



PURPOSE OF THE CEEES JUNIOR CLASS ANNUAL FIELD TRIP: To expose students to some of the biggest and most innovative infrastructure design and construction efforts going on in the United States; to provide an opportunity to see first-hand that the need to rebuild our often failing infrastructure is huge; to learn about the complexity of the structural, transportation, water resources, and environmental projects that keep our nation productive, efficient and healthy; and to interact one on one with project and design engineers. These trips help students see the wide range of opportunities available to become innovative leaders and also help connect the classroom to the outside world.

WEDNESDAY, NOVEMBER 9

5:00am Bus to **NYC**, meet at Eck Visitor Center bus stop (by bookstore)

(11 hour drive, 1 - 2 hours of stops, estimate 1 1/2 hours for traffic delays)



7:30pm Dinner at [KATZ'S DELICATESSEN](#)
205 E. Houston Street, New York, NY 10002
Founded in 1888, one of New York's oldest kosher-style delis, each week serves 10,000 pounds of pastrami, 5,000 pounds of corned beef, 2,000 pounds of salami and 12,000 hot dogs. Yes, the deli in When Harry Met Sally...

9:00pm Bus to [BROOKLYN BRIDGE](#) (15 minutes) and walk to midway point of bridge for views of Manhattan and to see this iconic bridge up close, back to bus by 10pm

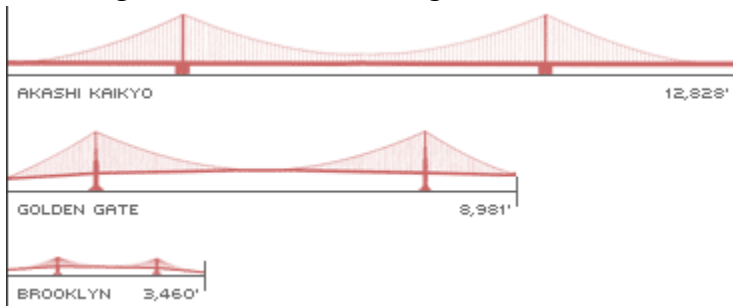
BROOKLYN BRIDGE

Considered a brilliant feat of 19th-century engineering, the Brooklyn Bridge was a bridge of many firsts. It was the first suspension bridge to use steel for its cable wire. It was the first bridge to use



explosives in a dangerous underwater pressurized containment structure called a caisson. At the time it was built, the 3,460-foot Brooklyn Bridge was also crowned the longest suspension bridge in the world.

But the Brooklyn Bridge was plagued with its share of problems. Before construction even began, the bridge's chief engineer, John A. Roebling, died from tetanus which resulted from a construction site accident. The project was taken over and seen to its completion



by his son, Washington Roebling. Three years later, Roebling developed a crippling illness called caisson's disease, known today as "the bends," caused by a person going too quickly from the pressurized caisson to the surface. Bedridden but determined to stay in charge, Roebling used a telescope to keep watch over the bridge's progress.

He dictated instructions to his wife, Emily, who passed on his orders to the workers. During this time, an unexpected blast damaged one caisson, a fire damaged another, and a cable snapped from its anchorage and crashed into the river. Despite these problems, construction continued at a feverish pace.

By 1883, 14 years after it began, Roebling successfully guided the completion of one of the most famous bridges in the world -- without ever leaving his apartment. The bridge opened to the public on May 24, 1883, at 2:00 p.m. A total of 150,300 people crossed the bridge on opening day. Each person was charged one cent to cross. The bridge opened to vehicles on May 24, 1883, at 5:00 p.m. A total of 1,800 vehicles crossed on the first day. Vehicles were charged five cents to cross.

<http://www.pbs.org/wgbh/buildingbig/wonder/structure/brooklyn.html>

Today, according to the New York City of Transportation, more than 120,000 vehicles, 4,000 pedestrians and 2,600 bicyclists cross the Brooklyn Bridge every day.



10:00pm

Bus to Hilton Garden Inn New York/West 35th Street, 63-67 W. 35th Street

10:30pm

Check-in [Hilton Garden Inn New York/West 35th Street](#)

63-67 W. 35th Street, New York, NY 10001

(Bus driver to stay at the Hilton Meadowlands, Two Meadowlands Plaza, East Rutherford, NJ 201-896-0500 – all items must be taken off of the bus)

THURSDAY, NOVEMBER 10

(Construction attire today until dinner time, need valid government issued ID for entrance to Empire State Building, business casual for dinner, coat/raingear/umbrella if needed)

6:30am-8:00am Breakfast available in hotel (use coupons provided)

8:15am Meet in lobby

8:30am Walk to 347 Madison Ave., [MTA headquarters](#), between 44th and 45th, 6th floor (15 minute walk) for beginning of East Side Access tour



The EAST SIDE ACCESS PROJECT (ESA) is being undertaken by the Metropolitan Transportation Authority (MTA) and is designed to bring the Long Island Rail Road (LIRR) into a new East Side station to be built below, and incorporated into, Grand Central terminal. The new connection will increase the LIRR's capacity into Manhattan, dramatically shorten travel times to Long Island and eastern Queens, and will provide easier access to JFK airport from Grand Central Terminal.

When completed, East Side Access will serve approximately 162,000 customers a day, providing a faster and easier commute from Long Island and Queens to the east side of Manhattan in a new 8-track terminal and concourse below Grand Central Terminal.

9:00am – 11:00am [GRAND CENTRAL TERMINAL EAST SIDE ACCESS Tour](#)
Guided tour through the GCT caverns



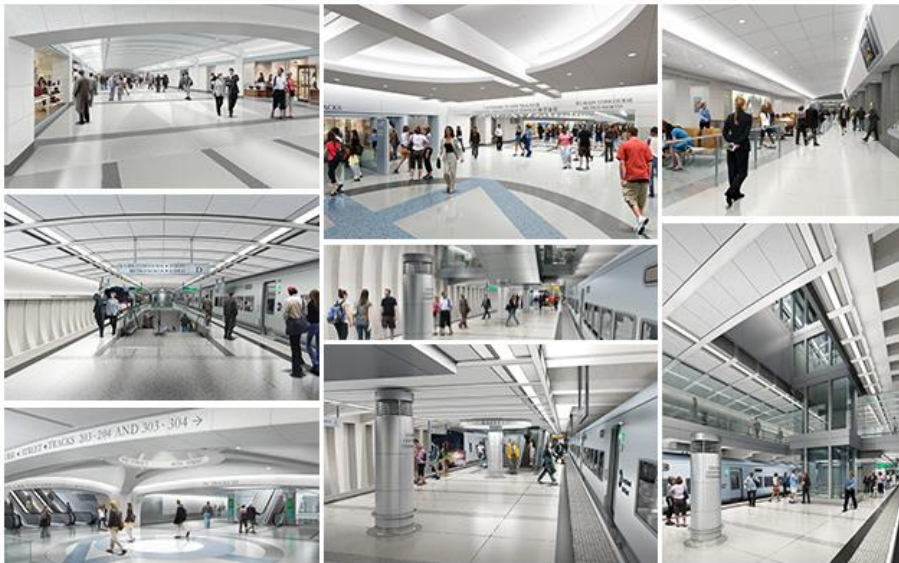


EAST SIDE ACCESS is one of the largest transportation infrastructure projects currently underway in the United States with a history that reaches back to the 1950's when discussions were first held regarding regional transportation planning. The project encompasses work in multiple locations in Manhattan, Queens and the Bronx and includes more than eight miles of tunneling.

http://web.mta.info/capital/esa_alt.html

EAST SIDE ACCESS PROJECT ELEMENTS:

Tunneling and Excavation: The dense bedrock beneath Manhattan and the mixed-face soil under Queens has been excavated and cleared to make room for new train tunnels, platforms, service facilities and ventilation and access shafts. Techniques include tunnel boring, cut-and-cover, drilling and blasting.



Concourse and Terminal Construction: At Grand Central Terminal (GCT), a new passenger concourse will be constructed in space currently occupied by Metro-North's Madison Avenue Yard. Eight tracks and four passenger platforms will be constructed, along with mezzanines and concourses, beneath Park Avenue below GCT's existing lower level.

Track Realignment, Reconfiguration and Modernization: Along the length of the ESA alignment, new tracks are being built and old tracks are being replaced. In Harold Interlocking – one of the busiest train interlockings in the United States – work is being done to reconfigure and modernize the complex system of switches and tracks that serve four commuter rail systems and a cargo freight rail with the goal of smoothing and speeding travel through the area. Benefits from this work will impact rail passengers using the northeast corridor.

Power and Ventilation Facilities: New facilities for ventilating the tunnels and concourse and powering trains are being constructed. In addition, numerous existing facilities are being modernized and improved.

Storage and Maintenance Facilities: In Queens and the Bronx, new facilities for storing and maintaining trains during the day are being constructed. http://web.mta.info/capital/esa_alt.html

11:00am – 11:30am Walk into [GRAND CENTRAL TERMINAL](#) to look around



Commonly referred to as 'Grand Central Station,' [GRAND CENTRAL TERMINAL](#) is one of the busiest train stations in the world. 750,000 people pass through every day. Opening in 1913, it was preceded by Grand Central Depot (1871) and Grand Central Station (1900), both of which were demolished. It is home to 44 train platforms, several great restaurants, and some of the most beautiful Beau-



Arts architecture in NYC. Grand Central is where NYC subway trains originate and terminate, hence "Terminal." Based on the number of platforms, Grand Central Terminal is the largest train station in the world. In the 1960's, it was nearly torn down, but with the help of first-lady Jacqueline Kennedy, it was designated as a historic American landmark. Renovations at the Grand Central Terminal were completed in 1998, and once more in 2007, with this Beaux-Arts NY landmark receiving an extensive cleaning of its ceiling. <http://www.nyctourist.com/grandcentral1.htm>

http://www.huffingtonpost.com/travel-leisure/secrets-of-new-york-citys_b_8916528.html

Clocks: Outside on the station's façade is the world's largest Tiffany clock, 1,500 tons and spanning thirteen feet in diameter, made of brass and stained glass, surrounded by a statue depicting Roman gods Mercury, Hermes and Minerva. Inside the main hall, the four-sided ball clock is worth an estimated \$10 million, its four faces made of opal set in brass with a brass acorn on top – the Vanderbilt family's symbol.

Whispering Gallery: If two people stand on opposite corners of the vaulted archway in the passageway near the Oyster Bar they can communicate, their voices reverberating like a game of telephone that no one else can hear.

Tennis Courts: On the fourth floor, and open to the public, anyone willing to pay \$200 - \$280 an hour can reserve time on the courts and in the fitness center.

Oak Tree and Acorn Motifs: The Vanderbilt family motto was "Great oaks from little acorns grow," and Cornelius Vanderbilt wanted everyone to know that he was responsible for the magnificent station. You can find the motifs on arches reaching up to the ceiling in the main concourse and on the giant bronze chandeliers.

Secret Entrance to the Waldorf: A two-story train shed concealed under the station contains 33 miles of tracks. VIPs who want to avoid the public gaze have used a top-secret track, known as Track 61, to get around. It connects to an elevator that goes directly into the Waldorf Astoria Hotel. President Franklin D. Roosevelt is believed to have used it to hide his polio from the public.

Windows Have Hidden Walkways: The giant windows visible from the main concourse have hidden walkways that offer bird's eye views of the station, allowing employees who work in the offices above to navigate and avoid the crowds below.

The Constellations on the Main Hall Ceiling are Backwards: Whether intentional or not, the otherwise accurate depictions of the Mediterranean winter sky are painted in reverse.

Top-Secret Room: It wasn't until the 1980s that officials acknowledge the existence of a top-secret room known as M42, though its exact location remains a well-guarded secret to this day. The 22,000 square-foot chamber ten stories below the main concourse doesn't appear on any blueprints or maps of the station.

11:30am – 11:45am Walk to the [EMPIRE STATE BUILDING](#) to [HNTB](#)'s design offices – need valid government issued ID for entrance to ESB (15 minute walk)

Noon Check-in and escort up to HNTB offices

Au Bon Pain box lunches in HNTB offices and design presentation on the Kosciuszko Bridge



Ted Zoli, PE
National Bridge Chief
Engineer, HNTB Corporation



Noon – 1:30pm [HNTB](#) Design offices

HNTB Corporation is an architecture, engineering, planning, civil engineering consulting management firm that was founded in 1914. Their areas of expertise range from architecture, aviation, bridges, construction management, design build, highways, intelligent transportation systems, program management, tolls, rail and transit, tunnels and water.

We will be learning about their work and their work on the Kosciuszko Bridge, to prepare us for our site visit following.

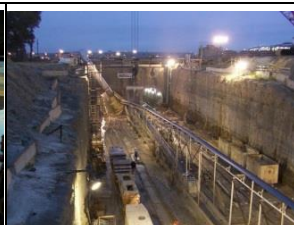
Below is a small sampling of HNTB's many, many projects:



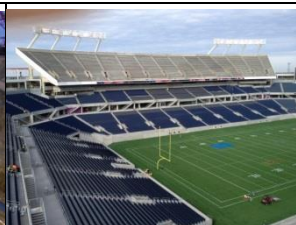
San Diego Convention Center Expansion



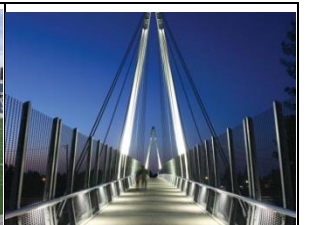
Tres Rios Ecosystem Restoration and Flood Control Project, Phoenix



Minneapolis St. Paul International Airport Light Rail



Florida Citrus Bowl Reconstruction



Mary Ave Bicycle Footbridge, Cupertino CA



Leonard Zakim Bunker Hill Memorial Bridge, Boston



Interstate 465 Reconstruction, Indiana



Washington Dulles International Airport Tunnel



Tacoma Narrows Bridge



San Francisco BART Station

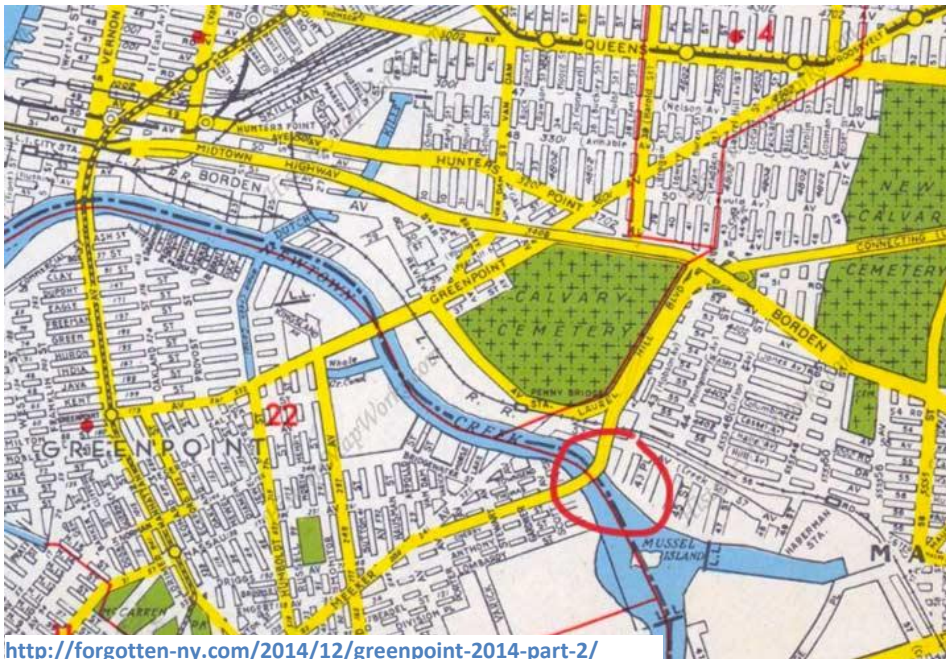
1:45pm – 2:15pm Bus to [KOSCIUSZKO BRIDGE](#) construction project for site visit (30 minute drive)
35-18 Laurel Hill Boulevard, Maspeth NY 11378

2:30pm – 4:30pm [KOSCIUSZKO BRIDGE](#) Site visit



The Old: The **KOSCIUSZKO BRIDGE** is a **truss bridge** that spans Newtown Creek between Brooklyn and Queens. It is also known as the Brooklyn Queens Expressway or BQE. The bridge opened in 1939, and was named after a volunteer in the American Revolutionary War. The current bridge has six lanes and no room for bikes or pedestrians and is on the list of most troubled state-owned elevated roadways, with an estimated lifetime of only three more years. According to *The New York Times*, the Kosciuszko Bridge is “**perhaps the city’s most notorious (bridge), hated and feared by drivers and synonymous in traffic reports with bottlenecks, stop-and-go and general delay.**” (Feb. 18, 2010, Andy Newman “A Tired Old Bridge Gets a New Look”)

The New: With a joint venture of [Skanska](#), [Kiewit](#), and [HNTB](#) as lead design firm, the first stage of the replacement is underway, a \$544 million **cable-stayed bridge**, building an eastbound viaduct to be completed in 2017. The existing eastbound structure will then be demolished. The westbound viaduct will be replaced in a future project, ultimately adding three lanes, bike path and walkway. This is the largest single contract ever awarded by the NY State Department of Transportation. By early 2017, all traffic in both directions will be driving on the brand new bridge. The 275-foot-tall towers for the main span are complete and can be seen for miles around.



<http://forgotten-ny.com/2014/12/greenpoint-2014-part-2/>



How do you pronounce Kosciuszko?

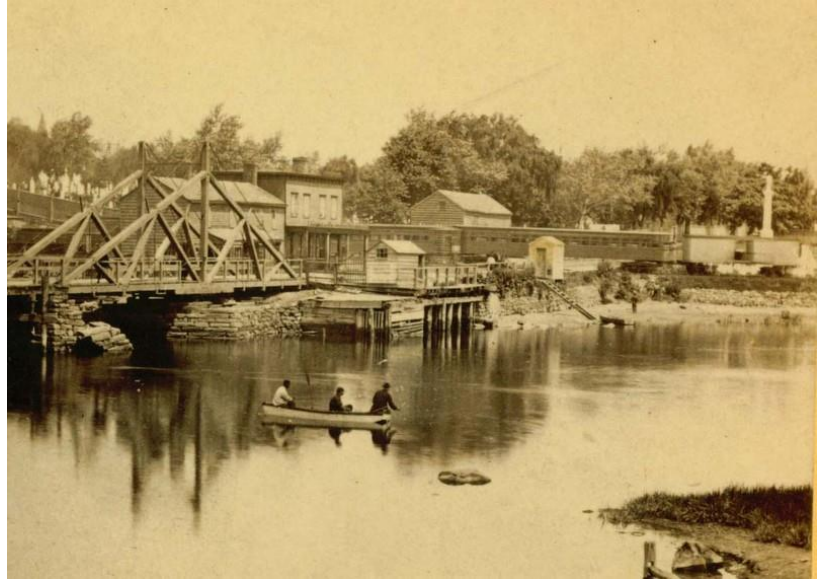
kah-skee-OOS-koh

Or

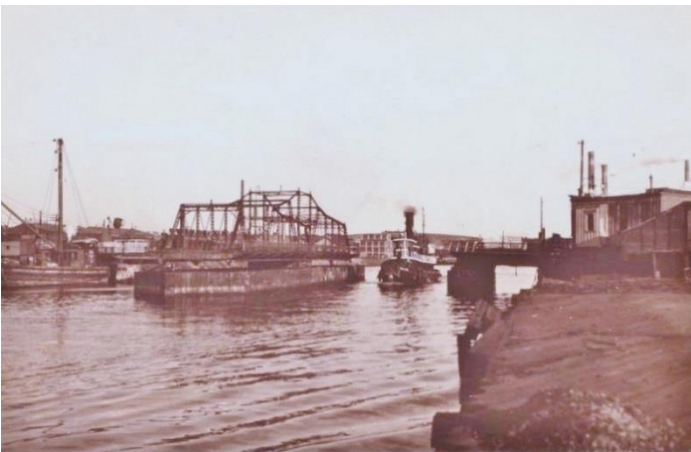
kuh-SHOO-skoh

In 2014, WNYC released a tool about "[How to Speak New York](#)" and the Kosciuszko Bridge was one of the stars. Tadeusz Kosciuszko was an American Revolutionary War general from Poland. Kosciuszko was trained as an engineer. He oversaw the construction the fortifications at West Point and was a celebrated military tactician not only in the American Revolution but also in Poland against the Russians. <http://untappedcities.com/2016/05/17/top-12-secrets-of-nycs-kosciuszko-bridge-between-brooklyn-and-queens/>

From a privately-owned **wooden drawbridge** in the late 1800s, that because of its toll, became known as the Penny Bridge...



"The draw is wider than that part of the old bridge left standing....A man not in his sober senses would have no difficulty in walking off from it into the water, and many a man in his sober senses might, on a dark evening, unconsciously stumble into the same trap."—Brooklyn Eagle, Nov. 2, 1869



In 1882, a new **steel structure** was built to replace the wooden bridge, designed as a **swing bridge**, a type that featured a turntable mechanism set on its own island mid-point across the creek that swung open and closed, depending on whether carriage or boat traffic needed passage. There were often problems. The turntable broke more than once, and the bridge was unusable at one point for three months. The island that supported the pivot took up almost a third of the entire width of the creek, leaving narrow boat passages on either side of it, resulting in constant slowdowns while boats crawled through the undersized chutes when they weren't banging into the piers.



In 1894, a newer version of the bridge was constructed as an overdue response to the delays caused by the increasing demands of carriage and shipping traffic. But while under construction, dozens of factory workers crowded onto the Queens side of the temporary wooden foot bridge, and the structure buckled, throwing them into Newtown Creek, ultimately leaving fourteen people dead. And after the actual bridge opened, the Queens side of the crossing started to experience another serious problem. The bridge exited close to the railroad tracks, and because there was no road adjacent to it, people often walked along the tracks. By 1908, an average of twenty people a year were killed in this spot by trains.



Designed in 1939 for 10,000 cars a day, this steel truss bridge originally kept the Meeker Avenue Bridge name, and then was changed in 1940 to honor Kosciuszko. At 300 foot-long, 125 feet tall in order for the masts of ships to pass under, it became a major cross town transportation link and a major part of the BQE, today seeing over 160,000 cars a day. However, due to its narrow lanes, the bridge has become notorious for traffic jammed bottleneck for crosstown traffic, has

an accident rate that is six times the statewide average, and has been labeled one of the most troubled bridges in the city. <http://untappedcities.com/2016/05/17/top-12-secrets-of-nycs-kosciuszko-bridge-between-brooklyn-and-queens/>



Figure 1 <https://brooklynrelics.blogspot.com/2014/11/kosciuszko-bridge-penny-bridge-meeker.html>



In 2010, the NY State Department of Transportation presented four bridge designs to the public (through arch, deck arch, box girder, cable-stayed).

<http://newyorkyimby.com/2015/10/the-new-kosciuszko-bridge-appears-on-the-skyline.html>

In a city known for its suspension bridge, the cable-stayed span, was selected, the first of its kind to be build in NYC. (A similarly designed **Goethals** bridge replacement connecting Staten Island to NJ is also underway.)

Keep an eye out for Super Skinny Supertall buildings known as Super-Slender

Over the last two decades, a new type of building has invaded New York City: The super skinny supertall known as a “super-slender.” This new generation of skyscrapers range from 50 to 100 stories, are almost uniformly filled with luxury housing—and some are wedged into the city with astoundingly tiny 45-foot-wide footprints. Here are 18 new “super-slenders” under construction in New York right now. (Images: The Skyscraper Museum)



Top:
One57,
111 West
57th Street,
432 Park
Avenue,
520 Park
Avenue,
Central Park
Tower,
220 Central
Park South

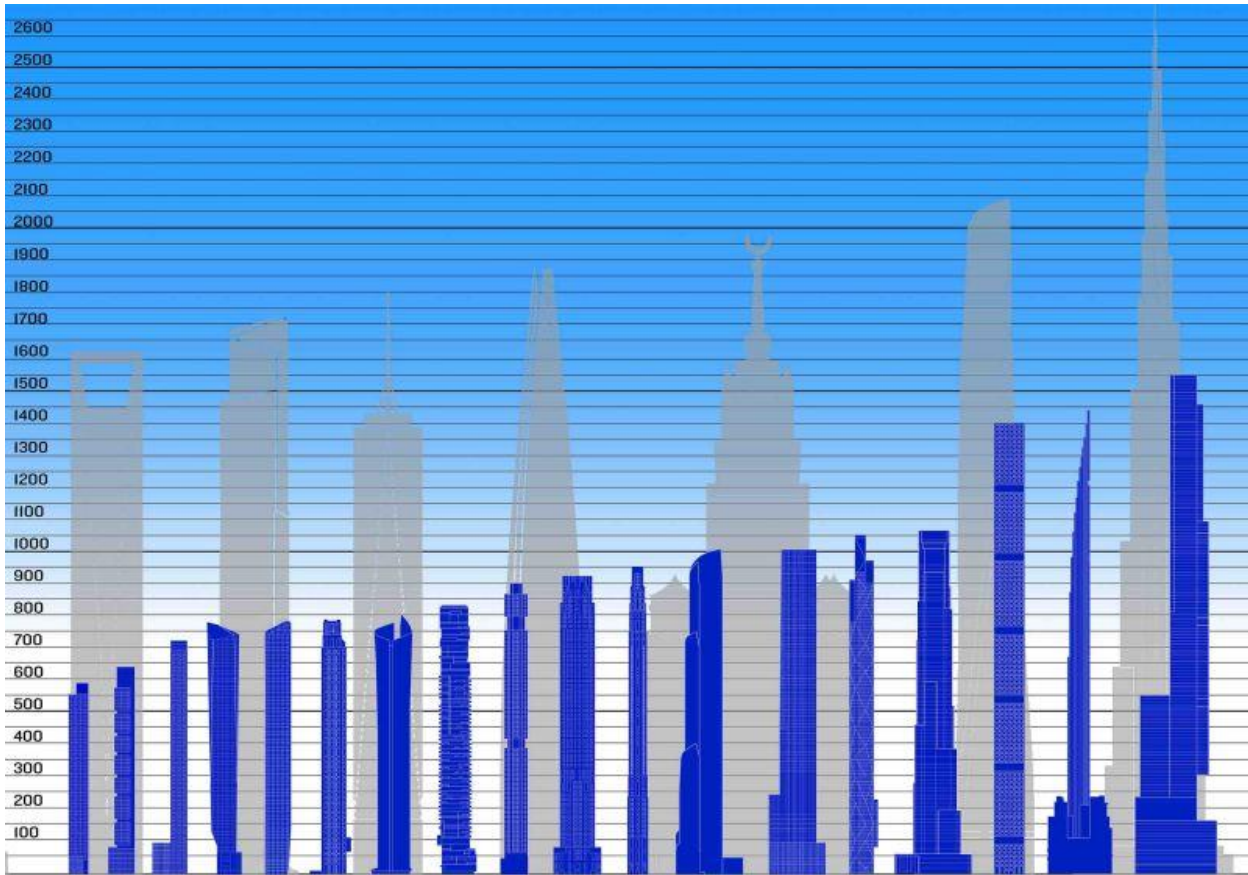


Middle:
53W53rd,
100 E 53rd
Street,
Sky House, 45
E 22nd
Street,
One Madison,
35 Hudson
Yards



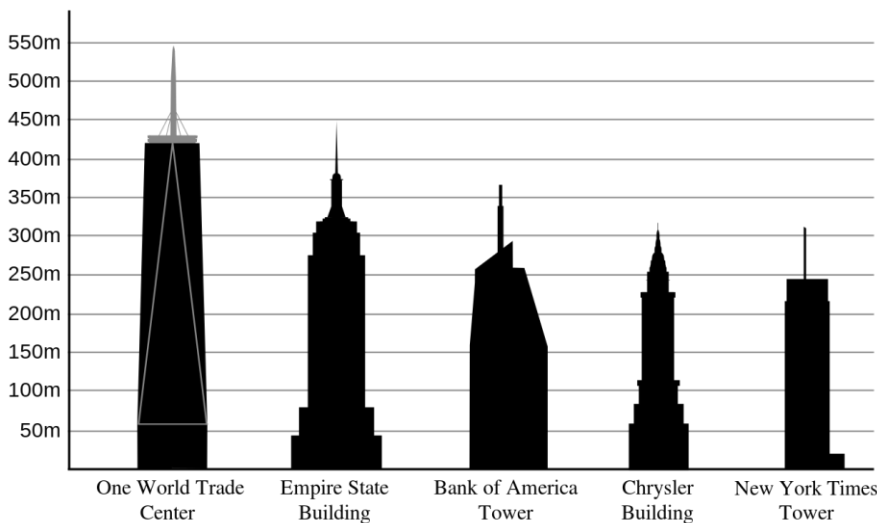
Bottom:
56 Leonard,
30 Park Place,
111 Murray
Street,
125
Greenwich
Street,
50 West
Street,
9 DeKalb Ave.

“Slenderness” is an actual term by engineers that historically describes a structure with a 1:10 or 1:12 ratio when comparing a building’s width to its height. In the last few years, newer buildings have been able to achieve even more jaw-dropping ratios. The SHoP-designed 111 57th Street has a ratio of 1:23. This will make it the most slender building in the world. Here are the 18 super-slenders compared to the super-talls. <http://gizmodo.com/how-nycs-super-skinny-skyscrapers-stack-up-next-to-the-1777687172>



From left to right, the grey buildings are: Shanghai World Financial Center, CTF Finance Centre, One WTC, Lotte World Tower, Mecca Royal Clock Tower, Shanghai Tower, Burj Khalifa

And, for comparison, the height of the Empire State Building and the Chrysler Building, both of which we’ll be in:

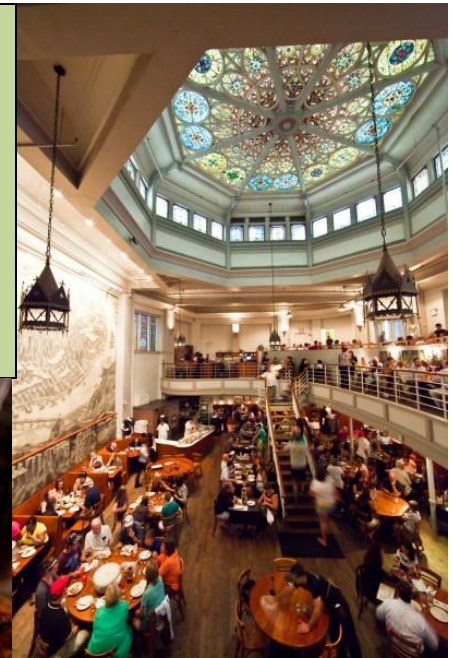


4:30pm – 5:30pm Bus back to hotel (30 minutes without traffic)

5:30pm – 7:45pm Free time

7:45pm Meet in lobby for walk to dinner (15 minute walk)

8:15pm **Dinner at [John's of Times Square](#)**
all you can eat NY pizza and calzones
 260 W. 44th Street New York, NY 10036



FRIDAY, NOVEMBER 11

(Construction attire today until dinner time, business casual for dinner, coat/raingear/umbrella if needed)

6:30am-7:45am Breakfast available (use coupons provided)

7:45am Meet in lobby for bus to [BAYONNE BRIDGE](#)

8:00am – 9:00am Drive to BAYONNE BRIDGE, 111 Linnet Street, Bayonne, NJ (40 minute drive without traffic)

9:00am – 12:15pm BAYONNE BRIDGE site visit, coffee/bagels and then pizza lunch at site



BAYONNE BRIDGE NAVIGATIONAL CLEARANCE PROGRAM:

The Challenge: Raise the road from 151 to 215 feet above the Kill van Kull while simultaneously keeping the bridge open to traffic.

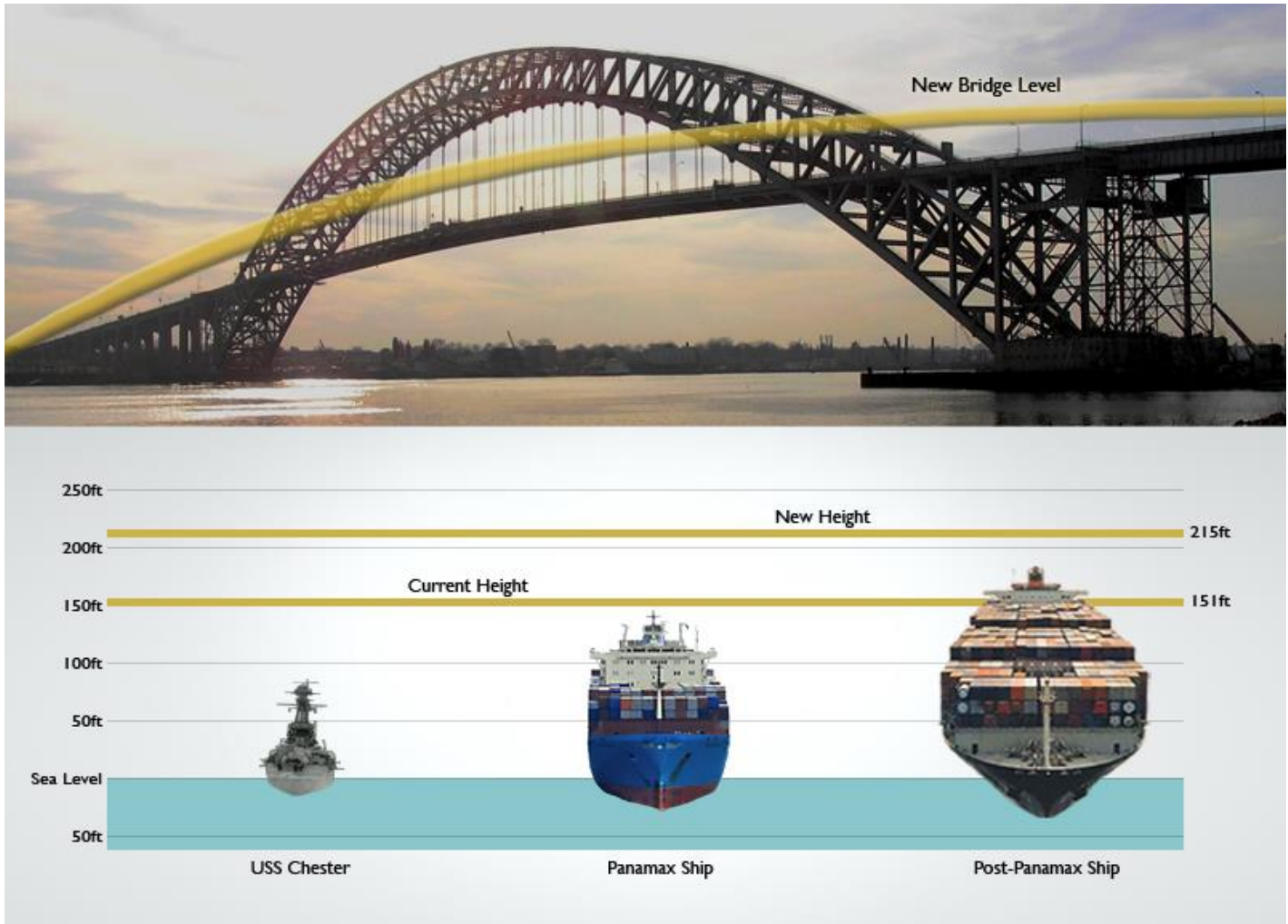


Today

Future

<http://constructionlawnc.com/2011/02/22/bayonne-bridge/>

BAYONNE BRIDGE NAVIGATIONAL CLEARANCE PROGRAM



BAYONNE BRIDGE Project Background: The Bayonne Bridge, a historic civil engineering landmark designed by Othmar H. Ammann, is the fourth longest steel arch bridge in the world, and was the longest in the world at the time of its completion. It connects Bayonne, New Jersey, with Staten Island, New York, spanning the Kill Van Kull. Construction began in September 1928 and was completed in 1931. The primary purpose of the bridge was to allow vehicular traffic from Staten Island to reach Manhattan via the Holland Tunnel.

SKANSKA KIEWIT

Because the bridge is only 151 feet above the water, larger container ships often cannot cross under it to reach marine terminals – Port Newark, Elizabeth and Howland Hook in Staten Island. Shippers who rely on these ports for access to a regional transportation network are forced to use other smaller, less-efficient and less environmentally friendly ships to bring goods into the region. The expansion of the Panama Canal is resulting in a shift to larger, cleaner, more-efficient ships servicing the region and other East Coast markets. In order to ensure these new ships can reach these ports, the clearance limitation needed to be addressed. In December 2010, the Port Authority announced its decision to take action to “Raise the Roadway” of the Bayonne Bridge to 215 feet. The 64 feet of additional air draft under the bridge will allow the Port Authority of New York and New Jersey to welcome larger and more efficient vessels to their ports. <http://www.panynj.gov/bayonnebridge/>



"In bridge designing, the aesthetics are quite as important as engineering details. It is a crime to build an ugly bridge."

Othmar H. Ammann, Swiss-born and educated civil engineer and designer, immigrated to NYC in 1904. He was the engineer behind the George Washington Bridge, the Queensboro Bridge, the Verrazano-Narrows Bridge, Bronx-Whitestone Bridge, Throgs Neck, the Triborough Bridge, and Bayonne Bridge.

The Bayonne Bridge is the only bridge within Ammann's work (which included numerous bridges outside of New York City) that is not a suspension bridge.

Othmar Hermann Ammann (1879-1965)



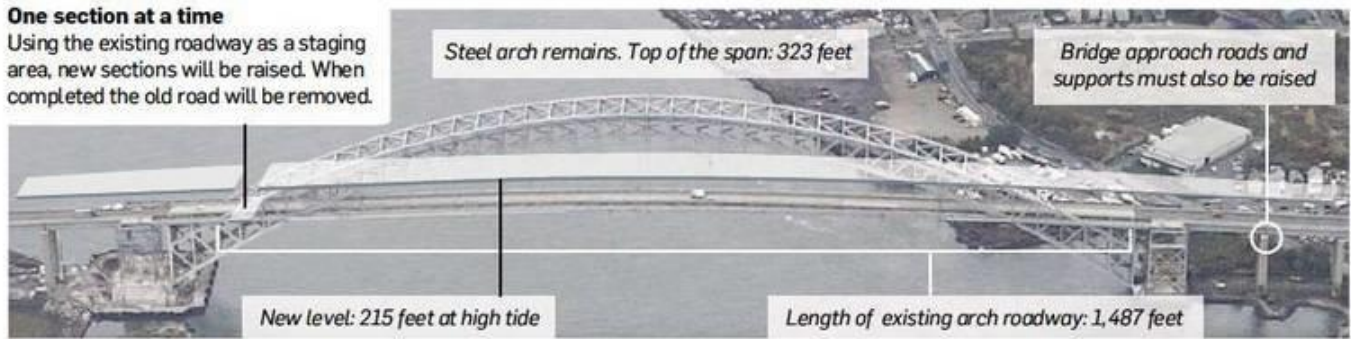
Completed in 1931, the Bayonne Bridge was named the most beautiful steel bridge by the American Institute of Steel Construction. At the opening ceremony for the bridge, Ammann said, ***"The Port Authority recognized the fact that its structures must not only be useful, but they must also conform to the aesthetic sense. This was one of the motives for the selection of an arch spanning the entire river in one sweeping graceful curve."*** The arch of the Bayonne Bridge measures 1675 feet, making it 21 feet longer than that of the Sydney Harbour Bridge in Australia. The Sydney bridge is wider, however. The Bayonne Bridge was the longest steel arch bridge in the world when it was completed, and held that title for 45 years.

The ribbon cutting ceremony for the Bayonne Bridge on November 14, 1931 was attended by delegates from the Sydney Harbour Bridge Commission. They brought a custom-made gold scissor, made by an Estonian named Vambola Veinberg, which was used for the ribbon cutting. Four months later, at the ribbon cutting for the Sydney Harbour Bridge, the same scissors were used again. According to the Port Authority, "following the ceremony, the scissors were taken apart and each bridge authority carried away a golden blade."



One section at a time

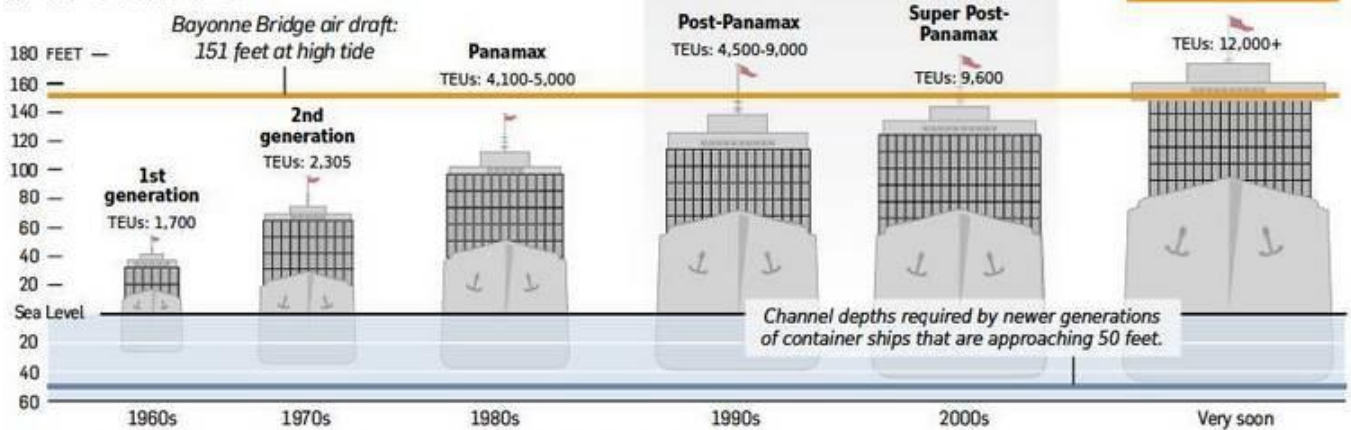
Using the existing roadway as a staging area, new sections will be raised. When completed the old road will be removed.



TEU: Twenty-foot equivalent unit

A measure of volume or capacity based on the standard dimensions of a 20-foot cargo-carrying container; a 40-foot container provides for the same volume or capacity as two 20-foot containers (2 TEUs).

☐ = one 40-foot container



U.S. Army Corp of Engineers; Maher Terminals; The Port Authority of N.Y. and N.J.; Pictometry

FRANK CECALA and ANDRE MALOK/THE STAR-LEDGER

<http://untappedcities.com/2016/04/13/the-top-10-secrets-of-the-bayonne-bridge-connecting-staten-island-and-new-jersey/10/>



“Raise the Roadway” has significant long-term benefits: (1) Larger, more efficient ships calling on the ports will mean cleaner air for neighbors; (2) Wider lanes, shoulders and median dividers will make the bridge safer for drivers; (3) A bikeway and walkway the entire length of the bridge will make traveling the bridge easier for all; (4) Stairs will be replaced with access ramps; (5) New piers, a new roadway deck and new approach roads will ensure the bridge will be built to last for generations; and (6) The design allows for future mass transit service.

12:15pm – 1:30pm Bus to [ARCADIS](#), Design & Consultancy for Natural and Built Assets
27-01 Queens Plaza N, Long Island City, Queens, New York (*at least one hour drive*)
(Jet Blue/Metlife Building, Arcadis is on 8th floor, 2nd floor has presentation rooms)

Arcadis's roots can be traced back to the Association for Wasteland Redevelopment in the Netherlands in 1888, while Hyder Consulting, which Arcadis acquired in 2014, can trace its history back to 1739. A global company, its US division has capabilities in architecture, master planning and sustainable urban development, commercially led program management, cost management, regulatory compliance, business advisory, engineering, environmental solutions, transportation solutions, and water solutions.

Some of Arcadis US's recent projects include: \$1million cost savings in former petrochemical facility demolition, three acres of fringe wetland restored with the design and construction of a former creosote facility, six cities have a strategic, long range transportation plan in the Cob County Corridor, increased flood



protection along 140 miles of shoreline, 10-15 year water plan identified for Oil and Gas Water Supply, an undeveloped industrial area is now a public waterfront at the Mohawk River Former MGP, an innovative approach to shallow groundwater remediation at NASA's Lyndon B. Johnson Space Center Biowall Remediation, \$22 million saved in designing an Innovative Cleanup at Reese Air Force Base, upgrade of NYC's largest wastewater plant at Newtown Creek, from space rockets to vibrant communities in an L.A. suburb as 160 acres are cleaned up, \$106 million in peak-hour congestion cost savings for Georgia's Regional Traffic Operations Program.

1:30pm – 3:30pm **Arcadis presentation: the engineering and design challenge of NYC's response to Hurricane Sandy, the Rebuild by Design competition, BIG U, and the East Side Coastal Resiliency Project**

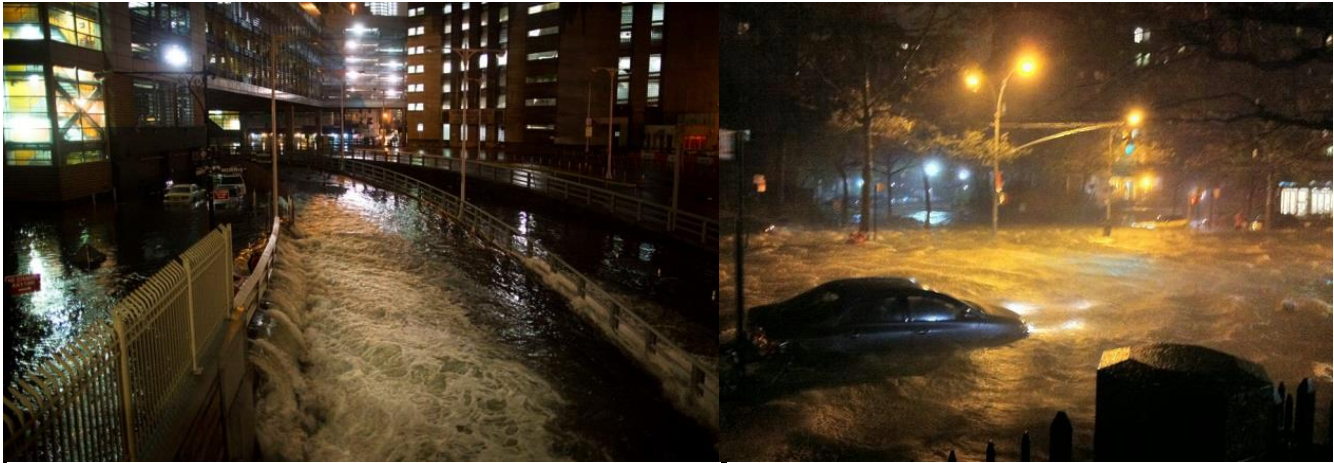
HURRICANE SANDY --- REBUILD BY DESIGN --- BIG U --- EAST SIDE COASTAL RESILIENCE PROJECT



First: Hurricane Sandy: Hurricane Sandy made landfall in the United States on October 29, 2012, striking near Atlantic City, NJ. A full moon made high tides 20 percent higher than normal and amplified Sandy's storm surge. Streets were flooded, trees and power lines were knocked down, and the city's famed boardwalk was ripped apart. Seawater surged

highways and into low-lying streets. The water inundated tunnels, subway stations and the electrical system that powers Wall Street and sent hospital patients and tourists scrambling for safety. Skyscrapers swayed and creaked in the winds that partially toppled a crane 74 stories about Midtown. <http://www.livescience.com/24380-hurricane-sandy-status-data.html>

A storm surge up to nearly 14 feet was recorded at The Battery (pictured above), with widespread flooding in lower portions of Manhattan including tunnels and subways. <http://www.nycareaweather.com/2012/10/hurricane-sandy-summary/>



<http://www.weather.gov/okx/HurricaneSandy>

Next: The [Hurricane Sandy Rebuilding Task Force](#) launched the [REBUILD BY DESIGN](#) competition in June 2013, a multi-stage planning and design competition to promote resilience in the Sandy-affected region. The United States Department of Housing and Urban Development (HUD) conducted the competition under the authority of the America COMPETES Reauthorization Act of 2010, and administered the competition in partnership with philanthropic, academic, and nonprofit organizations. The goal of the competition was to promote innovation by developing regionally-scalable but locally-contextual solutions that increase resilience in the region. The competition also represented a policy innovation by committing to set aside HUD Community Development Block Grant Disaster Recovery (CDBG-DR) funding specifically to incentivize the implementation of winning projects and proposals. Examples of design solutions were expected to range in scope and scale – from large-scale green infrastructure to small-scale residential resiliency retrofits. [Watch a short video](#) on the groundbreaking competition.

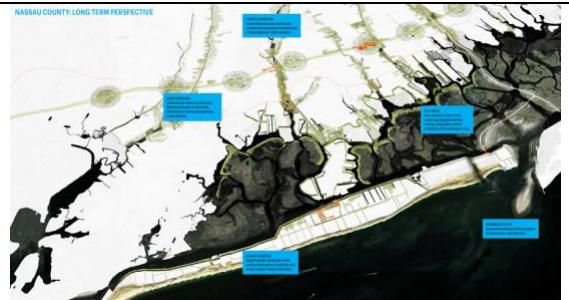
Ten interdisciplinary teams of scientists, engineers, designers, and architects (selected from over 148 applications) spent months understanding the major vulnerabilities of the Sandy-affected region and developing projects to improve the region's resilience. In June 2014, then-HUD Secretary Shaun Donovan announced the award of \$930M to six winning ideas. Each winning idea comprises multiple phases, which collectively represent a master plan for the area of focus. <http://portal.hud.gov/hudportal/HUD?src=/sandyrebuilding/rebuildbydesign>

The Winners:



[BIG U, BIG TEAM, New York, New York](#)

[Living with the Bay: A Comprehensive Regional Resiliency Plan for Nassau County's South Shore](#), [Interboro Team, Long Island, New York](#)





Meadowlands, New Jersey

[New Meadowlands: Productive City + Regional Park](#), MIT CAU + ZUS + URBANISTEN, The

[Resist, Delay, Store, Discharge: A Comprehensive Strategy for Hoboken, OMA](#), Hoboken, New Jersey



[Hunts Point Lifelines](#), PennDesign/OLIN, Bronx, New York

[Living Breakwaters, SCAPE/Landscape Architecture](#), Staten Island, New York



One of the Winners: [BIG U, The Dry Line](#):

One of the six winners of the Rebuild by Design competition, Bjarke Ingels Group's (BIG) "Dry Line" project, aims to protect Manhattan from future storms like Hurricane Sandy by creating a protective barrier around lower Manhattan. It would protect ten continuous miles of low-lying geography, shielding the city against floods and storm water and providing social and environmental benefits to the community. The plan comprises three systems, each created through consultation with local communities, each

comprising a physically separate flood-protection zone, isolated from flooding in other zones, yet integrated into the social, economic, and cultural fabric of the neighboring communities. Describing the scheme, Bjarke Ingels said, "The Big U is an example of what we call Social Infrastructure. The High Line [which we'll be visiting on Saturday morning] shows how a decommissioned piece of infrastructure – the abandoned elevated railway – can be transformed into a public space and green landscape. We asked ourselves: What if we could envision the resilience infrastructure for Lower Manhattan in a way that wouldn't be like a wall between the city and the water? The Big U will not only make the waterfront more resilient but also more accessible and inviting to the citizens around it." <http://www.rebuildbydesign.org/project/big-team-final-proposal/#details>



One section of the Big U partially funded: The East Side Coastal Resiliency Project: In June, 2014, HUD announced a \$335 million award to the City of New York for the implementation of one of the three systems of the BIG U proposal, an approximately 2.4 mile stretch along Manhattan's East River waterfront, from East 23rd Street to Montgomery Street - the East Side Coastal Resiliency Project. When completed, it will benefit thousands of public housing and other residents of a particularly vulnerable part of Manhattan, and will demonstrate a new model for integrating coastal protection into neighborhoods,

consistent with the City's resiliency vision. <http://www1.nyc.gov/site/escr/background/hud-rebuild-design-competition.page>

Arcadis contributed to three studies: the winning Big U concept, which will receive \$335 million in funding; the Bridgeport Resiliency study, which was awarded \$10 million for further studies, and the academic exercise, called “Blue Dunes.”



4:00pm Bus back into hotel (*approximately one hour drive*)

5:00pm – 7:00pm Free time

7:00pm Meet in lobby for walk to dinner (*10 minute walk*)

7:30pm Dinner at [The Capital Grille Chrysler Center](#)
155 East 42nd Street
New York, NY 10017



SATURDAY, NOVEMBER 12

(Casual clothes, comfortable walking shoes, raingear/umbrella if needed)

7:00am – 9:15am Breakfast available in hotel (use coupons provided)

9:30am Meet in lobby for bus ride to the [HIGH LINE](#) (*15 minute ride*), Gansevoort & Washington Streets



HIGH LINE: Out of Use Railroad Trestle to Public Landscape (from *thehighline.org*)

1934 As part of the West Side Improvement Project, the High Line opens to trains. It runs from 34th Street to St John's Park Terminal, at Spring Street. It is designed to go through the center of blocks, rather than over the avenue, carrying goods to and from Manhattan's largest industrial district.

1980s Following decades-long growth in the interstate trucking industry, the last train runs on the High Line in 1980, pulling three carloads of frozen turkeys. A group of property owners lobbies for demolition while Peter Obletz, a Chelsea resident, activist, and railroad enthusiast, challenges demolition efforts in court.

1999-2014 From conception by two residents of the High Line neighborhood, Joshua David and Robert Hammond, to planning studies, to ideas competition, to design selection, to ownership transfer to the City, to groundbreaking, and finally development in four stages/sections, the dream becomes a reality.

10:00am – 11:15am Guided tour of the [High Line](#) – meet at the Gansevoort entrance on the High Line.



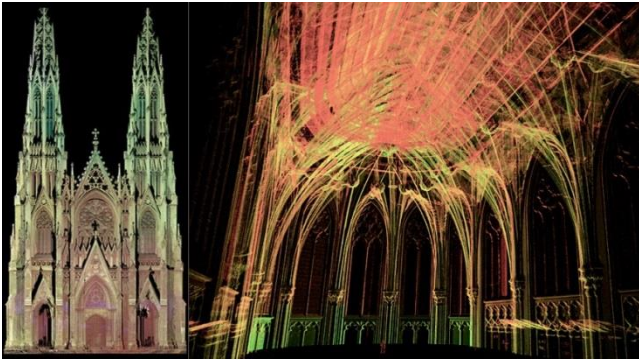
11:30am – 1:00pm Walk to and presentation at [LANGAN](#), 21 Penn Plaza, 360 West 31st Street, 8th floor about their work on the [High Line](#) and [Hudson Yards](#) projects, [Saint Patrick's Cathedral renovation](#), and other projects in the city.

New York bagels!



[LANGAN](#), an engineering and environmental consulting firm, was founded as a geotechnical specialty firm in 1970, and is now in its 45th year. Their projects include airports, brownfield redevelopment, colleges and universities, energy, environmental remediation, environmental compliance, hospitals and healthcare, infrastructure, residential, renewable energy, tall buildings, waterfront and marinas, among others. The company provides service in Site/Civil, Geotechnical, Environmental, Earthquake/Seismic, Demolition, Traffic and Transportation, Surveying and 3D Scanning, Information Management, Landscape Architecture and Planning, Environmental Planning, Natural Resources and Permitting.

We will learn about some of their ongoing work, but here are a couple of projects involving places that we will see on this trip.



St. Patrick's Cathedral publicly announced its restoration in 2012 after years of pollution critically deteriorated both the interior and exterior. Langan performed 3D laser scans of the façade, sanctuary, and attic spaces to document the conditions and model the building's unique layout. This highly detailed data saved the project team time and money, and the deliverables were regularly compared to the base survey to maintain accuracy.



An abandoned railroad structure spanning 19 blocks on Manhattan's West Side, the High Line overpass, became the nation's first elevated park. Langan site/civil engineers assisted with the design and permitting of three plazas within the High Line (the Gansevoort Street, 19th Street, and 10th Avenue Square plazas). Working with the developers, Langan obtained DEP drainage plan permits to connect drains for the project areas and at street level for the length of the high line structure. Langan environmental engineers provided remediation design and oversight.



Pier 57, an approximately 560,000-GSF pier, a once abandoned shipping and passenger terminal, is now the proposed site for public

green space, rooftop beach, rock-climbing wall, and 200 stores and businesses. Langan's environmental engineers performed extensive due diligence services for this location, including a Phase I Environmental Site Assessment and Phase II Environmental Site Investigation. As a result of flooding associated with Superstorm Sandy, Lagan provided an emergency spill response team when six above-ground storage tanks became buoyant and spilled approximately 31,000-gallons of fuel oil into the pier's Head House caisson and elevator pits.



Hudson Yards Redevelopment, under the joint guidance of the City, the Metropolitan Transportation Authority, and State of New York initiatives, is in the process of reinventing the Hudson Yards area in midtown Manhattan. Langan has been retained by multiple teams to provide geotechnical, site/civil, environmental, and traffic engineering, seismic design analysis, and surveying services during the pre-design phase of development.



HUDSON YARDS

New York

Hudson Yards is the largest private real estate development in the history of the United States and the largest development in New York City since Rockefeller Center. When completed in 2025, 125,000 people a day will work in, visit, or call Hudson Yards their home. The site will include more than 17 million square feet of commercial and residential space, state-of-the-art office towers, more than 100 shops including New York's first Neiman Marcus, and a collection of restaurants curated by Chef Thomas Keller. The urban development will include approximately 4,000 residences, The Shed, a new center for artistic invention, 14 acres of public open

<http://livehudsonyards.com/>

space, a 750-seat public school and an Equinox® branded luxury hotel with more than 200 rooms—all offering unparalleled amenities for residents, employees and guests. The development of Hudson Yards will create more than 23,000 construction jobs. <http://www.hudsonyardsnewyork.com/about/the-story/>

Building Hudson Yards: Constructed on 28-acres over a working rail yard, two “platforms” bridge over 30 active train tracks, three rail tunnels and the new Gateway Tunnel --- 300 caissons support the platforms and buildings. The caissons (four to five feet in diameter and 20 to 80 feet in depth) are drilled deep into the bedrock between existing tracks. Finished towers extend from the caisson foundations, through the platforms, and then rise skyward. This eastern portion of the platform will use 25,000 tons of steel, 14,000 cubic yards of concrete and weigh more than 35,000 tons. ---Caisson drilling started in March 2014 and the platform was completed in 2015. Throughout construction the trains have remained operational, and the new No. 7 Subway Extension opened at Hudson Yards in 2015.

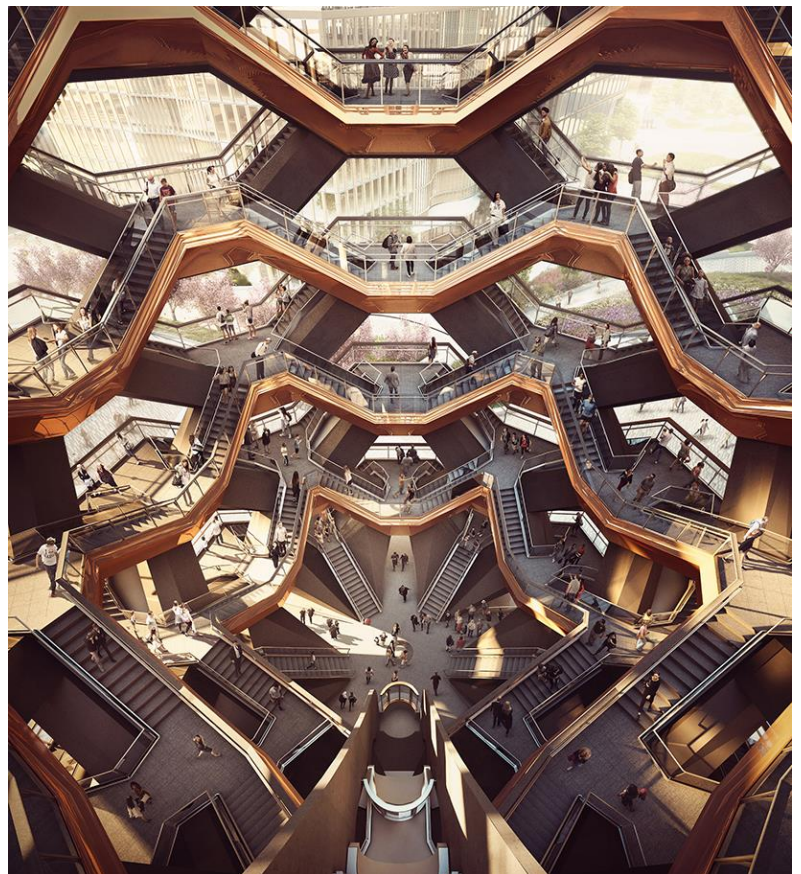


The first complete tower on the site is **10 Hudson Yards** and opened in May 2016. It is fully leased to companies that include Coach Inc., L’Oréal USA, SAP, Intersection, Sidewalk Labs, Vayner Media and Boston Consulting Group including BCG Digital. 10 Hudson Yards ascends 895 feet with 1.8 million square feet of commercial space. --- Another prominent skyscraper under construction is **30 Hudson Yards**, with 2.6 million square feet. At 1,296 feet high, it will be completed

in 2019 as the second tallest office building in New York. 30 Hudson Yards will be home to leading media, business and financial companies including HBO, CNN, Turner Broadcasting, Time Warner, Inc., KKR & Co. and Wells Fargo Securities. - -- **55 Hudson Yards** is the third commercial tower. At 780 feet and 1.3 million square feet, it will be home to MarketAxess, Milbank and Boise, Schiller & Flexner, LLP. The office towers are part of the overall master plan that includes 4,000 residences, a new hotel and a dynamic retail space that will feature more than 100 luxury and specialty shops, include Manhattan's first ever Neiman Marcus store. The retail component will include a collection of restaurants, and overlook the enthralling Public Square and Gardens. These components will open to the public by 2018. <http://www.hudsonyardsnewyork.com/about/building-hudson-yards/>



THE VESSEL: Thomas Heatherwick has unveiled plans for an engaging public landmark that will form the centerpiece of the Hudson Yards development. Named "Vessel", the interactive structure is intended to be climbed, explored, and experienced. Comprising 154 interconnecting flights of stairs, the installation will offer a variety of ways to engage with the city's urban landscape. In total, the design — with its almost 2,500 individual steps and 80 landings — will offer a mile's worth of pathway above a sprawling public garden. **The geometric lattice of intersecting flights of stairs, made from painted steel frame, will rise from a 50 foot diameter base and widen at the top to 150 feet, with an underside clad with a polished copper-colored skin. Vessel will form the centerpiece of a public square and gardens designed by landscape architects Nelson Byrd Woltz, in collaboration with Heatherwick Studio.** Informed by Manhattan's rich ecological history, the site will feature more than five acres of plazas with groves of trees, woodlands plants, perennial gardens and a 200-foot-long fountain that mirrors the flow of a river. The platform itself serves as a ventilating cover over the working rail yards below and is engineered to support large-scale plantings, while simultaneously acting as a reservoir for site storm-water management and reuse.



<http://www.designboom.com/architecture/thomas-heatherwick-vessel-hudson-yards-new-york-09-14-2016/>



One New York: The Plan for a Strong and Just City

In April 2015, Mayor Bill de Blasio’s administration announced “**One New York: The Plan for a Strong and Just City**,” a comprehensive plan for a **sustainable and resilient** city for all New Yorkers that addresses the profound social, economic, and environmental challenges ahead. The plan sets measurable goals, most notably: a poverty reduction target of 800,000 over the next 10 years, zero waste to the landfills by 2030, and the elimination of long-term displacement from homes and jobs after shock events by 2050.

Our Just and Equitable City New York City will have an inclusive, equitable economy that offers well-paying jobs and opportunity for all to live with dignity and security. The city plans to work towards:

Lifting 800,000 New Yorkers out of poverty or near poverty by 2025 by fighting to raise the minimum wage, and launching high-impact initiatives to support education and job growth.

Reducing premature mortality by 25 percent by ensuring that all New Yorkers have access to physical and mental healthcare services and addressing hazards in our homes.

Expanding Family Justice Centers to help victims of domestic violence.

Promoting the citywide integration of government services, information, and community data.

Our Sustainable City New York City will be the most sustainable big city in the world and a global leader in the fight against climate change. We will strive to minimize our environmental footprint, reduce dangerous greenhouse gas emissions, and have the cleanest air and water. The city plans to work towards:

Reducing greenhouse gases by 80 percent by 2050 (80 x 50)—the largest city in the world to make that commitment—by expanding from an initial focus on buildings to including energy supply, transportation, and solid waste as part of a comprehensive action plan to reach our goal.

Committing to a goal of Zero Waste to landfills by 2030. And keeping organics out of the landfill, which will also cut greenhouse gas emissions.

Making major investments to remediate contaminated land, and ensuring that underserved New Yorkers have more access to parks.



Our Resilient City The neighborhoods, economy, and public services are ready to withstand and emerge stronger from the impacts of climate change and other 21st century threats. As a resilient city, New York will be able to:

Respond to adverse events like Hurricane Sandy, deliver basic functions and services to all residents, and emerge stronger as a community—with the goal of eliminating long-term displacement from homes and jobs after shock events by 2050.

Upgrade private and public buildings to be more energy efficient and resilient to the impacts of climate change.

Adapt infrastructure like transportation, telecommunications, water, and energy to withstand severe weather events.

Strengthen coastal defenses against flooding and sea level rise.

Strengthen homes, businesses, community-based organizations, and public services to reduce the impacts of disruptive events and promote faster recovery.

The full report can be viewed at <http://www1.nyc.gov/html/onenyc/index.html>

Design and Construction Excellence 2.0 Guiding Principles

In March 2016, NYC's Department of Design and Construction (DDC) released a set of guidelines designed to ensure that public projects are designed and built to the highest standards that comply with Mayor Bill de Blasio's vision of a sustainable, resilient, equitable, and healthy City, One New York. They are specific and concise strategies for consultants to follow when they partner with DDC, helping to provide durable, aesthetically pleasing projects that also address key challenges such as population density and greenhouse gas emissions. Overall, there are 20 principles and five aims for each, that ask design teams to analyze each project and address issues such as: does a project invite public participation; does a project address local hazards such as erosion or flooding; is a building or structure welcoming to all segments of the population it's meant to serve; and does the project live up to its greatest opportunity to improve the City and the lives of its residents? <http://www1.nyc.gov/site/ddc/about/press-releases/pr-091516-introducing-dce-2.page>

Equity: Convey a Sense of Welcome to All

Design to invite. *An appealing façade and entry can attract passersby to enter a public facility. The arrival and entry sequence might be ample and expressively display the services and programming within the structure.*

Design to delight. People appreciate a public building with a unique presence that invigorates a neighborhood. Every facility can strive to be memorable and inspire civic pride.

Encourage use. Insightful design can legitimize use by everyone, especially populations who are often discouraged by insensitive design. Consider how facilities can convey a sense of safety and offer a place of refuge when needed.

Facilitate assembly. As the city grows denser, shared non-commercial indoor and outdoor public spaces become a more important means to connect with and strengthen community. Public facilities can accommodate opportunities for discussion, enjoying culture, congregation and recreation.

Support diverse activities. Public spaces can be flexible enough to allow people to engage in activities from quiet to loud, solitary to crowded, contemplative to active.

Equity: Ease Access to Resources

Design for inclusivity. *Consider how design can engage the needs of a diverse socioeconomic and multigenerational population. Go beyond programmatic requirements to consider the citizens who use facilities and who bring diverse needs and cultural expectations.*

Account for unique needs. *Truly inclusive design transcends ADA compliance and invites people with disabilities to fully participate in a dignified way.*

Incorporate user-centered design. *Consider the end users in the development of the design. Try to meet needs with one stop and well-integrated services.*

Ease access to transportation. *Consider the path from the facility to the nearest form of transport. Building entrances and infrastructure can be strategically located to encourage and facilitate the use of alternative transportation options.*

Provide a clear sense of orientation. *Consider how to achieve clear wayfinding throughout the project or building that is sensitive to impairment and language barriers. Architectural design can ease access, along with simple, clear signage and other navigation aids.*

Equity: Strengthen Communities

Bolster neighborhood pride. *Design can embody a locality's unique identity but also transcend it using architecture that is magnetic and therefore catalytic, drawing visitors, attention and ultimately, investment.*

Address unmet needs. *Consider how facilities can be valued resources for neighborhoods, not just individuals. Look for opportunities to fill critical gaps in services, amenities and safety.*

Strengthen community capital. *Emphasize the functions that inspire civic engagement, social cohesion, education and neighborhood stability. Plazas, public streets and public areas in buildings can accommodate a multitude of community building events in a way that inspires idea sharing and collaboration.*

Design spaces to unite. *Look for ways to break down physical and social dividing lines. The design of streets, parks, plazas, community rooms and gathering spaces informed by equity invites people to congregate and engage.*

Encourage knowledge sharing. *Ask whether settings can be developed for intergenerational exchange or skills development.*

Equity: Respect Histories and Cultures

Promote neighborhood culture. Design can recognize significant cultures and historic contributions and in that way contribute to identity and character. Such an evocation can nest amid the multitude of cultural expressions found in every neighborhood.

Learn from local voices and stories. Profound insight into community history and unmet needs can be revealed through deep engagement with key stakeholders. Consider the use of a collaborative design process that helps bring local understanding into design aspirations.

Incorporate local ecology. The natural environment, such as waterfronts and important designated landscapes can enhance the project's sense of place.

Use locally engaged art. Encourage the creation of art that is reflective of the culture and spirit of the community. Art in public spaces can help people forge a connection to place.

Express historic contributions. Artworks, memorials and commemorations are means to express remarkable community influences, which can often be best appreciated and understood through art.

Equity: Evolve with Needs and Change

Address community evolution. Social dynamics, including serial transformation of neighborhoods by the vitality of waves of immigration, can require the rethinking of service priorities and design preconceptions. Public buildings and spaces can be amenable to diverse interpretations over time.

Design places to evolve. Strive to anticipate programmatic change. Public spaces that can adapt over the day, the week, and the year with temporary events can successfully address vital issues and neighborhood change.

Inspire community stewardship. Consider how best to design to instill a sense of ownership that encourages community members to participate in the maintenance and upkeep of public structures and spaces over time.

Nurture economic empowerment. Entrepreneurship can be supported through the design of spaces that allow for diverse forms of commercial enterprise. Such places can be adaptable to the future growth of small businesses.

Design for growth. Considering opportunities for future growth of facilities, especially within existing footprints or sites, helps agencies quickly adapt to changing opportunities and service demands.

Sustainability: Use Natural Resources Responsibly

Choose renewable materials. Try to choose materials from responsibly managed or recycled sources as much as possible. Wood is the most common renewable material, but both steel and aluminum are among many materials that can be sourced from recycled stock and recycled again at the end of the project's useful life. Seek to limit the extraction of virgin materials.

Consider material lifecycles. Take into account how climate change and other evolving phenomena affect the replacement cycle and performance needs of products and assemblies. Consider life cycle analysis of key components that takes into account the full range of impacts beginning with extraction and ending with recyclability or demolition.

Adapt existing structures. Adaptive reuse of structures can capture enormous embodied energy and avoid waste while bringing new utility to culturally important buildings and sites.

Avoid toxins in materials. A rigorous analysis to minimize toxins may benefit users with special sensitivities, such as children and the elderly. Consider evaluating scientific consensus on harmful substances such as dioxins emissions from PVC and the ongoing presence of lead in pipes and paint.

Optimize waste management. Seek to minimize waste in construction operations. Consider how to ease recycling and advance other resource conservation practices for those who will use the project once in service.

Sustainability: Promote Sustainable Urban Ecology

Create or extend viable habitats. Even in high-density urban settings, opportunities abound to create habitats for plants and animals. These can include bird friendly planting areas, restoring culverted streams to a natural state or replacing bulkheads with a natural waterway edge. Look for opportunities to create multiple benefits, such as a wetland that serves recreation, erosion control and stormwater control purposes.

Use natural landscape elements. Consider including bioswales, riparian landscapes and green streets to filter pollutants and aid infiltration, minimizing the release of waste into the sewer system.

Use landscapes to hold floodwaters. The runoff from severe rain can be held in landscaped basins, street bioswales, widened streams and recessed playgrounds. These can be sized to hold runoff until capacity in the drainage system becomes available,

reducing one of the City's most severe pollution problems.

Reduce heat island effect. Green or blue roofs, tree canopies and plantings in public spaces and streetscapes are among many tactics that can dissipate severe heat, which is predicted to worsen. Canopies, porches and external shades are also elements that reduce solar loads on buildings.

Control site lighting. Consistent with use and safety, seek to design site lighting to reinforce natural habitat health and reduce impact on the night sky. Well-designed low-level lighting can enhance night visibility.

Sustainability: Minimize Energy Use and Reduce Greenhouse Gas Emissions

Optimize site conditions. Designs could take advantage of orientation to capture desirable daylight, solar heat and breezes. Explore means to minimize exposure to undesirable solar gain and glare through building shape and shading (by adjacent buildings, screening devices and plantings, for example).

Use passive tactics. Look to integrate highly insulated exterior walls and roofs, daylight to minimize electric lighting and natural ventilation where feasible. Coordinate these tactics to minimize the size of the HVAC plant and achieve the lowest energy use per square foot.

Use renewable sources. To achieve best energy and greenhouse gas emission performance, try to augment efficiency measures with renewable energy sources such as solar, solar thermal, geothermal, wind and fuel cells.

Optimize systems. Taking into account passive tactics and renewable sources used in the project, look at mechanical systems for greenhouse gas emissions and energy savings. Link systems design to enhanced commissioning operations and maintenance procedures to achieve superior ongoing performance.

Minimize secondary electrical loads. Consider load shifting tactics, especially when peak demand energy can be substantially reduced. Plug loads can be significantly lowered by shared, minimized use of office appliances, from copiers to coffeemakers.

Sustainability: Encourage Responsible Water Use

Conserve fresh water. Investigate reducing the amount of water used in buildings through fixture choice and programming. Look to minimize fresh water use for irrigation through water sensitive planting, stormwater retention and water recycling.

Capture rainwater. Runoff can be used for retention, infiltration and irrigation. Keeping water out of the municipal drainage system is especially important in areas where stormwater and sewage combine.

Reclaim gray water. Consider how to reuse water from sinks and other sources not severely contaminated when permitted.

Treat water on-site. Where possible, filter runoff using bioswales and other natural system treatment methods. Such tactics can be especially helpful when runoff would otherwise enter natural streams and other waterways.

Monitor water consumption. Consider meters to benchmark and set goals to meet conservation targets. Electronic dashboards that make usage information widely available often encourage users to conserve.

Sustainability: Design Holistic, Integrated Systems

Leverage site and envelope response. Site tactics (the reduction of building heating and cooling loads through orientation and shading) can amplify energy efficient envelope design (highly insulated, with daylight and breeze capture). These tactics, carefully coordinated, can create improved indoor and outdoor environments while reducing energy use and GHG emissions at modest or no cost.

Design with users in mind. Design that encourages energy efficient user habits can increase benefits and reduce costs. Staff could be encouraged to adjust shades and open windows when conditions merit. Explore a cooperative means of helping people learn to operate their buildings for maximum effectiveness and amenity as well as performance.

Bring sustainable urban ecology inside. Planting schemes and rainwater capture could be used within a building, both to create a more pleasing environment and to humidify and filter air.

Optimize campus solutions. At the scale of campuses or districts, many environmental strategies deliver substantial benefits at low cost. These include combined heat and power (CHP), such as sustainably sourced fuels, large-scale solar and wind, as well as advanced waste-to-energy, water recycling, habitat advancing water retention and biological water treatment facilities.

Improve commissioning. Optimizing system performance, including commissioning and periodic retrocommissioning, may improve energy performance as well as staff and user satisfaction. Systems could make performance readily measured against design intent and ease problem identification.

Resiliency: Prepare for Extreme Events

Design for emergencies. The key short-term hazards include severe storms, flooding, extreme heat, extreme cold, high winds and human caused events. Design tactics can include site protection, structural reinforcement, floodable spaces and the location of vulnerable spaces and systems away from threats.

Design for long-term threats. Erosion, rising sea levels, rain intensity and critical infrastructure failures have high potential to compromise the City's resiliency. The design of building elements should take into account the risks inherent in systems, building assemblies and operations. **Address multiple hazards.**

Pay special attention to events that trigger secondary effects. Among these are floods and fires accompanying storms, and electrical grid failure related to extreme heat and cold, as well as rain intensity. Think of responses that address relevant hazards with a minimum of means.

Use robust materials. For projects in vulnerable areas, think of materials, products and details that will degrade minimally after extreme events as well as assemblies that will not be weakened or deformed by repeated exposure to hazards, some of which are salt water, extreme temperatures, high winds and storm surges.

Reduce microclimate effects. Analyze buildings and sites for opportunities to reduce microclimate effects. Such tactics as refractive materials, green roofs and tree canopies prove especially useful during extreme heat events—especially those accompanied by power failures—by bringing ambient temperatures below harmful levels.

Resiliency: Secure Against Human Induced Threats

Integrate design for security. In projects that require extraordinary security measures, the design team should strive to seamlessly incorporate tactics, many of which need not be visible, and integrate them to permit unified operation. Security requirements can be consistent with the architectural expression of the design.

Avoid fortified-looking design. The design can strike a balance between usability, welcoming space and public safety. Excessively fortified-looking design induces fear, encourages avoidance, repels investment and sometimes precipitates attacks on nearby unprotected targets.

Analyze critical facilities. Examine capability of facilities, if they have not already been deemed essential, to ensure that extreme events do not compromise functionality. Relocation of programs or strengthening building components are among tactics that may be necessary for projects designated to be at high risk.

Consider emergency phase needs. Design teams are encouraged to assess needs at different disaster stages, such as emergency phase, short-term recovery, and long-term rebuilding. For immediate disaster response, the design may include planning for the provision of aid, refuge and emergency services.

Design for potential evacuation. Some buildings, sites and programs may demand unique design solutions to anticipate the need for local or citywide evacuation. Evacuation schemes can be reflected in a project's egress, circulation and first responder access.

Resiliency: Achieve Coordinated Hazard Response

Analyze infrastructure for service continuity. When a building or infrastructure system is vulnerable to failure in an extreme event, consider how to achieve continuity of service, using strategies such as on-site energy generation or back up generation.

Reduce potential for grid strain. Large buildings, campuses and energy-intensive facilities can help reduce electrical grid failure with temporary load shedding and load shifting tactics. Low energy schemes that rely on passive measures or renewable resources can diminish power outages and critical infrastructure disruptions.

Coordinate response over time. Given the dynamic nature of extreme and chronic events, the design of systems could take into account the risks likely to develop during their useful life—the effect of rising seas, for example.

Anticipate transport system risks. Consider facilities design in terms of transport mode failure (rails, buses, tunnels, airports, interruptions in the vehicle fuel supply chain). Extreme events can strand people away from home, or prevent essential staff from reaching their workplace.

Minimize emergency systems maintenance. Day-to-day maintenance of systems used only in an emergency can be overlooked. If systems are designed to minimize maintenance and operational complexity, they are less likely to fail.

Resiliency: Choose Flexible Tactics that Can Evolve

Prioritize multilayered approaches. Improvements that protect shorelines or other vulnerable areas could be designed to delay or preclude the need for property owners to make costly adaptation investments. If waterside protections are comprehensive, raising individual buildings may not be necessary.

Design for fast recovery. Consider how to make critical buildings or infrastructure facilities operative during disasters and capable of recovering swiftly. Low energy facilities with renewable power, on-site water systems and highly insulated buildings can extend the usefulness of places of refuge.

Use adaptable natural system solutions. Strategically include adaptable natural defense strategies to reduce risk from storms. Armoring tactics, such as sea walls, can be used in special circumstances but may not adapt as conditions change. Constructed water management landscapes may prove easier to alter over time.

Design sustainable site responses. Insightfully design green infrastructure intended for everyday stormwater management to counter effects of extreme weather, such as excess heat and rainfall. Resiliency-focused water management is especially important in areas where overflows from combined stormwater and sewage infrastructure must be managed.

Design to include information systems. Distribution of information is vital before, during and after extreme events. Consider including systems like free Wi-Fi in buildings and public spaces to facilitate a stable emergency and recovery communication infrastructure.

Resiliency: Bolster Community Capacity to Adapt

Engage the most vulnerable populations. Look to assess the needs of residents at higher risk—older adults, socially isolated and the poor—as they bear more of the effects of extreme events. Ask how facilities can make essential services readily accessible to these communities.

Help communities adapt. Project design can bolster community resilience by making spaces available and programming possible for neighborhood groups. These can bring together stakeholders to anticipate disasters and to unite to respond to them. Consider building types that can host activities that boost community capacity.

Respond to unique needs. Streets and buildings can use a variety of tactics to help those with physical impairments during extreme events and aid those who must shelter in place. The design of large sites can ease access and wayfinding to places of refuge that are identifiable.

Explore use for mobilization. For places vulnerable to repeated disasters and extreme weather events, it may be necessary to designate or design places where communities can mobilize, resources can be delivered and people can find assistance. These designated areas can be prominent so that they become part of people's everyday activities.

Anticipate places of refuge. Public buildings can become key assets for the surrounding neighborhood during or after a disaster. Designers can consider how to convert multipurpose spaces into places of refuge. Quickly installed temporary facilities can be essential in cases of large-scale displacement.

Healthy Living: Support Mental Health and Well-Being

Maximize connection to nature. Take advantage of opportunities to bring views and ready access to parks and green open spaces into streetscape and building projects. Experiencing nature is directly linked to improved mental health, reduced stress and overall improved well-being.

Create therapeutic environments. Consider designing to emulate biophilic and naturally calming elements. Think of using natural light, plants, running water and views of nature to enhance people's experience. Access to nature, calming restorative environments and public places that feel safe all contribute to well-being.

Offer empowering choices. Look for opportunities to provide movable furniture, experiential art and features that allow people to use public spaces and buildings as they see fit. Design that invites participation and choice can feel empowering.

Be responsive to people's needs. Create welcoming, unthreatening environments. Consider the population that will most likely use a space to ensure positive experiences and make people feel that they are valued.

Promote perceptions of safety. The presence of clear wayfinding, appropriate lighting, natural surveillance and art can reduce crime and vandalism, and increase the safety of the environment, which enhances quality of life for everyone.

Healthy Living: Strengthen Social Interaction and Engagement

Design for opportunities to interact. Public spaces can be designed to ease casual meetings as people move through their everyday routines and daily lives. Communities with naturally high levels of social interaction can grow to be stronger, healthier and more resilient.

Design spaces to reduce social isolation. Inviting meeting places for diverse groups can ease social connection. Diminishing the isolation of vulnerable and elderly groups can create cohesive communities and long-term health and safety benefits.

Introduce humor and playfulness. An amusing encounter becomes an occasion to make a personal connection. Design that draws people to share—their wisdom, experience and values—is design that builds well-being.

Consider the unique needs of populations. All people have unique needs, which are sometimes not obvious. Considering end-users, especially those often overlooked, can help transform life possibilities and reweave social bonds.

Accommodate group recreation. Provide space for multigenerational and multicultural recreation to entice social activity. Consider placing such opportunities in unused areas or in spaces that can be flexible, such as community rooms.

Healthy Living: Reduce Environmental Nuisances

Mitigate neighborhood pollution. Emissions— even those that meet regulatory thresholds—can have serious health consequences, especially after longterm exposure or if in close proximity to vulnerable populations. Inventive, thoughtful design and use of a site can reduce or eliminate these impacts.

Enhance air treatment and ventilation. Consider air quality improvements where use or conditions merit. Indoor and outdoor air quality is an important factor in the transmission of airborne pathogens. For example, the health and productivity of building occupants is linked to safe and secure access to fresh air.

Eliminate exposure to toxins and allergens. Exposure to nuisances can be thought of as a fact of life in cities, but special care can be taken on a building's interior finishings and furniture to ensure they do not emit unnecessary toxins, odors or allergens. VOCs in paint or flame retardant materials in furniture, for example, can have severe adverse health effects.

Minimize noise pollution. As the city grows and noise becomes ubiquitous, consider sound levels from ambient sources and manage transmissions within buildings.

Diminish light pollution. Outdoor lighting has the ability to augment safety as well as add allure to outdoor spaces. However, poorly designed lighting can impede safety by obscuring shadows and adversely affecting human circadian clocks, which is linked to negative mental health effects.

Healthy Living: Encourage Physical Activity as Part of Everyday Use

Invite movement. Consider site and building design elements that offer alluring options for physical activity. High levels of daily activity can improve physical health and mental well-being.

Design visually appealing streets and public spaces. Think about ways to create vibrant places with design such as active street frontages, intriguing paving and curiosity inspiring art. Enticing sidewalks and streetscapes can encourage increased walking and physical activity as part of everyday life.

Connect projects to green space. Seek opportunities to develop safe and convenient access to adjacent or nearby parks, playgrounds and pedestrian paths with generous entry plazas, widened sidewalks and cycling accommodations.

Link to multiple travel modes. When projects enhance convenient access to a variety of transit modes— walking, biking, bus routes—people are encouraged to choose active travel options. Access and proximity to buses is especially helpful for those with mobility impairments.

Enhance pedestrian safety. Design that is focused on the needs of pedestrians, especially in areas with high pedestrian and vehicular conflicts, aids safety and can promote increased walking and biking.

Healthy Living: Promote Healthy Choices

Accommodate healthy programming. Create spaces which accommodate opportunities for exercise classes and healthy eating options. Space could flex, for example, to allow health-improving activities when not in use for core programming.

Prompt healthy decisions. Architectural cues, such as an alluring, centrally placed stairway, can prompt more physically active choices. Signage and other visual aids can encourage healthy behavior and gently discourage unhealthy habits.

Promote access to outdoors. Look for opportunities to program underused spaces for outdoor recreation. Such locations are especially helpful for families with children, but they can be valuable in a wide variety of settings for example, clinical spaces could share a healing garden on a roof setback.

Encourage access to healthy food. Facilities may be able to address local food deserts with programmable public space for food kiosks or green markets. Creating places to sit, rest and gather in comfort can also encourage the eating of healthy meals.

Ease and invite access to drinking water. Appealing and well-maintained water fountains and bottle refilling stations encourage healthier dietary choices and reduce the incentive to buy sugary drinks. Water sources could be prominently placed as artistic presences in foyers and other high-use spaces.

<http://www1.nyc.gov/assets/ddc/downloads/DDC-Guiding-Principles-2016.pdf>

WORLD TRADE CENTER HISTORY OF THE TWIN TOWERS

1939 - At the World's Fair in Flushing, NY the "World trade center" pavilion is dedicated to "world peace through trade."

1964 - The Port Authority unveils an architectural plan for the WTC featuring the world's tallest buildings.

1966 - Construction begins at the WTC site with the demolition of 78 Dey Street. Excavation work begins for the WTC. First use of "slurry wall" method in the United States.

1970 - The North Tower of the WTC exceeds the height of Empire State Building at 1,368 feet, making it the tallest building in the world.

1971 - The South Tower of the WTC is topped off at 1,362 feet.

1973 - The World Trade Center is dedicated.

1974 - Tightrope artist Philippe Petit performs an unauthorized walk between the Twin Towers.

1975 - Top of the World Observation Deck opens, South Tower.

1976 - Windows of the World Restaurant opens, North Tower.

1993 - Terrorists detonate 1,500 pounds of explosives in a van parked in the underground public parking lot of the WTC, two levels below the southern wall of the North Tower. The attack kills six people, injures more than 1,000 people and creates a five-story crater beneath the towers, resulting in hundreds of millions of dollars of damage. The Port Authority implements a \$250 million upgrade plan focusing on life safety and security.

1994 - The WTC is designated one of the "Seven Wonders of the Modern World" by the American Society of Civil Engineers. The WTC is visited by every U.S. president between the time of its opening and the time of its destruction at least once, as well as by many dignitaries and heads of state.

1995 - A memorial fountain is dedicated in the WTC plaza to the victims of the 1993 bombing.

1998 - The Port Authority announces plans to seek a 99-year net lease of the complex.

2000 - The WTC reaches its highest occupancy rate.

July 2001 - The WTC is net-leased to private developer Silverstein Properties, Inc. for approximately \$3.2 billion. A three-to-six month transition period commences.

September 2001 - On September 11, two planes hijacked by terrorists crash into the Twin Towers, destroying the complex. One World Trade Center is struck at 8:46 a.m.; Two World Trade Center at 9:03 a.m. [A timeline of events of that day.](#)

2002 - Six-month anniversary of the September 11 attacks is marked with beams of light. On May 30, the WTC recovery ends with a public Last Column Ceremony.

2002 - The 9-11 Commission is created to study the events leading up to the September 11 attacks and to provide recommendations on emergency preparedness and response. The 9-11 Commission issues its report on July 22, 2004.

2003 - On November 23, a temporary World Trade Center PATH station opens to replace the one destroyed on September 11.

2006 - The newly constructed 7 World Trade Center opens on May 23, the first building to be rebuilt in Lower Manhattan after the September 11 attacks.

<http://www.panynj.gov/wtcprogress/history-twin-towers.html>



The 9/11 Memorial

The Reflecting Pools – These pools and cascading waterfalls are set in the exact footprints of the North and South World Trade Center Towers which



were destroyed on September 11, 2001. The pools are the largest man-made waterfalls in the North America. The pools are one of the most moving memorials in the world. It is nearly impossible to view the pools without experiencing overwhelming emotions.

The Memorial honors those who died on 9/11, including those who perished at the World Trade Center, the Pentagon in Washington D.C. and the victims of hi-jacked Flight 93 that crashed in Pennsylvania. Also included are the oft-forgotten six victims of the 1993 World Trade Center bombing.

The victims' names are inscribed around the bronze edges of the pools. Instead of being arranged alphabetically, the names are organized by "meaningful adjacencies." Names are grouped together based on their relationships with other victims, such as co-workers, family



members, friends, and even those who commuted together. <http://www.freetoursbyfoot.com/visit-911-memorial-nyc/#tickets>

The 9/11 National September 11th Memorial Museum



Through interactive technology, archives, narratives and a collection of artifacts, the Museum recounts the events of 9/11. Unlike the Memorial, you must purchase tickets to enter.

Information about

visiting: <https://www.911memorial.org/visit>



One World Trade Center



Nick-named the “Freedom Tower,” One World Trade Center is the tallest skyscraper in the Western Hemisphere and, as of 2016, is the 6th tallest in the world. It’s no coincidence that its height is 1,776 feet. The Observatory on the 100th and 101st floors is open and is quite an amazing experience. For

information on visiting click on this link: [One World Observatory \(“Freedom Tower”\)](#). Floors 1-19 are the base of the building with a 65-foot-high (20 meter) public lobby. Rented office space begins on the 20th Floor and continues to the 64th Floor. On Floor 65 is a sky lobby and then office floors resume on Floor 65 to Floor 90. Floors 91–99 and 103–104 are mechanical floors.

The World Trade Center Transportation Hub – the Oculus

The recently opened \$4 billion World Trade Center Transportation Hub serves 250,000 Port Authority Trans-Hudson (PATH) commuters daily and millions of annual visitors from around the world. At approximately 800,000 square feet, the Hub, designed



by internationally acclaimed architect Santiago Calatrava, is the third largest transportation center in

NYC. The Hub’s concourse will ultimately connect visitors to 11 different subway lines, the PATH rail system, the Battery Park City Ferry Terminal, the National September 11 Memorial & Museum, World Trade Center Towers 1, 2, 3, 4 and Brookfield Place.

The “Oculus” serves as the centerpiece of the World Trade Center Transportation Hub, incorporating 78,000 square feet of multi-level state-of-the-art retail and dining. The concourses emanating from the Oculus link the entirety of the site above and below grade. With an additional 290,000 square feet of multi-level retail and dining space, the World Trade Center site is the focal point of Lower Manhattan.

2 World Trade Center is, after 15 years, still not complete due to many delays in design. The currently agreed upon design is for a 90-story tower standing 1,270 feet tall encompassing 2.8 million square feet.



3 World Trade

Center is near completion and will be 80 stories tall rising to 1,079 feet.



The completed and opened **4 World Trade Center** is a light, ephemeral vision, facing directly onto the World Trade Center Memorial Plaza. Rising 977 feet, by Maki and Associates, the 72-story tower is intended to assume a quiet but dignified presence at the site



7 World Trade Center was completed in 2006 and was the first tower rebuilt after the attacks. Standing 741 feet and 52-stories tall it sits on the same site as the original 7 World Trade Center.



1:00pm – 1:30pm

Pick up by bus, and drive to [WORLD TRADE CENTER](#) site (30 minute drive)
Drop off (and pick up) on Trinity Place (east side of street) between Thames and Rector

1:30pm – 3:00pm

Walk around the WTC Memorial site and transportation center – an opportunity to see the memorial and transportation center.

3:00pm

Pick up by bus for transport to the Public House (30 – 40 minute drive)
***** You must be at Trinity Place (east side of street) between Thames and Rector at 3:00pm – bus can't wait *****



3:30pm

[Public House NYC](#)

140 E 41st St, New York, NY 10017

(212) 682-3710

We gather here on the mezzanine and food will be served as the game is underway. This is the location of the Notre Dame Club of New York game watch, so we'll be among fans.



Free time after the Public House – Hilton Garden Inn is a 15 minute walk from the Public House

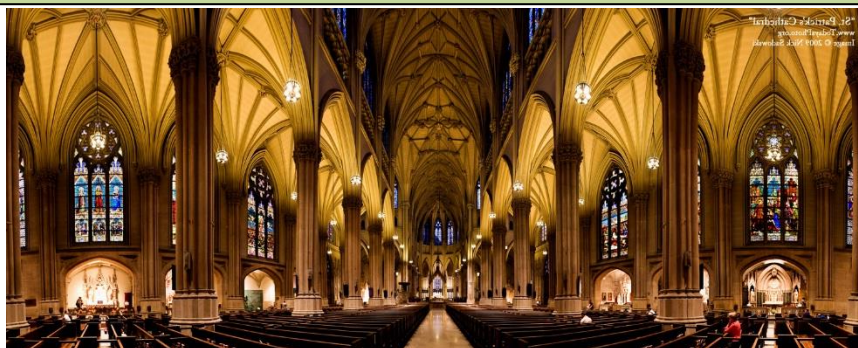
SUNDAY, NOVEMBER 13

(clothes for Mass)

7:00am – 8:00am Breakfast available (use coupons provided)

8:15am Meet in lobby **with all luggage – checking out of hotel** to board bus for St. Patrick's Cathedral (*15 minute drive*)

9:00am Mass at [ST. PATRICK'S CATHEDRAL](#)



New York City has two Saint Patrick's Cathedrals



The Basilica of St. Patrick's Old Cathedral, located in lower Manhattan, is the original Cathedral of the Archdiocese of New York and was built in 1840 to replace the original wood frame building of St. Peter's Church, the first Catholic house of worship in the city. St. Peter's was built in 1785 at time when there were only two hundred Catholics and one priest in the city. In 1805, Mrs. Elizabeth Bayley Seton, founder of the Sisters of Charity in this country, was converted to Catholicism and made her profession of faith, received her first communion, and was confirmed in the old Saint Peter's Church. In the early 1800s, the Diocese of New York was created, which inspired the increasing Catholic population. In 1842, Bishop John Hughes became Bishop of New York. At that time, his cathedral was the largest church structure in New York City. When New York became an archdiocese in 1850, Bishop Hughes became the first archbishop.

In 1853, when Archbishop John Hughes announced his ambition to build a new St. Patrick's Cathedral, the idea was ridiculed as "Hughes' Folly," as the proposed, near-wilderness site was considered too far outside of the city. Archbishop Hughes, nonetheless, persisted in his vision to build the most beautiful Gothic Cathedral in the New World in what he believe would one day be "the heart of the city."

Construction started in 1858, but was stalled for five years because of the Civil War and the need for additional funding. The workers needed to go fight in the war, and the war put a financial strain on the entire country. Money was so tight that the archdiocese had to settle for a plaster ceiling for the cathedral rather than continuing to use marble. The Cathedral was formally opened in 1879.

St. Patrick Cathedral facts: More than five million visitors each year step inside; The cathedral seats 2,400 people and conducts seven masses on weekdays on eight on Sundays; There are 9,000 organ pipes, more than 20 altars, 3,700 stained-glass panels, 19 bells, and the 9,000 pound bronze doors at the main entrance were designed to be opened using only one hand; and geothermal wells are being dug approximately 2,200 feet deep (the height of the Empire State Building) beneath the Cathedral which will result in a 30 percent energy-cost savings and an annual carbon-emission reduction of 94,000 kilograms. <http://saintpatrickscathedral.org/cardinals-welcome>, <http://www.amny.com/secrets-of-new-york/secrets-of-st-patrick-s-cathedral-1.9613804> http://www.architectmagazine.com/technology/st-patricks-cathedral-gets-an-update-fit-for-the-pope_o



10:00am

Drive back to Notre Dame (11 ½ hour drive without stops, but we will be stopping)

Trip Coordinators: Diane Westerink, 574-286-9696; Joannes Westerink, 574-532-3160