

# NATIONAL MALL UNDERGROUND

FLOOD PROTECTION, VISITOR ACCESS, AND  
RESILIENCE FOR THE NATIONAL MALL

by  
Albert H. Small  
National Mall Coalition (formerly National Coalition to Save Our Mall)  
Arthur Cotton Moore FAIA



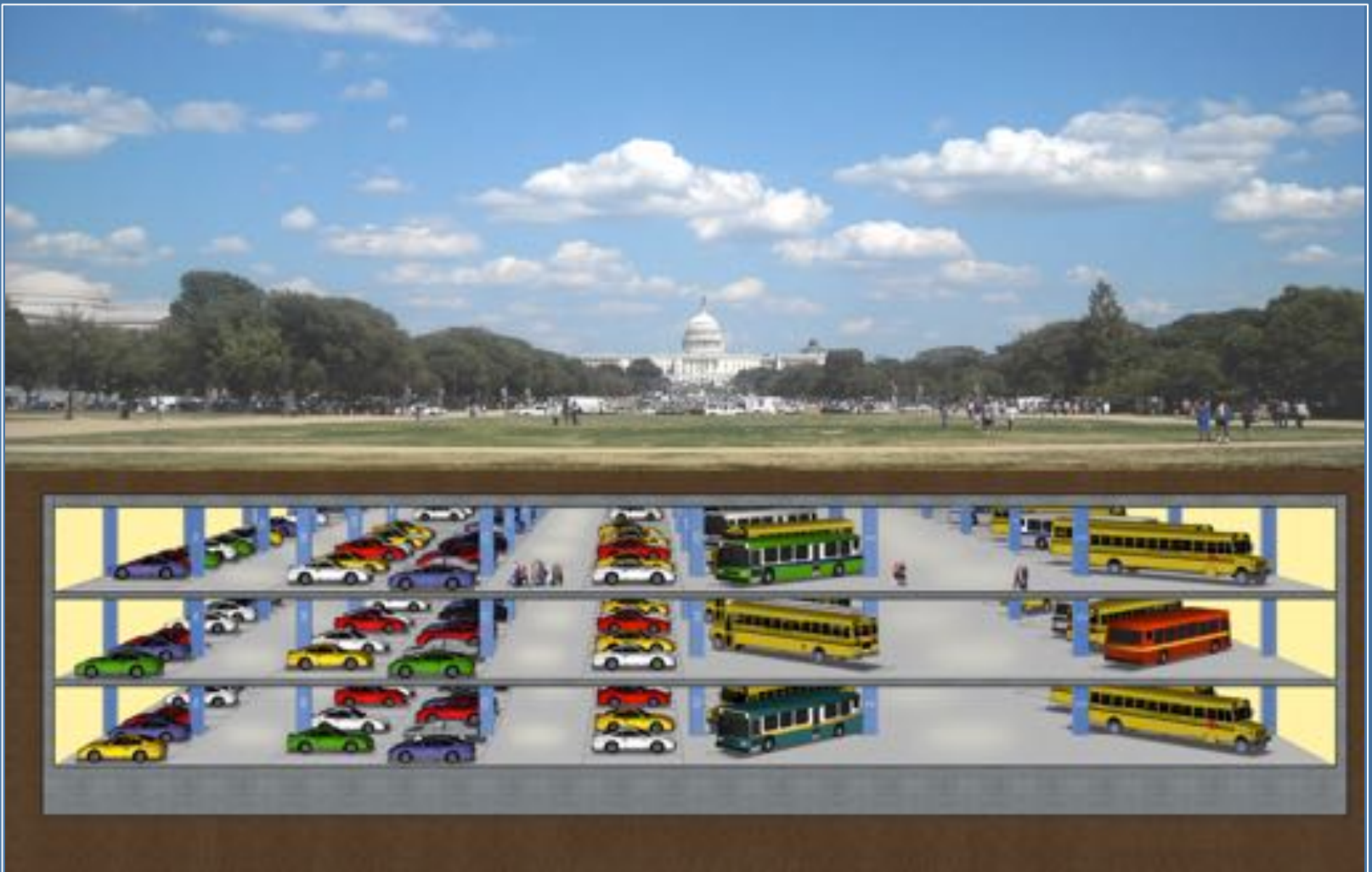
Federal Triangle area, 12<sup>th</sup> Street tunnel, and Constitution Avenue in 2006

Flood of June 25<sup>th</sup>-26<sup>th</sup>, 2006





National Mall  
Underground



- ✧ 200 tour bus parking spots close to national museums, monuments, and cultural events
- ✧ 900 car parking spots providing access to visitors, especially those of limited mobility and families
- ✧ Pollution control by removing idling buses and cars from the Mall and neighboring streets

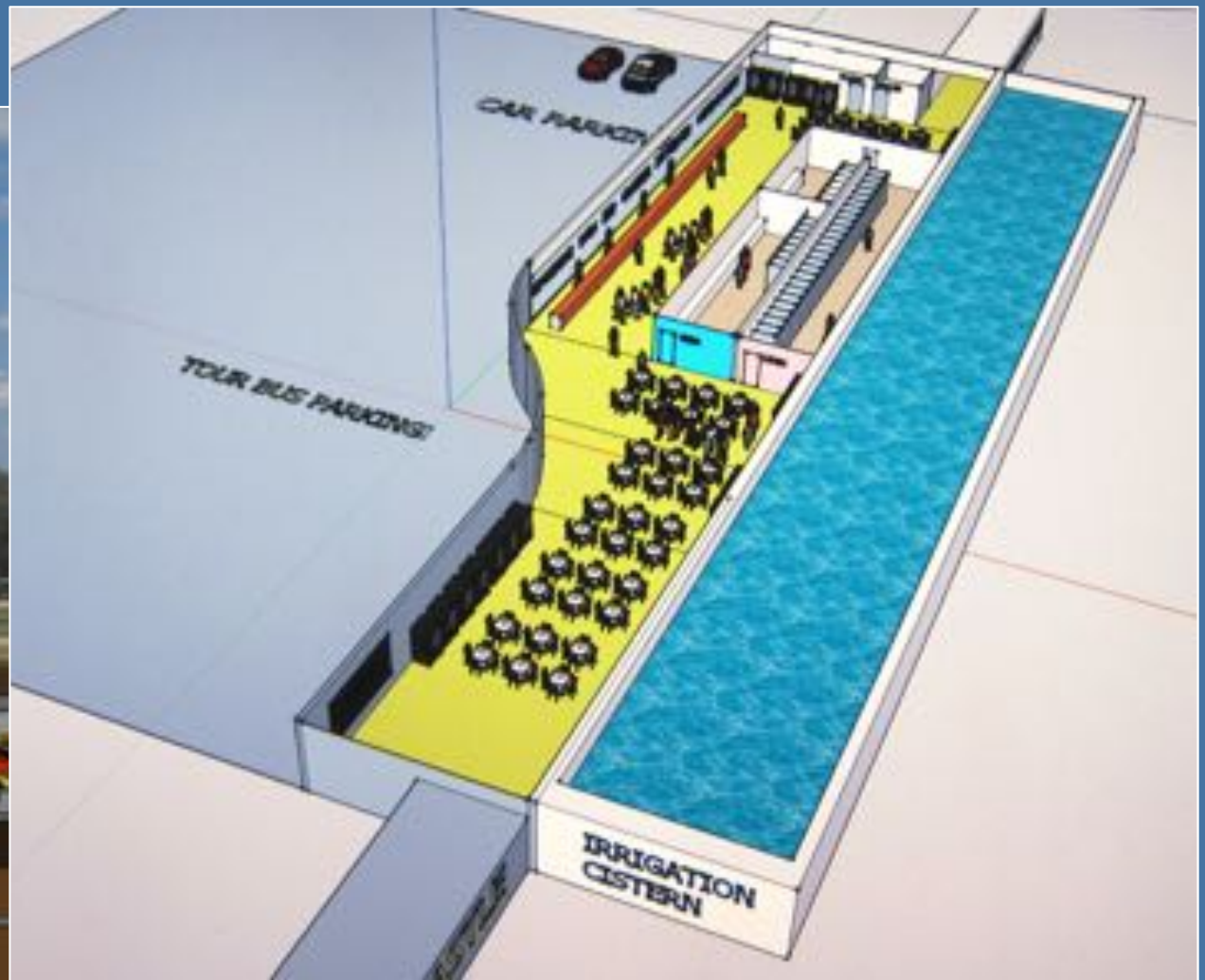




✧ A 34 million gallon floodwater reservoir for major storm events



✧ A Mall Visitor Center with amenities such as restrooms, food service, and first aid



- ✧ Cisterns to collect rainwater, graywater, and groundwater flow for use in irrigation and during drought.



# Over 200 briefings with Congress, government agencies, and public

## Congress White House

### Federal Agencies

Architect of the Capitol  
Army Corps of Engineers  
Commission of Fine Arts  
Council on Environmental Quality  
EPA  
Federal Emergency Management Agency (FEMA)  
IRS  
National Archives  
National Capital Planning Commission  
National Gallery of Art  
National Park Service  
Smithsonian Institution  
USDA  
U.S. Dept. of Commerce

### Federal Agencies (cont.)

U.S. Dept. of Homeland Security  
U.S. Park Police  
U.S. Secret Service

### District of Columbia

DC Councilmembers (staff) Wells (sits on NCPC) and McDuffie (sits on COG)  
DC Department of Transportation  
DC Water (WASA)  
DC Department of Environment  
Office of the Mayor  
DC Office of Planning  
WMATA

## Nonprofits & Other Organizations

American Institute of Architects, DC Chapter  
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Committee of 100 on the Federal City  
Destination DC  
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Dutch Embassy  
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Guild of Professional Tour Guides of Washington DC

Louis Berger Group  
Newseum  
Penn Quarter Association  
SmithGroup  
Trust for Public Land  
Trust for the National Mall (NPS fundraising partner)  
Washington Post Editorial Board



Consultations with engineers,  
transportation planners, parking



A viable and largely self-funding multi-purpose solution for the Mall, the capital, and the country



# The Problems





Lack of Access



Congestion and Pollution





New National Park Service cisterns will provide irrigation for the grass but not the trees or gardens throughout the Mall

Drought





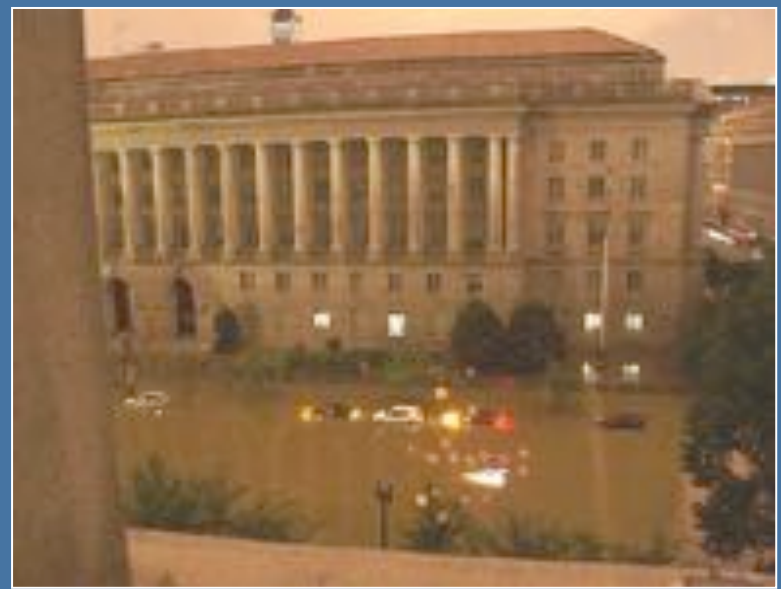
Pennsylvania Avenue in 1889



Hains Point in the 1980s (arrow at Jefferson Memorial)



The 1930 flood



2006

Flooding

## Sea Level Rise and Nuisance Flood Frequency Changes around the United States



City Dock in Annapolis, Maryland. Photo Credit: Amy McGovern.

Silver Spring, Maryland

June 2014



**noaa** National Oceanic and Atmospheric Administration

U.S. DEPARTMENT OF COMMERCE  
National Ocean Service  
Center for Operational Oceanographic Products and Services

June 2014

The nation's capital came in eighth on the list of cities with the **biggest increases in flood days** between the periods 1957-1963 and 2007-2013:

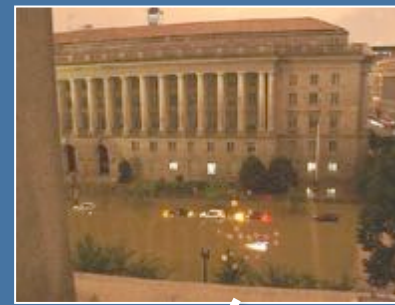
1. Annapolis, Maryland, 925 percent
2. Baltimore, Maryland, 922 percent
3. Atlantic City, New Jersey, 682 percent
4. Philadelphia, Pennsylvania, 650 percent
5. Sandy Hook, New Jersey, 626 percent
6. Port Isabel, Texas, 547 percent
7. Charleston, South Carolina, 409 percent
8. **Washington, DC, 373 percent**
9. San Francisco, California, 364 percent
10. Norfolk, Virginia, 325 percent

Source: <http://www.bloomberg.com/news/2014-07-28/ten-u-s-cities-where-flooding-is-much-more-common.html>

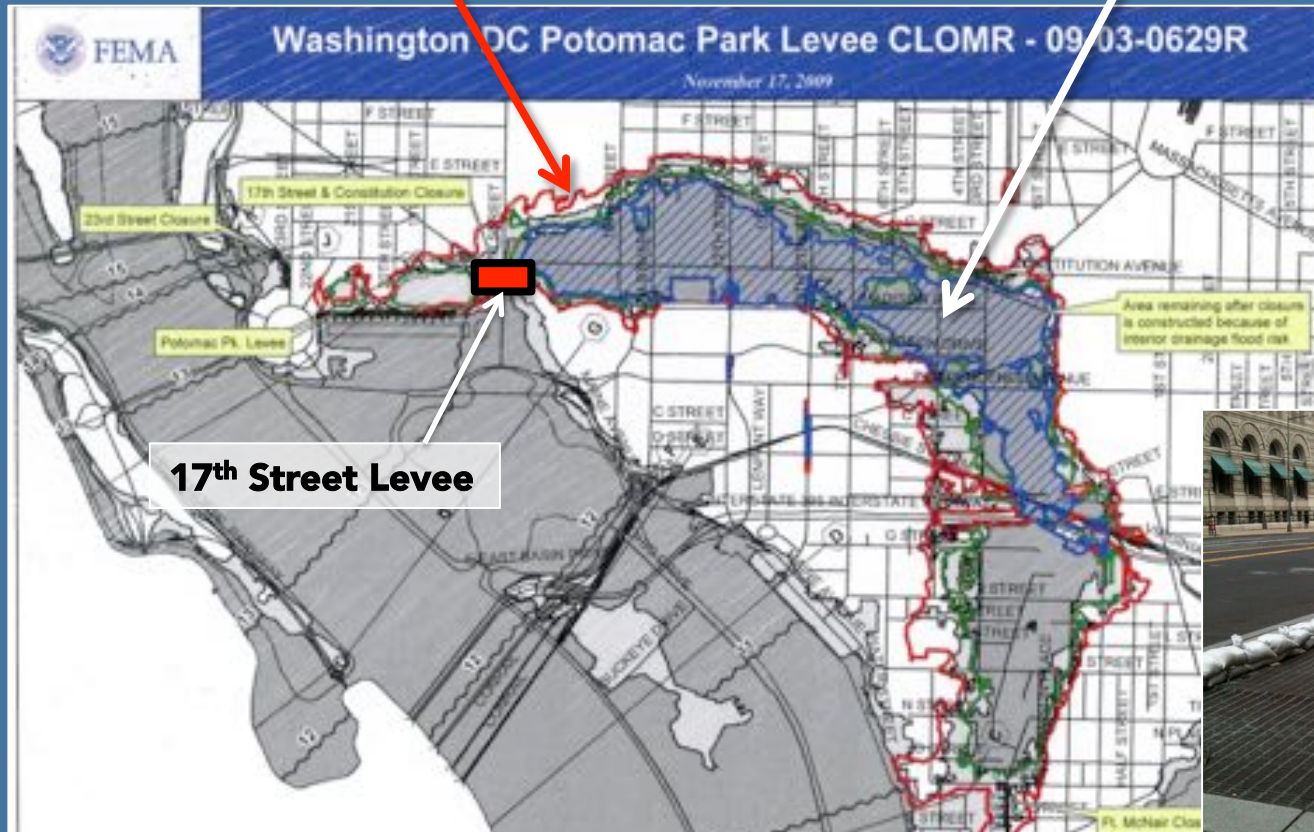
Washington DC has had a **373% increase in low-grade flooding** over 50 years, according to this new NOAA report



Potomac River flooding (17<sup>th</sup> St. levee)



Stormwater runoff flooding (no protection)



**17<sup>th</sup> Street Levee**



WMATA stormwater barriers

2 Different Flood Threats





Visualization of 2006 flood



Pooling of stormwater during 2006 flood

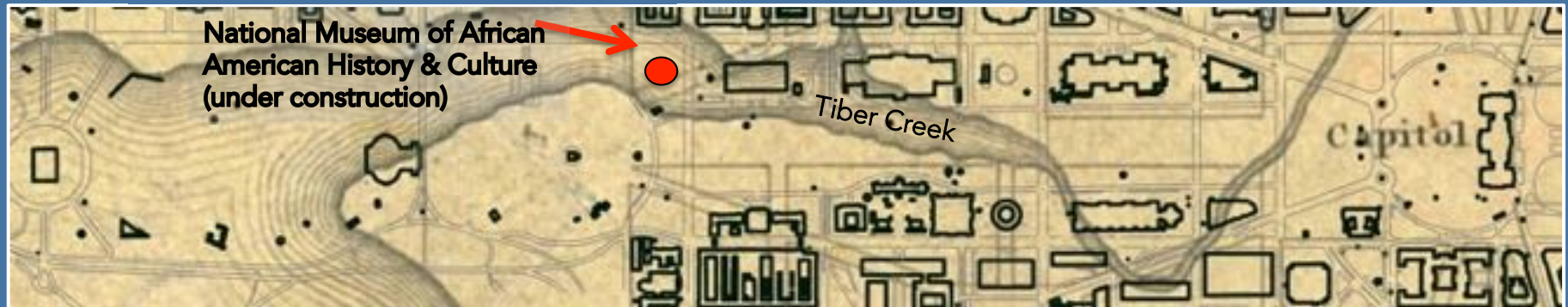




Historical location of Tiber Creek now buried beneath Constitution Avenue



Blue areas show pooling of stormwater during the 2006 flood from runoff from higher ground (red arrows)



Tiber Creek, while often said to be under Constitution Avenue, may flow also beneath the Federal Triangle-National Mall area.

Low-lying site of old Tiber Creek

# Federal Triangle Stormwater Drainage Study

July 2011

Members of the Federal Triangle Stormwater Working Group:

- General Services Administration (GSA)
- District of Columbia Office of Planning (DCOP)
- District of Columbia Department of the Environment (DDOE)
- District of Columbia Homeland Security and Emergency Management Agency (DC HS&EMA)
- District of Columbia Water and Sewer Authority (DC Water)
- Federal Emergency Management Administration (FEMA)
- National Archives and Records Administration (NARA)
- National Capital Planning Commission (NCPC)
- National Gallery of Art (NGA)
- National Park Service (NPS)
- Smithsonian Institution (SI)
- U.S. Department of Justice (US DOJ)
- U.S. Environmental Protection Agency (US EPA)
- Washington Metropolitan Area Transit Authority (WMATA)

2011 Federal and District Government Study Confirms Future Flood Threat





Reservoir required  
for 200-year flood

Reservoir required  
for 50-year flood

Cisterns planned  
for Mall irrigation

Solution proposed by the 2011 study? Floodwater Reservoir Under the Mall



Fragmented Mall management leads to government inaction

# The Multi-Purpose Solution





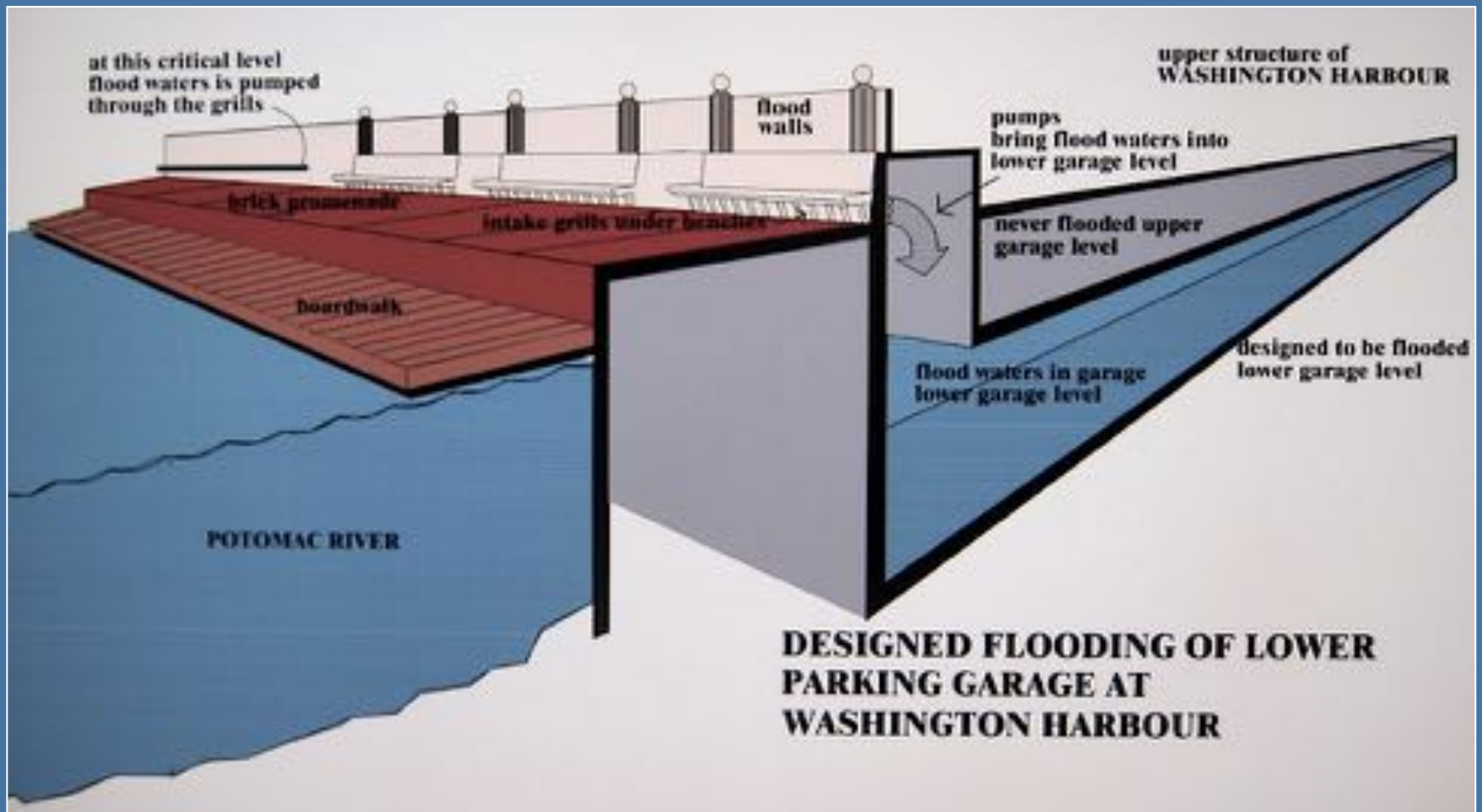
### NATIONAL MALL UNDERGROUND solution: Everyone benefits

- ◆ Flood control – Federal agencies, Smithsonian, DC Government and economy
- ◆ Congestion and pollution relief – Local residents, DC Government, children
- ◆ Visitor parking – tourists, local economy, Smithsonian, tour operators, museums
- ◆ Irrigation water – National Park Service, Smithsonian, GSA, ...
- ◆ Shelter and Public Safety – tourists and other Mall visitors
- ◆ Security -- US Park Police, Secret Service, Homeland Security

# Dual Purpose at Washington Harbour



Architect Arthur Cotton Moore already has designed a successful dual-purpose garage



Flooded Garage at Washington Harbour  
by Arthur Cotton Moore FAIA





Inconspicuous Entrances & Exit

# SAFETY AND SECURITY



The National Mall Underground offers key safety and security features, such as:

- \* Providing a **safety office with first aid** available to National Mall visitors
- \* Providing for **screening of vehicles** – just as vehicles are screened as they enter the parking garage beneath the Ronald Reagan Building
- \* Serving as a **safe haven for National Mall visitors** during inclement weather and other circumstances requiring the public to shelter in place. Although Smithsonian museums on the Mall are only between open 10:00 am and 5:00 pm, the National Mall Underground would be accessible for extended hours to serve this function
- \* Allowing **law enforcement personnel access to the facility** for use in protecting the public during high-profile events on the Mall

# SAFETY AND SECURITY



The U.S. Department of Homeland Security, U.S. Secret Service, U.S. Department of the Interior's Office of Law Enforcement and Security, and U.S. Park Police have evaluated the National Mall Underground proposal and found no security risks associated with the proposed underground facility. It is understood that the facility would be closed to the public and/or restricted to security/safety vehicle parking during Presidential Inaugural ceremonies, Fourth of July fireworks, and other events where security concerns are elevated.

- \* Serving as a safe haven for National Mall visitors during inclement weather

## Shelter in Place Facility?

Centrally located to the Mall, for Mall Visitors, and Central Washington

- \* Allowing law enforcement personnel access to the facility for use in protecting the public during high-profile events on the Mall



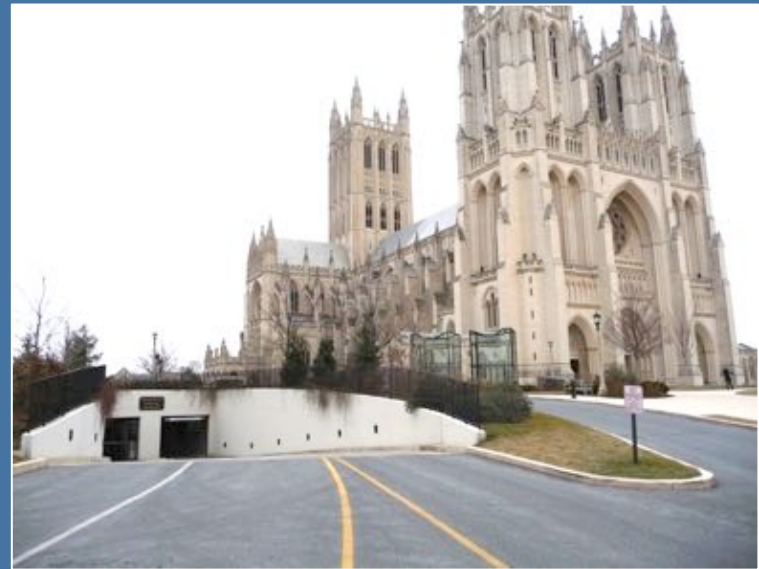
# Precedents



Chicago



Philadelphia



Washington, DC

Underground parking provides visitor access while creating car-free public spaces



Underground bus parking at St. Peter's in Rome





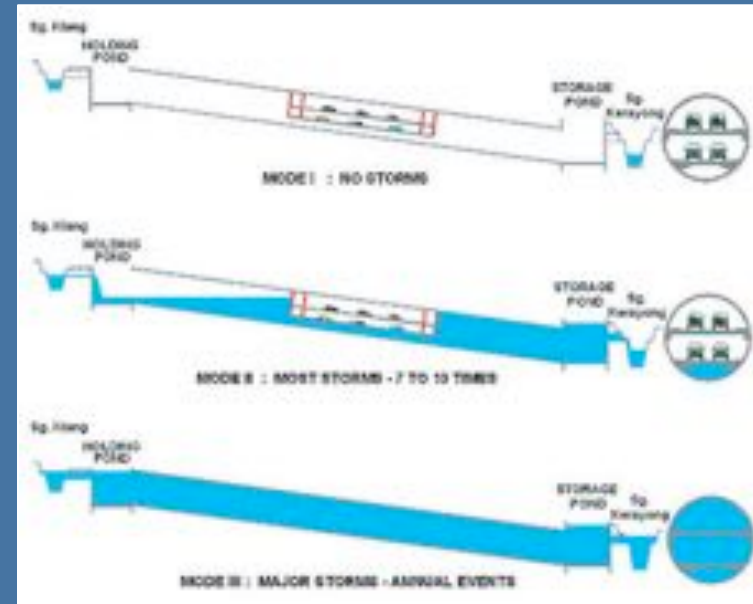
Dual purpose parking and flood control in Rotterdam, Netherlands



This Stormwater Management and Road Tunnel (SMART) tunnel is "The first and only dual purpose tunnel in the world"  
-- <http://smarttunnel.com.my/>



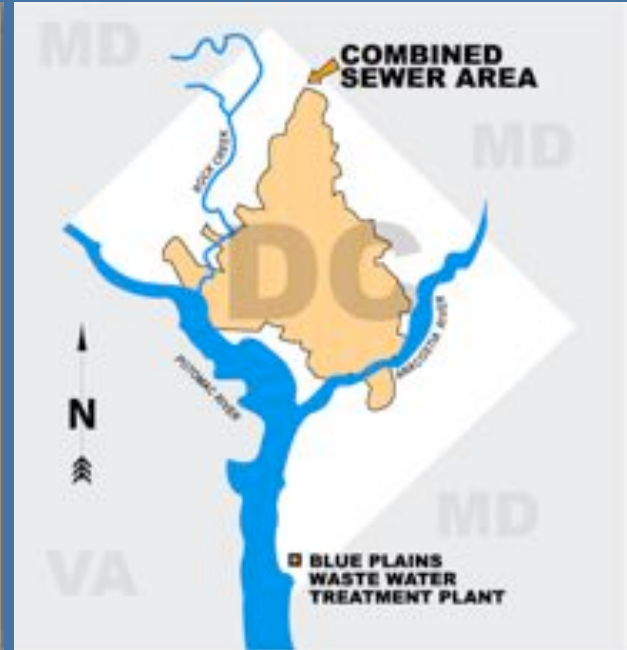
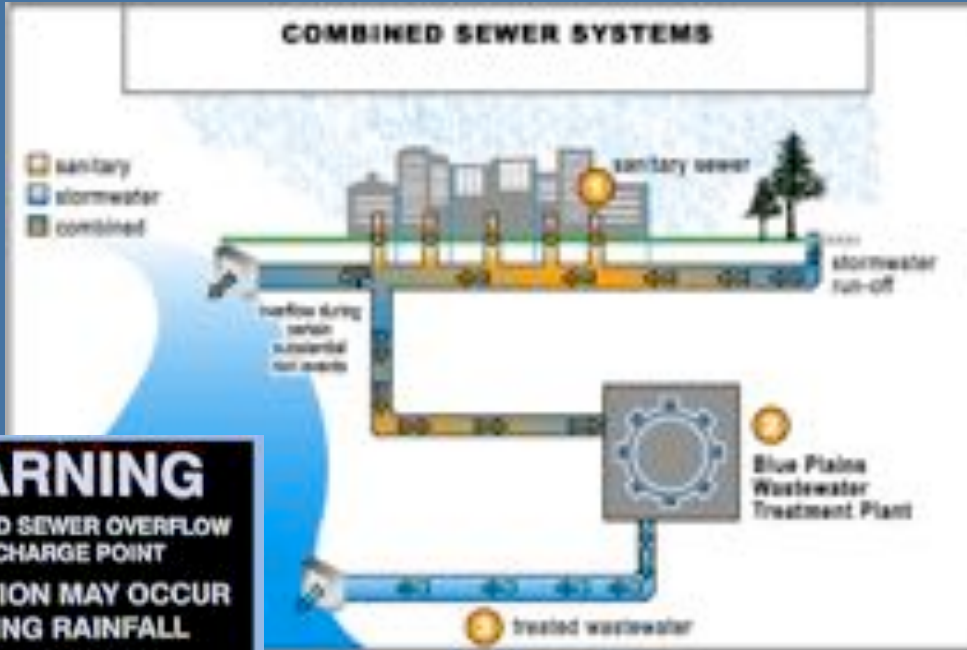
Flooding in central Kuala Lumpur



Dual purpose in Kuala Lumpur, Malaysia

**WARNING**  
 COMBINED SEWER OVERFLOW  
 DISCHARGE POINT  
 POLLUTION MAY OCCUR  
 DURING RAINFALL  
 CSO OUTFALL NO. 019  
 PERMIT NO. DC 0021199  
 TO REPORT PROBLEMS CALL  
 DISTRICT OF COLUMBIA  
 WATER AND SEWER AUTHORITY  
 TELEPHONE NO. (202) 613-3490

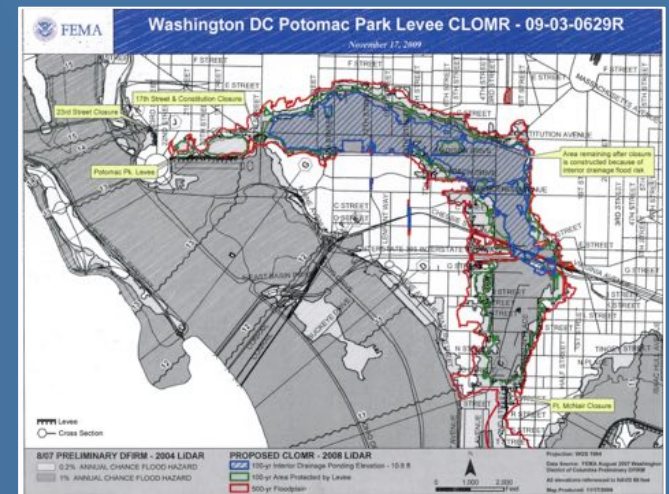
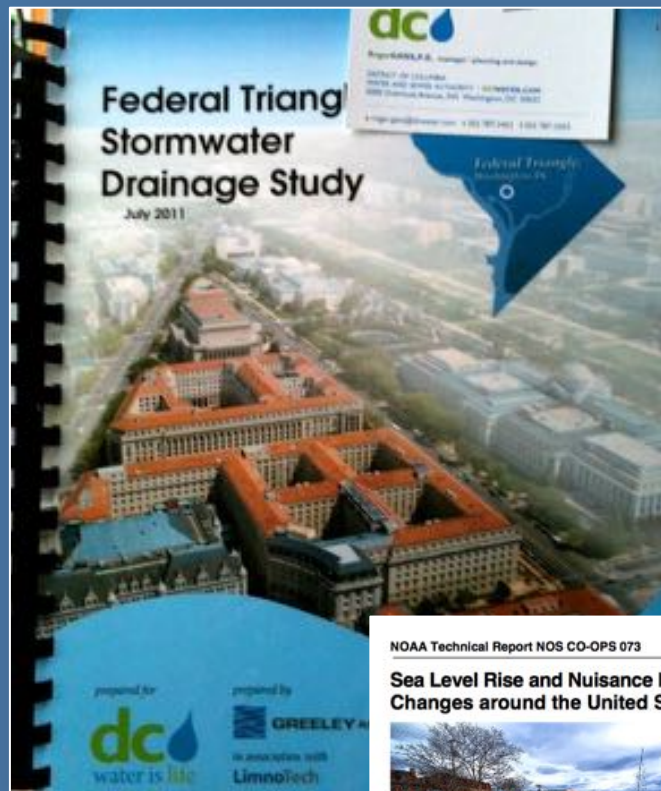
Washington, DC's  
 combined sewers mix  
 wastewater and rainwater



A Model for Other Parts of Washington DC



# Studies/ Reports



NOAA Technical Report NOS CO-OPS 073

## Sea Level Rise and Nuisance Flood Frequency Changes around the United States



Silver Spring, Maryland

June 2014



**noaa** National Oceanic and Atmospheric Administration

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## District of Columbia Motorcoach Action Plan

Final Report

Prepared by:  
District Department of Transportation

December 1, 2011

**Dewberry**

**CLARK**  
CONSTRUCTION



**PES**  
Partners for  
Economic Solutions

**GOROVE / SLADE**  
Transportation Planners and Engineers

Fact-based and Data-driven Solution and Design



# Support

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## The Washington Post

AN INDEPENDENT NEWSPAPER

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EDITORIALS

SUNDAY, MARCH 31, 2013

### One fix for three problems

*The solution to congestion at the Mall could also address some added benefits.*

**T**HIS EDITORIAL is for anyone who has ever circled the Mall, looking for a place to park. Or who has been irritated by all the cars that are circling the Mall, looking for a place to park. Or who has breathed fumes of buses that are idling near the Mall, or had a perfect photo ruined by those idling buses. Or who has considered taking the family to the Mall and decided against it, because it would be impossible to park.

Have we left anyone out?

Oh, yes. Anyone who's been stuck on the Mall looking for a bathroom.

An energetic and civic-minded nonprofit organization called National Coalition to Save the Mall is promoting what sounds like a pretty sensible idea: build parking under the Mall. The facility, which the group suggests might stretch from Ninth to 12th streets NW, would serve a triple purpose, providing on its bottom level cisterns to collect rainwater and groundwater runoff and a reservoir to capture water in the

event of major floods. The water could help keep the Mall's grass green, and the extra capacity could save Constitution Avenue and its buildings from damage in an era of increasingly severe weather.

Officials have recognized the need for such a flood-control facility, but an estimated \$400 million cost has put off serious consideration. Over a long period (say, 30 years), parking fees, primarily from buses and out-of-town tourists, could pay for the construction.

And why stop there? Promoters of the idea, who include the philanthropic president of Southern Engineering Corp., Albert H. Small; the architect Arthur Cotton Moore; and coalition chair Judy Scott Feldman, point out that such an underground space could include washrooms for tourists, shower facilities for tour bus drivers and underground connections among the museums and Metro. Fees and parking hours would have to be thought out carefully. But if the internal roads of the Mall could be freed up for pedestrians and cyclists, maybe along with a Circulator bus, the

visiting experience would be more pleasant for everyone.

So far the idea is in the early stages, with plenty of financial and engineering challenges no doubt to come. But as always on the Mall, the biggest challenge may be political: So many local, regional and federal agencies have overlapping claims to the territory that it's hard to get anything done.

The promoters have taken the idea to many of these stakeholders and, so far, have received encouragement. Del. Eleanor Holmes Norton (D-D.C.) told us that a great deal of "due diligence" obviously would be needed but that she liked the coalition's idea of a public-private partnership and the principle of going underground.

Pedro Ribeiro, spokesman for Mayor Vincent C. Gray (D), told us that the absence of tour-bus parking is a particular problem for managing traffic around the Mall. City officials think the idea is intriguing and worth further exploration, Mr. Ribeiro said.

We think so too.

Broad Support from All Quarters



# National Capital Planning Commission

## April 4, 2013 Meeting

"we are interested . . .  
we can revise the National Mall Plan."  
-- NPS Superintendent Bob Vogel

"this solves a lot of problems ....we've identified  
over the years... it's an intriguing idea... This  
(underground reservoir) could generate credit  
that could be sold... another source of revenue....  
I want to see the financial plan..."  
-- DC Office of Planning Director Harriet Tregoning



"The Mall is the centerpiece of the district economy, culture, identity and tourism. If you're talking tourism and not talking about the Mall you're missing something crucial. This project has the potential to make the Mall for the 21<sup>st</sup> century a place people populate and animate."

-- Former DC mayor Anthony Williams, now head of the Federal City Council





UNITED STATES  
HOLOCAUST  
MEMORIAL  
MUSEUM



NHD  
NATIONAL  
HISTORY DAY

SMITHGROUP JJR



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- 2011 Federal Triangle study
- FEMA maps
- News articles
- Flood history



PUBLIC EDUCATION: National Mall Underground Exhibit (November 2013 – December 2014)



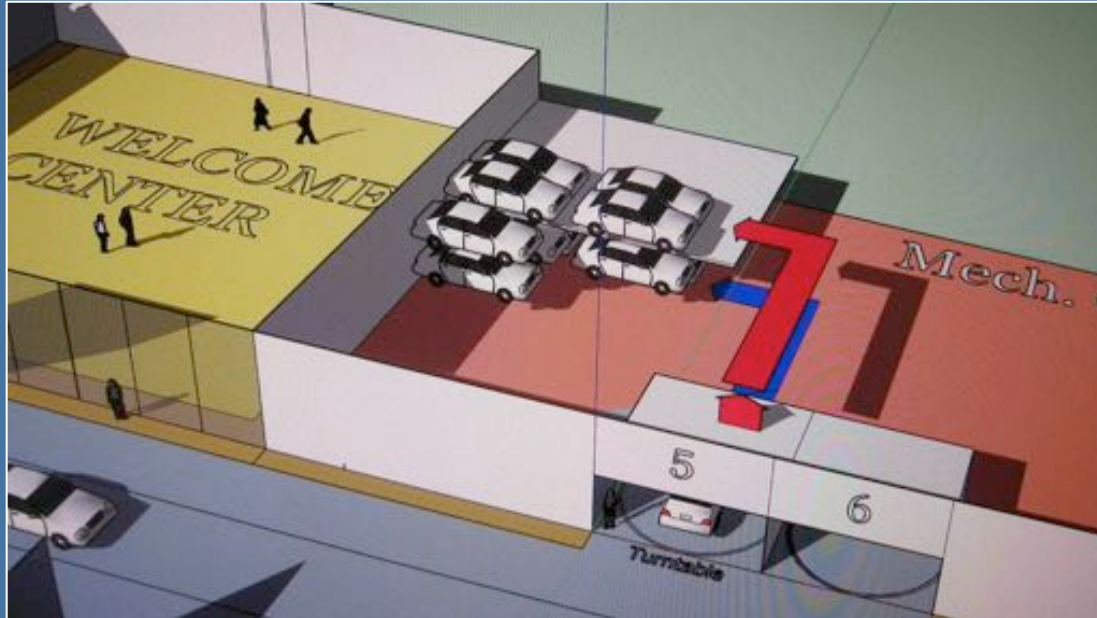
What's New?

# Alternatives – Options A - D

- OPTION A: Three-level garage for 900 autos/200 buses
- OPTION B: Two-level garage for 600 autos/133 buses

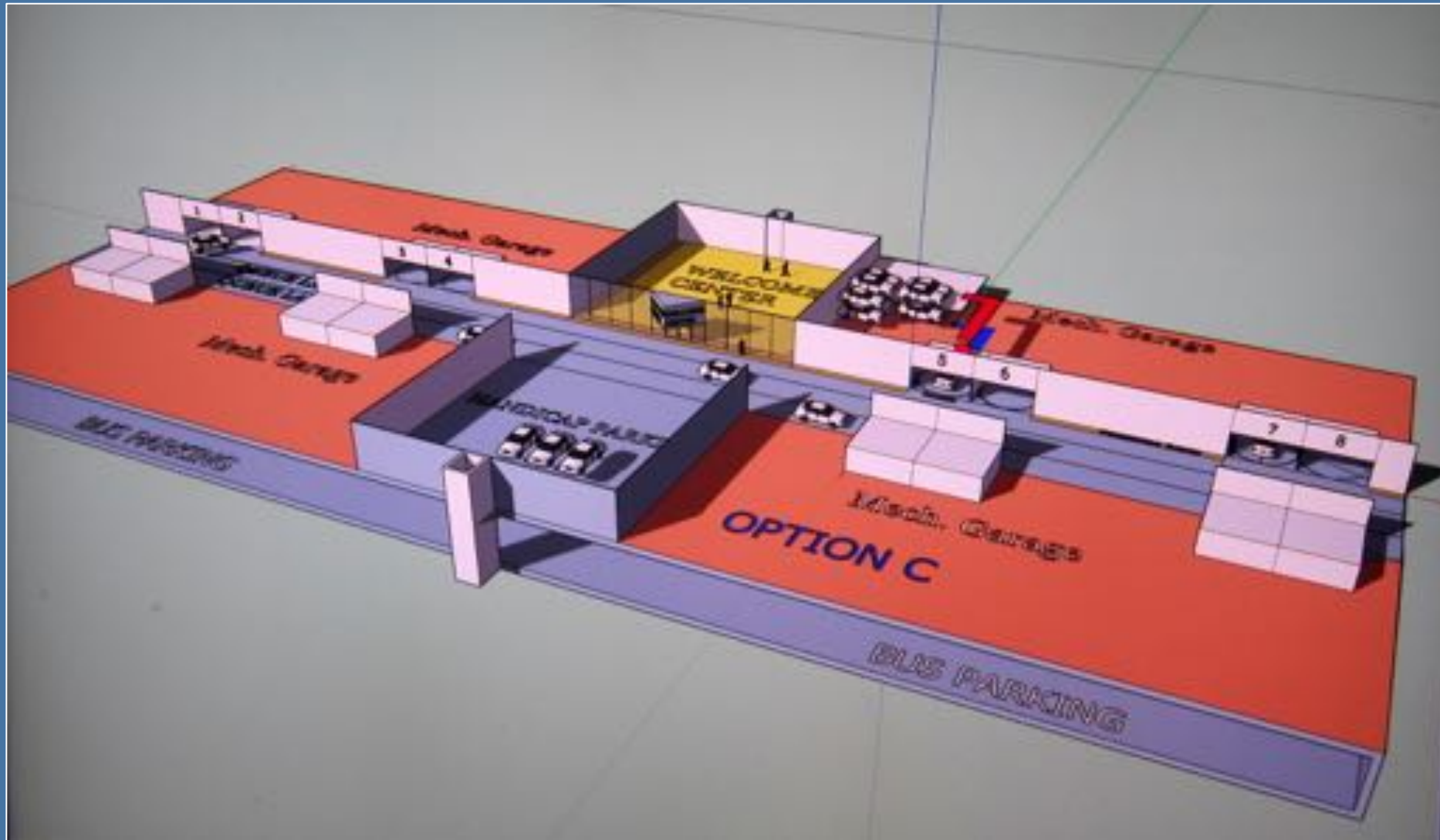


- OPTION C: Mechanical system for 1070 cars/150 buses

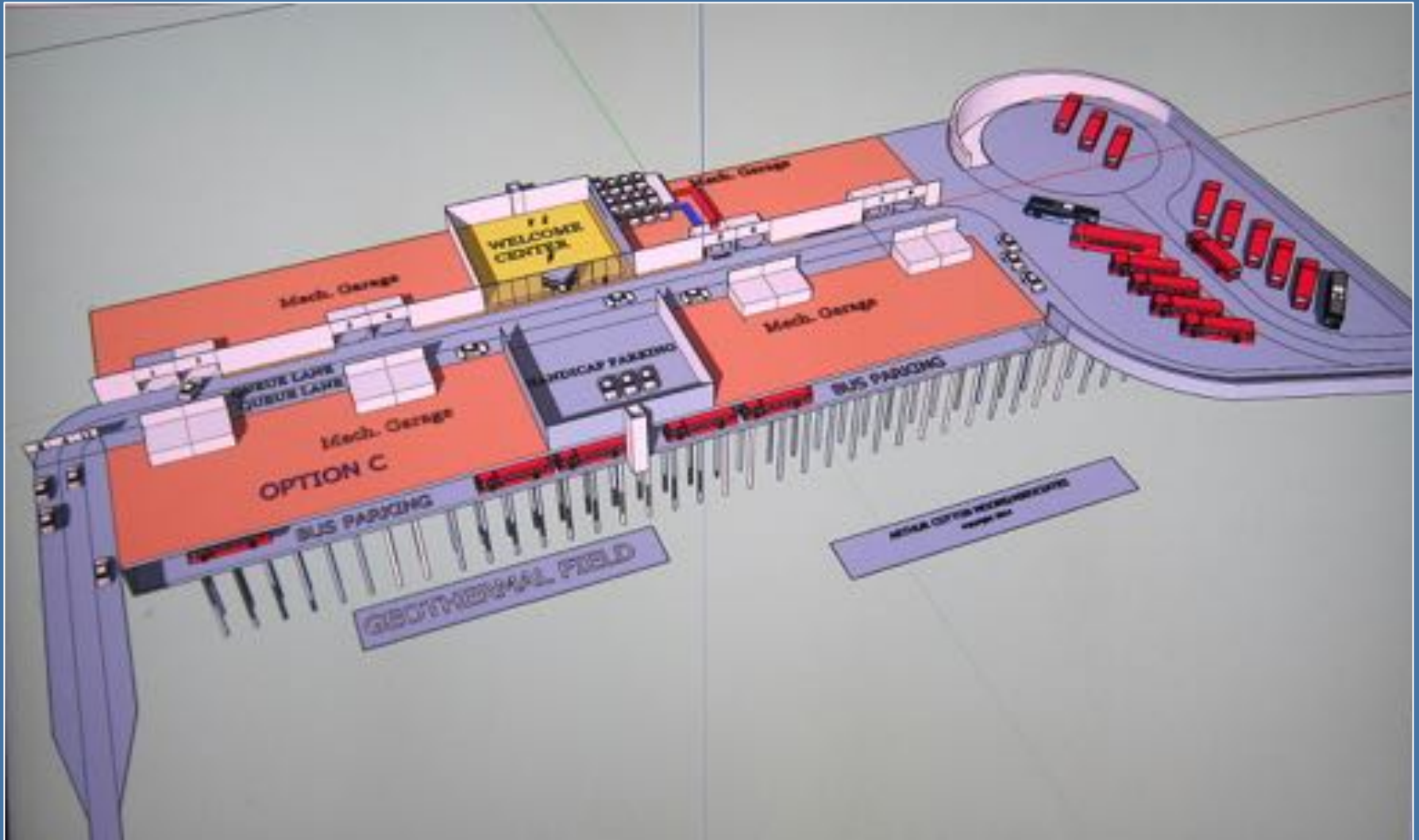




- OPTION C: Mechanical system for 1070 cars/150 buses



- OPTION D: Mechanical system with GEOTHERMAL



# Costs



## Estimated Cost of Stand-Alone Flood Reservoir

(proposed in the 2011 Federal Triangle Stormwater Drainage Study)

\$125 - \$200 million

## Estimated NMU Development Costs

	Two Levels for 600 Cars/133 Buses	Three Levels for 900 Cars/200 Buses
Hard Costs	\$140,393,000	\$197,695,000
Soft Costs	\$22,094,000	\$27,653,000
Total Costs	\$162,487,000	\$225,348,000

Source: Clark Construction Preconstruction Services, 2014; Partners for Economic Solutions, 2014.

National Mall Underground is Largely Self-Funding



# Costs



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(proposed in the 2011 Federal Triangle Stormwater Drainage Study)

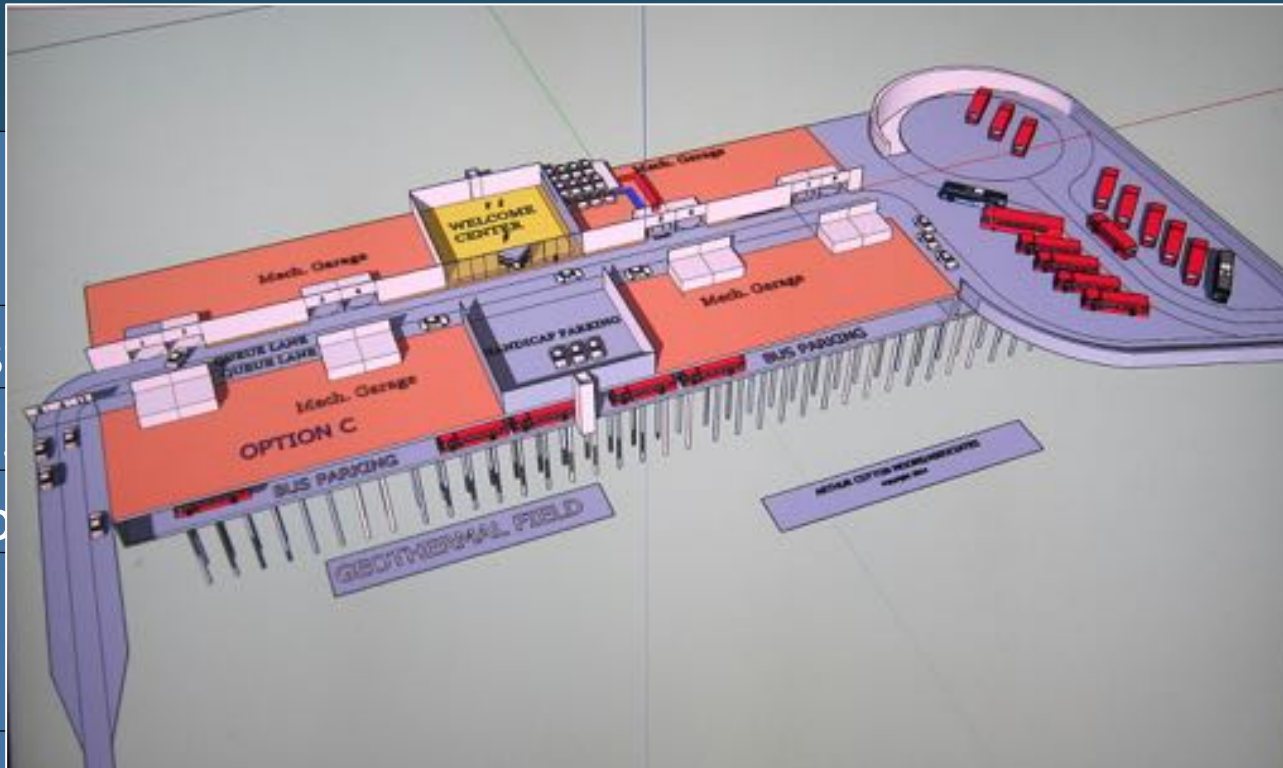
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Hard Cost

Soft Cost

Total Cost

Source: Clark



for 900  
uses

695,000

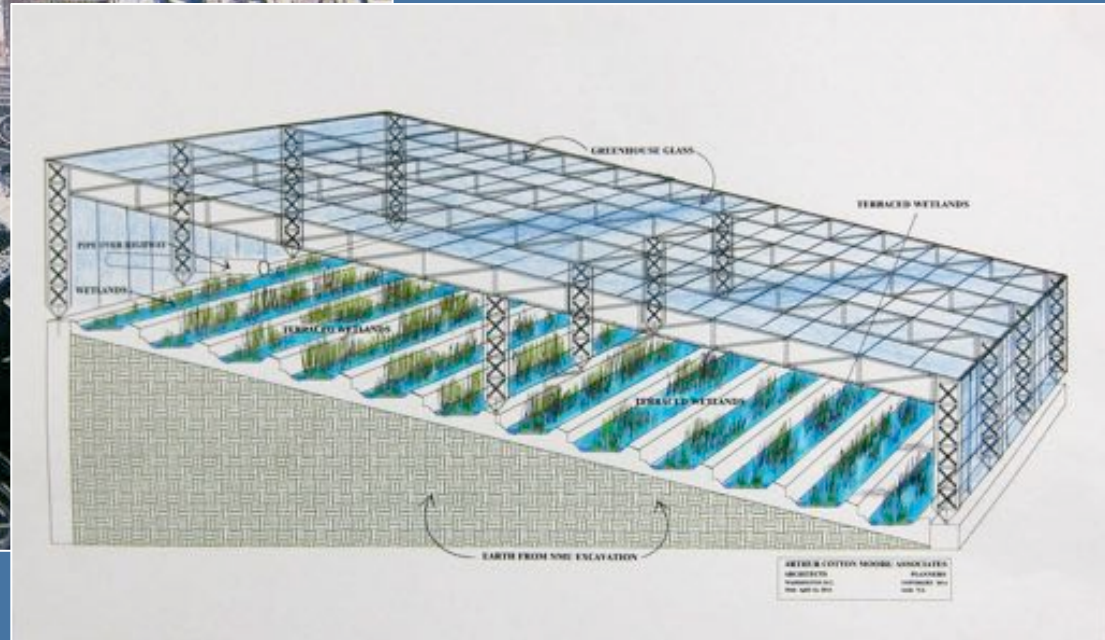
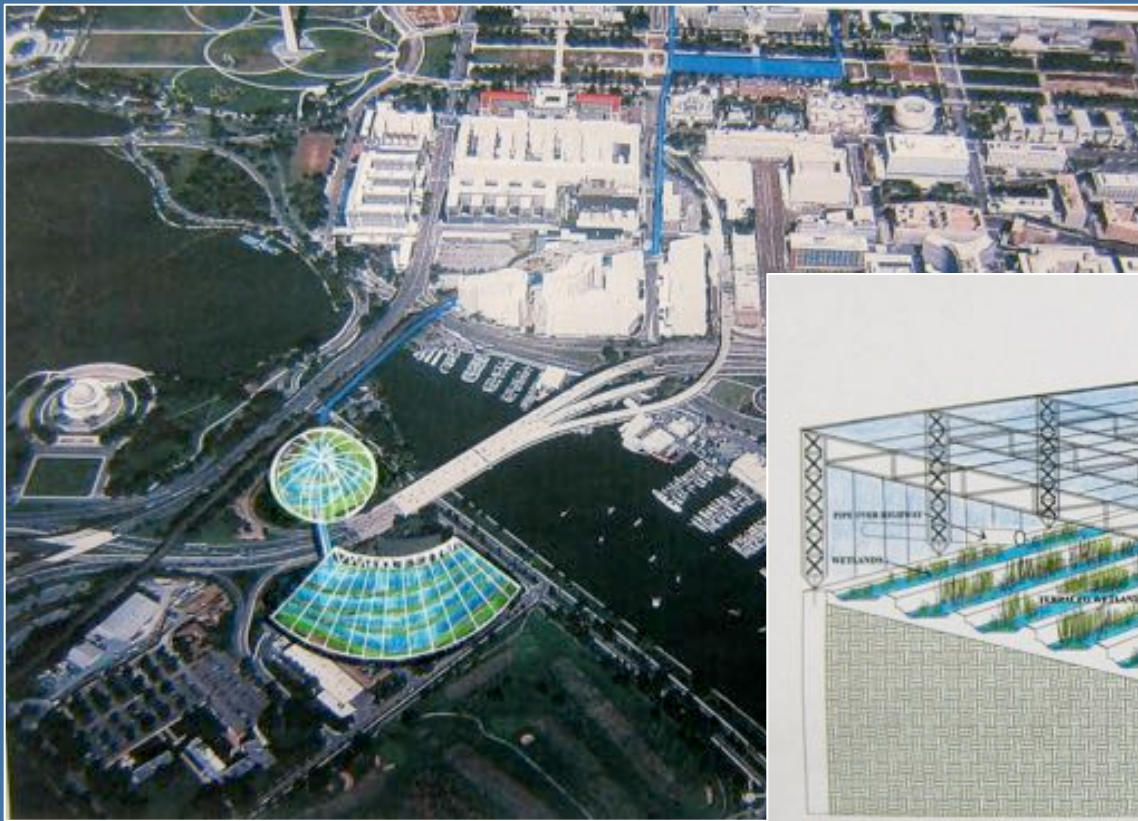
653,000

848,000

ons, 2014.

National Mall Underground is Largely Self-Funding

Mechanical garage and geothermal rods would reduce construction cost and operating expenses



**A Next Step in Resiliency:** Stormwater collected in the National Mall Underground can in future be discharged to a wetlands – created from the excavated soils from the Mall – that filters the water so that it can be discharged directly into the Potomac River, thus reducing the water treatment load at Blue Plains; or that clean water can be used to water the golf courses on East Potomac Park.

# EVERYONE BENEFITS

## Public, Federal, DC Government



- Addresses interior DC stormwater flooding risks – unrelated to Potomac River flooding
- Reduces unsightly bus parking



- Increases Mall sustainability and resilience
- Reduces air pollution
- Improves Mall accessibility & visitor experience



- Increases tourist income and tax revenue
- Self-funding so no public funding



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(formerly *National Coalition to Save Our Mall*)  
[www.nationalmallcoalition.org](http://www.nationalmallcoalition.org)