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Baltimore Waterfront Healthy Harbor Initiative

Creating a Swimmable, Fishable Harbor



**WATERFRONT
PARTNERSHIP**
OF BALTIMORE, INC.



Acknowledgements

This Healthy Harbor Initiative represents the collective thinking and collaboration of a wide range of interested and committed parties that include:

The Waterfront Partnership Baltimore (WPB) Board

Baltimore City Mayor's Office

Baltimore City Department of Public Works

David Scott
Director

Kishia Powell
Head of Bureau of Water & Wastewater

Celeste Amato
Communications Director

Bill Stack
former Acting Chief, Bureau of Water & Wastewater

Duncan Stuart
Watershed Liaison, Bureau of Water & Wastewater

Baltimore City Department of Planning

Beth Strommen
Director, Office of Sustainability

Sarah Zaleski
Sustainability Coordinator, Office of Sustainability

Frances Flanigan
Environmental Consultant

Biohabitats, Inc.

Keith Bowers
President, Landscape Architect & Restoration Ecologist

Chris Streb
Ecological Engineer

Nicole Stern
Ecological Designer

Jean Wisenbaugh
Graphic Designer

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Maryland Science Center

Colin Tarbert
Baltimore Development Corporation

David Benn
Cho Benn Holbeck

Bill Minarik
National Aquarium in Baltimore

Dan Nadeau
former GM, Marriott Waterfront Hotel

The WPB Executive Committee provided input and direction, including:

Michael Hankin
Brown Advisory

Michael Beatty
H & S Properties

James Bond
Living Classrooms Foundation

Dave Pittenger
National Aquarium in Baltimore

Van Reiner
Maryland Science Center

Ed Rudzinski
Waterfront Marriott Hotel

Christopher Schardt
General Growth Properties

Zed Smith
Cordish Company

Colin Tarbert
Baltimore Development Corporation

Laurie Schwartz, staff member

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- Baltimore City Department of Public Works
- Baltimore City Office of Sustainability
- Cleaner Greener Baltimore Initiative
- Baltimore Harbor Watershed Association
- Baltimore Harbor Riverkeeper
- Chesapeake Bay Foundation
- Living Classrooms Foundation
- Jones Falls Watershed Association
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Report prepared by:

- Biohabitats, Inc.

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Executive Summary



Envision a fishable, swimmable Harbor

Baltimore’s Waterfront has always changed with the times. Through transformations and revitalizations, it has evolved from bustling seaport to lively marketplace to celebrated travel destination. Through it all, the Baltimore Waterfront has remained a central, life-giving force to the culture and commerce of the City.

Today, amidst a wave of worldwide enlightenment about environmental stewardship, Baltimore’s Waterfront is on the brink of becoming a model sustainable urban waterfront park. The era of polluted, discolored, trash-filled water has come to an end. This is the beginning of another revitalization – in the truest sense of the word. It involves the regeneration of life in and around the water of our Waterfront. The Waterfront

TOPIC AREAS AND GOALS



1 Water Quality

OVERARCHING GOAL:
Swimmable fishable harbor

SHORT-TERM GOAL :
No fish kills by 2012

MID-TERM GOAL:
Swimmable Harbor majority of days of the year by 2015

LONG-TERM GOAL:
Swimmable fishable harbor



2 Water Conservation

OVERARCHING GOAL:
Reduce demand/use for drinkable water for WPB member buildings by 50% by 2025

SHORT-TERM GOAL:
Lower drinkable water demand by 50% by 2012

MID-TERM GOAL:
No drinkable water use for WPB landscape O&M by 2015

LONG-TERM GOAL:
Reduce drinkable water demand/use for WPB buildings by 50% by 2025; educate visitors about ways they can lower their own water demand



3 Landscape and Ecology

OVERARCHING GOAL:
Harbor teeming with fish, landscape full of pollinators, migratory stopover (maximizing biodiversity)

SHORT-TERM GOAL 1:
Attract and support more and more diverse pollinating insects, native birds, and native aquatic species

SHORT-TERM GOAL 2:
Increase available shaded seating and provide safe night lighting

MID-TERM GOAL 1:
Increase areas of viable habitat

MID-TERM GOAL 2:
Increase available shaded seating

LONG-TERM GOAL:
Harbor teeming with fish, landscape full of pollinators, migratory stopover (maximizing biodiversity)

HEALTHY HARBOR INITIATIVE

Partnership of Baltimore (WPB) is poised to implement the Baltimore Waterfront Healthy Harbor Initiative in partnership with City government, nonprofit organizations, businesses, and the public. The Harbor belongs to everyone. Together we can realize the thrilling vision of a swimmable, fishable Waterfront.

It really is possible.

By implementing the strategies presented in this guide, WPB will lead by example, engaging and educating the public to gain collective participation, bringing this bold vision to life. The work we start today will help ensure that years from now, when our children and grandchildren visit the Harbor, they will pack their bathing suits and fishing gear.



4 Mobility

OVERARCHING GOAL:

Vast majority of people who work, live, and recreate in and around the Waterfront use alternative transportation

SHORT-TERM GOAL:

Walking, biking and public transportation use to and from the Waterfront are well facilitated

MID-TERM GOAL:

Expanded public transportation options

LONG-TERM GOAL:

Vast majority of people who work, live, and recreate around the Waterfront use alternative transportation



5 Energy and Climate Change

OVERARCHING GOAL:

Climate neutral WPB landscape and buildings

SHORT-TERM GOAL:

Lower WPB landscape operations and maintenance energy demand by 50% by 2012

MID-TERM GOAL:

Climate neutral WPB landscape O&M by 2015

LONG-TERM GOAL:

All WPB member buildings climate neutral (O&M for existing buildings and +materials for renovations and new buildings) by 2025



6 Materials and Waste

OVERARCHING GOAL:

All new materials from sustainable sources; all waste recycled or composted

SHORT-TERM GOAL:

Reduce trash (weight or pick up frequency) by 50% by 2012

MID-TERM GOAL:

Reduce waste and use sustainable materials

LONG-TERM GOAL:

All new materials from sustainable sources (no red list materials); all waste recycled or composted

Introduction

Vision

The Baltimore Waterfront is an evolving model of a sustainable, urban park which honors its central attraction – clean water. This hub of Baltimore City allows all who reside, work, or visit to celebrate and connect with the culture and life of the Chesapeake Bay through an educational, fun, and inspiring landscape that improves the health of the Harbor and all the living creatures it supports.



Figure i-1. Map of Site Boundaries

Background

The Waterfront Partnership of Baltimore retained Biohabitats to create a long-term plan for a healthy Harbor. While this initiative focuses on the public and private open spaces along the Waterfront, the strategies also address larger issues. The strategies are not focused on the practices of the Waterfront Partnership alone, but are designed to engage and educate the broader public through fun, educational, and experimental pilot projects along the Waterfront. The aim is to catalyze our collective role in working toward a swimmable, fishable Harbor.

Context

The Baltimore Waterfront is a park along the Harbor that embodies the historic, natural and cultural heritage of the region. The central organizing feature of the Baltimore Waterfront is water itself. Covering eight miles of shoreline on one of America's premier urban bodies of water, the larger Harbor shoreline connects historic communities, such as Fells Point and Federal Hill, to the modern Inner Harbor and Harbor East.

Following the Inner Harbor project in the late 1970s, the City of Baltimore experienced a sense of renewal and vitality, which continues to this day. The creation of a public park along the Waterfront has stimulated regeneration throughout all the neighborhoods adjacent to the water, from Locust Point to Canton over the last thirty years.

Water is the key ingredient inspiring this renewal. Baltimore is a city on the water, in safe harbor on the Chesapeake Bay. Although water is the appeal for development, it is visually obvious that we have not treated this water body well. Poor water quality is just one symptom of unsustainable practices that limit our quality of life. Ecology, Mobility (transportation), Energy, and Materials and Waste are all topics linked to the health of our city, the natural resources we depend on, and our own health and vitality.

HEALTHY HARBOR INITIATIVE

Site

The Waterfront Partnership area, which is the focus of these strategies, begins at the Rusty Scupper on the south and wraps around the Harbor to Bond Street Wharf. The WPB area begins at the water's edge and ends at the closest street edge (e.g., Key Highway, Light, Pratt, President, Caroline, Thames Streets) and in Harbor East from the water to Fleet Street. To increase the rate of progress, stakeholders all along Baltimore's Waterfront must become involved. Waterfront Partnership seeks to partner with stakeholders along the Waterfront in order to expand the number of involved and committed parties and to maximize the effects of this Strategy along the Waterfront promenade.

Sustainability

The Baltimore Waterfront Healthy Harbor Initiative (HHI) aims to make the connection between our actions on land and the impact on water and the environment as a whole. As a central visitation area, the Baltimore Waterfront holds a unique opportunity to educate, enlighten, and inspire by implementing practices and actions that conserve and restore natural resources. The HHI provides a road map to make the Waterfront a model of sustainability. The recommended practices and actions strive to reveal the invisible connections that tie our quality of life to the quality of the environment and sense of place.



Figure i-2. Simulation of Marsh Restoration in Unused Harbor Edges, Credit: Biohabitats

Education & Awareness

With the National Aquarium and Maryland Science Center as prominent educational institutions, anchored along the Promenade, education is already a major part of the Baltimore Waterfront. Public education and awareness can play a major role in the water quality of the Harbor by using every strategy along the Waterfront as an opportunity to make visitors aware of the role they can play through their own lifestyle practices that can directly contribute to improving Baltimore's water quality.

Watershed

Watershed-Wide Effort

While the 120-acre Waterfront Partnership area is a prime location to showcase sustainable practices, it will take a watershed-wide effort throughout the Harbor's 134,200-acre drainage area to improve Harbor water quality.



How to Use This Document

6 Topic Areas

The Strategies within this document are organized by 6 relevant sustainability topic areas:

-  **1 Surface Water**
-  **2 Potable Water**
-  **3 Landscape and Ecology**
-  **4 Mobility**
-  **5 Energy and Carbon**
-  **6 Materials and Waste**

Goals

Within each of these six topics are relevant goals for the short term, mid term, and long term. The goals can not be achieved by WPB actions alone. Rather, they are desired endpoints that require the collective participation of everyone in the watershed working toward a common vision.

Short-Term Goals = 0-3 years

Mid-Term Goals = 3-10 years

Long-Term Goals = 10+ years

Strategies

The Strategies are ordered by the topic area and under the goal which they help to achieve. Many Strategies relate to multiple topics. This interrelationship is shown by the topic symbols to the right of the Strategy number and title:

Strategy 0.0:      
Example

Each Strategy includes a Issue, Action, and Objective:

Issue: Issues inventory current unsustainable issues relevant to the project site.

Action: Actions state a recommendation or strategy with a measurable metric to address the problem described in the Issue, working towards the larger goal. Some actions may overlap between multiple Strategies, working towards different Issue aspects. For example, converting impervious surfaces to planted areas meets the Surface Water goals related to quality but also offers the opportunity for increased native planting which could add to the goals under Landscape and Ecology. Therefore, this same action of replacing impervious surfaces may be listed under both topic areas but with different Issues.

Objective: Objective includes a bulleted list of projected objectives from implementing the action. Longer lists of Objectives may indicate higher priority strategies.



1 Water Quality

SHORT-TERM GOAL :
Limit fish kills by 2012

Strategy 1.1: Reduce Runoff



Issue: Impervious, hard surfaces such as roads and rooftops collect pollutants and speed the flow of stormwater, causing erosion and stream damage throughout the watershed. that would normally be absorbed into soil washes pollutants and sediment into waterways which outlet into the Harbor. Along the waterfront, stormwater runoff flows untreated into the Harbor, delivering contaminants like oil and heavy metals.

Action: Reduce runoff by replacing at least 10% of impervious surfaces (currently 90% of the site) with permeable paving, native planting, or green roofs. Install rain gardens to filter and retain runoff from remaining impervious areas.

Objective:

- Lower stormwater runoff quantity
- Improve water quality
- Increase habitat and biodiversity
- Public education/awareness

Strategy 1.2: Reduce Water Pollution



Issue: Underutilized lawn areas and other non-native landscaping create unnecessary resource demands for irrigation, mowing, fertilizing, and herbicide application. Lawns and landscapes in the larger watershed contribute nutrients from fertilizers to the Harbor water. In turn, nutrients in the Harbor cause algal blooms and fish kills.

Action: Reduce water pollution by replacing underutilized lawn areas and non-native planting with native perennial planting, native trees, or marsh planting to reduce fertilizer, herbicide, and pesticides by at least 50%.

Objective:

- Lower water demand
- Lower nutrient runoff
- Lower fuel/energy for mowing
- Increase habitat and biodiversity
- Public education/awareness

Strategy 1.3: Oxygenate Harbor Water



Issue: Nitrogen, phosphorous, and other nutrients flow from the watershed into the Harbor, causing algal blooms which rob the Harbor water of oxygen. The lack of oxygen, called dead zones, cause fish kills and odor. The desired concentration of oxygen in water is 5 mg/L.

Action: Create life zones where dissolved oxygen exceeds 5 mg/L at five monitoring sites for every day of the year by pumping oxygen into Harbor water. Use pedal-, wind- or solar electric-powered pumps incorporated with living floating harbor islands.

Objective:

- Nitrogen, phosphorus, and other nutrients are removed from water
- Zones of higher dissolved oxygen create fish refuges
- Public education/awareness

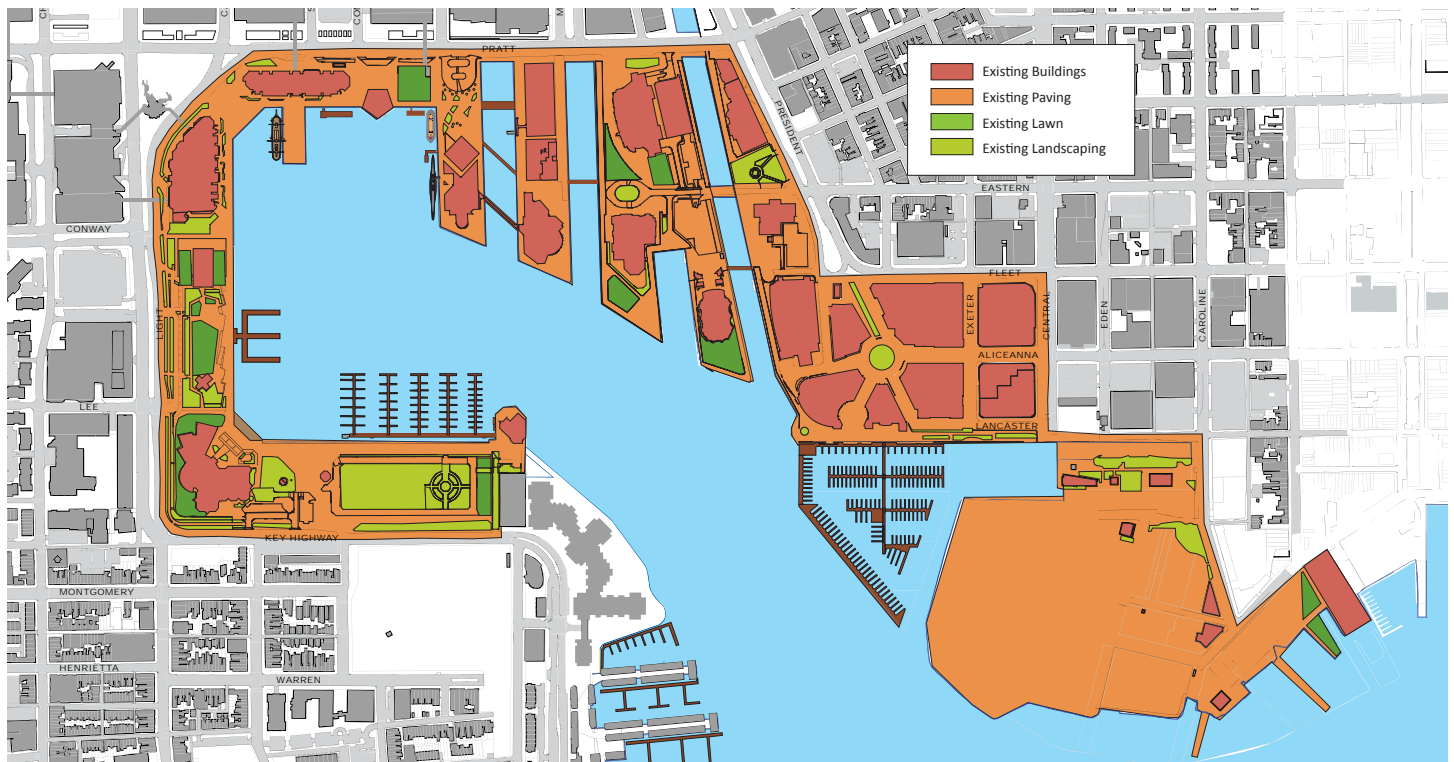


Figure 1-1. WPB Site Existing Surfaces

HEALTHY HARBOR INITIATIVE

Strategy 1.4: Remove Floatable Trash



Issue: Trash from litter, cigarette butts and fallen trash cans throughout the watershed flows into storm drains and streams, eventually accumulating in the Harbor.

Action: Install trash collecting and removal structures at strategic tributary outflows including educational signage nearby working towards no visible floatable trash at 5 monitoring sites. Create a trash sculpture to teach the public that littering is not out of sight and out of mind.

Objective:

- Trash removal
- Enhanced public perception
- Public education/awareness on trash sources

Strategy 1.5: Participate in Watershed Efforts



Issue: Poor Harbor water quality is caused by practices upstream from the Waterfront Partnership site throughout all watersheds which drain to the Harbor (as shown on the map on page 5).

Action: A Waterfront Partnership representative will participate in meetings/events related to City and County watershed efforts. Create educational areas for use by Waterfront Partnership and watershed groups to share information about the health of the Harbor and its tributaries.

Objective:

- Improved Harbor water quality
- Public education/awareness



Figure 1-3. Water Oxygenating Sculpture by Paul Daniel, Credit: Paul Daniel



Figure 1-4. Trash Collecting Debris Boom

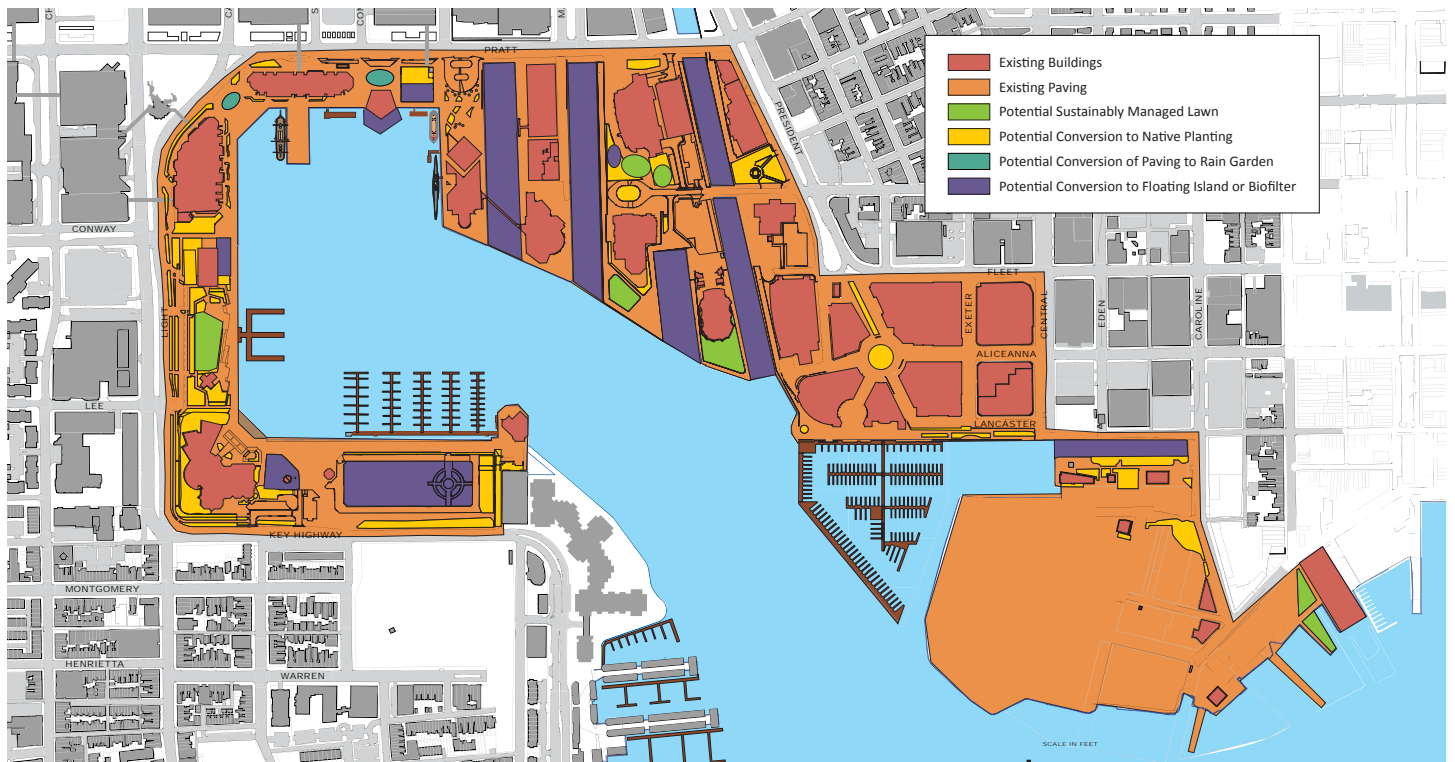


Figure 1-2. WPB Site Potential Landscape Conversions

MID-TERM GOAL:
Swimmable harbor majority of days of the year by 2015

Strategy 1.6:  **Increase Public Awareness**

Issue: After centuries of harvesting, dredging and dumping our waste into the Harbor water, the numbers and varieties of aquatic life have dwindled. Many people are unaware how their behavior and practices contribute to this lack of productivity today. Seeing and experiencing what is living there can help make that connection.

Action: Host at least one education and awareness day per year such as a BioBlitz where people can catch and see the life in the Harbor. Data can be recorded to see progress year after year. BioBlitz have the potential to increase public understanding and appreciation of Harbor ecology and human impacts on that ecology.

- Objective:**
- Improved Harbor water quality
 - Public education/awareness

Strategy 1.7:  **Create Harbor Biofilters**

Issue: The Harbor is a tidal water way that, prior to settlement, was ringed by wetlands. These wetlands helped filter water and provided habitat. Those wetlands have been replaced by bulkheads and piers which provide no water quality benefit and little habitat.

Action: Convert under utilized turf, pavement, and/or water edge areas into salt marsh biofilters to clean at least 200,000 gallons of Harbor water of nutrients and suspended solids per day.

- Objective:**
- Harbor water quality filtration
 - Potable (drinkable) water conservation
 - Habitat for birds and beneficial insects
 - Public education/awareness

Strategy 1.8:  **Introduce Bivalves**

Issue: Bivalves like mussels and oysters were an important natural filter for the waters of the Chesapeake Bay. Harvesting and disease have resulted in a significant population decline. This decline combined with excessive nutrient inputs has dramatically increased algae production. Excess algae can harm aquatic vegetation and lower oxygen in water, limiting habitat and productivity of all other aquatic life.

Action: Introduce at least 50 viable baskets of bivalves for water quality in the Harbor.

- Objective:**
- Harbor water quality filtration
 - Increase habitat and biodiversity



Figure 1-3. Simulation of Marsh Grass Edge as Biofilter, Credit: Biohabitats

HEALTHY HARBOR INITIATIVE

LONG-TERM GOAL:
Swimmable fishable harbor

Strategy 1.9: Further Reduce Runoff



Issue: The majority of surfaces around Harbor are hard (impervious). Pollutants that settle on surfaces are washed off during rain events and collect in the harbor.

Action: Reduce or filter at least 50% of stormwater runoff from impervious areas using permeable paving, landscaping, rain gardens, or green roofs.

Objective:

- Lower stormwater runoff quantity
- Improve water quality
- Increase habitat and biodiversity
- Public education/awareness
- Example to property owners in watershed

Strategy 1.10: Promote Watershed Efforts



Issue: Improving water quality in the Harbor can not be done alone in the Harbor. This will require actions and behavior changes throughout the contributing watershed to reduce stormwater runoff, pollutant loading, and litter.

Action: Promote public awareness campaigns (such as Cleaner Greener Baltimore) and host events related to City and County Watershed-wide efforts.

Objective:

- Improved Harbor water quality
- Public education/awareness

Strategy 1.11: Designate Fishing Piers



Issue: Once the Harbor water quality is fishable, there are no designated fishing areas to allow for fishing away from crowds along the main Promenade.

Action: Create 1 - 3 designated fishing areas at the Bond Street Wharf and/or at the end of one of the Piers (3, 4 or 5).

Objective:

- Public awareness
- Local food source

Strategy 1.12: Host Harbor Triathlons



Issue: A lack of public awareness and funding impairs ongoing watershed and Harbor cleaning efforts.

Action: Announce public goal of holding Harbor Triathlon in 2020 to inspire the public about water quality improvement.

Objective:

- Fundraising
- Public awareness



Figure 1-4. Simulation of a Rain Garden on Flood-prone Lawn between World Trade Center and the Aquarium, Credit: Biohabitats



Figure 1-5. Baltimore Marathon, Credit: William Diegel



2 Water Conservation

SHORT-TERM GOAL:

Lower drinkable water demand by 50% by 2012

MID-TERM GOAL:

No drinkable water use for WPB landscape O&M by 2015

Strategy 2.1: Monitor and Report Water Use



Issue: Fresh water is a limited resource. The amount of potable (drinkable) water used for landscape operations and maintenance (irrigation and power washing) is largely unknown. Informal measuring began in 2009 which was a wetter than average precipitation year.

Action: Create a monitoring protocol for operations and maintenance water use. Compile monitoring data into monthly and annual reports. Use monitoring information to identify potential reduction strategies. Create annual plans working towards a 50% reduction in potable water use by 2012.

Objective:

- Potable water conservation
- Public education/awareness

Strategy 2.2: Plant Native Landscapes



Issue: Existing landscape planting requires irrigation with potable water, some annual replanting, and prioritizes ornament over habitat value. Potable water requires energy that emits greenhouse gases responsible for climate change. Annual plantings are raised in greenhouses which require energy, fertilizers and pesticides. All of these resources negatively impact the environment.

Action: Replace at least 30% of the existing landscape planting with native perennial planting suited to the site.

Objective:

- Potable water conservation
- Habitat for birds and beneficial insects
- Public education/awareness

Strategy 2.3: Harvest Rainwater and Condensate



Issue: Rainwater is unused, flowing off rooftops and other structures into pipes that drain into the Harbor. Condensate from air conditioners is a consistent supply of water during summer months which is unused. Meanwhile, potable water is used for site irrigation and power washing.

Action: Harvest rainwater and condensate from rooftops and air conditioners around the Harbor. The water may be collected in cisterns and used for landscape irrigation and power washing. Use at least one site as a highly visible demonstration with signage to encourage visitors to harvest their own rainwater.

Objective:

- Potable water conservation
- Public education/awareness

Power Washing Water and Energy

Power washing is one of the most water and energy intensive practices performed by the Waterfront Partnership maintenance staff. During the month of July 2009, power washing activities consumed an average of 450 gallons of potable water and 2.5 gallons of non-renewable fuel per day.

HEALTHY HARBOR INITIATIVE

LONG-TERM GOAL:

Reduce drinkable water demand/use for WPB member buildings by 50% by 2025; educate visitors about ways they can lower their own water demand

Strategy 2.4: Reduce Water Use



Issue: Potable water demand in Waterfront Partnership member's buildings is unknown. Many fixtures are not efficient and increase potable water consumption. Increased potable water use puts greater pressure on Baltimore's wastewater treatment system, which can result in the discharge of nutrients to the Bay.

Action: Encourage members to install or retrofit water fixtures in buildings to be low flow to reduce potable water use by 25%.

Objective:

- Lower building water demand
- Potable water conservation
- Public education/awareness

Strategy 2.5: Use Recycled Water



Issue: Potable water demand for uses where recycled water could be substituted.

Action: Encourage members and public to use rainwater, filtered greywater or filtered wastewater for toilet flushing to reduce potable water use by 25%. Use rainwater for water features.

Objective:

- Lower potable water demand
- Public education/awareness

Strategy 2.6: Demonstrate Water Use



Issue: Use of water resources without awareness of impacts.

Action: Design and install at least 3 demonstration sites showing methods of reducing water use.

Objective:

- Lower potable water demand
- Encourage sustainable water use practices
- Public education/awareness



Figure 2-1. Rainwater Harvesting Cisterns at the Chesapeake Bay Foundation Building, Credit: Jennifer Dowdell



3 Landscape and Ecology

SHORT-TERM GOAL 1:

Attract and support more and more diverse pollinating insects, native birds, and native aquatic species

Strategy 3.1:



Convert to Native Planting

Issue: Impervious surfaces and lawns dominate over native landscape, offering little habitat or food to support a diverse ecological community.

Action: Replace impervious surfaces and/or underutilized lawns with native planting and native trees. Do not add any new/additional impervious surfaces.

Objective:

- Increased habitat for birds and beneficial insects
- Lower heat island and increased shading (from trees)
- Lower stormwater runoff quantity
- Improved stormwater runoff quality
- Public education/awareness



Figure 3-1. Simulation of Lawn Conversion to Native Planting, Credit: Biohabitats

Strategy 3.2:



Increase Tree Canopy

Issue: A lack of tree canopy throughout the waterfront leaves wide open vistas, but creates a heat island effect, offering little refuge from the sun. Summer heat can drive visitors indoors or cause health issues. The lack of trees also contributes to poor habitat for birds.

Action: Increase the number of healthy trees to assist with the City's tree canopy goal (see Strategy 3.7 to improve tree survival rates), especially those attractive to pollinating insects and native birds.

Objective:

- Increased habitat for birds and beneficial insects
- Shade
- Lower heat island effect
- Carbon sequestration
- Cleaner air
- Slow stormwater runoff



Figure 3-2. Existing Ecosystem Planting by the Aquarium



Figure 3-3. Simulation of Floating Harbor Island Aquatic Habitat, Credit: Biohabitats

HEALTHY HARBOR INITIATIVE

SHORT-TERM GOAL 2:

Increase available shaded seating and provide safe night lighting

Strategy 3.3:

Sustainably Manage Turf



Issue: Turf /lawn used for recreation and seating requires water for irrigation, energy/fuel for mowing, and application of fertilizers and herbicides.

Action: Sustainably manage all well-used turf areas by using harvested rainwater or recycled water for irrigation, reducing potable water use by 50%, lowering mowing emissions by 20%, and reduce fertilizer, pesticides and herbicides by 50%. Consider replacing maintenance equipment with more energy efficient, lower greenhouse gas emitting, and less noise polluting models.

Objective:

- Lower potable water demand
- Lower energy demand
- Lower greenhouse gas emissions
- Improved stormwater runoff quality

Strategy 3.4:

Create Floating Island Aquatic Habitat



Issue: Low dissolved oxygen levels and lack of aquatic vegetation around the Harbor offer little refuge or food for fish, crabs and other aquatic organisms.

Action: Design, build, and install prototype floating islands at 3 sites for aquatic habitat. Design could include using renewable and recycled waste materials and volunteer help for construction.

Objective:

- Oxygenated refuge for fish
- No fish kills by 2012
- Water filtration
- Increased biodiversity
- Public education/awareness

Strategy 3.5:

Create Shade and + Harvest Rainwater



Issue: Inadequate shaded areas along the promenade create a heat island effect. Irrigation and power washing have a high water demand.

Action: Add at least 2,000 sq. ft. of shade structures which also harvest rainwater.

Objective:

- Increased shading
- Lower potable water demand
- Public education/awareness



Figure 3-4. Rainwater Harvesting Shade Structure, Credit: Forgotten Rain LLC.

Strategy 3.6:

Reduce Light Pollution



Issue: Night lighting creates light pollution, uncomfortable glare, reduces view of the night sky, impacts wildlife, and requires energy which contributes greenhouse gas emissions responsible for climate change.

Action: Retrofit or replace site lighting with fully shielded fixtures, LED lights, and solar power. Follow Dark Sky Lighting recommendations.

Objective:

- View night sky
- Reduce impact on night animals
- Reduce light pollution
- Increase visual comfort
- Lower greenhouse gas emissions
- Maintain safety and security

MID-TERM GOAL 1: Increase areas of viable habitat

Strategy 3.7: Install Structured Urban Soil



Issue: Compacted urban subsoils compress tree root development and prevent rain water from soaking into the ground, leading to high rates of tree death and increasing storm-water runoff.

Action: Install at least 1,500 cubic feet of soil for tree pits using structural soils or suspended pavement for any new impervious surfaces or retrofit/redevelopment projects which are not limited by piers and contaminated soils. Use these techniques to increase survival rate for all newly planted trees.

Objective:

- Increased soil area for tree roots
- Improved tree health and urban tree survival
- Increased habitat for birds and beneficial insects
- Increased tree canopy and shading
- Lower heat island effect
- Increase landscape stormwater storage capacity



Figure 3-4. The Silva Cell system is a plastic grid which structurally supports pavement with healthy soil underneath for tree roots and water absorption. Credit: Deep Root

HEALTHY HARBOR INITIATIVE

LONG-TERM GOAL:

Harbor teeming with fish, landscape full of pollinators, migratory stop-over (maximizing biodiversity)

Strategy 3.9: Double Tree Canopy



Issue: The Baltimore Sustainability Plan and Tree Baltimore Initiative have noted that the lack of tree cover in the City contributes to urban heat island effect. As pavements absorb heat from the sun, more energy is required to cool buildings.

Action: Per Tree Baltimore and the Baltimore Sustainability Plan, double the tree canopy along the waterfront. Train maintenance crews in best management practices for tree health.

Objective:

- Increased habitat for birds and beneficial insects
- Shade
- Lower heat island effect
- Lower energy demand
- Carbon sequestration
- Cleaner air
- Slow stormwater runoff

Strategy 3.10: Add Green Roofs and Living Walls



Issue: Majority of surfaces around the Harbor are impervious offering little habitat or food to support a diverse ecological community.

Action: Add green roofs and living walls to all new buildings and any existing buildings with appropriate structure to provide habitat for pollinators and native birds.

Objective:

- Lower stormwater runoff quantity
- Improve water quality
- Increase habitat and biodiversity
- Public education/awareness
- Example to property owners in watershed

Strategy 3.11: Maximize Floating Island Aquatic Habitat



Issue: Low dissolved oxygen levels and lack of aquatic vegetation around the Harbor offer little refuge or food for fish, crabs and other aquatic organisms.

Action: Install at least 200,000 sq. ft. of floating islands in areas unused for boating in the Harbor for aquatic habitat and water quality based on prototype floating islands from 3.4.

Objective:

- Oxygenated refuge for fish
- Fewer fish kills
- Water filtration
- Increased biodiversity
- Public education/awareness



Figure 3-5. Living Classroom's Green Roof
Credit: Jennifer Dowdell



Figure 3-6. Simulation of a fish-eye view of floating islands next to the World Trade Center
Credit: Biohabitats



4 Mobility

SHORT-TERM GOAL:

Walking, biking and public transportation use to and from the Waterfront are well facilitated

MID-TERM GOAL:

Expanded public transportation options

Strategy 4.1: Promote Bicycling



Issue: Bicycling to, around, and from the Harbor can be a challenge. Bike racks can be difficult to find. The City’s effort to improve cycling routes is helping, but this mode of travel is not widely accepted by all residents and visitors to Baltimore.

Action: Move existing bike racks and/or install new bike racks at major site entrances (based on use/demand), offer bike rentals and/or start a Baltimore bike sharing program and clearly delineate and promote bike trails to elevate cycling as a primary mode of transport. Organize bicycle days, bike rallies, and tour rides. See the Baltimore City Department of Planning Bike Master Plan for connection to bike routes around the City and beyond.

Objective:

- Lower Vehicle Miles Traveled
- Improved air quality
- Improved human health

Strategy 4.2: Encourage Use of Public Transportation



Issue: Many people around the Harbor use cars as a primary form of transportation. This increases traffic, contributes greenhouse gas emissions, and degrades air quality.

Action: Make public transportation information more easily available to visitors and City residents, building on the A Smarter Way To Get There (asmarterwaytogether.org) initiative. Create amenities at all transit stops to facilitate use of public transport such as clear signage (maps, schedules, wait times) and comfortable waiting areas with seating and shelter from sun, wind, and rain at all transportation stops within the Waterfront Partnership site.

Objective:

- Lower Vehicle Miles Traveled
- Improved air quality
- Lower greenhouse gas emissions
- Reduced demand for parking lots (impervious surfaces)

Strategy 4.3: Expand Circulator, Water Taxi, and Other Options



Issue: New Charm City Circulator hybrid electric buses and water taxi routes need to connect Waterfront locations and larger public transportation points.

Action: Promote use of the Charm City Circulator (www.yournameyourride.com) and double the number of riders on Harbor Connector water taxi routes. Seek flexibility of schedule and increased commuter service.

Objective:

- Lower Vehicle Miles Traveled
- Improved air quality
- Reduced demand for parking lots (impervious surfaces)

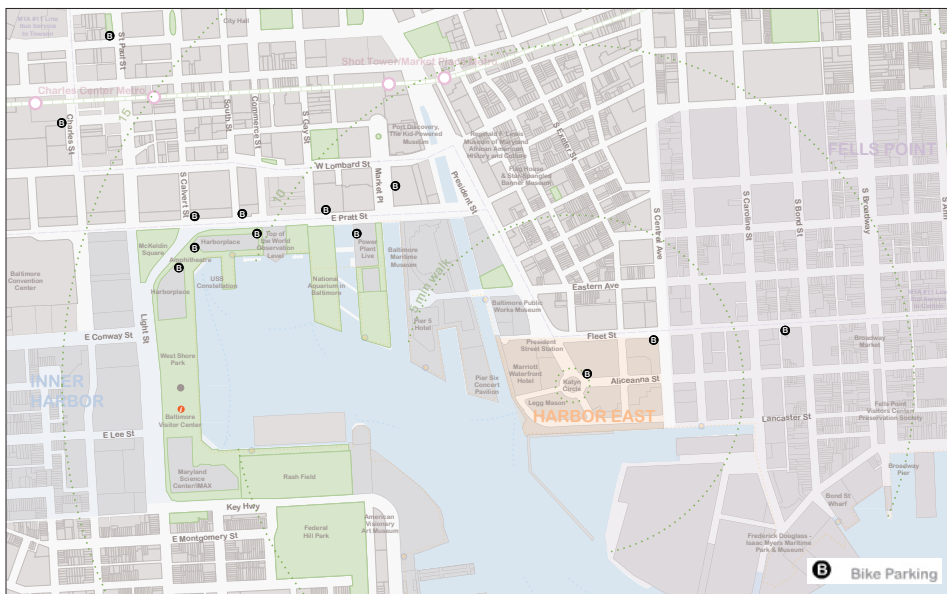


Figure 4-1. A Smarter Way To Get There Walking and Biking Distance Map from Harbor East



Figure 4-2. Charm City Circulator Electric Bus



Figure 4-3. Water Taxi

HEALTHY HARBOR INITIATIVE

LONG-TERM GOAL:

Vast majority of people who work, live, and recreate around the Waterfront use alternative transportation

Strategy 4.4: Promote Car Sharing



Issue: Car share programs have the potential to lower the need for and use of individually owned vehicles. Car share members who sell their personal vehicle reportedly lower emissions associated with commuting by 90%.

Action: Help introduce a car share program citywide.

Objective:

- Lower Vehicle Miles Traveled
- Improved air quality
- Lower greenhouse gas emissions
- Reduced demand for parking lots (impervious surfaces)



Figure 4-4. The Altcar used in the Science Center's electric car sharing and car rental program

Strategy 4.5: Link to Regional Transportation



Issue: Various public transportation options and trail systems are not continuously linked in an inviting, easy to use system.

Action: Advocate linking the Waterfront to City and regional public transportation and bike routes more directly and provide readily available maps, schedules, and site amenities.

Objective:

- Lower Vehicle Miles Traveled
- Improved air quality
- Lower greenhouse gas emissions
- Reduced demand for parking lots (impervious surfaces)

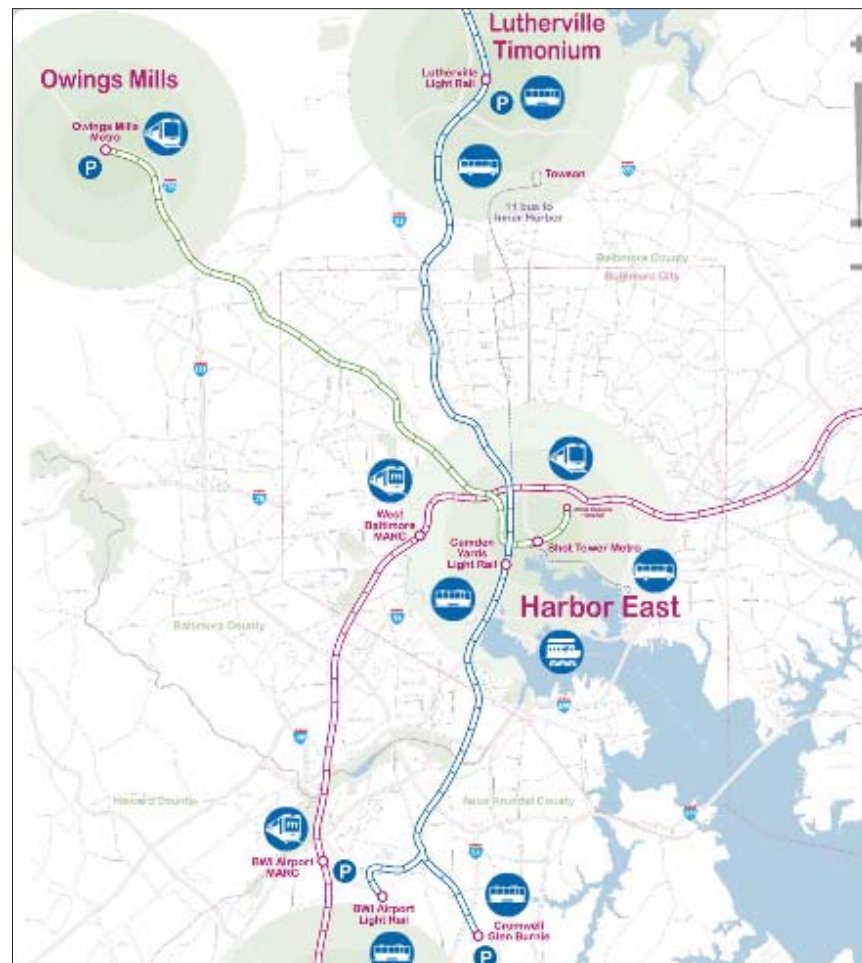


Figure 4-5. A Smarter Way To Get There Regional Transportation Map



5 Energy and Climate Change

SHORT-TERM GOAL:

Lower WPB landscape operations and maintenance energy demand by 50% by 2012

Strategy 5.1: Monitor Energy



Issue: WPB operations and maintenance (O&M) energy use is not currently monitored. O&M is the primary source of Waterfront Partnership's greenhouse gas emissions, which contribute to climate change.

Action: Create a monitoring protocol for (O&M) energy use. Display monitoring data as an educational tool.

Objective:

- Determine energy demands and opportunities to reduce
- Educate Partnership on energy use
- Public education/awareness

Strategy 5.2: Increase Energy Efficiency in O&M



Issue: Currently, WPB O&M vehicles and equipment do not maximize fuel efficiency or consider low/no energy alternatives.

Action: As WPB replaces its vehicles, it should consider using more fuel efficient maintenance vehicles and equipment. Consider ways to reduce O&M energy demands based on on-going monitoring data. Reduce gallons of non-renewable fuels used by at least 50%.

Objective:

- Lower O&M energy demand
- Lower greenhouse gas emissions

Strategy 5.3: Convert to Energy Efficient Lighting



Issue: Lighting around the Waterfront Partnership properties is energy intensive and light polluting. The Baltimore Sustainability Plan calls for a reduction of energy use by 15% by 2015. The City currently provides electricity for the Waterfront light fixtures.

Action: Retrofit or replace light fixtures/bulbs with more energy efficient versions that focus light with shielding and reduce energy consumption by 50% to support the Baltimore sustainability goal of 15% reduction.

Objective:

- Reduce light pollution
- Lower energy demand (for City)
- View night sky
- Educational demonstration of appropriate site lighting for energy efficiency and Dark Sky compliance

Strategy 5.4: Wind and Solar Energy



Issue: Energy for site lighting and other demands likely comes from unsustainable, non-renewable sources.

Action: Purchase off-site wind energy and/or install appropriately scaled wind turbines and/or solar panels to provide 50% of site power for lighting and other site energy demands. Hold a design competition for a landmark wind and/or solar energy generating sculpture.

Objective:

- Lower energy demand
- Lower greenhouse gas emissions
- Use alternative energy installations as public education tool



Figure 5-1. Off-site Wind Energy

HEALTHY HARBOR INITIATIVE

MID-TERM GOAL:

Climate neutral WPB
landscape O&M by 2015

LONG-TERM GOAL:

All WPB member buildings climate neutral (O&M for existing buildings
and +materials for renovations and new buildings) by 2025

Strategy 5.5: Energy Efficient O&M



Issue: WPB O&M vehicles and equipment do not maximize fuel efficiency or consider low/no energy alternatives.

Action: As budget allows, replace all maintenance vehicles and equipment with electric, biodiesel, or other energy efficient/carbon neutral fuel source.

Objective:

- Lower O&M energy demand
- Lower carbon footprint

Strategy 5.6: Use Biodiesel for O&M



Issue: On-site waste vegetable oil from restaurants is generated daily, collected and taken elsewhere for rendering or processing. Meanwhile, there is ongoing fuel demand for maintenance vehicles and equipment.

Action: Process used restaurant vegetable oil waste into biodiesel to use for diesel O&M vehicles and equipment. Set up a biodiesel demonstration site at the Science Center or in another location.

Objective:

- Lower O&M energy demand
- Lower carbon footprint
- Reuse of waste product

Strategy 5.7: Audit Building Energy Use



Issue: Buildings consume high amounts of energy from non-renewable and polluting sources.

Action: All member buildings perform an energy audit and set goals for improved energy efficiency. This should be prioritized for buildings in need of renovation (lighting, HVAC, etc.).

Objective:

- Lower building energy demand

Strategy 5.8: Use Renewable Energy Sources



Issue: Site amenities and buildings are powered by off-site, non-renewable, polluting energy sources.

Action: Use renewable sources (purchased from off-site or produced on-site) for all energy for buildings and landscape.

Objective:

- Lower energy demand from unsustainable sources



Figure 5-2. This parking lot at Oberlin College in Ohio is shaded by solar panels which generate power for the adjacent building, Credit: Nicole Stern



6 Materials and Waste

SHORT-TERM GOAL:

Reduce trash (weight or pick up frequency) by 50% by 2012

MID-TERM GOAL:

Reduce waste and use sustainable materials

Strategy 6.1:
Recycle



Issue: The majority of the trash from the site is going to the City incinerator.

Action: Install single stream recycling bins next to every regular trash can on site and work with businesses to recycle in buildings. Work with the City to measure recyclables removed from Waterfront bins and seek to increase amount annually. Work with businesses to use recyclable materials and to recycle these materials.

Objective:

- Lower waste going to landfills
- Create opportunity for materials reuse
- Work towards improving City commercial recycling
- Public education/awareness

Strategy 6.3:
Use Sustainable Materials



Issue: On-site materials and elements like benches, lamps and pavers may come from non-renewable sources, unsustainable extraction and manufacturing processes, and contain toxic substances. From their origin to the end of their life cycle, these materials may be impacting the environment.

Action: Seek sustainable alternatives for all landscape furnishing and O&M material purchases. Choose sustainable materials that are renewable, recycled, local, and non-toxic.

Objective:

- Lower ecological and socio-cultural impacts on material source origins
- Avoid health impacts of toxic materials
- Public education/awareness

Strategy 6.4:
Offer Vendor Incentives



Issue: Disposable take away containers from food vendors create large amounts of waste.

Action: Advocate for vendors to use compostable materials for take away and food court foods. Provide clear signage on compost collection points to ensure compostable materials are composted and not sent to the landfill.

Objective:

- Lower waste going to landfills
- Create beneficial resource material for reuse in landscape
- Work towards creating citywide composting service
- Public education/awareness

Strategy 6.2:
Compost



Issue: Majority of trash from site, including compostable material, is going to the landfill.

Action: Hold compost consortium for WPB members, hosted by the Aquarium. Implement a joint compost collection and pick-up program for WPB member properties. Re-use compost generated on WPB landscape.

Objective:

- Lower waste going to incinerator
- Create beneficial resource material for reuse in landscape
- Work towards creating citywide composting service
- Public education/awareness



Strategy 6.5:
Install a Three Bin System



Issue: There is currently no organized and consistent site furnishing system to collect and separate recyclable and compostable waste.

Action: Install three-bin system for every trash can in the Waterfront landscape with recycling and composting.

Objective:

- Lower waste going to incinerator
- Create beneficial resource material for reuse in landscape
- Work towards creating citywide recycling and composting service
- Public education/awareness



Figure 6-1. Examples of Three Bin System

HEALTHY HARBOR INITIATIVE

LONG-TERM GOAL:

All new materials from sustainable sources (no red list materials); all waste recycled or composted

Strategy 6.6: No Use of Red-List Materials



Issue: Commonly used materials contain toxic substances like heavy metals and endocrine disrupting compounds. These elements and compounds are accumulating in the tissue of living organisms, including humans. The health effects of constant exposure to these elements is degrading our quality of life.

Action: Use only non-red list, sustainable materials for any replacement of site furnishings or other landscape materials. See Living Building Challenge for red-listed materials.

Objective:

- Avoid health impacts of toxic materials
- Improved human health
- Public education/awareness

Strategy 6.7: Use Only Sustainable Materials



Issue: Landscape and building materials can have unseen environmental and social impacts on their source locations as well as health impacts on users. Disposal of materials after their lifespan can add to landfills and create toxic leaching in their disposal destination.

Action: All new materials for landscape and buildings from sustainable (renewable, recycled, local, and non-toxic) sources. See the Materials chapter of LEED (www.usgbc.org/LEED/) for detailed guidelines and materials certifications.

Objective:

- Lower ecological and socio-cultural impacts on material source origins
- Avoid health impacts of toxic materials
- Public education/awareness

Materials Red List

The Cascadia Region Green Building Council's Living Building Challenge (<http://ilbi.org/the-standard/lbc-v1.3.pdf>) includes a Materials Red List. In order to be eligible to for the Living Building Challenge, a project must not use products which contain any of the following:

- Cadmium
- Chlorinated Polyethylene and Chlorosulfonated Polyethylene
- Chlorofluorocarbons (CFCs)
- Chloroprene (Neoprene)
- Formaldehyde (added)
- Halogenated Flame Retardants
- Hydrochlorofluorocarbons (HCFCs)
- Lead
- Mercury
- Petrochemical Fertilizers and Pesticides
- Phthalates
- Polyvinyl Chloride (PVC)
- Wood treatments containing Creosote, Arsenic or Pentachlorophenol

Implementation

Pilot Projects

The Waterfront Partnership has selected Biohabitats and Mahan Rykiel to implement pilot projects based on high priority Strategy actions. Among the projects being worked on are:

- Floating Harbor Islands with Aeration Bubblers
- Rainwater Harvesting Cisterns
- New Family Park
- Pedal Powered Aeration Pumps
- Landscape Biofilters
- Lawn and Landscape Conversion to Native Planting
- Rain Gardens
- A Smarter Way to Get There
- Cigarette Butt Pollution Prevention Campaign
- Advocacy for policy changes that will benefit streams, waterways, and Harbor water quality



Figure I-1. Floating Harbor Island Pilot Project Prototype

Local Community Involvement

Implementing these Strategies should involve the local community as much as possible to foster stewardship and maximize education and awareness opportunities. The more involved citizens are, the more stake they will have in keeping the Waterfront vital. Local companies should be chosen to design and construct any action related projects which go beyond the role of Waterfront Partnership staff. All projects are an opportunity in which local artists can participate.

Conclusion

The Baltimore Waterfront is poised to become a model sustainable urban waterfront park through its location, visibility, and educational resources.

The Waterfront exemplifies many of the issues affecting the health of the watersheds that flow into the Harbor: paved, impervious surfaces and lawns which cause pollutant runoff and limit biodiversity; too few trees to slow down stormwater and provide shade and habitat; and lack of awareness of water and energy conservation or full cycling of wastes by residents and businesses. While implementing the strategies in the Healthy Harbor Initiative will help reduce the impact of WPB properties on the environment, perhaps the more powerful purpose of these actions is the potential to educate everyone walking along the promenade about sustainability issues and spread awareness of what they can do to lessen impacts on the waters of the Harbor and regenerate surrounding watersheds and beyond.

By replacing impervious surfaces with permeable pavement, native planting, green roofs, rain gardens, or marsh biofilters wherever applicable, stormwater runoff could be slowed and filtered before flowing into the Harbor. Converting underutilized lawn areas and other conventional landscaping to native planting, rain gardens, or marsh biofilters could lower or eliminate the need for fertilizers (which runoff into the harbor, causing high nutrient loads), lower or eliminate the need for irrigation (saving potable water resources), lower O&M energy/fuel demand by lowering mowing needs, increase habitat for birds and beneficial insects, increase human comfort, and save money. While the impact of the pollutants from stormwater runoff on-site on the overall Harbor water quality is relatively minor, these practices could serve as examples to others in the watersheds affecting the Harbor.

The action of increasing the urban tree canopy on the site would have the most direct objectives for the site including slowing stormwater runoff, providing needed shade, reducing urban heat island, and increasing habitat and biodiversity.

The strategies, which focus on water quality issues include actions to actively filter water and provide fish refuge. Such actions would generate public attention if done artfully and creatively and increase awareness. Actions to create floating harbor islands or bike powered aeration are opportunities to mix art, function, participation, education, and fun.

The Baltimore Waterfront, since the City's creation, has always been the hub of the City. The Healthy Harbor Initiative aims to reveal this connection and call on the community to take part in working toward a fishable and swimmable Harbor.



410.467.1880
laurie@waterfrontpartnership.org
www.waterfrontpartnership.org

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