgment.

We have read this thesis and recommend that it be approved.

Marta Canaves

Michael del Guidice

Amy Condon

Juan Antonio Bueno, Major Professor

Date of Defense: April 1, 2004

The thesis of Rebecca Agnes Conable is approved.

Dean Juan Antonio Bueno
School of Architecture

Dean Douglas Wartzok
University Graduate School

Florida International University, 2004

DEDICATION

I dedicate this thesis to my husband. Without his patience, understanding and support the completion of this work would not have been possible.

ACKNOWLEDGMENTS

I wish to thank the members of my committee for their support, patience and guidance. To Marta Canavés, thanks for your time and interest in this project. Thanks also to Amy Condon for your time and enthusiasm, I appreciate all the information you generously shared with me. I would especially like to thank Michael del Guidice for sharing his love of the profession with us throughout the many classes he taught us, for pushing us to do our best and encouraging us to succeed. Gray Read provided critical focus, thank you so much for holding me to a higher standard and helping me finish. Last but certainly not least, a heartfelt thank you to Dean Juan Antonio Bueno, for agreeing to be my Major Professor in spite of his many other commitments, for his patience and support and for his many insights into the region, the city and the ecosystem that elicited a more relevant design response.

ABSTRACT OF THE THESIS

BAYWALK DEVELOPING LANDSCAPE MEMORY

by

Rebecca Agnes Conable

Florida International University, 2004

Miami, Florida

Professor Juan Antonio Bueno, Major Professor

The primary purpose of this thesis was to investigate the narrative potential in the contours of a site, specifically, in contours shaped by dredge and fill. Contours provide a record of weather, growth and erosion as well as the processes of dredge and fill. In South Florida, our modification of both the coastline and inland swamps document the history of our occupation of the land. The record or memory of this change is often apparent only as an absence. This thesis design exposes the landscape narrative of dredge and fill in Miami's Biscayne Bay through the design of two areas of Baywalk Park along the eastern edge of downtown Miami from Margaret Pace Park to the mouth of the Miami River. The design reveals the historic sequence of dredge and fill on the site.

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I. INTRODUCTION

> *...The power which an ancient environment possesses to command our affection and respect derives from its having accepted change of function; its beauty comes from its having been part of the world, not from having been isolated and protected, but from having known various fortunes.*—John Brinkerhoff Jackson (1997, 368)

Land records the passage of time in its contours. It exhibits change through the natural processes of weather, growth and erosion and from the processes of dredge and fill. In South Florida, drastic modification of both the coastline and inland swamps document the history of our occupation of the land. The minimal elevation change apparent across our region belies the extent to which we have sculpted the land around us. The record or memory of this change is often apparent only as an absence, invisible in the face of its replacement. This thesis design will memorialize this history of loss and replacement by exposing the landscape narrative of dredge and fill in Miami's Biscayne Bay. The site selected for this design project is the Baywalk along the eastern edge of downtown Miami. The boundaries of the site will be Margaret Pace Park to the north and the mouth of the Miami River to the south. Due to an existing public access easement, the Baywalk edge presents an opportunity to develop a linear park on land created by fill from Biscayne Bay. The primary purpose of this thesis is to investigate the narrative potential in the contours of a site, specifically, in contours shaped by dredge and fill.

II. DESIGN CONTEXT

Landscape Narrative

In landscape architecture, the term landscape narrative has been used to describe many different ways that landscapes tell stories (Potteiger 1998). These narratives range from explicit, as in the story landscapes of Disney, to implicit, as in the narrative of processes like erosion or succession. As used here, the meaning of the term will be limited to narrative suggested by the land itself; by its processes, its development and as implicit meaning read by close examination of the land. Landscape narrative as a story told by the land, not on it.

Ann Spirn addresses the idea of inherent landscape meaning in *Language of Landscape.* She argues that the landscape was our first text, the ability to read weather and water, find food and shelter, reading the meaning around us ensured our survival as a species (Spirn 1998, 15). First-hand experience looking and listening closely to the land as we hunt, fish or raise crops has been replaced by limited contact with the world around us. The concepts of wasteland and wilderness illustrate a change that has occurred in our perception of nature in the last hundred years. Both terms once meant the same thing, but now they are opposites (69-70). This dichotomy applies directly to the history of South Florida. A massive restoration of the Everglades "wilderness" has replaced the once-lauded plan that drained the Everglades "wasteland" and created arable land that allowed the South Florida to boom. The dredging and filling that enabled land development across our region has created "wasteland," as we now apprehend the value of viable ecological systems.

In the regional landscape of South Florida, the processes of dredge and fill are among the most important to the land's development over the last hundred years. The shape of the land around us has changed radically from swamp and shallow bay to dry land. Spirn (1998, 105) writes, "A shape reflects, at a given moment, the limits and potentials of its materials, the processes that shape it, and the particulars of its context." Part of reading landscape meaning is being able to understand the land's structure, the relationship of its parts to the whole, both in its underlying materials and enduring processes (103). Due to their prevalence, the processes of dredge and fill have become as important to reading the region as an understanding of its natural processes and materials.

Design Issues

> *My hope is that my intuitive method of working manifests so that people will connect viscerally with the work in a way that makes it their own, provides a lens for their own vision.*—Kathryn Gustafson (Levy 1998, 9)

The idea of the narrative potential of dredge and fill, suggested an exploration of the following design issues. These issues focused the selection of environmental work to analyze as design precedent for this thesis design project.

- Dredge and fill
- Boundaries between land and water
- Elevation changes and plant communities
- History of site intervention
- Water movement
- Permanence and impermanence

Precedent

> *The most rewarding thing ever said to me was by a Dutch woman of a shape I had carved in the sand. She said, 'Thank you for showing me that was there.' That is what my work does for me myself, the discovering 'what was there.' If it does so for others, then so much the richer.*—Andy Goldsworthy (1993, 163)

The exploration of the design issues above started with a review of other work that deals with the same themes. Over the last forty years, many landscape architects and artists have worked with the processes of cut or dredge and fill in sculpting the land. The projects considered here also explore the interaction between land and water, the importance of scale, concepts of excavation and impermanence, and of plasticity, texture and emotion. Two of the pieces examined here come from the temporary land-art installations commissioned by the San Francisco Museum of Modern Art in 2001 for the show *Revelatory Landscapes*. Created by landscape architects, architects and environmental artists, the installations sought to reveal typically unseen forces that shape the land (Wilson 2001, 7). The first piece, *Wind, Sound and Movement*, was created by a team lead by Kathryn Gustafson, the second, *Markings*, was lead by Hargreaves Associates. Other pieces considered here are Robert Smithson's *Broken Circle* and *Spiral Jetty*, Maya Lin's *Wave Field* and Jesse Reiser and Nanako Umemoto's *Water Garden*. The visual analysis of these works developed a set of principles to use as tools in designing the dredge and fill memorial.

Wind, Sound and Movement

Figure 1. (Left) *Wind, Sound and Movement.* Eroding cliff created by land removed for fill, note vegetation contrast.

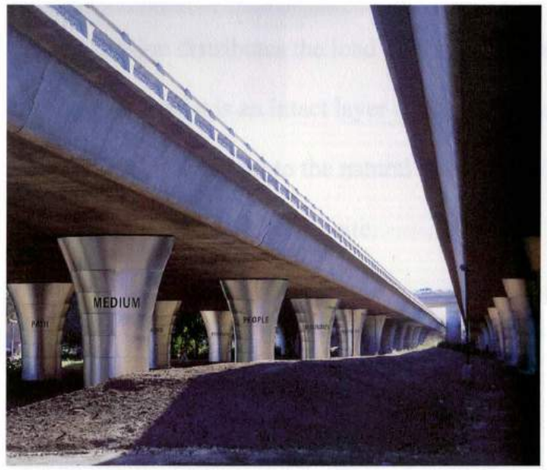
Figure 2. (Above) *Wind, Sound and Movement.* Mylar spinners make wind visible.

Photographs above: Copyright San Francisco Museum of Modern Art, 2001. Permission applied for, see Appendix 1.

Summary:	*Wind, Sound and Movement*
Date:	2001
Designed by:	Kathryn Gustafson, Jaimi Baer, Conger Moss Guillard Landscape Architecture
Commissioned by:	San Francisco Museum of Modern Art
Located:	Candlestick Point, San Francisco, California.
Relevance:	Contrast natural and artificial, make visible an invisible site process—wind.

Wind, Sound and Movement makes visible the play of wind over a hill using spinning spirals of Mylar. The piece was located on a hill around a terraced space created by land removed for fill. The landfill removal created a visible scar, with the steep, cut edge eroding in sharp contrast to the overgrown state of the site's heavily vegetated, undisturbed contours (Wilson 2001, 29-36). This disruption of the hill's contours changed the pattern of the wind over the site. The project makes this change visible using Mylar spirals on poles, whose spin reflects the different wind patterns across the site. This simple device demonstrates the change that has occurred on the site due to the fill events that took place there.

Markings



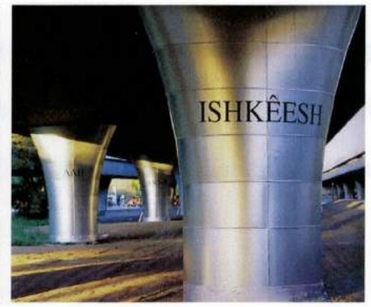


Figure 3. (Above) *Markings*. Native American words on silver painted pylon form a poem through site.

Figure 4. (Left) *Markings*. Dirt mound between highway lanes references burial mounds.

Photographs above: Copyright San Francisco Museum of Modern Art, 2001. Permission applied for, see Appendix 1.

Summary:	*Markings*
Date:	2001
Designed by:	George Hargreaves, Mary Margaret Jones and Julian Lang
Commissioned by:	San Francisco Museum of Modern Art
Located:	Intersection of Interstate 280 and Highway 87, San José, California
Relevance:	Memorial land poem to previous land uses, hidden from "normal" view.

The *Markings* project uses the marginalized space under a freeway interchange in San José to contrast the cultural and natural history of the site. The ground under the freeway is bare, and a large earth

mound rises up between two concrete freeway ceilings, exposed to the sun. This berm alludes to burial mounds, construction sites, children's playgrounds. A scramble up the loose dirt sides of the mound releases one into sunshine, elevated almost to the level of the cars on a long raised path, a midpoint between the exposed cars and hidden world below. The team clad the highway pylons with metal and labeled each with a single English word on one side and the corresponding Native American word on the other. The simple black words invite a visitor to walk through the forest of metal pylons, with the cars roaring by overhead, to read the poem created across the site (Wilson 2001, 37-44). Developed in connection with a Native American poet/linguist, the poem expresses, "a belief in myth as the conveyer of truth, and in an essential connectedness between humans and the earth (40)."

In response to the *Markings* project, Dean MacCannell argues that all landscapes are memorials, all ground hallowed by previous inhabitants and all contain buried memories. He invokes the Navajo concept that to remember something, the object must no longer exist. "There is no truer marker for the gap between consciousness and a lost object than *absence* (Wilson 2001, 27)." Thus, the Navajo destroy their ceremonial sand paintings to remember the ceremony, the act of creating them. The idea of the memorial of destruction applied to the narrative of dredge and fill, informs the memorial design created here. A landscape's lack of physical form implies a form of memory.

Spiral Jetty

Figure 5. (Far Left) *Spiral Jetty*

Figure 6. (Left) *Spiral Jetty.* Salinity increases in center of spiral, illustrated by pronounced red color of algal bloom.

Photographs above: Copyright Estate of Robert Smithson and VAGA. See Appendix 1.

Summary: *Spiral Jetty*
Date: 1970
Designed by: Robert Smithson
Located: Great Salt Lake, Utah
Relevance: Form exaggerates/demonstrates natural process of site: increasing salinity gradient in spiral reflected in algal bloom.

Robert Smithson's piece *Spiral Jetty* is a fifteen-foot wide path of earth and black basalt rubble built in a spiral one thousand five hundred feet long, that curls out into the Great Salt Lake in Utah. The water around *Spiral Jetty* is red, colored by local algae. The spiral shape creates a maximum "edge" or shoreline condition in a minimal space. Water interacts with land on both sides of the spiral path, forced to travel a long distance to reach the center. Though the Great Salt Lake is a relatively static body of water, the spiral creates a gradient effect on the salinity of the water as it gets closer to the center. Captured in the photograph below, thriving halophilic algae show up as the darker red center of the spiral, their population size (demonstrated by water color) tapering off as the salinity decreases away from the center.

One of the other significant features *Spiral Jetty* is that it floats on the mud of the lakebed. "…Spiral Jetty was staked out in such a way as to avoid the soft muds that broke up through the salt crust; nevertheless there were some mud fissures that could not be avoided. One could only hope that tension would hold the entire jetty together, and it did (Flam 1996, 147)." Built using spoil from the beach, internal surface tension distributes the load over the bottom and prevents sections from sinking. The spiral floats on the mud because it is an intact layer of fill, separate from, but resting directly on top of the bottom. *Spiral Jetty* calls attention both to the natural condition of the lake and to its disruption, successfully demonstrating the significant processes of its site.

Broken Circle

Figure 7. (Far Left) *Broken Circle.* Canal circle in abandoned quarry.

Figure 8. (Left) *Broken Circle.* Dikes flooded to create canals.

Photographs left: Copyright Estate of Robert Smithson. Permission applied for, see Appendix 1.

Summary: *Broken Circle*
Date: 1971
Designed by: Robert Smithson
Located: Emmen, Netherlands
Relevance: Flooding and canalization of region reflected in form creation.

The second piece by Robert Smithson is *Broken Circle*, built in Emmen, Holland in 1971. One hundred forty feet in diameter, the piece is a sand circle created by a twelve-foot canal dug into the quarry bank, and by a twelve-foot wide promontory pushing out into the quarry lake. Smithson again chose a marginalized piece of land to site the piece, reclaiming the site by giving it a different shape, a shape related to the processes that created it. *Broken Circle* was created by making a series of dikes, and ultimately by deliberately flooding the canal that cut through the circle. As intimately concerned with water levels and flooding as the Netherlands are, *Broken Circle* references the region's land/water interaction with its canal structure. The processes used to create Broken Circle reflect the processes encapsulated within the piece, water and land, flooding, filling and dredging (Flam 1996, 255).

Wave Field

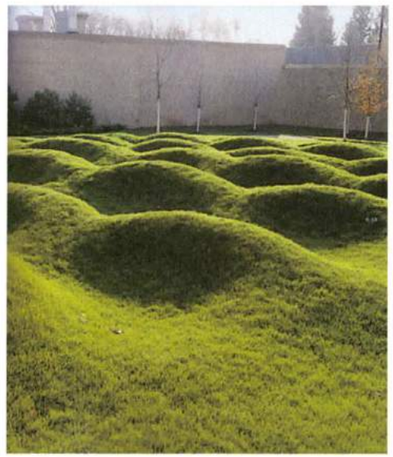


Figure 9. (Far Left) *Wave Field*

Figure 10 (Left) *Wave Field.* Detail of berms.

Summary: *Wave Field*
Date: 1995
Designed by: Maya Lin
Located: University of Michigan, Ann Arbor, Michigan
Principle: Recast fluid phenomena in solid form.

Photographs above: Copyright Maya Lin Studio, 2000. Permission applied for, see Appendix 1.

Wave Field, created by Maya Lin, occupies a ninety-foot-by-ninety-foot space near the University of Michigan's Aerospace Engineering building. The piece is a series of slightly scooped berms, "waves," that stand roughly five feet above the surrounding elevation. The berm series mimics the shape of a wave phenomenon seen in the open ocean (Lin 2000). *Wave Field* solidifies a form normally created by fluid media, like air or water, by translating it on the land. The piece creates immutable space that demonstrates movement.

Water Garden

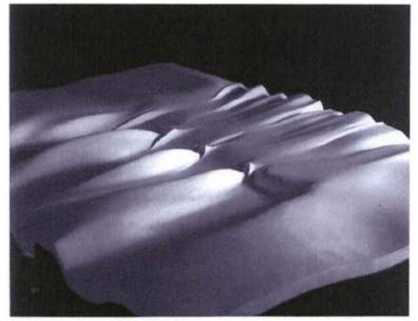
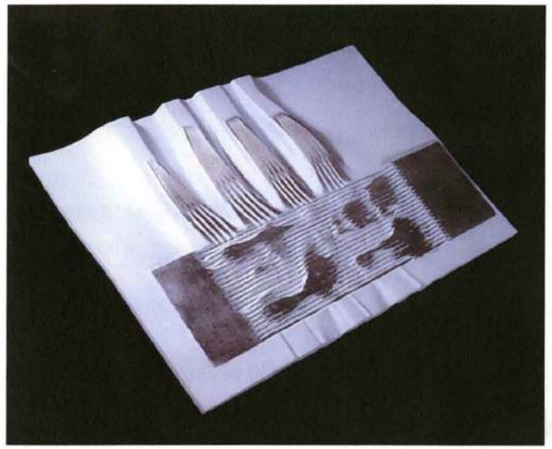


Figure 11. (Above) *Water Garden.* Model.

Figure 12. (Below) *Water Garden.* Model shows water inflow to laminar concrete subsurface.



Photographs above and right: Academy Group 1998. Permission applied for, see Appendix 1.

Summary: *Water Garden*
Date: 1997
Designed by: Jesse Reiser and Nanako Umemoto, in collaboration with Jeffrey Kipnis
Located: Columbus, OH
Relevance: Form forces expression of underlying structure on surface through vegetation.

The architecture firm Reiser and Umemoto proposed Water Garden in collaboration with Jeffrey Kipnis in 1997. The project was in two parts, a built garden of linked pools at Kipnis' home in Columbus, Ohio, and a further theoretical conceptualization of models and drawings. The project consists of a grooved concrete slab whose shape mimics the bumpy topography of a terminal moraine. Covered with earth, planted and watered by interwoven grooves to three water sources, this underlying structure expresses itself in the variation in surface growth that results from varying soil depths and moisture.

At the heart of the Water Garden project is the idea of expression of forced instability. "Nature, it will be argued, will of its own inertia tend towards developments of increasing stability and banality. A salient and intensive architecture thus requires the deliberate production of instability in order to produce novelty (Benjamin 1998, 85)." The region's geologic structure was recast in grooved concrete and covered with earth. This underlying structure reveals itself at the surface through the interaction of plant material and soil conditions that result. Ann Spirn's ideas of shape and structure resurface here; the grooved laminar layer provides structure, mirrored on the surface shape through the media of plant growth.

Design Guidelines

The project's design issues have been further refined here in response to the ideas suggested by the work above. The four guidelines below outline the design development of the project and are expressed in the final design for a public park along Biscayne Bay.

- Establish the historical baseline conditions of the site and contrast them with current developed conditions, making visible the process of development.
- Create a memorial to site processes that recognizes the importance of loss, absence.
- Investigate regional processes within designed form, specifically tidal flow, regional hydrology and vegetation.
- Demonstrate processes on the site so they may be explored and understood by the public.

III. SITE ANALYSIS

> *My touch is the most recent layer of many layers that are embedded in the landscape which in turn will be covered by future layers—hidden but always present.*—Andy Goldsworthy (2000, 8)

Site analysis is critical to landscape architecture. To place this site in proper context, three types of site analysis were conducted. First, an overview of the original ecological condition of the site is helpful in orienting the site within the region. Second, an analysis of the development of the site since 1899 demonstrates the amount of disruption that has occurred over the past hundred years. Finally, analysis of current conditions on the site presents opportunities and constraints to be capitalized upon during the design process.

Ecological Overview

An understanding of the original hydrology and ecological communities that prevailed on the site is essential to give context to current conditions. Studies of the changes to Biscayne Bay's ecology documenting the reduction in habitat of both plant and animal species caused by increased depth, turbidity and changes in salinity over the last hundred years were reviewed. These changes are in response to the drainage of the Everglades, dredge events in the bay, and to the increased pollution pressure on the bay due to agricultural and urban expansion.

Figure13. Original extent of Everglades system (USGS 2002).

The hydrologic system of the region is driven by the more than fifty-two inches of annual rainfall we receive on average, which directly influences surface water storage and flow. The original Everglades watershed acted as a single hydrologic unit, flowing from the middle of the state, near Orlando, to Florida Bay (USGS 2002). The slow sheet flow from Lake Okeechobee descended an average of one foot per mile toward the bay, at an average depth of six inches to six feet (ENP 2004). This allowed the Everglades wetland to filter the water and remove most nutrients before it reached the bay and permitted the recharge of the Biscayne Aquifer, which forms the current major water supply of Dade, Broward and Monroe counties. The other regional groundwater resource is the Floridian Aquifer, a deeper, confined aquifer that exists independently of the surface and superficial systems in our region and is largely brackish in South Florida. The Biscayne Aquifer is a superficial aquifer system that exists above ground in wetland areas due to the shallow water table of the region. Historically, the water table was higher along the coast than in the Everglades, which prevented the flow of water eastward. The hydrostatic pressure of the groundwater was so great it caused freshwater springs in Biscayne Bay (Reich 2004).

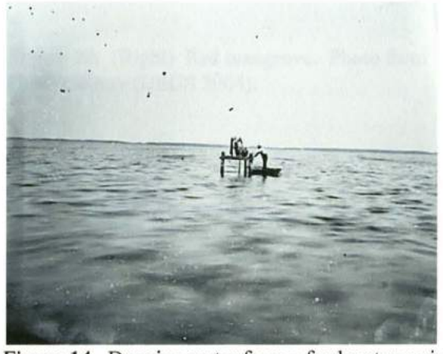


Figure 14. Drawing water from a freshwater spring circa 1890. Photograph by Ralph Munroe (HASF 2000).

Figure 15. Ralph Munroe drinking from the Punch Bowl, a freshwater spring at the foot of Silver Bluff, circa 1890. Photograph by Ralph Munroe (HASF 2000).

The dynamics of the system changed dramatically after the draining and development of the Everglades. The drainage canals not only drained the surface water from the Everglades, but also lowered the water table by several feet, reducing its hydrostatic pressure and allowing saltwater intrusion along the coast and canal margins (USGS 2002). In spite of the tremendous amount of rain we receive every year, fresh water is in high demand because our retention and detention areas are so much smaller. The flow of water across South Florida is heavily managed to try and balance the competing needs of crop irrigation, flood management, a clean, freshwater supply and wetland preservation to name a few. The Comprehensive Everglades Restoration Plan is a multi-billion dollar federal effort slated to rehabilitate the Everglades system and restore the region's hydrologic system to working order, but for now, the system remains problematic.

Figure 16. Hydrodynamics of site circa 1900, before Everglades drainage began (Alleman 1999).

Figure 17. Current hydrodynamics of site, responding to increased population water use and drainage of fresh water from Everglades (Alleman 1999).

The drainage canals pose several problems for the ecological health of the bay. Historically, Biscayne Bay had provided both estuarine and marine habitat, both of which have been degraded. The estuarine habitats have decreased due to increased or inconsistent salinity. Instead of providing a dispersed, relatively constant low volume of fresh water to the bay, the canals provide sporadic, high volumes burst of fresh water. The changes in timing and location have harmed sea grass and their associated fish nurseries. Clear and shallow, with original depths from three to nine feet, the bay floor supported extensive benthic communities that trapped sediment. More than half of the area in north Biscayne Bay, where our site is located has been dredged to a depth of ten feet or greater (Mulliken and Van Arman 1995). This dramatic increase in depth resulted in increased turbidity, as disrupted benthic communities could not reestablish themselves in the unsettled steep sides of the new channels. The northern portion of Biscayne Bay experiences more pronounced tidal flow through dredged navigation channels which results in increased system salinity but decreases pollution in the bay by flushing it out to the Atlantic.

The north bay area was once bordered on both sides by tidal marshes and swamps, of which only two small areas remain (Browder et al. 2003). Characterized below, both of these communities were extremely productive, providing breeding habitat and protection for a variety of species, as well as forming soil and stabilizing the shoreline.

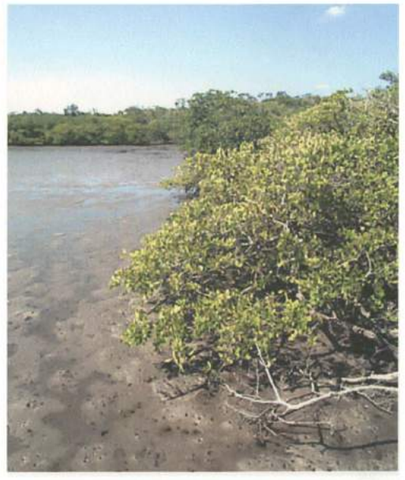


Figure18. (Above left) Salt marsh, also known as tidal marsh. Photo from SOFIA Ecosystem Photo Gallery (USGS 2004).

Figure19. (Above right) Mangrove swamp, also know as tidal swamp. Photo from SOFIA Ecosystem Photo Gallery (USGS 2004).

Figure 20. (Right) Red mangrove. Photo from SOFIA Ecosystem Photo Gallery (USGS 2004).

Table 1. Estuarine Communities: Tidal Wetlands (Bueno 2001).

Community:	Tidal Marsh (Salt Marsh)	Tidal Swamp (Mangrove Swamp)
Climate and Geology:	Hot humid microclimate, intense sunlight Marl, muck or sand bed; low soil aeration, highly saline soils	Hot, humid microclimate, deep shade Deep muck, sand shell bed; low soil aeration, highly saline soils
Topography:	Level to nearly level relief Intertidal to supratidal elevations Gradient to 1% Transition to freshwater tidal marsh and swamp, tidal swamp, coastal berm, maritime hammock, shell mound. Sites often inland of tidal swamp.	Level to nearly level relief Intertidal to supratidal elevations Gradient to 1% Transition to sea grass bed, sand bottom, tidal marsh, coastal berm, maritime hammock, shell mound.
Hydrology:	Intertidal and supratidal Sites along coastlines with low energy waves Tidal flood and ebb of brackish water Very slow percolation, even at low water table Tidal import nutrients, upland runoff nutrients	Intertidal and supratidal Sites along coastlines with low energy waves Tidal flood and ebb of brackish water Inundation at high tide, saturation at low tide Tidal import nutrients, upland runoff nutrients
Ecology:	Dense, uniform grass, rush, sedge prairies Smooth cord grass at deep sites, black rush at shallow sites, saw grass inland Extremely high biological productivity Habitat for numerous fish, shellfish, birds Stabilization and protection of shore; soil formation	Dense, low canopy forest of red, black, white mangrove and buttonwood Estuarine-marine food cycle link Nursery sites for fish, shellfish; breeding sites for shorebirds, wading birds Stabilization and protection of shore; form mangrove islands
Human Impact:	Apparently secure natural community in Florida, may be rare in some regions Offshore pollution, inland pollutant runoff, dredging and filling, erosion of unvegetated marsh.	Rare natural community in Florida, very rare on Earth Offshore pollution, inland pollutant runoff, Freshwater input alteration, dredging and filling Disturbance of formation factors; temperature, salinity, substrate, wave energy, tidal ebb and flow.

Site Development

The current form of the site was created by fill dredged from Biscayne Bay over the last hundred years. Cloaked in concrete, pushed out into Biscayne Bay and relocated as necessary, the constructed bay edge has never settled into a fixed form. The changes at the bay edge are primarily reactive changes, recording a response to demands placed elsewhere on Biscayne Bay. The mutability of this boundary tells a story of impermanence and of the changing desires of its inhabitants. The landscape narrative of dredge and fill generated forms that expose the process of the site's development and of the estuarine "wasteland" destroyed in its creation. The historical analysis of the features of the site has established the primary layers in the gradual development of the site. These layers form the backbone of its narrative. The major fill events that were revealed by studying maps and photographs were correlated with the dredge events in Biscayne Bay that produced the fill. Additional historical information about the site, compiled from photographs and historical accounts, gives a more complete picture of the site's character, commercial and recreational activity.

Figure 21. Aerial photograph from 1992 shows channels on bay floor, sediment plume from Miami River (Cantillo et al. 2000).

The following images (Plates 1 through 4) show the significant dredge and fill events that shaped the site. The timeline identifies major events reflected in the changing contour of the site, further illustrated by the embedded photographs. Of the resources consulted in creating these images, the most substantial debt is owed to the Sanborn Fire Insurance Maps of Miami from 1899 to 1950, the archives of the Historical Association of South Florida and the NOAA technical memorandum *Biscayne Bay: Environmental History and Annotated Bibliography* (Cantillo et al. 2000). Plate 4 summarizes the changes to the site over the past hundred years, the original shoreline, filled area and disrupted area where filled land was reshaped.

Plate 1. Dredge event timeline and shoreline development, 1896 to 1906.

TIMELINE

1896
Channel dredged to Cape Florida, fill used in construction of Royal Palm Hotel and in port construction on Miami River.

1900
Channel to Cape Florida deepened to 10', fill used to build terminal at Florida East Coast (FEC) Railroad Station.

1902
Dredging of Government Cut provides more direct shipping access to new rail terminal.

1903
Everglades drainage plan started.

1904
Salt intrusion begins.

SHORELINE 1899

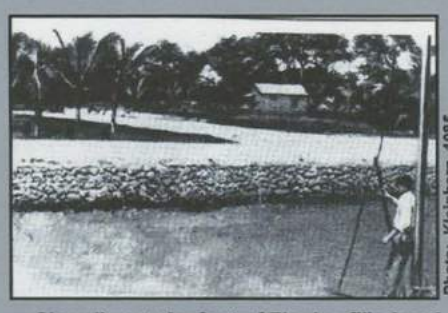


Photo: Kleinberg, 1985.
Shoreline at the foot of Flagler, filled and stabilized, 1896.


Photo: Kleinberg, 1985.
Groundbreaking for the Royal Palm Hotel, 1896.


Photo: Gaby, 1993.
The Royal Palm Hotel, 1900.


Photo: GGSITES.COM, 2004.
Royal Palm Park, 1898.


Photo: Shofner, 1990.
The mouth of the Miami River, 1899.


Photo: Gaby, 1993.
The mouth of the Miami River, 1884.

SHORELINE 1906


Photo: Peters, 1984.
Steamliner S.S. Shinnecock, 1909.

Photo: Peters, 1984.
Fish market, on the bay at the foot of 2nd Street, 1909.


Photo: Peters, 1984.
Rail terminal at Knight's Key dock, 1909.


Photo: Peters, 1984.
Steamliner, S.S. Miami, 1909.


Photo: Peters, 1984.
Royal Palm Park, 1909.


Photo: Kleinberg, 1985.
Steamship, S.S. St. Lucy, at mouth of Miami River, 1906.

Site Development: Fill Event Layers

Legend
1899
1903
1906

N

SCALE: NTS

Plate 2. Dredge event timeline and shoreline development, 1907 to 1927.

1913 — Miami River dredged. Drainage canals become operational and Everglades drainage begins.

1914 — Collins Bridge to Miami Beach opens.

1915 — Turning basin dredged to 18' deep. Government Cut deepened and Municipal Docks built.

1918 — County Causeway to Miami Beach opened.

1925 — Intercoastal Waterway (ICW) dredged. Fill used to create Bayfront Park. Collins Bridge replaced with Venetian Causeway.

1926 — Category Four hurricane hits Miami. Harbor deepened after ship runs aground and closes port for a month.

1927 — Port expands.

SHORELINE 1918

Photo: Kleinberg, 1985.

View of piers, 1919.

COLLINS BRIDGE TO MIAMI BEACH

COUNTY CSWY TO MIAMI BEACH

Photo: GGSITES.COM, 2004.

Area that will become Bayfront Park, 1917.

Photo: HASF, 1915.

View of piers, Royal Palm Park, 1915.

Photo: HASF, 1915.

Aerial view bayfront, 1915.

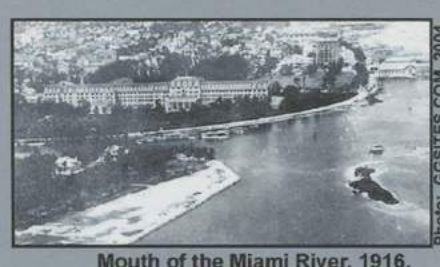


Photo: GGSITES.COM, 2004.

Mouth of the Miami River, 1916.

SHORELINE 1925

Photos: Reardon and Kleinberg, 1992.

Biscayne Boulevard, after storm 1926.

Yacht against Venetian Causeway, 1926.

COLLINS BRIDGE REPLACED WITH VENETIAN CSWY

COUNTY CSWY TO MIAMI BEACH

Photo: GGSITES.COM, 2004.

Bayfront Park, 1925.

Photo: Kleinberg, 1985.

Biscayne Boulevard, 1927.

Photo: HASF, 1926.

Bayfront Park fishing pier, October, 1926.

Photo: GGSITES.COM, 2004.

Parking along Biscayne Boulevard.

Photo: GGSITES.COM, 2004.

Newly filled Bayfront Park.

Photo: HASF, 1926.

Bayfront Park, May, 1926.

Site Development: Fill Event Layers

Legend

1899
1903
1906
1914
1918
1924
1925

N

SCALE: NTS

Plate 3. Dredge event timeline and shoreline development, 1928 to 1979.

1942 — County Causeway renamed in honor of General MacArthur.

1956 — Sewage disposal system complete, eliminates raw sewage discharge into Biscayne Bay.

1963 — Port relocates to Dodge Island.

1976 — Old Port filled to become Bicentennial Park.

1979 — Construction begins on Isamu Noguchi's redesign of Bayfront Park.

SHORELINE 1950

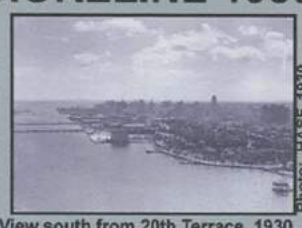


Photo: HASF, 1930.

View south from 20th Terrace, 1930. Note Miami Woman's Club building.

Photo: HASF, 1935.

Venetian Causeway, 1935.

VENETIAN CSWY.

Photo: HASF, 1927.

Port of Miami, 1927.

Photo: HASF, 1935.

Sears building, Trinity Cathedral, 1935.

Photo: HASF, 1935.

Biscayne Boulevard near Port, 1935.

Photo: HASF, 1935.

Bayfront Park 1935.

Photo: HASF, 1928.

Bayfront Park 1928.

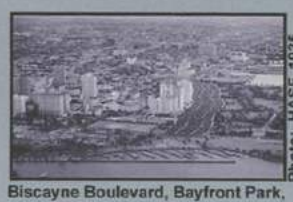


Photo: HASF, 1935.

Biscayne Boulevard, Bayfront Park, 1935.

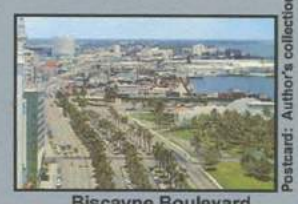
Photo: HASF, 1940.

Mouth of Miami River, 1940.

SHORELINE 1979

Postcard: Author's collection.

Bayfront Park, FPL postcard.

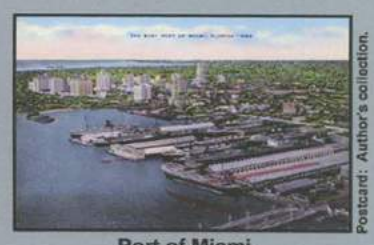


Postcard: Author's collection.

Biscayne Boulevard.

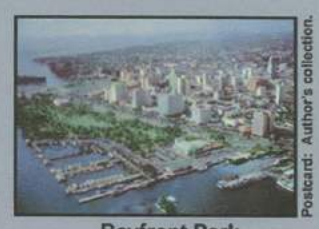
VENETIAN CSWY.

MACARTHUR CSWY.



Postcard: Author's collection.

Port of Miami.



Postcard: Author's collection.

Bayfront Park.

PORT BLVD. BRIDGE

Photo: HASF, 1948.

Dade County aerial photograph, 1948.

Site Development: Fill Event Layers

Legend

1899 1903 1906 1914 1918 1924 1925 1950 1972 1976 1979

N

SCALE: NTS

1987

Bayside shopping complex opens near Miamarina.

American Airlines Arena opens.

1999

DISRUPTION SUMMARY

SHORELINE 1999

Photo: NOAA, 1992.

Aerial photograph shows channels in bay bed, 1992.

VENETIAN CSWY

MACARTHUR CSWY

Photo: GGSITES.COM, 2004.

Bicentennial Park, 1989.

Photo: GGSITES.COM, 2004.

Bayside and Miamarina, 1988.

PORT BLVD. BRIDGE

Photo: NOAA, 1992.

Aerial photograph shows sediment plume, 1992.

Photo: GGSITES.COM, 2004.

Mouth of Miami River, 1989.

FILLED AREA

VENETIAN CSWY.

MACARTHUR CSWY.

MOST DISRUPTED AREA

PORT BLVD. BRIDGE

FILLED AREA

ORIGINAL BAY EDGE

DISRUPTED AREA

Site Development: Fill Event Layers

Legend

1899	1924	1979
1903	1925	1999
1906	1950	
1914	1972	
1918	1976	

N

SCALE: NTS

Plate 4. Dredge event timeline and shoreline development, 1980 to 1999.

Current Conditions

Site analysis of current conditions along the bay front focused on four general areas: vehicular circulation, points of interest along the site, pedestrian circulation and edge condition. Compiled into a list of opportunities and constraints, this information helped focus the design development of the Baywalk linear park.

Vehicular Circulation

This site is most frequently viewed from an automobile. Biscayne Boulevard, also know as United States Highway One, is the major north-south corridor through the site (see Plate 5, p. 13). Other important vehicular access to the site occurs at the two causeways to Miami Beach, the Venetian Causeway and the MacArthur Causeway. The site can also be accessed via the Metromover public transportation system, which has several stops in the downtown area.

Heavily used both by local and through traffic, Biscayne Boulevard has existed in its present location almost from the founding of the city of Miami. Photographs taken at intersections along Biscayne Boulevard document how few view corridors to the bay remain. Views from the street have received low priority, restricting visual access to the bay to those who can afford a high-rise view. A classic example of the poor planning that has contributed to this problem is at the intersection of East Flagler Street and Biscayne Boulevard, where a one-way street (East Flagler) directs traffic away from one of the few unobstructed views to the bay through Bayfront Park. This failure to maintain views has effectively cut off the city's connection to the bay at street level. Unfortunate that Miami's grand boulevard located along the historic bay edge has become so isolated from its namesake.

Points of Interest

The potential to link the many currently isolated points of interest along the site is one of the most exciting factors in developing this site as a linear park (see Plate 6, p. 14). The number and variety of attractions along the site indicate the potential for both day and evening use of a pedestrian link through downtown. The development of the Baywalk would connect two existing parks, Bayfront Park and Margaret Pace Park, with the proposed Museum Park site of the Miami Science Museum and Museum of Modern Art. Other attractions along the site are the Omni Complex, Miami Woman's Club, Miami Performing Arts Complex (under construction), Miami Herald, American Airlines Arena, two marinas, a cathedral, three hotels and Bayside Marketplace.

Pedestrian Circulation

Many sections of the site are already pedestrian accessible, however, significant obstacles exist to pedestrian connection along the entire site (see Plate 7, p. 15). Miami-Dade County code intends to "…provide the maximum amount of public visual and physical access to the water through the provisions of mixed use facilities and places open to the public at large, such as walkways, boardwalks, plazas and observation areas along the shoreline (Miami-Dade County 1981)." Indeed, public access has been provided along much of the site. Unfortunately, several sections of the edge have been fenced off due to problems with vandalism and petty crime, as often happens with underused urban areas, especially those that are substantially hidden from view. Another contributing factor to the failure of these sections is their isolation from one another, which prevents the public from using the bay edge as a pedestrian corridor. Major impediments to pedestrian access along the site occur at every causeway.

Edge Condition

The bay edge bears little relation to its natural condition (see Plate 8, p. 16). Bay depths are as much as four times the original depths of three to nine feet. Though contamination is below acceptable levels, urban storm water runoff and petrochemicals from the port and Intercoastal Waterway pollute the bay. Seawalls line the majority of the site's bay edge. Land elevations range from approximately two to six feet above average high tide.

Opportunities and Constraints

The major opportunities and constraints summarized here are listed in Plate 9 (p. 17):

- Opportunities: To provide pedestrian linkage to many points of interest through downtown Miami, provide access to the bay, improve ecology of bay edge and educate public about site's history.
- Constraints: Lack of pedestrian connectivity across site, problems with petty crime, few view opportunities for current users of site and disrupted natural systems.

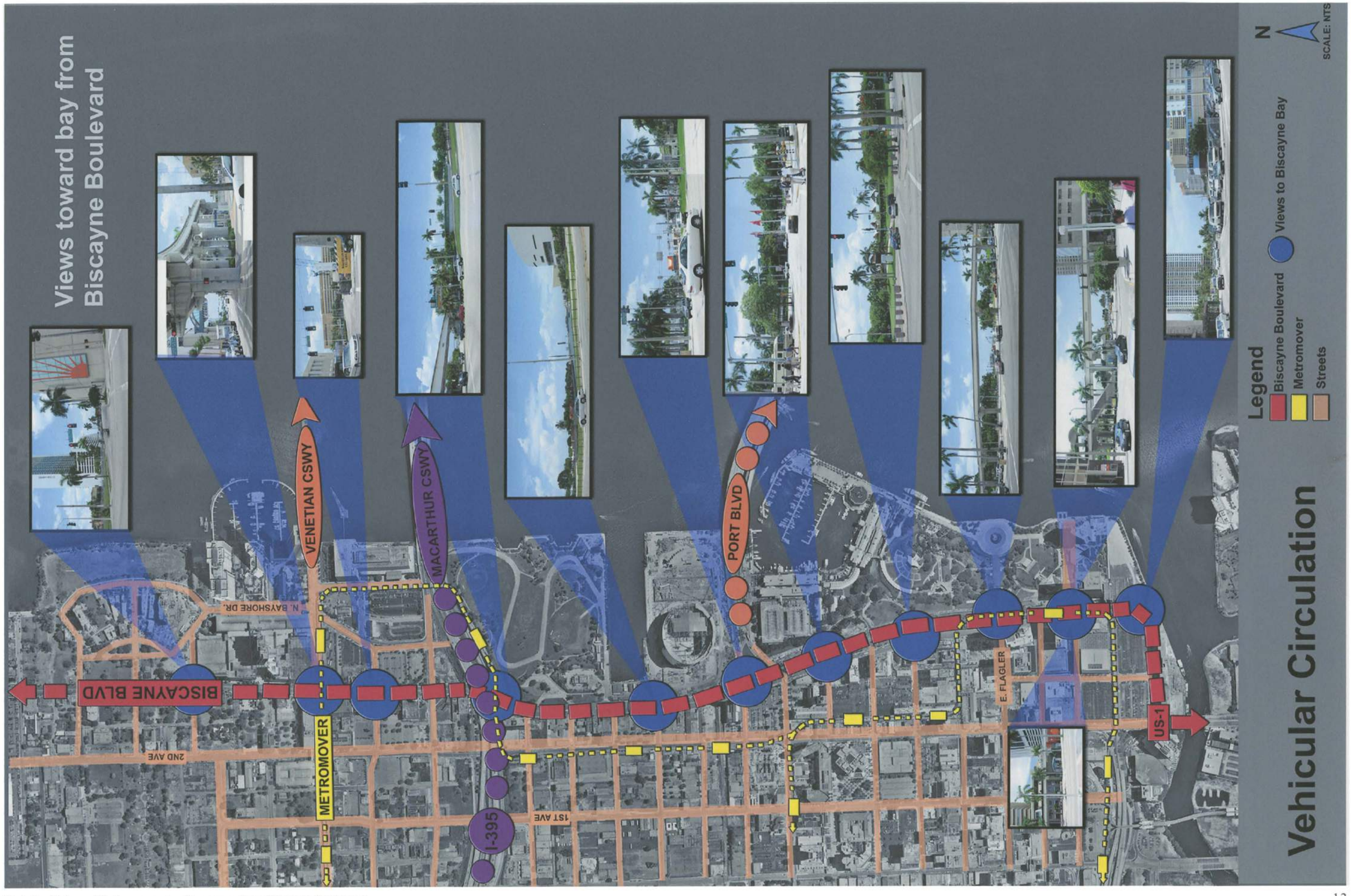


Plate 5. Major vehicular access to site occurs along Biscayne Boulevard.

Plate 6. The creation of a Baywalk would link many currently isolated points of interest.

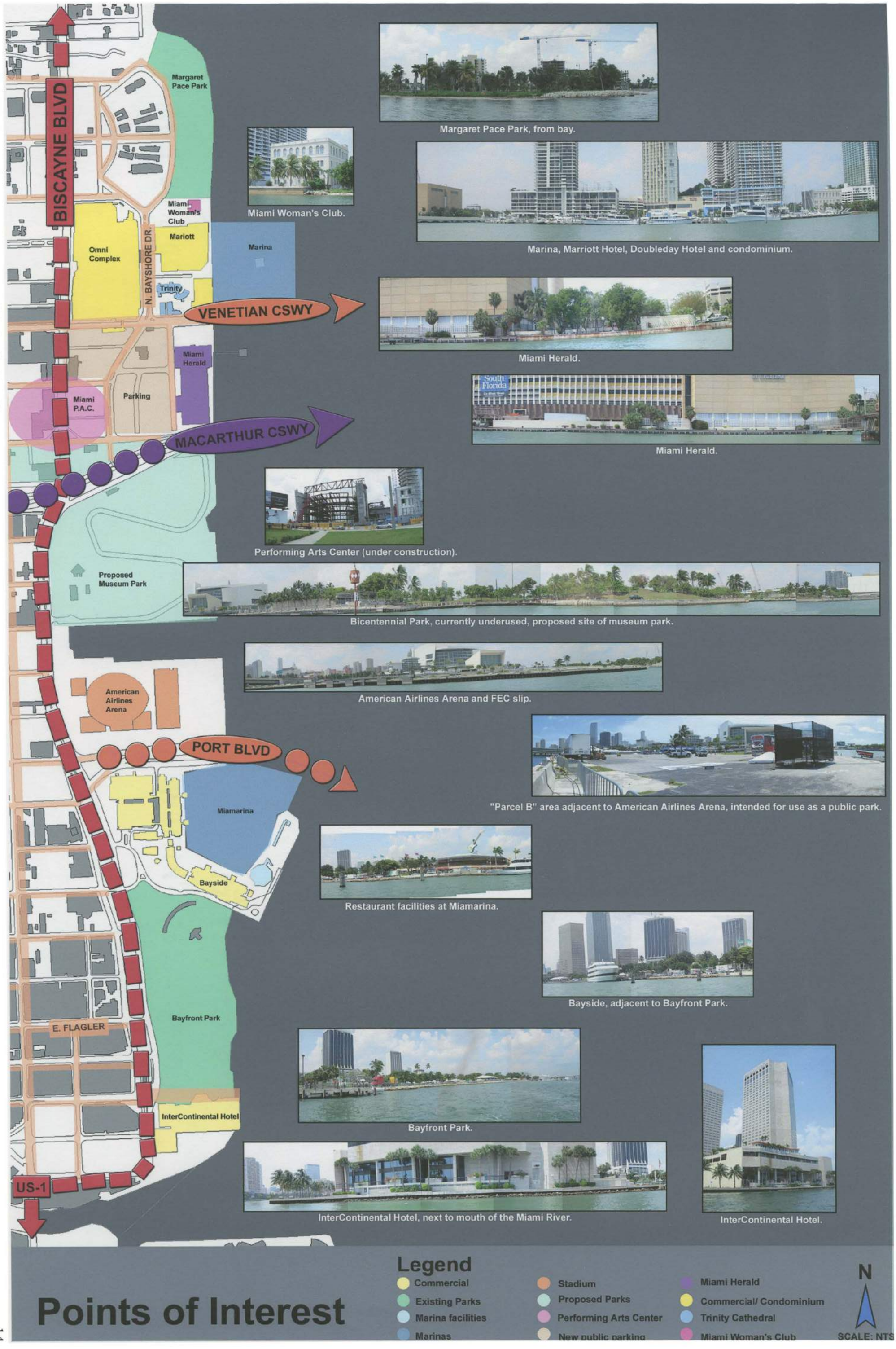


Plate 7. Though sections of the site are pedestrian accessible, significant obstacles are shown above.

Plate 8. The edge condition of the site reflects its urban character and long history of use.

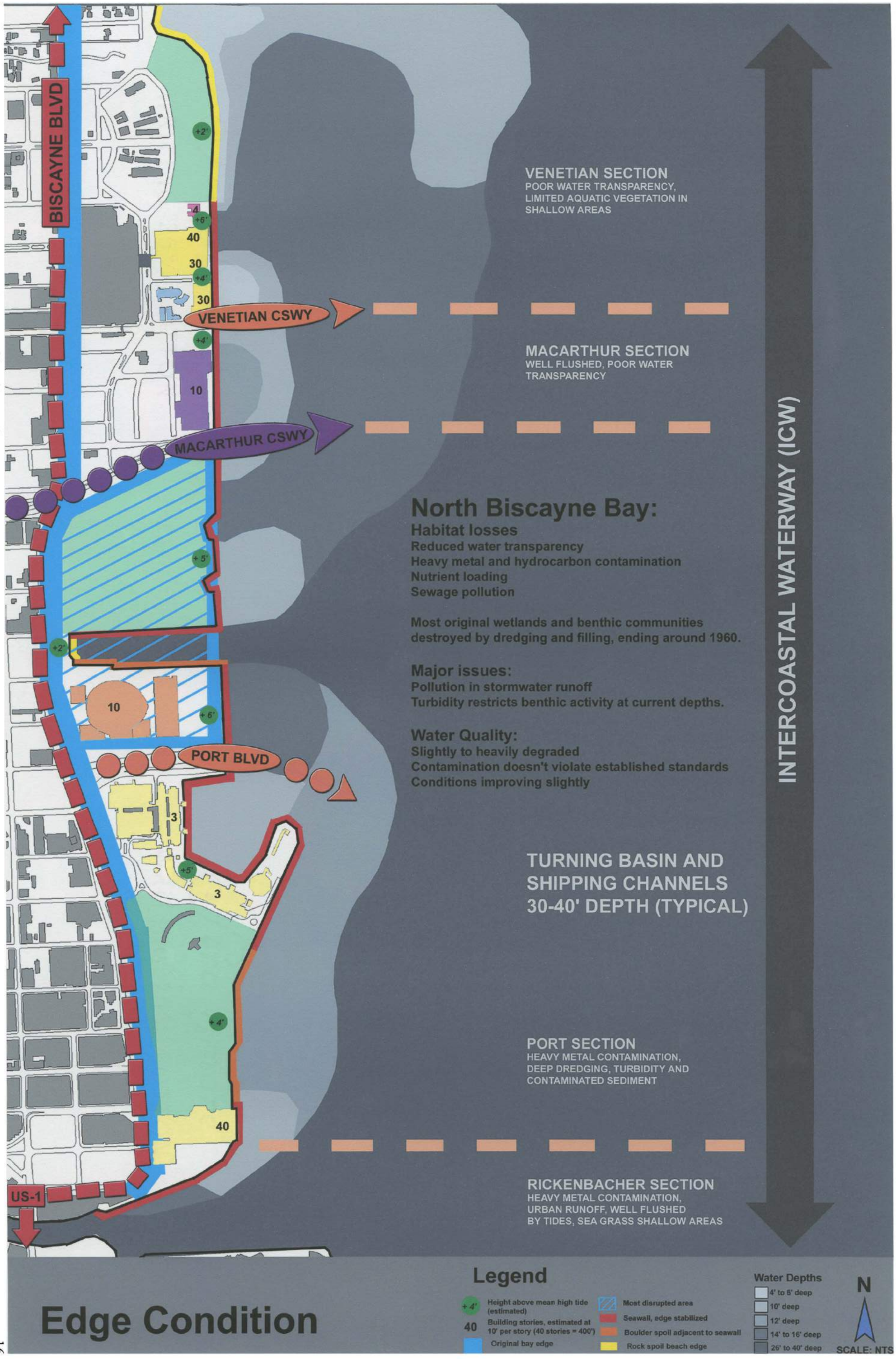
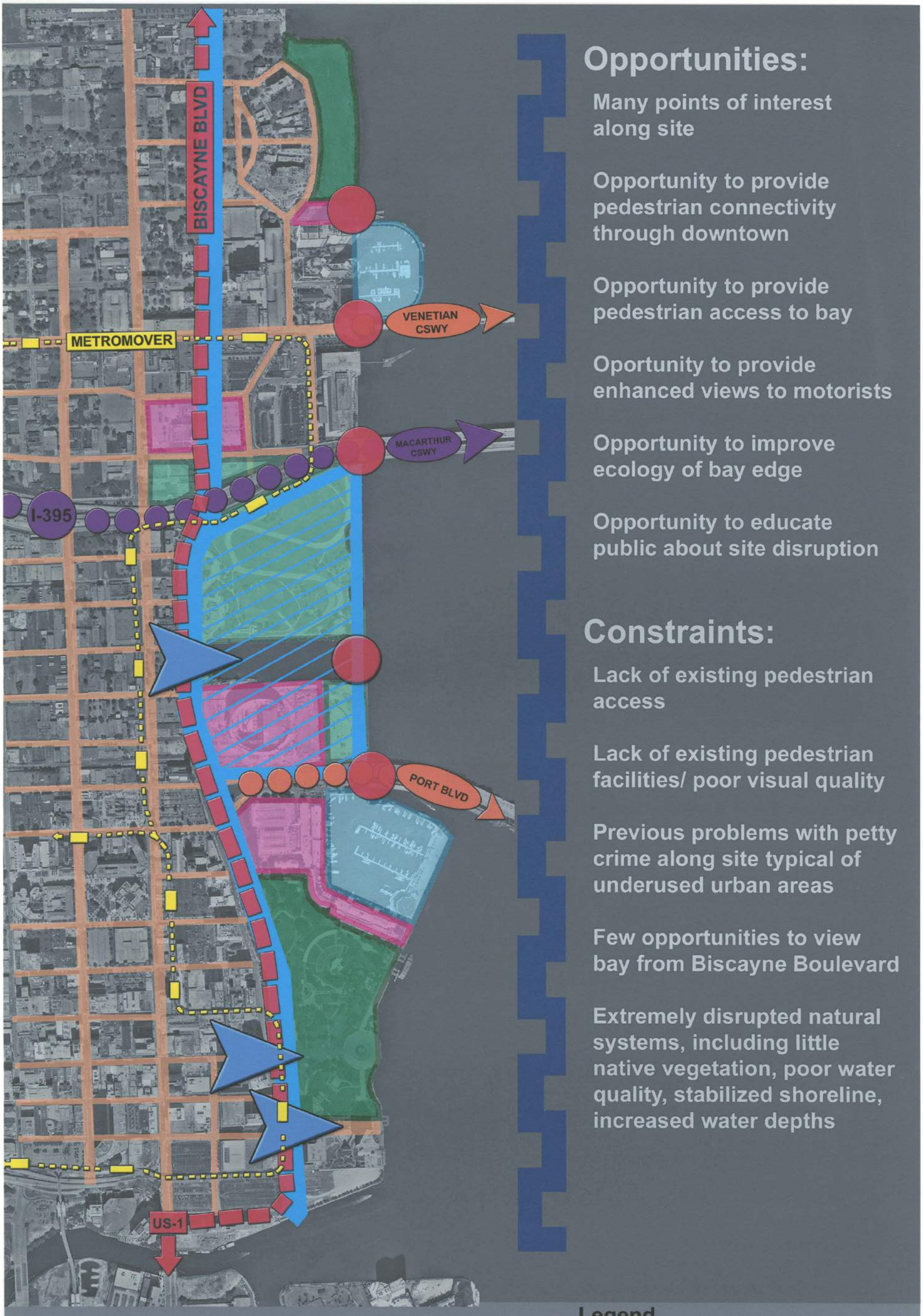


Plate 9. Site analysis of current conditions resulted in the opportunities and constraints presented here.



Opportunities & Constraints

IV. DESIGN PROGRAM

Site Concept

> *What I introduce into the land does not try to dominate or overwhelm the existing landscape but instead tries to work with it, producing a new experience or framing of the site. Both the art and architectural works are environmental—they both create entire environments and reflect my concerns with environmental issues.*—Maya Lin (2000, 2:07)

The concept for developing this three-mile urban site into a linear park responds to the analysis of the site and to the design guidelines for the project; summarized in one word: connection. To create a viable linear park on this site, pedestrian access failures along the site must be resolved; the isolated features of the site must be connected. To create a memorial that reveals the site's development and processes, visual and physical connections must be reestablished with the bay and cultural connections must be established between the public and these processes.

Often the design of a park is unified by a consistent aesthetic, created using common site furnishings and paving materials throughout the site. In this case, the visual fragmentation of the site will be preserved to provide a record of both its history and existing uses. Currently, the points of interest along the site provide a variety zones with different visual characteristics. Instead of replacing the character of these established areas with a new, homogenized bay edge, the existing segments will simply be joined together, prioritizing the creation of a strong pedestrian link over a renovation of existing spaces. The other concept that affects the entire site is the idea of memorializing the loss of the bay connection. Restoration of a sense of the original edge of the bay replaces consistent visual character as the visual marker used to unify the park.

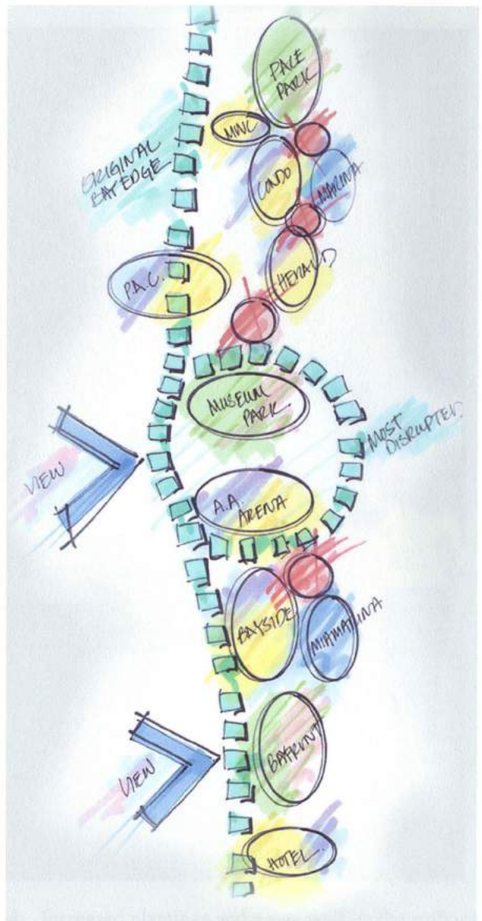


Figure 22. Bubble concept diagram.

Design Solution

In developing a design solution, the obstructions to pedestrian access were classified into three categories. In the first category are temporary obstacles, such as the fencing behind the Miami Herald (shown Plate 7, p. 15) which would be removed once the site became safer due to increased activity. This first category requires no design solution. The second category requires minimal capital improvement and equally minimal design input. There are two areas which fall into this category, the first, identified with a red circle at right (see Figure 23), is behind the Miami Woman's Club, the second, across Venetian Causeway. The third category of pedestrian obstacle requires substantial capital improvement. The three areas that fall into the third category are the FEC slip, MacArthur Causeway and Port Boulevard. The area between the two bridges was selected for a more detailed design exploration, labeled at right as Site Design: Mangrove Swamp Exploration. In addition, that area of the site is the most disrupted historically and is the only remaining area of the site where the bay touches the original shoreline. The other area selected for detailed design development is the fountain area at Bayfront Park, one of the other visual corridors to the bay. Lastly, a scheme for restoring a connection to the bay along the original bay edge is identified at right with a blue circle.

Figure 23. Overall site development.

The Miami Woman's Club has expressed concern about criminal activity along future public access behind their facility. Studies show (Brennan and Zelinka 2001) that well-used, highly visible public spaces are less likely to attract criminal activity. Creating a viable pedestrian corridor should reduce crime across its entirety. The proposed access would extend the walkway at the Marriott marina behind the Miami Woman's Club to connect to Margaret Pace Park, as shown below, Figure 25.

Figure 24. Photograph of existing conditions behind Miami Woman's Club.

Figure 25. Sketch shows proposed walkway behind Miami Woman's Club. Increased plantings and a seat wall on the walkway side limit access to the club property.

At the Venetian Causeway, there is currently no provision for safe pedestrian crossing, as seen in Figure 26, at right. There is also no physical impediment to the installation of a typical pedestrian grade crossing, shown below in Figure 27. A traffic light would most likely be required, due to the speed of traffic across the causeway.

Figure 26. Photograph of existing conditions at Venetian Causeway.

Figure 27. Sketch of proposed traffic light and pedestrian grade crosswalk at Venetian Causeway.

Biscayne Boulevard, shown at right, Figure 28, is both the major vehicular corridor and major pedestrian corridor through downtown Miami. The lack of shelter along this route is a major deterrent to increased pedestrian use of this existing facility. Even in the winter, pedestrians tend to prefer to walk in the shade in Miami. In the summer, shelter from the rain is essential. A series of pedestrian shelters, like the one shown in Figure 29 at right, would make pedestrian activity along Biscayne Boulevard more pleasant.

Figure 28. Existing conditions, Biscayne Boulevard near Bayfront Park.

Figure 29. Proposed pedestrian shelter and freshwater collection system.

Another reason to add these shade structures is the potential to use them to reclaim fresh water. As was discussed earlier, Florida's hydrologic system is driven by the tremendous amount of rainfall received every year. One of the sources of disruption in the estuarine system of Biscayne Bay is the change in fresh water inflow to the bay that has resulted from the draining of the Everglades. Returning clean, fresh water to the bay in a gradual distributed flow would improve conditions for the bay's benthic organisms. Rainwater recaptured from rooftops is clean because it has not been exposed to any sources of pollution. This water would be returned to the bay through a network of pipes, without having to be filtered or cleaned. Although Miami receives more than fifty inches of rain each year, the heat causes evaporation losses of almost two-thirds that amount. Reclaiming the water into an underground pipe system allows use of the total rainfall. Reclaiming rainfall in this way also reduces the burden of the city storm water system, and results in a cleaner bay system, because less water is contaminated by contact with urban brownfields. Additional gains could be made by tapping in to the downspouts from existing buildings on the site, such as the Intercontinental Hotel. In addition to returning this water to the bay, it could be used for irrigation of plantings along the site.

Biscayne Boulevard also marks the original edge of Biscayne Bay. As a memorial to the loss of the connection between Biscayne Bay and the City of Miami, the design proposes to mark this edge with a series of electric bollards connected to a tide clock. These "tide bollards" would rise and fall with the tide in Biscayne Bay. Starting at a low tide height of one foot, the bollards would rise with the tide to a high tide level of about three feet. Visible both to pedestrians and vehicular traffic, the slowly changing height of the line of translucent blue bollards along the original bay edge would reveal itself with repeated viewing, subtly infusing this urban space with tidal rhythm.

Figure 30. Tide bollards mark the original edge of Biscayne Bay, providing a visual connection to the bay's tidal system.

Plate 10. Proposed interactive spiral spring fountain to be located in Bayfront Park.

Interactive Spiral Spring

The location of this interactive play fountain was selected for several reasons, first among them that the space occupies the only view corridor through Bayfront Park from Biscayne Boulevard to the bay. Other considerations included the lack of interactivity with and pedestrian activity around the existing fountain and the terrific visibility of the site, located in the center of Bayfront Park, adjacent to Bayside and visible from downtown.

Figure 31. Existing condition of fountain designed by Isamu Noguchi in Bayfront Park.

The design of the play spiral mimics the natural hydrology of the region, with all slopes one percent or less. The spiral ramps are twenty feet wide and slope down to a maximum depth of three feet. Bay water passes through a filtration system under the walkway edge of the spiral and flows as a sheet down the spiral to the bottom. Fresh water from the rain collection system mentioned earlier feeds fountain jets that shoot at intervals from the floor of the spiral. These fresh water jets reference the freshwater springs in Biscayne Bay that were lost when the systems hydrology was disrupted. These jets may be programmed to run at random to add another play element. The brackish water that collects in the fountain basin (water depth less than 3" at all times) will be circulated through the tidal marsh plantings that flank the fountain. The bay depth is restored to a shallow shelf of sea grass adjacent to the fountain. This provides additional remediation and ensures that the view of the bay is unobstructed by a railing or fence. The spiral itself is to be a rough limestone. The area surrounding the spiral and all new pathways are to be permeable paving. Fingers of rough limestone set slightly below the adjacent grade radiate out from the spiral, planted with a stylized mixture of mangrove swamp plantings, mostly white mangrove mixed with green and silver buttonwood. These trees will provide shade around the fountain without interfering with the view of the bay. The spiral shape of the fountain, with its radiating arms blends with the existing Noguchi design of Bayfront Park.

Figure 33. Perspective of Interactive Spiral Spring fountain.

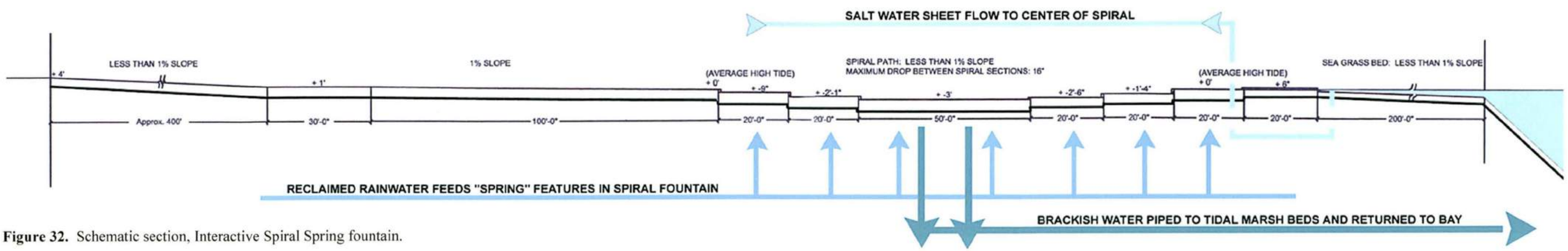


Figure 32. Schematic section, Interactive Spiral Spring fountain.

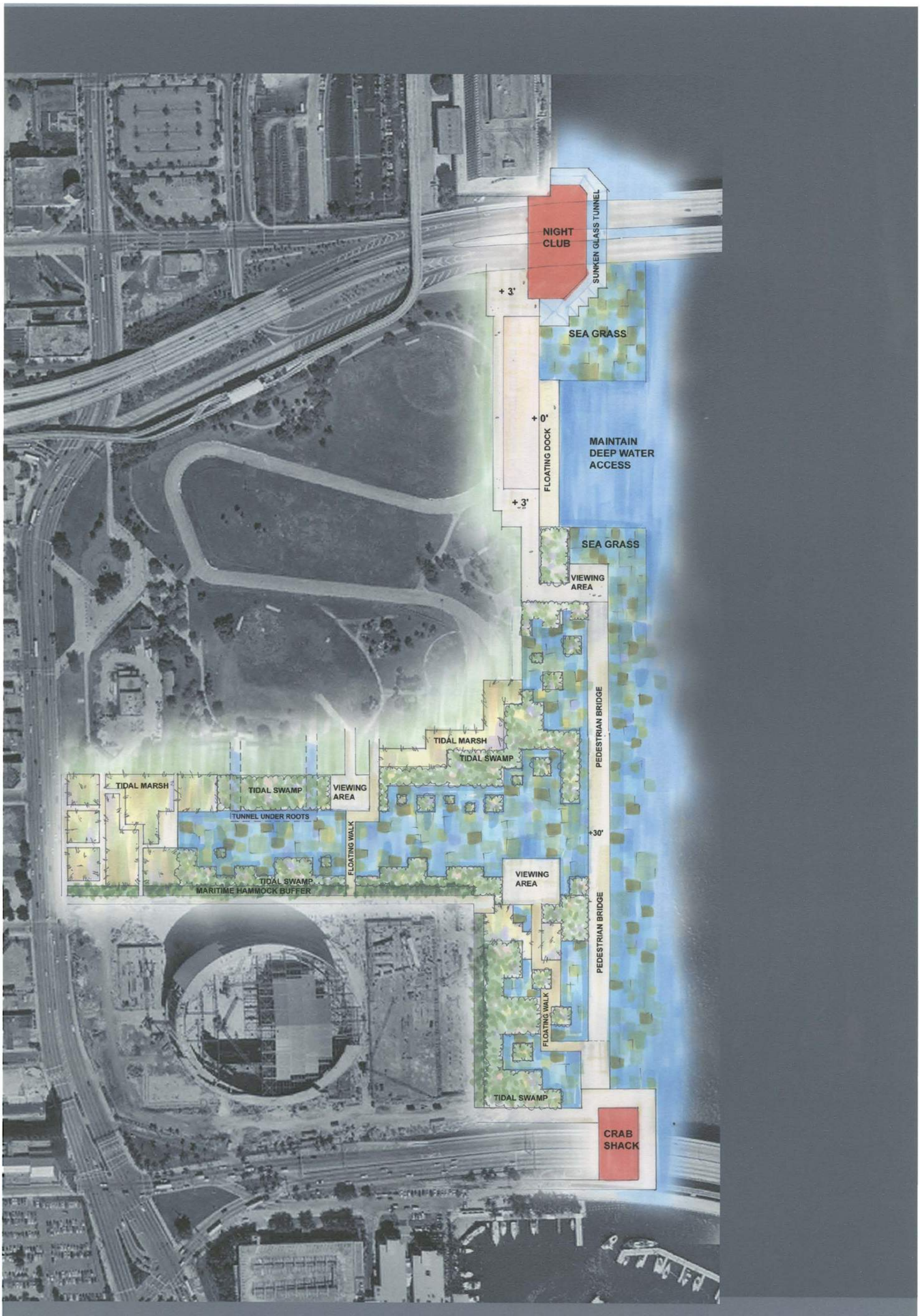


Plate 11. Proposed Mangrove Swamp Exploration.

Baywalk Design: Mangrove Swamp Exploration

Mangrove Swamp Exploration

This location on the site was selected for design exploration because it contained three significant pedestrian obstructions, occupies the most disrupted area of the site and contains the only place along the site where the bay approaches Biscayne Boulevard. The location also presents the opportunity to develop underused public lot "Parcel B" adjacent to American Airlines Arena and the land at the base of the FEC slip. Parcel B is the subject of some controversy within the city, due to the failure of the Arena to develop the lot into a public park as was agreed in the original contract. Shown below in Figure 34, the lot is currently used for overflow parking.

Highly visible from Biscayne Boulevard and sandwiched between the Arena and the future site of Museum Park, this location presents a great opportunity to demonstrate bay features to a wide section of the public. Adjacent to the future home of the Miami Museum of Science, the location presents an opportunity to create a demonstration garden that showcases the natural processes of the bay, available for hands-on exploration and interaction within the urban context.

Figure 34. Existing conditions, Parcel B.

Figure 35. Existing conditions, base of FEC slip and Biscayne Boulevard.

The first concern of the design solution was to remove the obstacles to pedestrian access. Both the Port Boulevard Bridge and MacArthur Causeway have sufficient space underneath them to allow a pedestrian walkway to be constructed (see Figures 36 and 37). Unfortunately, in an urban environment such "tunnel" structures are attractive to both the homeless and criminal element due to their poor street visibility. Visible spaces are safe spaces (Brennan and Zelinka 2001), so each bridge should have a vending opportunity constructed underneath and around it, with the pedestrian bridge along the outside. These areas are labeled "Night Club" and "Crab Shack" on the plan view of this area (see Plate 11, p. 23). These bridge restaurants could become popular destinations following events at the American Airlines Arena and Miami Performing Arts Center, activating the bay edge in the evening.

Figure 36. Space for pedestrian access under Port Boulevard Bridge, safeguarded by vending opportunity, retail or restaurant.

Figure 37. Night club opportunity under MacArthur Causeway.

The other pedestrian obstacle at this location is the FEC slip. Most pedestrians walk if it is both convenient and comfortable and tend to prefer to walk in straight lines between destinations. The more direct and continuous the pathway along the bay edge is, the more probability that the public will choose to walk rather than drive to destinations connected along the site. A direct bridge connection across the eastern

edge of the FEC slip would remove a long detour from this path, but must be carefully designed not to interrupt the visual link between Biscayne Boulevard and the bay. The development of the Baywalk will create a continuous link through downtown Miami while improving the ecological condition of the bay. It is an opportunity to make a statement about what is possible, to demonstrate at the site of major tourist attractions that Miami has truly become an international gateway. The investment in a world-class pedestrian bridge, like the ones shown below by Santiago Calatrava, are one way to make that statement (see Figures 38 and 39 below).

Figure 38. Calatrava pedestrian bridge, Bilbao, Spain.
Photographs above: Copyright Santiago Calatrava, calatrava.com.

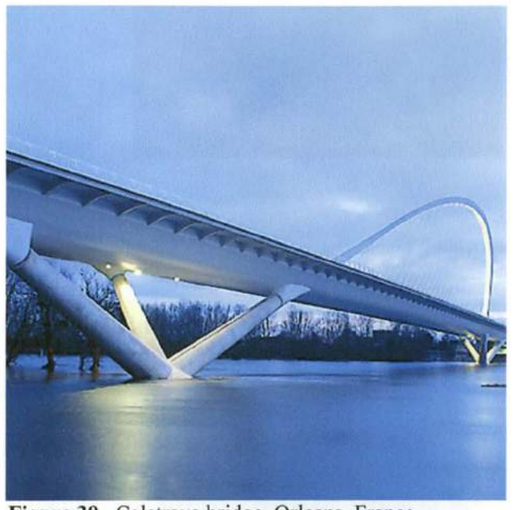


Figure 39. Calatrava bridge, Orleans, France.

Figure 40. Perspective of FEC slip showing pedestrian bridge at eastern end.

This area of the Baywalk is the most disrupted. Many separate dredge and fill events contributed to the current shape of this area of the site. To expose this disruption further, the design has modified the edge further, removing rectangular pieces of shoreline to create a jagged edge. This visual reflection of disruption is continued under the water, where a patchwork of rectangular sea grass beds at different levels cause the bay bed to read as a patchwork of different colors. To remediate the bay bottom in this area, which contains some of the deepest water adjacent to the site, the bay bottom will be filled to return water depths to between three and nine feet using staggered rectangular forms, which will be planted with sea grass. The turbidity prevents sea grass from growing at the existing depths, but a dramatic reduction in those depths would allow sea grass to flourish. The resulting offset grid patchwork of sea grass, clearly visible through the water mediates between the existing city grid and manmade disruption and the original natural systems of the site.

Figure 41. Disrupted sea grass beds (DEP 2004).

Figure 42. Manatee are often seen around the FEC slip.
Photo: savethemanatee.org 2004

The edge of this installation is a combination of the two original edge communities, the salt marsh and mangrove swamp, recreated using rectangular spaces penetrated by pathways for the public to use. Many of the proposed walkways float on the water, interacting with the tidal motion of the bay. Salt marsh and mangrove swamp plant communities in Florida often have a maze-like character when viewed from above, due to the increased water flow through slightly deeper channels in any region. The pathways mimic this maze experience. Mangrove islands protrude into the FEC slip, their roots collecting debris and building land over time. The incredible productivity of these root systems, as well as the sea grass planters can be observed through the proposed glass tunnel connecting to the Museum Park site, limiting access to ensure its safety while giving the public the rare opportunity to observe this underwater scene.

Figure 43. (Right) Mangrove roots provide food and protection for estuarine species (Photo: NOAA 2003).

Figure 44. (Below) Unusual view of Mangrove roots, above and below the water (Photo: NOAA 2002).

V. DISCUSSION

Resolution of Design Guidelines

The various site improvements to the Baywalk respond to the design guidelines developed for the project and resolve the problems presented by the site. Creating pedestrian access along this corridor reconnects downtown Miami's business and tourist attractions with Biscayne Bay. The tidal bollards memorialize the loss of the bay connection at the original edge, while demonstrating the tidal action of the bay. The interactive spiral spring mimics the natural hydrology of the region, restoring distributed fresh water to the bay and recalling the unique freshwater springs that early settlers used for drinking water, while at the same time providing a downtown center for children and adults to gather and interact with the bay. The Mangrove Swamp Exploration provides the opportunity to educate the public about the natural communities of the bay through interaction with those communities, restores the benthic community of the bay bottom and comments on the disruption of the site with its designed form. All of these design examples are interactive, educational and appealing. In addition to providing a connection between existing points of interest, these design features create destinations along the bay edge to celebrate the bay itself.

Summary

The design of the park resolves current impediments to pedestrian connection through downtown, gives voice to both what was lost and what was created by the fill events that shaped its recent development, and celebrates the enduring beauty of the site through all its many fortunes.

Recommendations

The Baywalk is a real project, currently under consideration by city government. Too often, the decision to create something visionary is lost before it begins where public projects are concerned. There is a hesitation to modify existing spaces simply because they are visible in their current form. The recognition that this site is wholly manmade should eliminate the need to think of it a having a sacred shape. The most profound design recommendation resulting from this project is the importance of maintaining an awareness of the depth and complexity of any site as it is developed. Many civic designs skim the surface, resolving the obvious functional issues without questioning the site's history, without questioning what might be missing from the site, what might have been lost. On a more functional level, restoration of ecological systems to their original condition is often impossible in an urban environment and so is usually abandoned as part of urban design programs. Though a pure restoration may not be possible, even a small improvement can make a big difference, both to the natural and urban environment. The more the public understands and claims ownership of the world around us the better protected our natural systems will be.

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