BQE ENHANCEMENT STUDY

NYCEDC
New York City Economic Development Corporation

NEW YORK CITY DOT

STARR WHITEHOUSE
Landscape Architects
and Planners PLLC

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EXECUTIVE SUMMARY

This report is the final product of a study, commissioned by the New York City Economic Development Corporation (NYCEDC) in coordination with New York City Department of Transportation (NYCDOT), aimed at developing a blueprint for a safer, more attractive pedestrian environment among the Cobble Hill, Carroll Gardens, and Columbia Street Waterfront neighborhoods. The goal of the study, conducted along the length of Hicks Street between Atlantic and Hamilton Avenues, was to identify methods to beautify the streets, reconnect the neighborhoods separated by the BQE, and mitigate noise and air pollution from the sunken highway below.

Local stakeholders responded to the project with enthusiasm, participating in three community design workshops held between May and November, 2010. The three conceptual designs that resulted from this process were vetted for feasibility with City and State agencies, and subsequently presented to the public at a final presentation on November 15, 2010.

Concept 1: Maximum Green would employ traffic calming techniques and context-sensitive planting design to prioritize pedestrian safety and sustainable streetscape beautification. Chicanes, bump-outs, extended sidewalks, and protected parking lanes would reduce pedestrian crossing distances and slow traffic. An optional acoustic barrier could significantly reduce noise at street level.

Benefits:
- slows traffic
- shortens pedestrian crossing distances by an average of 11 feet

Maximum Green

Cost: $10 million to $18 million*

*All costs are preliminary and subject to change with final design.

- adds 6,500 square feet of pedestrian space
- adds nearly 1 acre of plantings including 412 new trees
- employs an innovative storm water capture and reuse system
- can reduce noise by 11 decibels at street level

Concept 2: Connections would reconnect the Columbia Street Waterfront neighborhood with its eastern neighbors via five new pedestrian and bicycle bridges. The Summit Street pedestrian bridge would be replaced with an ADA-accessible upgrade. These new bridges could be configured with photovoltaic panels (PVs), green walls, decorative LED lighting, and acoustic panels to create "green machines" that would generate green energy, provide visual landmarks, and contribute to reduced noise and cleaner air on the bridges. This concept would include traffic calming and planting strategies from Maximum Green.

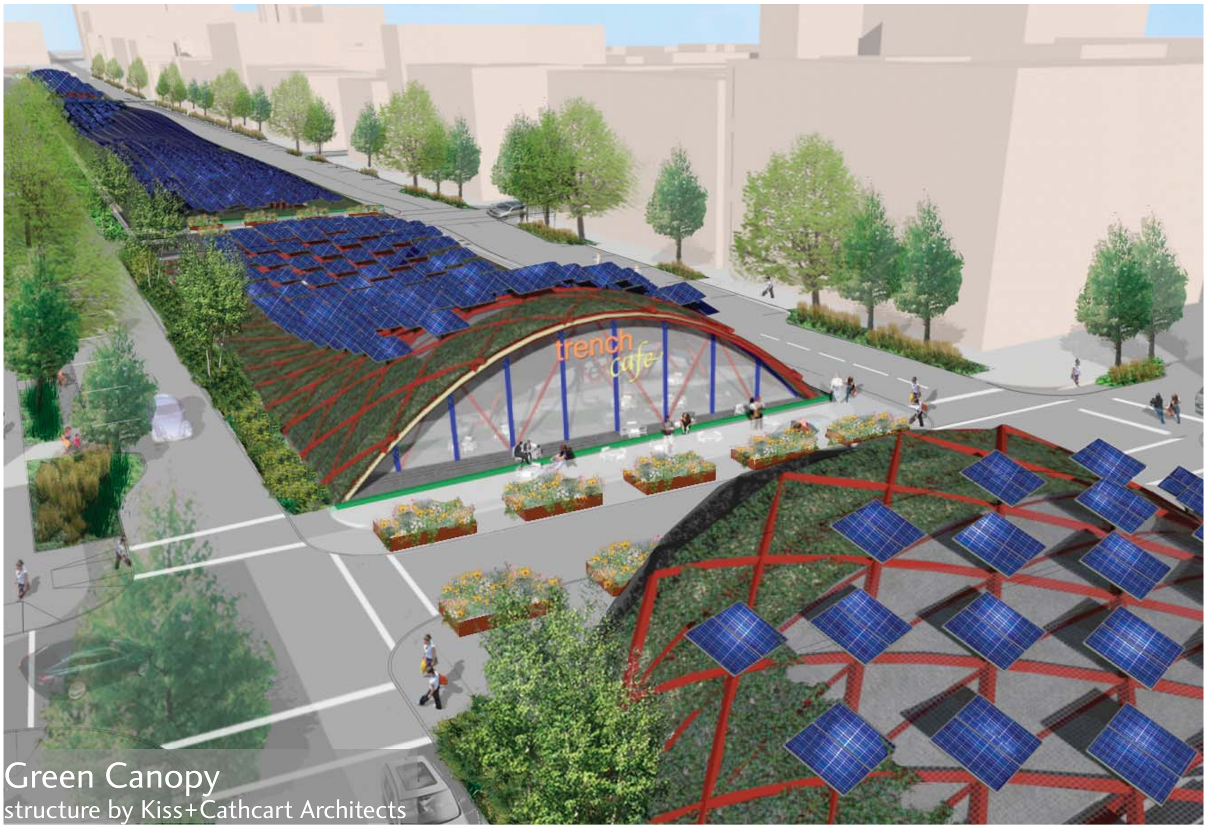
Benefits:

- reconnects neighborhoods with 5 new pedestrian/bicycle bridges
- creates an accessible connection at Summit Street
- adds up to 2,600 square feet of vines
- has the potential to generate up to 380 kWh per year from photovoltaic panels

Concept 3: Green Canopy (pictured, next page) would visually screen the highway with a low-rise metal trellis augmented with subsurface acoustic panels, an armature of vines, and photovoltaic panels that would turn the BQE trench into an environmentally productive, architecturally distinctive landscape amenity. This concept would incorporate plantings, traffic calming elements, and bicycle/pedestrian

Connections

Cost: $30 million to $38 million*; Potential Income: $15,000* annually from PVs



Green Canopy
structure by Kiss+Cathcart Architects

Cost: $79 million to $83 million*;
Potential Income: $312,000* annually from PVs

bridges from previous concepts.

Benefits:

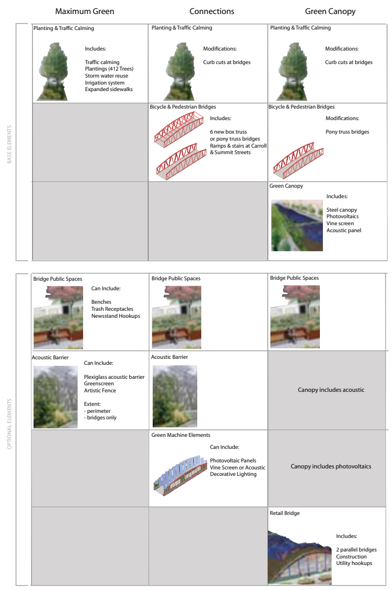
- screens the BQE from view
- creates a large-scale architectural landmark
- reduces noise at street level by 9 decibels
- adds 100,000 square feet of vines
- has the potential to generate up to 1.25 million kWh per year from photovoltaic panels
- reconnects the neighborhoods via bicycle & pedestrian bridges

Implementation

The three concepts are envisioned as additive in nature, combining elements from a shared menu (or "kit of parts") to achieve different levels of change. With small modifications and the addition of bridges, Maximum Green could become Connections; with the addition of the canopy, Connections could become Green Canopy.

Common elements in the kit of parts include planting treatments, traffic calming elements, acoustic barriers, and bicycle/pedestrian bridges. These elements could be implemented on a per-block basis, or incrementally over time.

For the average block (275 linear feet of northbound and southbound Hicks), or per unit, incremental costs of concept elements are estimated (based on conceptual designs only) to be:



The concepts comprise elements from a standard kit of parts; this enables flexible implementation. (See page 64 for larger image.)

- Hardscape and planting (per block): $890,000
- Perimeter acoustic barrier (per block): $200,000
- Bicycle/pedestrian bridge (per bridge): $2.9 million
- Green Machine bridge components (per bridge): $343,000
- Green Canopy, fully outfitted (per block): $4.1 million

All cost estimates are preliminary, based on conceptual designs only, and estimated in 2010 dollars. Estimates will change with future design.

Community Response

Community response to the designs, expressed through surveys distributed at the November 15, 2010 presentation and available online after the event, was generally favorable. Planting and traffic control strategies received near-universal support. Using bicycle and pedestrian bridges to reconnect severed streets was also popular, although some respondents felt that fewer bridges could suffice. The Green Canopy garnered enthusiastic support, balanced by questions of whether its benefits outweighed its costs.

Other aspects of the designs elicited mixed feelings. Community members thought an acoustic barrier encircling the trench perimeter offered valuable reduction of noise, but worried that it could create a visual barrier. Others were concerned about loss of on-street parking.

The majority of respondents supported incremental implementation as an alternative to waiting for full funding before beginning construction.

Next Steps

Although the community surveys did not reveal a clear preference among the three design concepts, several relatively low-cost steps toward incremental implementation could be undertaken in the near term:

- Implementing recommended traffic calming measures by reconfiguring lanes and designating future chicanes with markings or flexible bollards.
- Installing proposed swales as part of NYCDEP's storm water management pilot program.
- Adding bicycle lanes to Congress and Amity Streets to create a clear and direct connection between existing lanes in eastern Brooklyn and the waterfront.

These steps have the advantage of being inexpensive to implement, falling within agencies' current agendas and programs, carrying relatively limited maintenance costs, and having an immediate, visible impact on the neighborhood. Data collected before and after implementation could lay the groundwork for moving forward with permanent interventions.

NYCEDC will continue to work with involved agencies (DPR, DEP, NYCDOT, NYSDOT), key community stakeholders, and elected officials to craft next steps and advance toward implementation.

PURPOSE & NEED

The Brooklyn-Queens Expressway, built in the 1950s to alleviate congestion and create new connections between Brooklyn, Queens, and Manhattan, changes elevation multiple times along its circuitous route. Just south of Atlantic Avenue in Brooklyn, the 6-lane expressway dives below street level, becoming an open-air, sunken roadway. Perjoratively referred to as “the ditch,” this section of roadway divides the neighborhoods of Cobble Hill and Carroll Gardens to the east from the Columbia Street Waterfront District to the west. The highway trench longitudinally bisects residential Hicks Street between Congress Street and Hamilton Avenue. Neighbors are exposed to noise and air pollution emanating from the sunken highway, to which the New York State Department of Transportation (NYSDOT) ascribes an annual average daily traffic volume of 155,000 vehicles. Only four of the eleven streets in the project area span the BQE to create east-west vehicular connections: Congress, Kane, Sackett, and Union. Summit Street provides an elevated pedestrian connection that is not ADA-accessible.

The BQE tracing the perimeter of Brooklyn. The red box shows the project area.

In order to promote economic development for the Downtown Brooklyn area, the NYC Economic Development Corporation

Before & After: the project area in 1924 (left), and in 2008 (right). Robert Moses' Brooklyn-Queens Expressway dug a hole through the middle of this neighborhood in the 1950s. Today only four streets cross the trench: Congress, Kane, Sackett, and Union (marked in green).

(NYCEDC), in coordination with New York City Department of Transportation (NYCDOT), engaged Starr Whitehouse to “develop a safer and more attractive pedestrian transportation network among the Cobble Hill, Carroll Gardens, and Columbia Street Waterfront neighborhoods.” The community-driven process began in May 2010 with the first of three community design workshops, at which participants were asked to help define both the problem and the project goals.

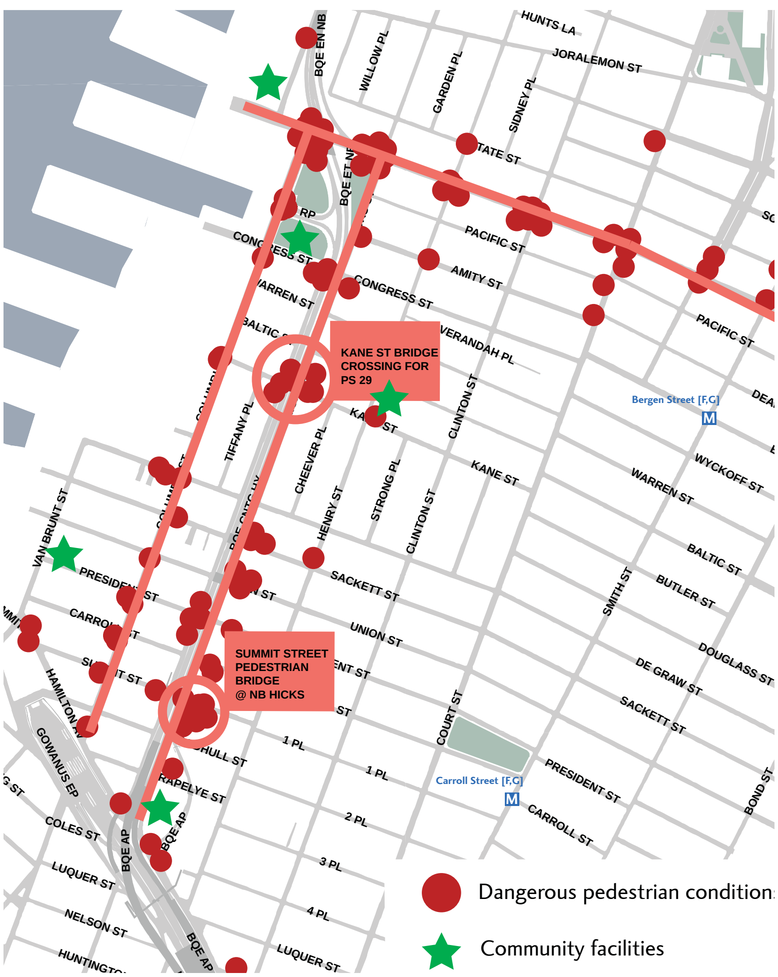
Community Input

61 community members joined representatives of NYCEDC, NYCDOT, and the design team for the first workshop. 69% of the attendees considered themselves residents of the project area; of the 46 who identified their neighborhoods, 16% lived in Carroll Gardens, 43% in Cobble Hill, and 30% in the Columbia Street Waterfront District. On average, these respondents had lived in their neighborhoods for 17 years.

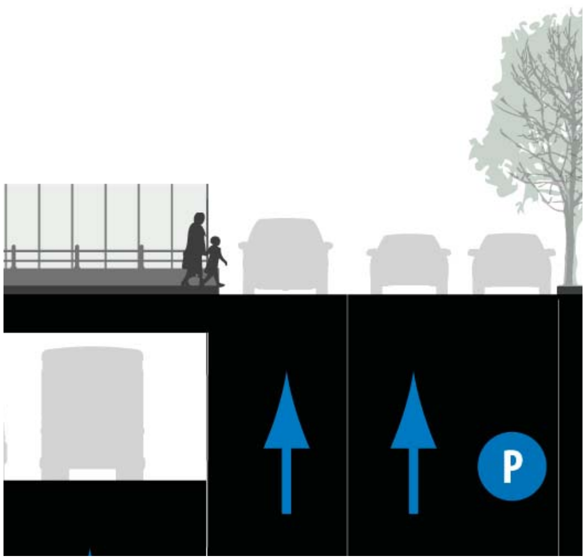
Before devising solutions to improve the area, the project team needed to understand the extent to which the BQE trench and Hicks Street impacted residents’ lives. A survey conducted during the workshop indicated that Hicks Street poses a significant barrier to travel in the area, particularly for residents of the Columbia Street Waterfront District. Where the average workshop participant crosses the trench 1.4 times per day, Columbia Street residents cross 3.6 times per day. Residents cross to commute to work, take the subway, go to the gym, patronize shops and restaurants,

Shops and restaurants identified were primarily east of the BQE, with a cluster of popular spots on Union Street west of Hicks.

Community facilities included several parks and playgrounds, as well as the PS 29 elementary school on Kane Street.



Areas identified by community participants as dangerous to pedestrians generally follow Atlantic Ave and Columbia and Hicks Streets. Proximity to community facilities like playgrounds and schools (shown with green stars) may influence individuals' perceptions of dangerous conditions.



Crossing northbound Hicks Street can be challenging; at typical bridges (section, left), and the Summit Street bridge (photo, right), lack of pedestrian refuge forces walkers to extend their heads into the vehicle lane to see oncoming cars.

walk dogs, run errands, and go to school. Participant-generated maps of shops, restaurants, and community facilities show that a majority of destinations lie east of the trench, but a handful of restaurants and popular playgrounds also draw foot traffic west.

Having established the frequency with which residents cross the trench, the project team sought to understand the experience of crossing. Workshop participants mapped locations they felt had dangerous pedestrian conditions (facing page, bottom), highlighting multiple locations along the lengths of Atlantic Avenue, Columbia Street, and Hicks Street. The majority of the conflicts on Hicks Street were marked along the northbound lanes, with clusters at the Kane and Summit Street bridges.

A number of the intersections identified as unsafe are in close proximity to community facilities: for example, the Kane Street bridge is the closest crossing to Public School 29 (PS29), an elementary school located at the intersection of Kane and Henry Streets. While this bridge does not differ in its design from other bridges, it discharges pedestrians (many of them children) onto a high-speed section of northbound Hicks Street (see pg. 11). Other clusters of difficult crossings were marked at the north end of the project area, where complicated traffic patterns at Atlantic Avenue abut popular parks and playgrounds, and at the terminus of the Summit Street bridge, which provides Columbia Street residents access to St. Stephen's church.

The consistent clustering of markers on northbound Hicks Street appeared to be a response to a common condition: the east ends of all the bridges crossing the BQE align with the 8' high security fence around the trench in such a way that pedestrians are forced to step or lean into the northbound vehicle lane to check for oncoming traffic. This creates a dangerous condition for pedestrians and drivers alike.

Workshop participants clearly identified Hicks Street as the origin of noise in their neighborhoods.

Workshop participants also mapped noise in their neighborhoods, clustering noise points around the BQE and Hicks Street, and

28% Reduce Noise

20% Mitigate Pollution

15% Create Connection

13% Improve Pedestrian and Bike Safety

12% Green the Neighborhood

7% Be Buildable in 5-10 Years

3% Create Beauty

1% Incremental Steps Toward Decking

1% Preserve Neighborhood Character

Workshop participants ranked project objectives prior to creating a goal statement. 28% gave top priority to reducing noise.

identifying the north end of the trench as the noisiest area. Side streets received fewer markings, apart from a cluster beyond the project area on northern Clinton Street.

Noise reduction was identified by a plurality of participants as the most important goal for the project. Other high-priority objectives included mitigating air pollution, creating connections among the neighborhoods, improving pedestrian and bike safety, and greening the neighborhood.

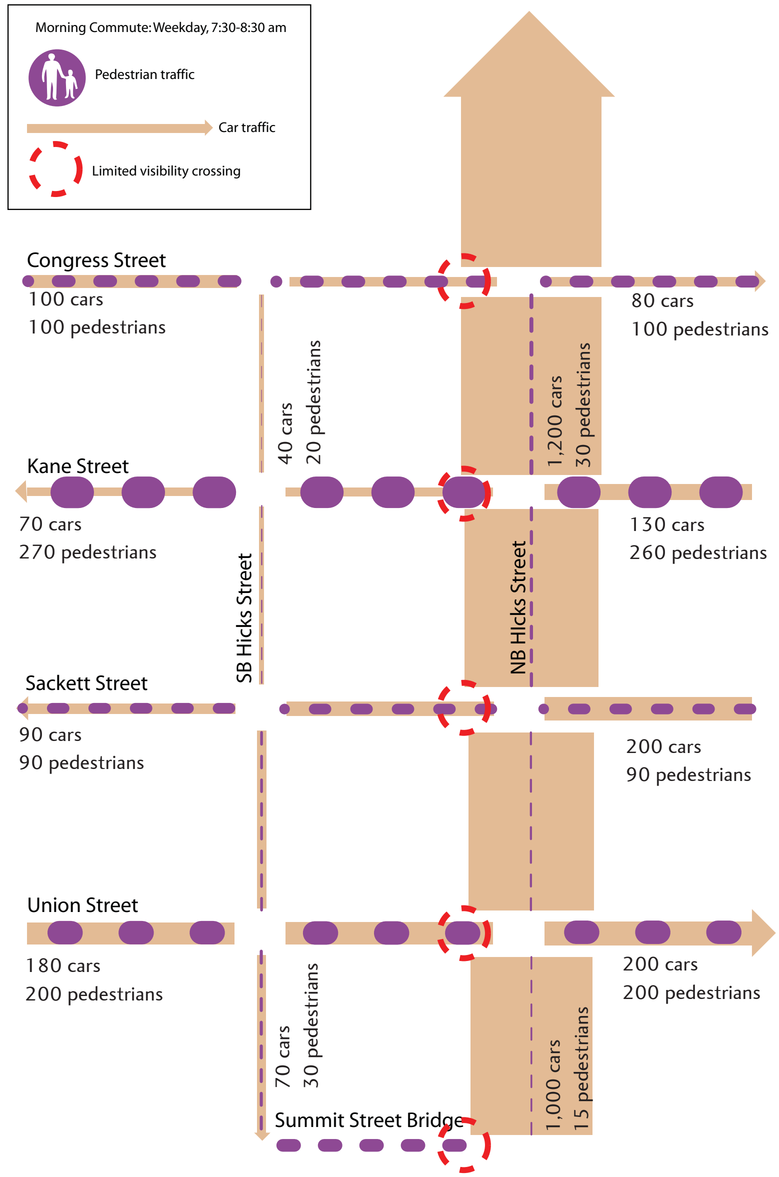
Finally, participants helped craft a goal statement for this study. After working separately in small groups, attendees assembled an aggregated goal to guide the project:

> "Develop an achievable vision for enhancing the pedestrian and cyclist environment above the BQE, adding green components and improving the physical connection and sociability among the adjacent neighborhoods."

Before the design team could take action on this mandate, they needed to develop a more in-depth understanding of existing conditions in the project area.

Traffic

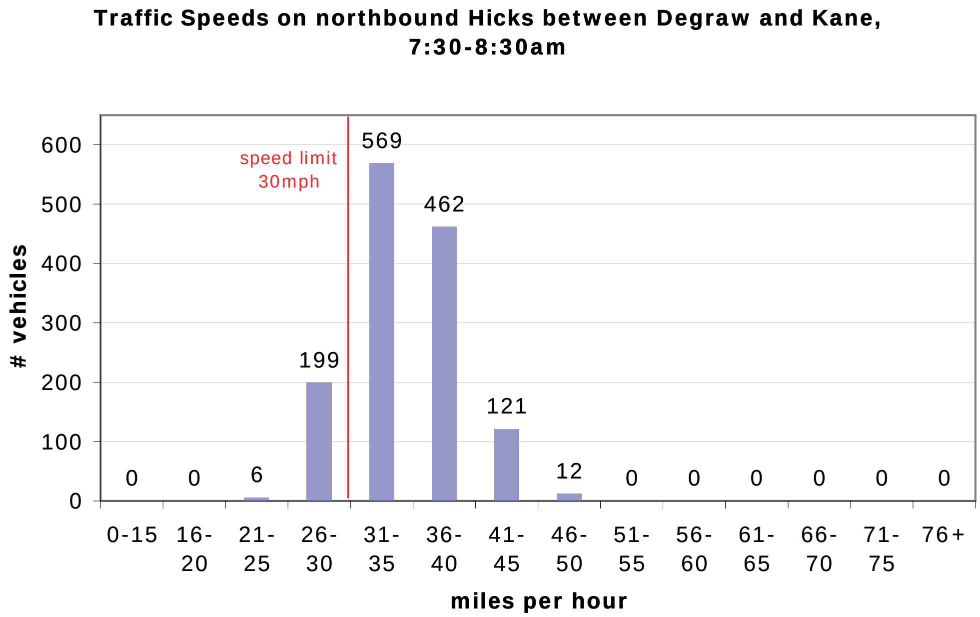
Participants' analysis of dangerous pedestrian conditions largely concurred with the traffic analysis performed for this project. On northbound Hicks Street, the trench perimeter fence blocks pedestrians' view of oncoming traffic and drivers' view of pedestrians, creating a potentially dangerous condition that is exacerbated by high traffic volumes. Automated traffic counts performed in April 2010

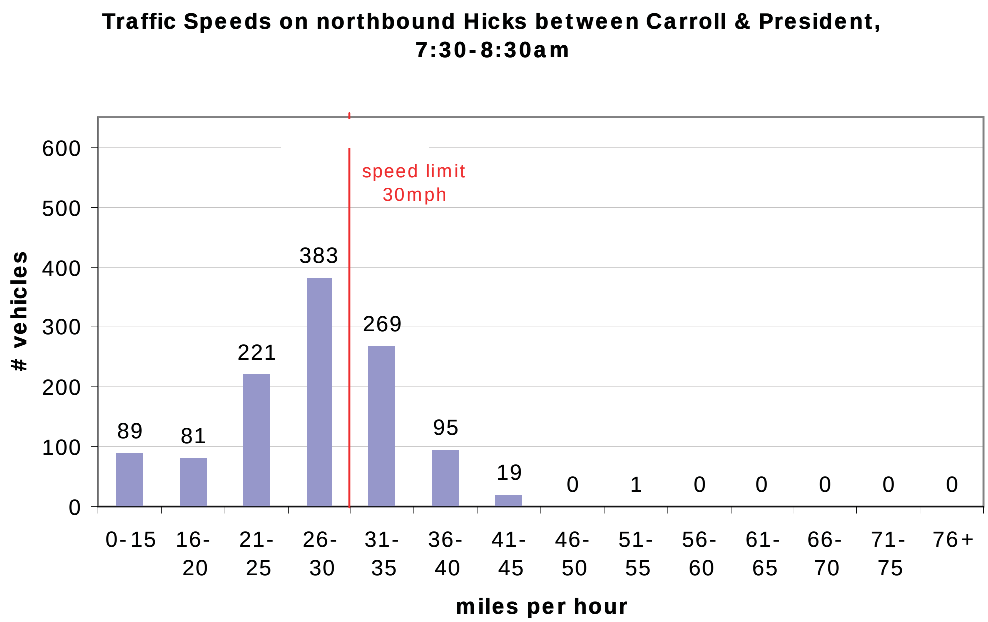


Traffic volumes in the project area during the 7:30 - 8:30am peak travel time.

found northbound traffic volumes on Hicks of 1,000 to 1,200 vehicles during the morning peak travel time (7:30 to 8:30am). During the same hour, 200 pedestrians each cross northbound Hicks at Kane and Union Streets, 100 each cross at Congress and Summit, and an additional 90 at Sackett Street (see diagram, following page). Not only are pedestrians forced to lean into traffic to find a safe crossing opportunity, they must contend with a significant amount of traffic while crossing.

The width of Hicks Street adds to the problem. Each side of the street is roughly 28’ wide. On southbound Hicks Street, width creates unnecessary capacity: the road’s 7’ parking lane, and variable-width travel lane serve only 40-70 cars during the morning peak. Northbound Hicks sees peak travel of 1,200 vehicles in the same space; its 28’ width comprises two full-time travel lanes and a shared parking/travel lane. Because this third lane is reserved for travel during peak times, pedestrians crossing northbound Hicks at the peak hour face three lanes of oncoming traffic.





Northbound Hicks combines high traffic volumes with a wide, straight geometry that encourages drivers, many of whom use the corridor as an alternate route to the slow-moving BQE below, to speed. Speed counts performed in April 2010 confirmed that speeding is a problem. Vehicle speeds were measured at two locations: on a typical block at the south end of the project area, between President and Carroll Streets, and on the long block between Degraw and Kane Streets, near the north end of the project area. At the south end, 33% of cars were speeding. Average traffic speed among speeders was 35mph. On the block between Degraw and Kane, which is roughly twice the length of a typical block with no traffic signals to interrupt vehicle flow, 85% of traffic was speeding, at an average speed of 36mph. According to the NYC DOT, only 20% of pedestrians struck by vehicles traveling 30mph are likely to die, compared to 60% of those struck at 35mph.

For more information on NYCDOT's "That's Why It's 30" campaign regarding relative mortality of speed limits, see: http://www.nyc.gov/html/dot/html/pr2010/pr10_053.shtml

The current configuration of northbound Hicks Street encourages high traffic volumes and speeds, and creates unsafe pedestrian crossing conditions.

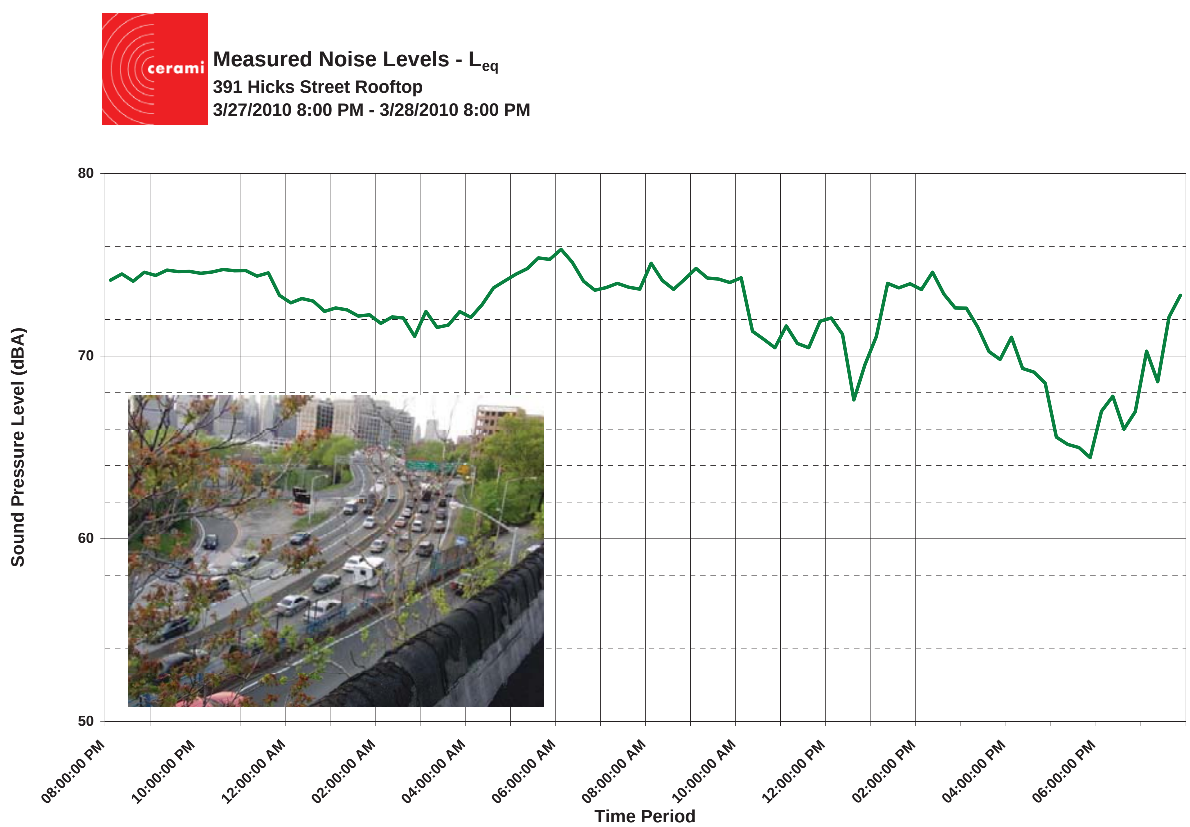
Noise

Noise reduction was the highest-ranked priority for this project, and community members were unanimous in attributing the noise in their neighborhoods to the BQE.

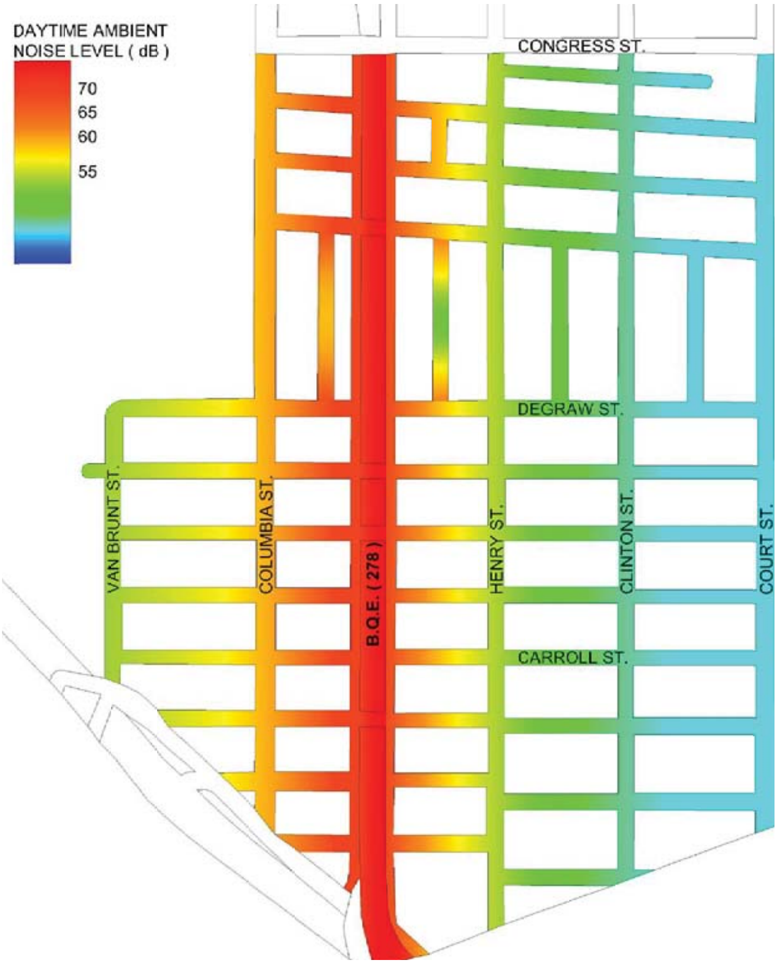
A six-lane highway traveled by roughly 155,000 vehicles per day, the BQE generates a significant amount of noise: engine noise, tire hiss, and horns honking in traffic. A noise study performed in August 2010 as part of this project found that sound levels along Hicks Street remained fairly consistent at 70-75 decibels (dB) throughout a typical 24 hour period, with the exception of a short period around 6pm when levels dipped to 65 dB. The dip in noise at a presumed peak travel time is unexplained; acoustic engineers speculated that trucks may avoid the highway during rush hour, or that gridlock may minimize tire hiss.

A second phase of study examined noise as it relates to distance from the trench. Acoustic engineers took spot measurements at locations increasingly distant from the highway during a typical evening rush hour. As expected, the study found that noise was most intense closest to the BQE, and least intense furthest from the highway.

Noise travels along sight lines: if a noise source is visible, it is also likely to be audible. Interposing a physical barrier between a noise source



Above: Noise levels on the BQE stayed fairly constant during a typical 24-hour period, around 70-75 decibels, with a dip to 65 decibels at 6pm.



Noise levels during evening rush hour were highest near the BQE, and dissipated with increased distance form the source.

and a recipient will noticeably reduce the level of noise experienced. The effectiveness of acoustic barriers are limited, however, by the extent to which noise can travel around or over them. A continuous barrier will have a greater impact on noise levels than one with gaps; barriers that are long and tall compared to their receiving locations will block noise more effectively. In the case of the BQE, a tall, continuous barrier encircling the trench perimeter would attenuate the most noise on Hicks Street and adjacent side streets, reducing noise by approximately 11 dB at street level. This acoustic treatment would not reduce noise meaningfully for residents of upper-story apartments, however; engineers found that such a wall would lead to only a 1dB reduction 40 feet above the street.

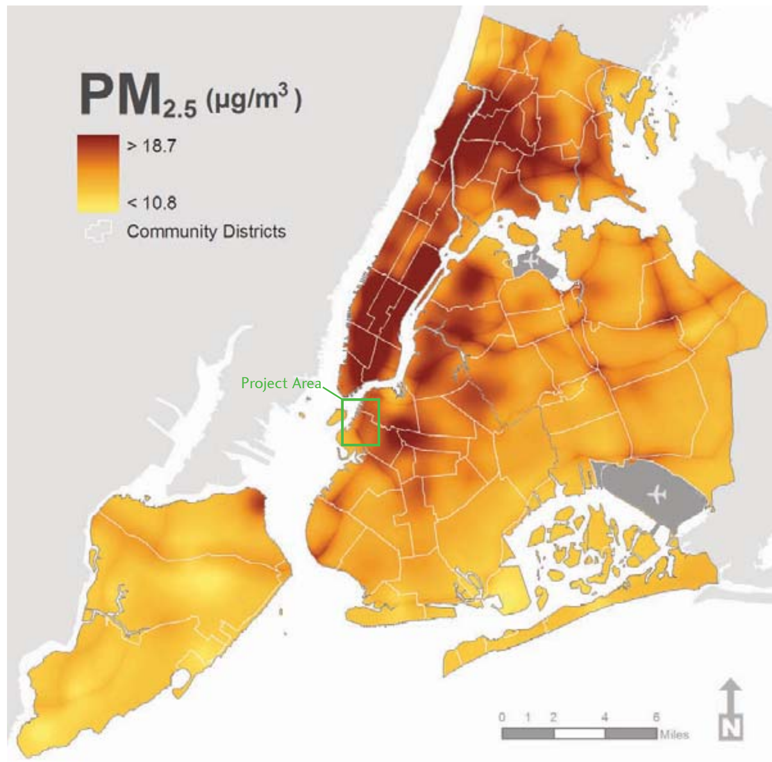
Other measures to control BQE-related noise could include alternative pavements (rubberized asphalt will reduce tire hiss, although not engine noise) or sound-absorbing veneers applied to the trench walls.

Air Pollution

Community members' concern about air pollution was second only to their concern about noise, and available data suggest that several air pollutants are found at slightly elevated levels adjacent to the highway.

Neighborhood-level data on air pollution is difficult to come by, and street-level data nonexistent, but the NYC Department of Health's New York City Community Air Survey (NYCCAS) strives to evaluate local air pollution where possible. According to the Winter 2009 Survey, several pollutants can be correlated to traffic proximity: notably, fine particulate matter (PM2.5), elemental carbon, and nitrogen dioxide.

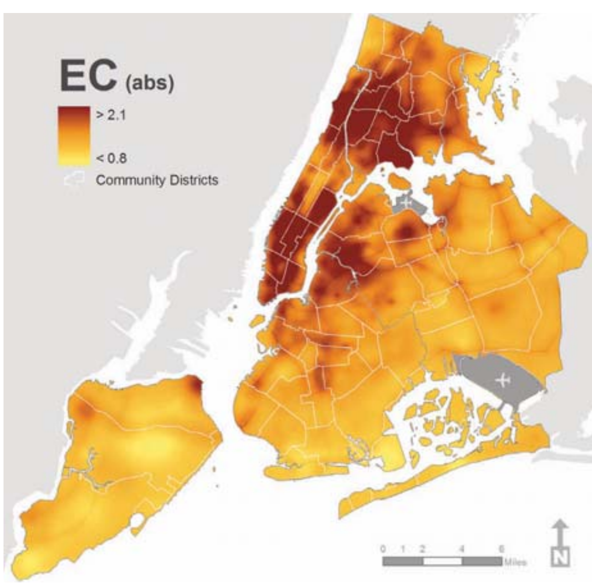
Elevated levels of PM2.5 correlate with two factors: buildings burning particular types of heating oil, and heavy traffic. Although oil-burning heat was a stronger predictor of elevated PM2.5 levels than proximity to traffic, the study found that PM2.5 levels were, on average, 27% higher at sites with heavy traffic than with light traffic. Elemental carbon was found to correlate strongly with concentrations of diesel truck traffic and oil-burning heat, while nitrogen dioxide correlated strongly

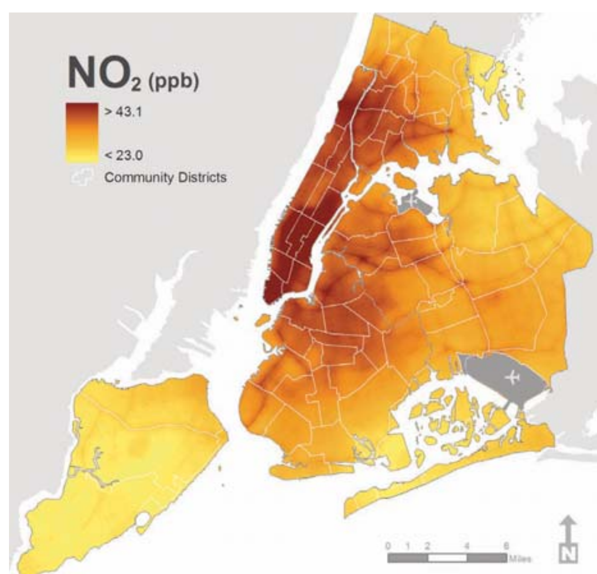


The NYC Department of Health's New York City Community Air Survey Winter 2009 Study found elevated levels of PM2.5 (fine particulate matter) in proximity to highways and areas with higher concentrations of large buildings with oil-burning heating units.

The line of the BQE is visible on the map (right) as an area of elevated PM2.5 concentration. Elemental Carbon (EC) and Nitrogen Dioxide (NO2), below, both correlate to some degree with traffic density.

Read the NYCCAS here: http://www.nyc.gov/html/doh/html/eode/nyccas.shtml





with building density and to a lesser degree with local traffic density.

While the maps below show all three pollutants visibly elevated in the project area, concentrations elsewhere in the city are much higher. Because the NYCCAS winter data currently cover only a single year, it cannot yet identify variations or pollution drift from other locations. Future data will enable such analyses. The data are also not comparable to EPA standards, due to methodological differences. Nonetheless, the data provide an interesting starting point for evaluating spatial variation in pollution across the city.

According to the NYCCAS, the most effective ways of reducing these pollutants are minimizing the number of facilities burning certain types of heating oil, and reducing vehicle emissions, particularly from diesel trucks. Localized, street-level, landscape interventions are not widely credited as having a measurable impact on air pollution, although PLANYC states:

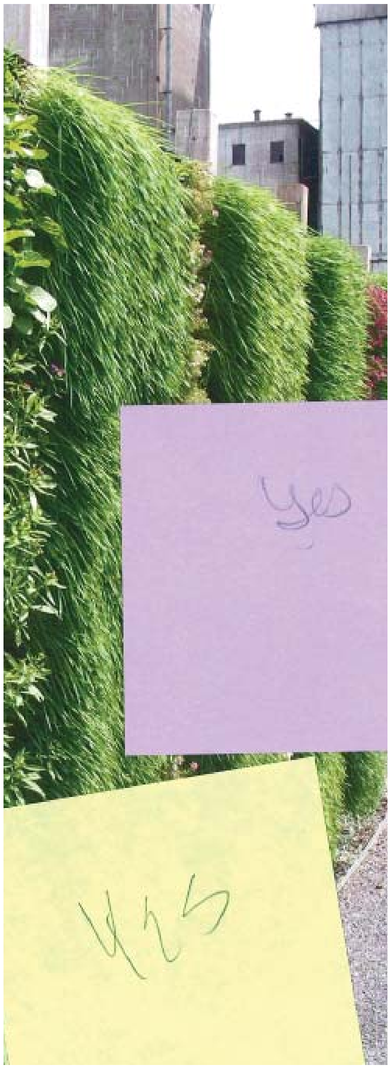
> "Trees in particular are effective at cleansing the air. They do this by absorbing pollutants—sulfur dioxide, nitrogen dioxide, and carbon monoxide—through their leaves and intercepting airborne particulate matter on leaf surfaces."

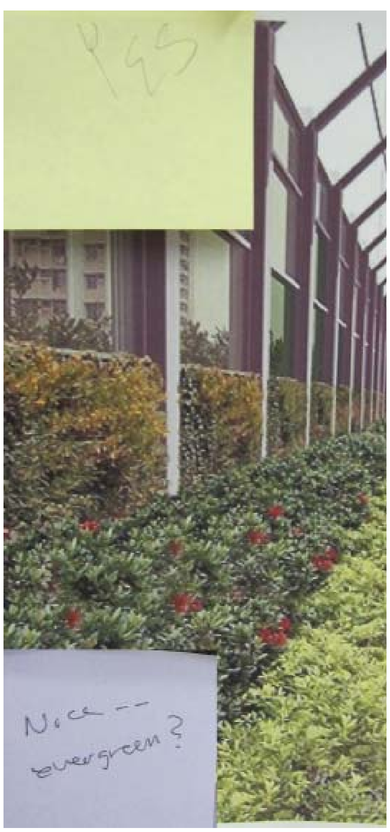
PLANYC is New York City's comprehensive sustainability plan. It can be viewed online at: http://www.nyc.gov/html/planyc2030/html/home/home.shtml

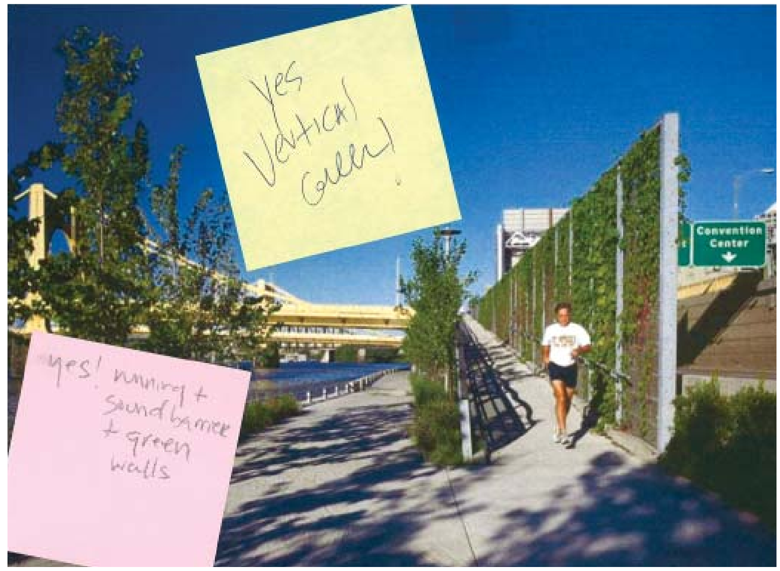
The largest possible air quality improvements in the study area would likely come from curbing tailpipe emissions or curtailing diesel truck traffic on the BQE. As policy interventions of this nature (and physical alterations to the highway itself) are beyond the scope of this project, the design team addressed air quality to the extent possible by maximizing opportunities for plantings. The three final concepts envision a variety of air-purifying vegetation enhancing the study area: trees and water-loving plants in sidewalk beds, drought-tolerant species abutting the BQE trench, hardy container plantings on bridges, and 100,000 square feet of vines growing in the currently empty space above the BQE.

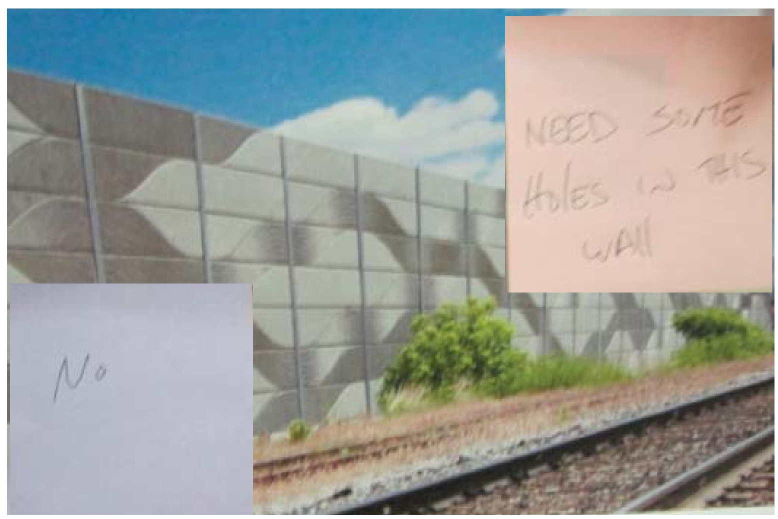
COMMUNITY DESIGN PREFERENCES

In addition to expressing their concerns, workshop participants communicated their desires, annotating an inspiration wall of precedent photos with comments on post-it notes.



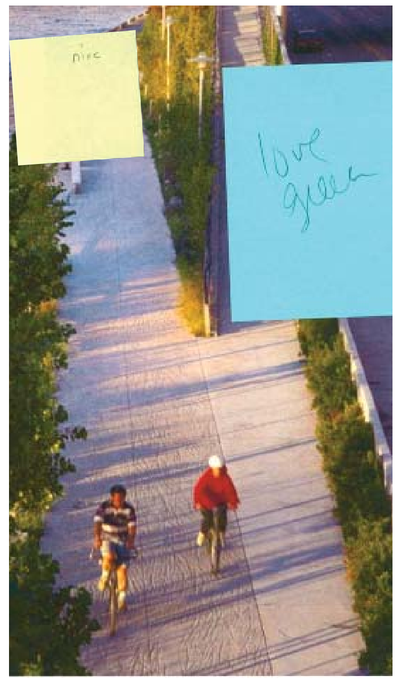


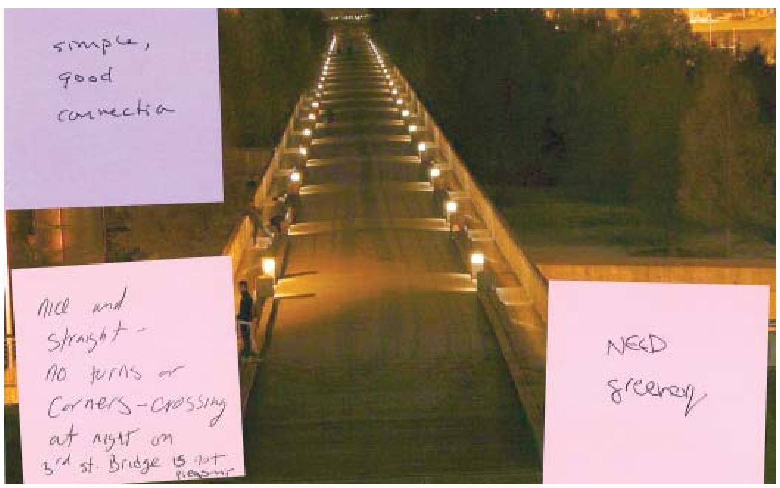


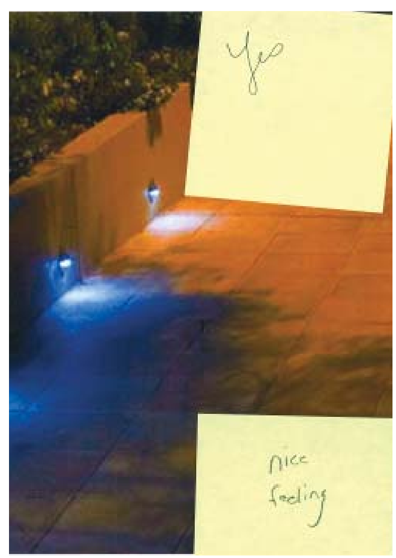


Of all the images, those with green walls received the highest number of positive comments. Green walls that doubled as sound barriers were enthusiastically embraced, although sound barriers (whether concrete or glass) without greenery were rejected.

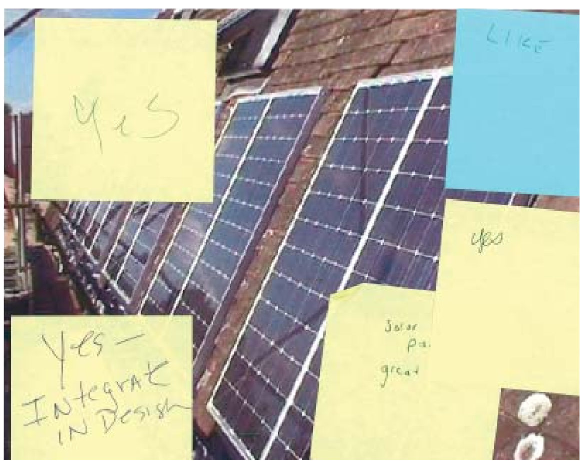
Pedestrian crossings featuring simple, open designs and landscaping elicited more positive feedback. Open, green spaces, and well-lit, simple crossings received high marks, as did playful design. Images of covered crossings were not well-received.

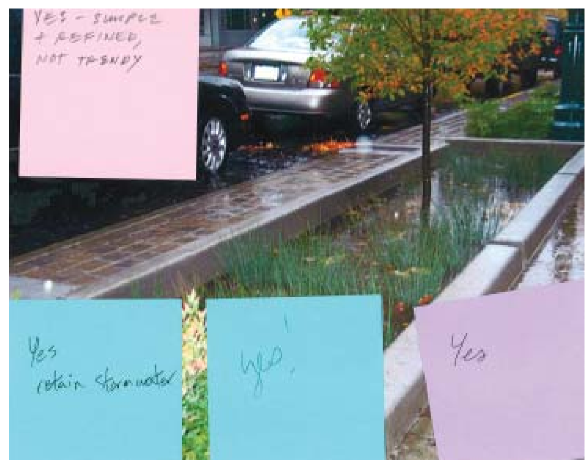






Participants also responded well to images that showed road space reallocated for pedestrian and bicycle use, noting the importance of safety and the potential of pedestrian spaces to activate the street. Concerns about potential maintenance arose regarding more labor-intensive designs.





Photovoltaic panels (PV), also known as solar cells, can convert the sun's rays into sustainable electricity

Finally, community members expressed great enthusiasm for sustainable landscape features beyond green walls: photovoltaic panels and storm water recycling systems received accolades.

By the end of the first workshop, the design team had developed a clear idea of the physical transformations that residents of the project area wished to see: increased greening, pedestrian and bicycle friendly streets, increased connections among the neighborhoods, sustainable elements, and playful, adventurous design. Armed with insight into the community's hopes, their experiences of the BQE, and a host of supporting data, the team crafted five initial designs to transform the project area according to stakeholders' wishes. The community saw the designs at the second workshop, held on July 20, 2010.

INITIAL CONCEPTS

The design team's five initial concepts featured elements from a tool kit developed in response to community input at the May 2010 workshop. These tools, which combined flexibly to create unique solutions, included:

- **plantings** to green the neighborhood, help control storm water, and mitigate air pollution;
- **traffic calming features** to slow traffic and promote pedestrian and bicyclist safety;
- **an acoustic barrier** to attenuate noise emanating from the trench;
- **bicycle & pedestrian bridges** to reconnect severed streets;
- **a cantilevered park** to increase public and planting space along the trench while attenuating noise; and
- **an architecturally distinctive canopy** to visually screen the trench, incorporating vines, photovoltaic panels, and suspended acoustic panels for sound attenuation.

The five initial concepts combined these elements in different ways, illustrating a series of scalable solutions that could be implemented independently or in combination. Participants in the second community workshop were invited to comment on the concepts, identifying aspects of each that they liked and disliked, and assessing how well each concept addressed the project priorities.

Minimum Structure/Maximum Green Version A

Reallocation of travel lanes on both sides of Hicks Street concentrated a continuous zone of lush plantings alongside the BQE trench, including a vertical greenscreen.

Residents Liked:
- Wide Plantings

Residents Disliked:
- Seasonal plantings with minimal impact in winter
- Greenscreen would obstruct views without attenuating noise
- Perceived failure to address traffic problems
- Loss of parking

Minimum Structure/Maximum Green Version B

By distributing Version A's trench-side plantings on both sides of Hicks Street and combining them with traffic calming features and expanded sidewalks Version B proposed to slow traffic, decrease crossing distances, promote storm water reuse, and green more of the neighborhood. An 8' high plexiglass acoustic barrier replaced Version A's greenscreen.

Residents Liked:
- Wide Plantings
- Noise Attenuation
- Storm water Re-use

Residents Disliked:
- Seasonal plantings with minimal impact in winter
- Acoustic panel seen as "cold," "non-residential," "disconnecting," and a visual wall
- Graffiti potential
- Perceived failure to deal with pollution

Enhanced Connections

Bicycle & pedestrian bridges completed the five streets severed by the BQE, effectively reconnecting the Columbia Street district to neighborhoods to the east. This concept included the planting treatments from Minimum Structure/Maximum Green Version A, with the exception of the vertical greenscreen.

Residents Liked:
- Achievability
- Effectively reconnection of the neighborhoods
- Great for bicyclists
- Catalyst for economic development

Residents Disliked:
- Perceived failure to address Hicks Street
- Unrealized potential of bridges to host green walls, sound barriers, solar lighting
- Perceived failure to address traffic problems

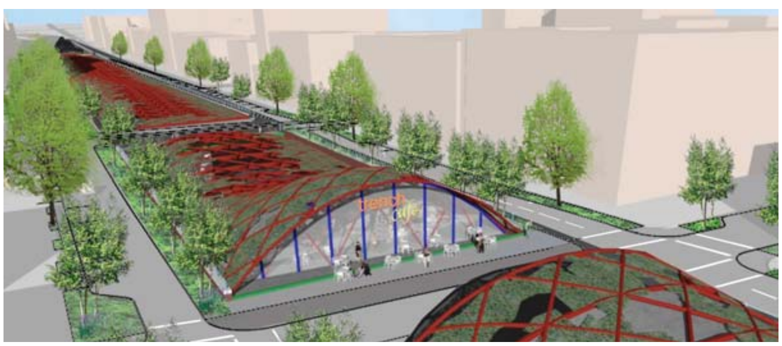
Widened Street/Narrowed Trench

A lushly planted, counterweighted cantilever outfitted with an 8' high acoustic barrier extended ten feet over either side of the BQE, increasing neighborhood open space and improving air quality. This concept originated with a community member.

Residents Liked:
- Perceived as the best design for pollution mitigation
- Perceived as the best design for noise attenuation

Residents Disliked:
- Seasonal plantings with minimal impact in winter
- Acoustic barrier perceived as a wall
- Costly and potentially disruptive to build

Green Screen Canopy



A lightweight steel trellis structure augmented with acoustic panels, vines, and photovoltaic panels visually screened the trench while providing environmental benefits.

Residents Liked:
- Ecological Considerations
- Aesthetics
- Potential to produce green energy/income stream
- Innovation
- Ability to incorporate commercial space

Residents Disliked:
- Repair and maintenance issues
- Aesthetics
- Perceived failure to address traffic problems

The community was quite enthusiastic about some aspects of the initial concepts. Plantings received positive reviews in all locations, although there was some concern that the benefits of plantings (visual transformation of the neighborhood, air filtration) would be reduced in winter. The concept that relied primarily on plantings to transform the neighborhood, Maximum Green/Minimum Structure A, was rejected on the grounds that it did too little; Version B, which combined extensive plantings with stronger traffic calming features, was better received.

Traffic calming measures appealed to the residents, as did bicycle and pedestrian bridges over the trench, which were perceived as achievable and beneficial for cyclists. Workshop participants wondered if these bridges could be made more productive by equipping them with photovoltaics, greenery, and acoustic panels to offer environmental benefits as well as connectivity.

The cantilever design, which originated with the community, was embraced, with participants commenting that it seemed like the best design for both pollution and noise attenuation (although further research would show this to be untrue). They worried, however, that such an ambitious design could be costly and disruptive to build.

The Green Screen Canopy sparked enthusiasm as well. While the structure's aesthetics appealed to some residents and displeased others, its originality was undisputed. Workshop participants were excited by Kiss+Cathcart's incorporation of photovoltaics, acoustic

Participants in workshop 2 used worksheets to rank and respond to the initial concepts.

panels, and passively-irrigated vines, as well as the structure's potential to house retail space and spur economic development.

The perimeter acoustic barrier was the most contested design element; while stakeholders appreciated the potential noise reduction it conferred, many objected to its aesthetics, referring to the translucent plexiglass barrier as "cold," "non-residential," "disconnecting," and "a visual wall." Others expressed concern that the structure would be a target for graffiti.

The three top-rated concepts were Enhanced Connections, Widened Street/Narrowed Trench, and Green Screen Canopy. The most common request from the community was for Enhanced Connections and Green Screen Canopy to incorporate the traffic calming and planting ideas from Maximum Green/Minimum Structure.

The design team accepted the community's feedback and resumed the design process, developing the ideas further and investigating their implications. As part of this process, they met with engineers and City and State agencies under whose jurisdictions the implemented projects would fall, to ensure the projects' eventual feasibility.

Feasibility

New York State Department of Transportation (NYSDOT)

NYSDOT is responsible for the BQE highway facility and the veneers of its retaining wall. NYSDOT's feedback regarding the initial concepts centered on impacts to the BQE itself.

Plantings Abutting the Trench: NYSDOT was concerned that water, soil, and root systems from large trees planted adjacent to the trench wall could damage the wall itself and lead to deterioration and crumbling of the structure.

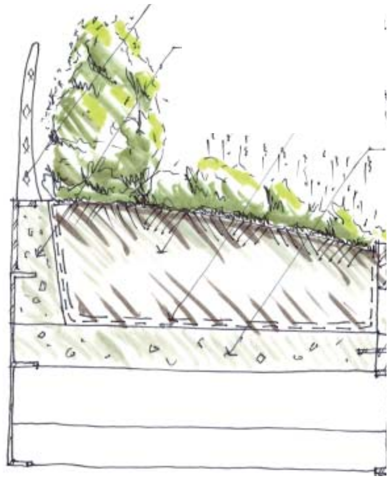
Large trees growing adjacent to the BQE retaining wall.

Bridges: NYSDOT expressed concern about impacts on BQE traffic flow during installation of the bridges, and about the cumulative impact of six bridges resting on the retaining wall. The agency noted that any concepts that increase the loading on the retaining walls and their footings would have to be investigated. Modifications to the walls could have significant cost and construction impacts.

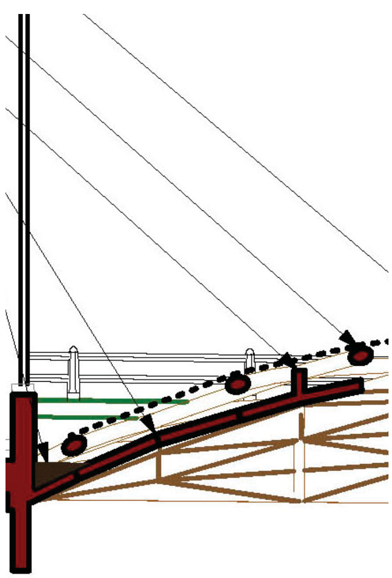
Canopy: NYSDOT needed more clarification on how maintenance and inspection would be performed on the canopy, and how horticultural maintenance of vines could be conducted in such a way that vegetative matter did not fall onto the highway below.

NYSDOT also noted that the canopy could potentially impact air quality for highway users; air and exhaust circulation would need to be analyzed during future design phases.

Maintenance: As part of agency review for the publication of this report, both NYSDOT and NYCDOT agreed that the maintenance associated with any newly built bridges or bridge infrastructure would be the responsibility of the agency initiating their construction.



Initial plans showed soil masses and plantings directly on the surface of existing bridges, which did not accommodate NYCDOT's need to inspect the bridges every 2 years.



The Green Canopy's initial tube structure presented difficulties for NYCDOT inspectors.

New York City Department of Transportation (NYCDOT)

NYCDOT is responsible for inspection, maintenance, and cleaning of the City's surface-level streets and 786 bridges. Because all bridges must be inspected every 2 years, by Federal mandate, NYCDOT's comments largely focused on inspection concerns.

Plantings on Existing Bridges: NYCDOT was concerned about proposed masses of soil and plantings on bridges. Soil would obscure bridge decks and interfere with inspections, while water and roots could lead to structural deterioration. NYCDOT requested that plantings on bridge surfaces be restricted to moveable containers.

Additional Bridges: While NYCDOT representatives agreed that additional bridges could prove valuable in reconnecting the neighborhoods, they emphasized the need for operational funding to defray the additional inspection and maintenance costs of any new bridges. Additionally, NYCDOT clarified that their staff would not maintain any plantings.

Canopy: NYCDOT was concerned that initial drawings showed the canopy made of tube, as the inner surface of the tube would be inaccessible to inspectors. Assuming that the agency would bear the same responsibility for the canopy as for a new bridge, NYCDOT requested that the canopy be constructed of beams and angles instead.

Retail Bridges: NYCDOT cited several precedent cases in the City: Newkirk Plaza, Fordham Plaza, Foster/Newkirk on Q line, Whole Foods below the Queensborough Bridge/Honey Locust Park.

New York City Department of Parks and Recreation (DPR)

DPR oversees the Greenstreets program, for which some of the proposed planting beds might be eligible, and is responsible for maintenance of all NYC street trees. DPR was primarily concerned with maintenance.

Acoustic Maintenance: DPR identified potential concerns for the entity responsible for ongoing maintenance of a continuous acoustic panel at the trench perimeter, suggesting that it would be a target for graffiti.

Plant Maintenance: Due to the limited width available for planting on Southbound Hicks Street, DPR requested an 18" pedestrian refuge strip be added to the trench buffer plantings. This strip would consist of a 6" curb + 1' cobble band along the outer perimeter of the planting bed, to enable workers to safely perform maintenance. DPR also emphasized the need for operational funding, and the importance of establishing a community partner to assist with maintenance. With regards to the 1' trench buffer planting zone proposed on northbound Hicks, DPR strongly advised against planting this area and would not be able to maintain it due to safety concerns.

New York City Department of Environmental Protection (DEP)

DEP is the agency responsible for the City's sewer system and drainage. Their comments related to ensuring compatibility with agency infrastructure and procedures.

Catchbasins and Water Mains: DEP emphasized that all storm water swales would need backup overflow drainage into the sewers. Catchbasins would need to be located downstream of all swales, but upstream of ADA-accessible sidewalk ramps. Any catchbasins affected by revised sidewalk geometry (bump-outs and sidewalk extensions) would have to be relocated appropriately. Water mains in the streets must have 5' minimum clear horizontal distance from curb edges for maintenance; water mains whose clearance would be reduced by bump-outs would need to be relocated. Water mains disturbed by construction equipment or processes might require replacement. Relocated and/or replaced water mains would need to meet all restrained length requirements. DEP would need to review and approve detailed plans of all proposed work before construction could begin.

Swales, like this one in Portland, Oregon, are low-lying planting beds engineered to capture and retain storm water.

Additional Drainage Capacity: The five proposed additional bridges and the canopy would divert rainwater normally handled by infrastructure in the highway trench to the side streets. Although proposed swales would increase streets' capacity to handle stormwater to some extent, no calculations have been done at this stage to ensure that the designs provide adequate capacity to offset this increased storm flow. Future design phases would need to investigate potential for flooding from this increased storm flow. Detailed plans, sub-soil borings, and infiltration/capacity calculations would need to be submitted to DEP for final approval before construction could begin.

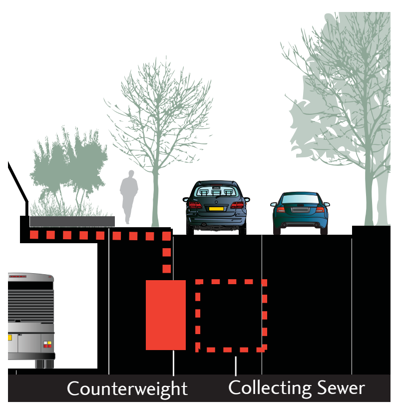
Cantilever: Construction of the cantilever would necessitate burying a large counterweight in the roadbed. Between Carroll Street and Congress Street, a DEP collecting sewer under the centerline of Hicks Street northbound increases in size from 48" to 90" in diameter. DEP determined that it would be extremely difficult to engineer the cantilever in such a way that its construction would not damage the sewer, and future sewer maintenance would not undermine the cantilever's structural integrity.

Outcomes

The design team modified the concepts in response to feedback from community stakeholders and agency representatives:

Concept 1: Minimum Structure/Maximum Green

- 1' planting strip on northbound Hicks Street eliminated
- 18" cobble maintenance strip added to trench buffer plantings on southbound Hicks
- Soil masses on bridges replaced with moveable container plantings
- Bump-outs and swales redesigned to accommodate catchbasins
- Acoustic barrier and greenscreen reconceived as optional



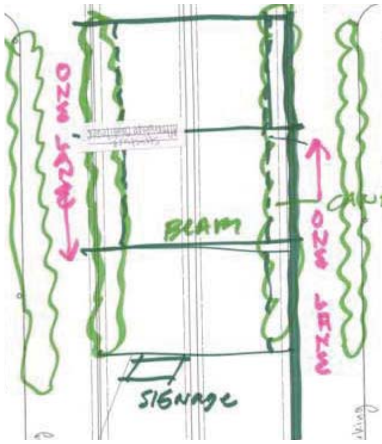
A combined collector sewer runs below the centerline of northbound Hicks Street from Carroll Street to Amity Street. The sewer increases in diameter from 48" to 90", greatly complicating construction of a cantilever.

Concept 2: Enhanced Connections

- Incorporated road configurations and plantings from Concept 1
- Additional options incorporated for bridges: planting, decorative lighting, infill acoustic panels, and energy-generating photovoltaic panels.

Concept 3: Widened Street/Narrowed Trench

This concept was eliminated from consideration during this phase of design development. DEP's assessment of the logistical difficulties contributed to this decision, as did a preliminary estimate that the cost of the cantilever would roughly double the cost of the green screen canopy. Finally, acoustic analysis revealed that the cantilever (with acoustic barrier) reduced sound by only half a decibel more than the acoustic barrier on its own. Without any unique benefit to counterbalance them, the high costs and logistical difficulties spelled the end of the cantilever.



One group of workshop participants suggested an alternate way of supporting the cantilever—but it proved impractical.

Community members at the second workshop suggested an alternative that featured a flat beam framework supporting 12'-15' wide planted areas overhanging the trench. Preliminary analysis revealed that the beams would have to be at least 36" deep to support the loads, and, at the spacing required, would create a visually near-solid cover. Greater spacing would necessitate even deeper beams. The anticipated size, cost, and appearance of the members rendered this solution infeasible.

Concept 4: Green Screen Canopy

- Structure revised to eliminate tubular components
- Incorporated road configurations and plantings from Concept 1
- Incorporated bridges from Concept 2

Kit of Parts

During this development phase, the design team made many alterations in accordance with the community's desires, and also reconceived the final designs as scalable combinations of elements from a flexible kit of parts. Rather than defining options, the team saw its job as creating a menu from which the community might pick and choose.

On November 15, 2010, the design team presented the three final conceptual designs and its menu of options to members of the community, agency representatives, and elected officials**.** The three design concepts were intended to be feasible, buildable within five to ten years, and compliant with agency preferences and guidelines. Rough capital and maintenance cost estimates were provided for each concept and broken down incrementally to facilitate use of the menu.

CONCEPT 1: MAXIMUM GREEN

Maximum Green would combine road realignments with planting to prioritize pedestrian safety and streetscape beautification. By employing a toolbox of traffic calming elements, including chicanes, bump-outs, extended sidewalks, and protected parking lanes, this concept would improve pedestrian sight-lines, reduce crossing distances, and slow traffic speeds. It would also green the neighborhood, adding nearly 1 acre of green space that incorporates more than 400 new trees, and retain and reuse storm water.

Maximum Green

Traffic Calming

Maximum Green would calm the traffic on northbound Hicks Street while taking advantage of southbound Hicks' unused capacity. By re-allocating traffic and parking lanes and adding sidewalk space, the design would reclaim 6,522 square feet for pedestrian use, shorten crossing distances by an average of 11 feet, and create new public spaces on the existing bridges.

Northbound Hicks Street

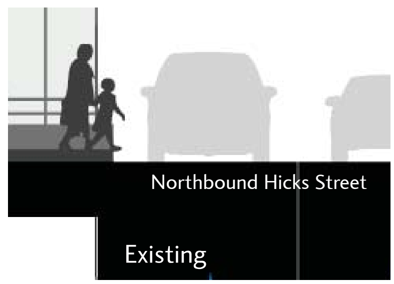
With two to three lanes of fast-flowing, comparatively heavy traffic, northbound Hicks Street poses a problem for pedestrians. Drivers using Hicks as an alternate route to the BQE treat the street as a highway, not part of a residential neighborhood. Obstructed sight lines crossing the BQE make pedestrian crossings difficult and dangerous. Maximum Green would address these concerns through hardscape modifications designed to slow traffic, re-introduce the rhythm of the street grid, and shorten pedestrian crossing distances.

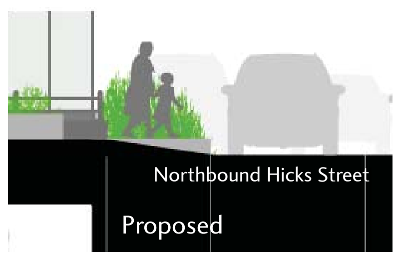
Chicanes shift travel lanes to one side, slowing vehicle speeds.

The existing part-time travel lane on northbound Hicks would be converted to a full-time, permanent parking lane. Concrete bump-outs at the corners would narrow the road to two lanes, preventing drivers from using the parking lane for travel, and creating additional sidewalk space that would shorten pedestrian crossing distances.

The corner bump-outs would function in tandem with extended sidewalks to create a pattern of chicanes that would shift the travel lanes slightly to the east at every cross street. By removing long, straight lanes that encourage speeding, this rhythmic undulation of the street would prevent drivers from treating the street like a highway, slow traffic at intersections, and attune drivers to the pattern of the underlying street grid.

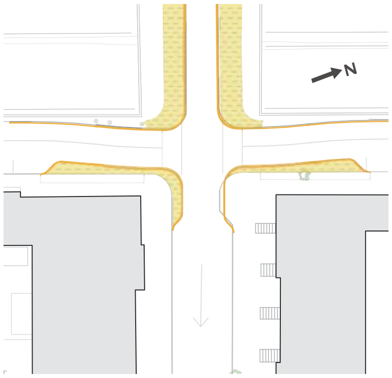
To create the chicanes, sidewalks on existing bridges at Congress, Kane, Sackett, and Union Streets would be extended 6' beyond the line of the trench perimeter fence. This would remove the sight-line obstruction of the fence, creating a safe place where pedestrians could see and be seen by oncoming traffic. Combined with corner bump-outs on the east side of the street, the sidewalk extensions would reduce average crossing distances by 10 feet.





Extending the sidewalks of existing bridges into northbound Hicks Street creates a safe place where pedestrians can see and be seen.

CONCEPT 1: MAXIMUM GREEN - Street Design



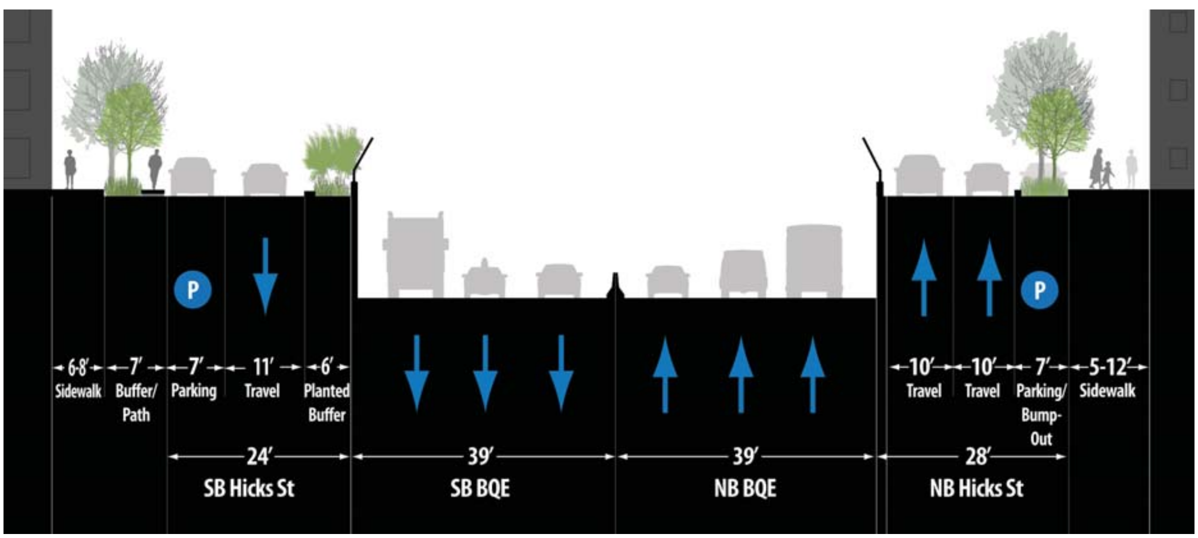
Chicane detail at Northbound Hicks Street. Extended bridge sidewalks and corner bump-outs combine to shorten pedestrian crossing distances and induce vehicles to observe speed limits.

By slowing drivers at intersections, shortening crossing distances, and improving sight lines, Maximum Green would create a safer pedestrian environment on northbound Hicks.

Southbound Hicks Street

Conditions on southbound Hicks differ significantly from those on the northbound side. Similar in width to the northbound side, the southbound side comprises a permanent parking lane and just one travel lane, with ten feet of unused buffer space. Maximum Green would take advantage of this buffer to create additional planting and pedestrian space.

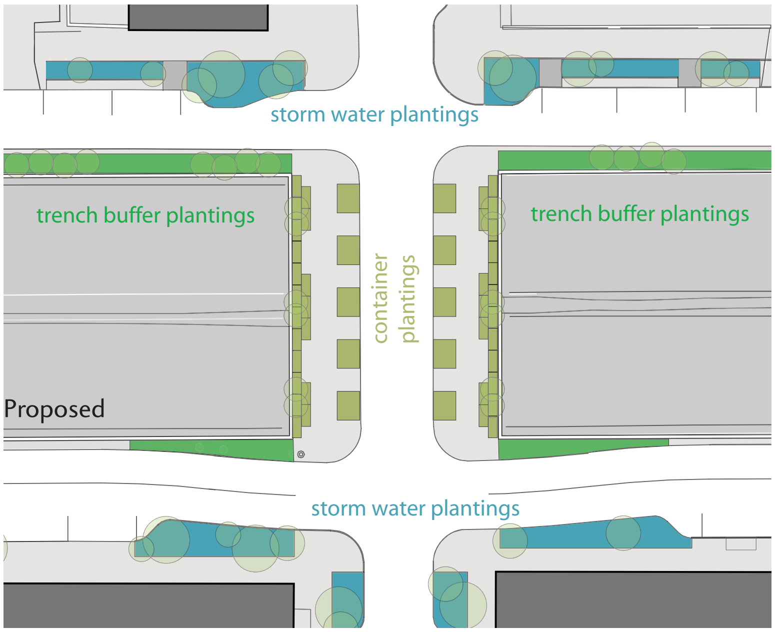
Sidewalk extensions would reclaim asphalt buffer space, reducing the road width from 29 feet to a more reasonable 18 feet, comfortably accommodating a 7' parking lane and an 11' travel lane. Beside the trench, a 6' curb extension would hold a long, planted buffer that would soften the effect of the trench. Flanking the parking lane on the west side of the street, a 4' curb extension would carve out space for a continuous street-edge planted swale that would collect and filter storm water before using it for irrigation. A curbside paving strip would enable drivers to access parked cars without getting their feet wet. Concrete bump-outs at the corners would create a protected parking lane and work with extended bridge sidewalks to shorten pedestrian crossing distances by an average of 12 feet.



Revised geometry of Hicks Street, mid-block. From west to east: planted curbside swales and a trench-side buffer make use of the unused space on southbound Hicks; travel lanes are reallocated and a protected parking lane created on northbound Hicks.

Existing Bridges

A typical existing bridge over the BQE features a 20’ travel lane, flanked on either side by 10’ parking lanes and sidewalks. Maximum Green would eliminate the parking lanes and widen each sidewalk by 10’, creating expanded pedestrian spaces that align with extended curbs at corner bump-outs. Plantings could turn these sidewalks into miniature public plazas.



Typical intersection at existing bridge (above). Maximum Green (left) would reduce pedestrian crossing distances, expand sidewalks and slow traffic.

Three distinct landscape typologies would combine to create a vivid landscape. Drought-tolerant plants would line the trench; water-loving plants would filter and reuse storm water on street corners, and hardy species would line existing bridges in containers.

Planting

Save for a few street trees, the current environment above the BQE trench is largely composed of concrete. Neither southbound Hicks, with its wide street and moderately wide sidewalk, northbound Hicks, with three travel lanes and narrow sidewalks, nor the existing bridges feature much greenery. Maximum Green would transform this space into a sustainable, green, welcoming place featuring three distinct landscape typologies.

Storm Water Swales: wet plantings

Both sides of Hicks Street slope away from the BQE trench. During rain events, water sheets across the road surface to the downslope

CONCEPT 1 : MAXIMUM GREEN - Planting Plan

Planting areas would feature different treatments. Planted swales at the street edges would showcase water-loving plants and trees (top); the trench buffer (middle) would hold drier plants; and containers on bridges (bottom) would house drought-tolerant species.

curbs, where it pours through catchbasins into a combined sewer and makes its way to the river. Maximum Green proposes to intercept the rainwater by installing swales on the downslope sides of the road. On southbound Hicks, planted swales would populate the 4' of sidewalk space gained through curb extensions, as well as areas at the corner bump-outs. On the northbound side, plantings would be confined to the bump-outs. Runoff would flow through curbside grates into the swales, where it would be absorbed through soil and stored below the surface in collecting tanks. Excess water from the southbound side could be pumped across the southbound lanes, below ground, to irrigate the trench buffer planting (see pg. A-9 for details).

Storm water swales and bump-out plantings could provide ideal opportunities for maintenance by community partners. Such partners could water during dry spells and perform intermittent horticultural maintenance. These easily accessible, highly visible planting beds could be rewarding locations for volunteer labor. (No community groups have yet been identified to fill this role, and a partnership of this kind would require further exploration.)

Trench Buffer Planting: dry plantings

The trench buffer, a 6' wide strip of planting running the length of the trench on southbound Hicks, would feature drier plants than the storm-water swales. Primarily passively irrigated, the buffer plantings could also receive water from the swales via underground pumping (see pg. A-9 for details).

An 18" cobble pathway would provide safe maintenance access to the buffer strip. Where possible, conceptual plans for the trench buffer include water service connections.

Existing Bridges: drought-tolerant plants

In order to accommodate NYCDOT's need to conduct biennial inspections, plans to "green" the existing bridges do not feature in-ground plantings. Instead, plans specify shrubs and small trees in moveable containers of various sizes to create shade, visual interest, and places to stop for a chat on the bridges.

Required seasonal watering could be handled by DPR or by community partners. The plan and estimate for Maximum Green provide for water service at each bridge.

Optional Elements

In addition to hardscape and landscape treatments, Maximum Green incorporates several options for additional improvements.

Bridge Treatments

Sidewalk expansions and plantings would transform the existing bridges into pleasant, social spaces; strategically placed street furniture could encourage passers-by to stay and activate the bridges, turning interstitial areas into destinations. Higher traffic streets like Union might be able to support newsstands at the corners. The expanded sidewalks, with their captive audience of residents crossing the trench, could be ideal locations for temporary farmers' or flea markets. (Any use of bridges for commercial purposes would require coordination with NYCDOT.)

Perimeter Acoustic Barrier

Workshop 1 participants rated noise reduction as their highest priority, yet the hardscape and landscape treatments of Maximum Green do not meaningfully reduce noise. A continuous acoustic barrier would.

An 8' high, continuous plexiglass acoustic barrier would reduce noise on the street by 11 decibels, while minimally affecting views across the trench. This barrier could be erected behind the existing chain-link fence and concrete parapet wall, or it could be fronted by other treatments that might serve to deter graffiti. By restricting access to the surface of the acoustic barrier with an object of visual interest, an artistic fence would break up the solid canvas and make graffiti more

Four visions of a typical bridge. Clockwise from upper left: section of existing typical bridge; section of bridge reconfigured through Maximum Green with added planters and furniture; Maximum Green bridge with added newsstand; Maximum Green bridge hosting a temporary market, e.g. the "BQE Flea."

difficult to apply. Design of such a fence could provide an opportunity to showcase the work of local artists. (See pages A-1 and A-2 for examples of fences.) A vertical greenscreen rooted in the soil of trench-side planting beds could further disrupt the acoustic barrier's visual continuity, and make it even less appealing for vandals, while contributing to a greener environment.

While the green screen or fence would interrupt the visual continuity of the acoustic barrier, they would also reduce visibility across the trench. A vocal minority of community members prize the visual openness of trench, and consider it more important to preserve the expansive view than to attenuate noise.

While the acoustic barrier would significantly reduce noise at street level for pedestrians and residents of first-floor apartments, it would do little to dampen sound reaching upper-story dwellings. According to engineering analysis, only 1dB would be reduced 40' above the trench.

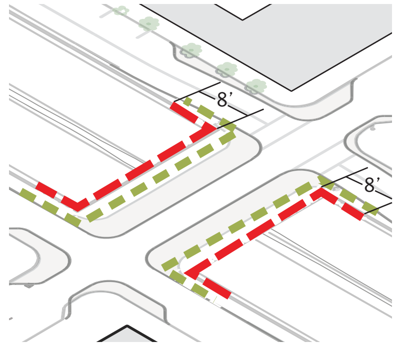
If a continuous barrier surrounding the trench were to prove infeasible,

An 8' high, continuous acoustic barrier encircling the trench (shown here with the existing parapet wall and chain-link fence) has the greatest effect on sound attenuation, reducing 11.3 decibels of noise. Some see it as a magnet for graffiti.

Replacing the existing chain-link security fence with an artistic fence could break up the visual field sufficiently to deter graffiti artists; the fence also interrupts the view across the trench. Coming to consensus about the aesthetics of such an element is an added challenge. See pages A-1 and A-2 for some examples of fence types.

A vertical greenscreen rooted in trench-side planting beds further deters graffiti artists, while contributing to a greener neighborhood. It also reduces visibility across the trench.

the community could opt for partial acoustic enclosures at the bridges. A partial enclosure would be governed by the same principles as a full enclosure: the more difficult it is for sound to flank around the barrier, the more effective the noise reduction. For maximum efficacy, a barrier should extend the length of a bridge and wrap around to encircle the trench sides for a minimum of eight feet.



Optionally, an acoustic barrier, shown here in red, could be erected at existing bridges only. In order to block sound effectively, the barrier would need to wrap around the trench for 8' at each corner.

Costs

All costs are approximate, estimated in 2010 dollars, and based on conceptual designs only. The purpose of the estimates is to provide preliminary figures that may facilitate the identification of future funding. Actual costs may vary with design changes and through the development of more detailed designs.

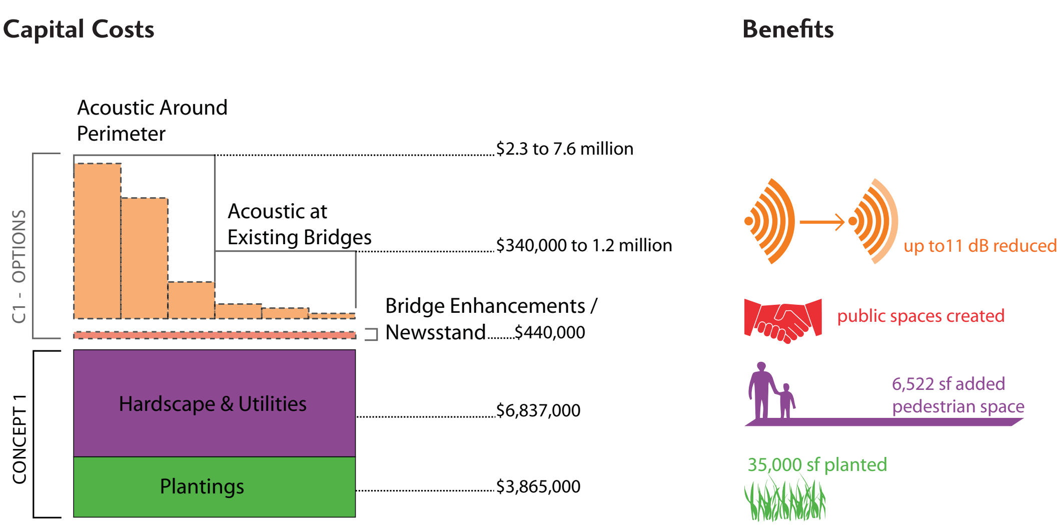
Capital Costs

Hardscape modifications would necessitate some demolition and removal of existing curbs, pavement, and sidewalk areas; relocation of some catchbasins and water mains; installation of a sub-surface catchment and irrigation system, new asphalt, sidewalk, and curbing; and lane re-striping. Other anticipated costs include modification of traffic signals, possible relocation of utility infrastructure, and traffic maintenance during construction. The estimated cost for this work, including escalation and contingency, is $6.84 million.

Planting costs include site preparation, fill material, and topsoil for nearly 1 acre of in-ground plantings; 412 new trees of varying sizes; 80 moveable planters; and over 53,000 square feet of shrubs and ground cover species. Estimated cost is $3.86 million.

Additional bridge treatments, including benches, trash receptacles, their installation and any necessary painting and repairs, are estimated to cost $387,000. Utility connections for a newsstand would be $30,000, not including the cost of the newsstand itself or necessary licensing fees, which would be paid by the operator.

A plexiglass acoustic barrier encircling the trench would cost $2.38 million. Replacing the parapet wall and adding an artistic fence would



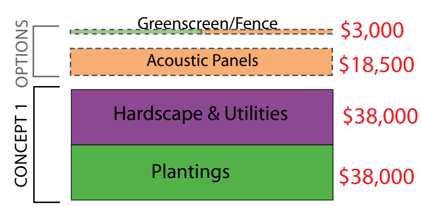
increase the cost by $5.36 million (depending on details of the fence), compared with $7.5 million for artistic fence with intermittent greenscreen.

Maintenance Costs

Maximum Green would require new resources for maintenance, although community partners (as yet unidentified) could alleviate some of the burden by taking responsibility for watering some planted areas. Anticipated maintenance items include: horticultural maintenance and trash removal by DPR workers; cleaning, maintenance, and eventual replacement of irrigation systems; costs to DEP for cleaning and repairing additional catchbasins; NYSDOT inspection of acoustic panel; maintenance and cleaning of a continuous acoustic barrier and greenscreen/fence; and cleaning and trash collection on bridge plazas. The total anticipated cost (in 2010 dollars) for this work over a 25-year period is $2.4 million; spread over 25 years, this annualizes to $98,000. Costs would not be equal year to year. Elimination of the acoustic panel, greenscreen, fence, and/or bridge plazas would reduce the cost. Full costs are outlined on pages A-37 and A-38.

Maintenance costs were developed by Starr Whitehouse based on estimates from VJ Associates that were modified using information from several sources. The resulting figures are preliminary only, and should be refined in the future in coordination with the appropriate agencies.

Annualized Maintenance Costs



Incremental Implementation

Maximum Green could be implemented incrementally. A first step could be to test traffic calming modifications with temporary barriers and paint. If the measures seemed effective and desirable, the scheme could be enacted on a block-by-block basis, or as funds become available. Applying hardscape and plantings on a typical block (275 linear feet on both sides of the BQE, or 1/12 of the total site area) would cost $890,000. Adding bridge amenities would cost $97,000 per bridge. The acoustic barrier could be erected around the trench on a single block for $200,000, and fronted by artistic fence for an additional $450,000, or by the fence with greenscreen for $630,000.


Maximum Green

CONCEPT 2: CONNECTIONS

Connections would incorporate Maximum Green's hardscape and planting into a greater scheme to reconnect the Columbia Street Waterfront neighborhood with its eastern neighbors. Five new pedestrian and bicycle bridges would span the trench at sundered cross streets; the Summit Street bridge would be replaced by an ADA-accessible upgrade.

Connections

Pedestrian & Bicycle Bridges

Connections would reduce the impact of the BQE trench on residents' lives by making the trench more convenient to cross. Five new pedestrian and bicycle bridges would reconnect the streets severed by the trench: Warren, Baltic, Degraw, President, and Carroll. Combined with the traffic calming measures outlined in Maximum Green, the bridges would make neighborhood amenities more accessible for everyone.

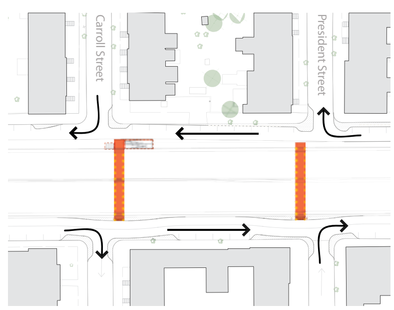
Bridges

Reconnecting the streets is a simple solution to increasing connectivity among the separated neighborhoods. The question is, whom should the connections serve? Community members' interest in reconnecting the neighborhoods largely revolves around difficulties they currently face while conducting everyday business: shopping, accessing transit, getting children to school, and so on. Fully reconnecting the streets would require a significant construction project with major disruptions to traffic on the highway below, without necessarily meeting the project goals. Lightweight bicycle and pedestrian bridges, if designed properly, could be implemented with minimal disruption, and would not add more cars to the road.

In light of these considerations, the design team chose to reconnect the streets with truss bridges. These bridges are self-contained, fabricated off-site, and could be set into place overnight once their abutments were prepared. 80' long and 13' wide, with concrete decks, the structures would be lightweight enough to sit on the existing BQE walls (with minor modifications), obviating the need for extensive new foundations.

To emphasize their non-vehicular nature, the bridges would align not with the existing streets, but with sidewalks. This, along with physical barriers, would deter drivers from interpreting the visual connection across the trench as a vehicular route, while creating a more seamless pedestrian experience. To minimize conflicts with motorists, bridges would align with sidewalks that did not encounter turning traffic. For example, at Carroll Street, where traffic flows east to west, a bike/ped bridge would align with the north sidewalks. Vehicles turn south from Carroll onto Hicks, and west from Hicks onto Carroll; at both locations, pedestrians crossing in line with the northern sidewalk would avoid

Top, a box truss bridge in Manchester, England, equipped with acoustic panels. Bottom, a pony truss bridge in Indianapolis. Connections could be completed with either kind of truss, or with a combination of multiple types. Bridges of different types, colors, or details could impart a sense of whimsical individuality to the crossings.



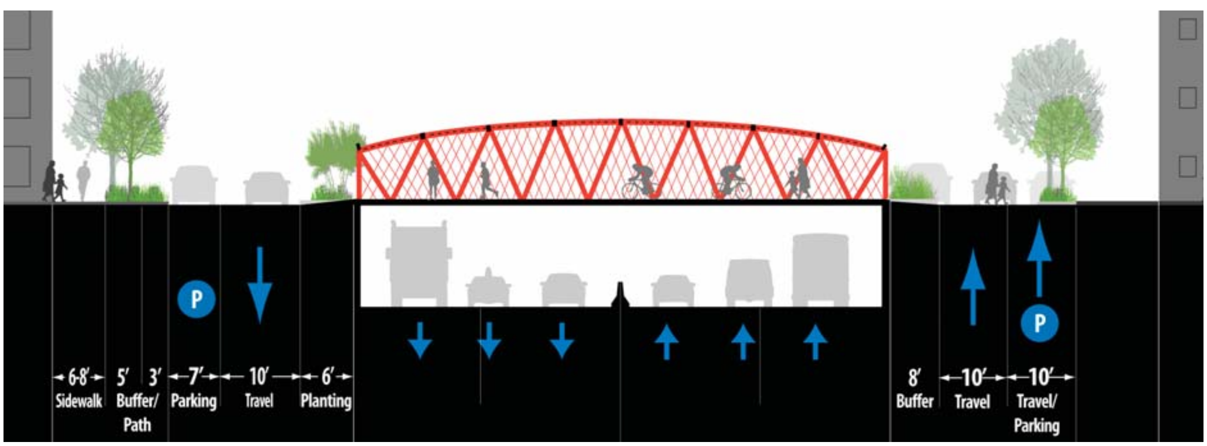
Bridges align with sidewalks and avoid conflict with turning traffic (indicated by arrows).

CONCEPT 2: CONNECTIONS - Proposed Bridges

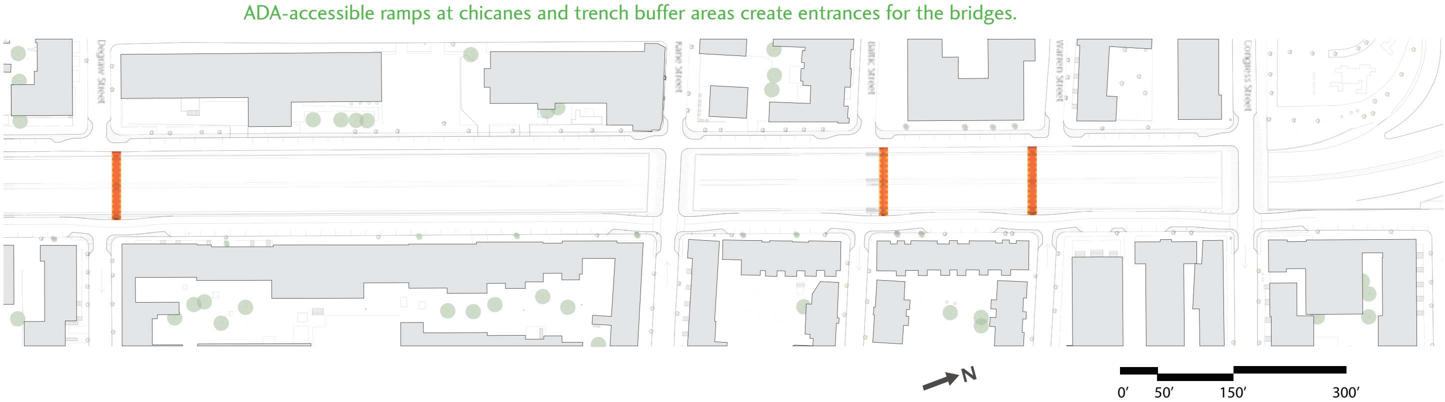
"Stitch the Ditch": Connections posits six new bicycle & pedestrian bridges spanning the BQE trench, reconnecting streets that were severed and replacing the existing Summit Street pedestrian bridge with a new, ADA-accessible bridge.

conflict with turning cars. At President Street, where traffic flows west to east, a bridge aligned with the southern sidewalks would achieve the same effect.

Traffic calming and planting measures introduced in Maximum Green could easily be modified to accommodate the bridges. Chicanes on northbound Hicks, introduced in Maximum Green, prepare the street for insertion of the bridges by emphasizing the rhythm of the street grid. Curb cuts and ADA ramps in the buffer planting and sidewalk extensions on either side of the trench would create bridge entrances. These entrances would extend 6' from the trench wall. Newly created intersections would require striped crosswalks and some form of traffic controls (stop signs, traffic signals) to create viable pedestrian crossing opportunities.



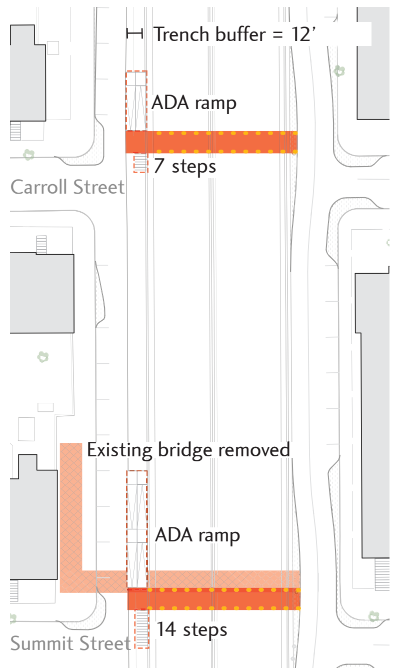
ADA-accessible ramps at chicanes and trench buffer areas create entrances for the bridges.



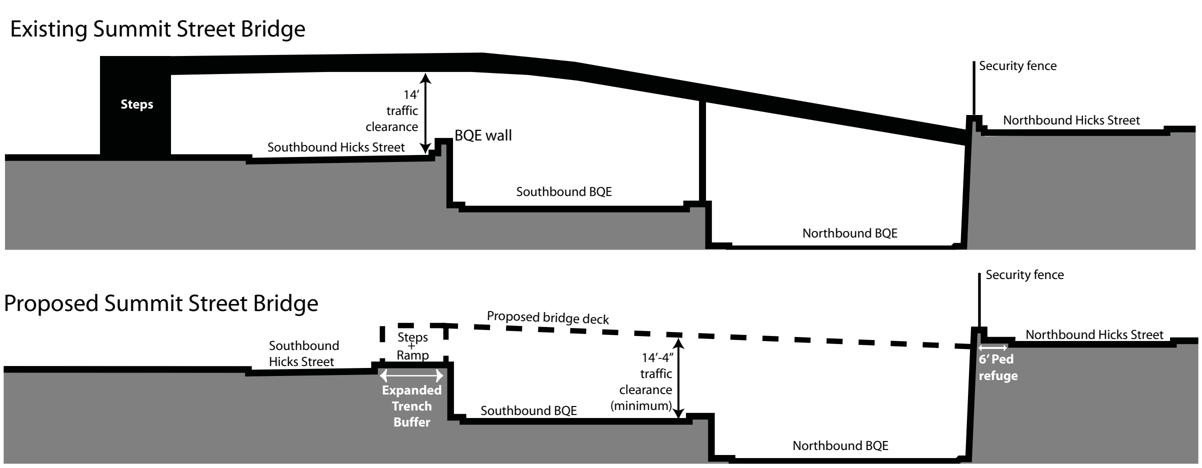
The existing Summit Street bridge rises 14' above southbound Hicks Street before reaching the BQE.

ADA Accessible Bridges: Summit and Carroll

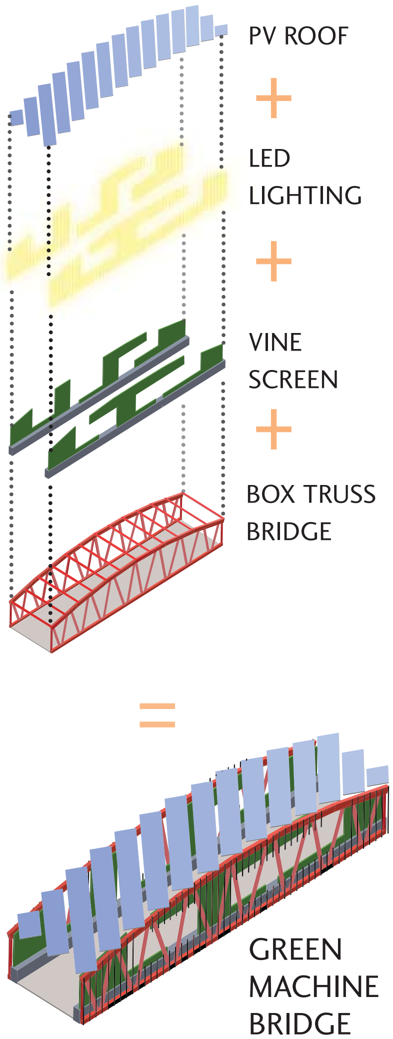
At the south end of the project area, the BQE begins rising out of its trench, transitioning back to an elevated highway. Crossings south of Carroll Street must be elevated in order to preserve adequate clearance above the traffic below. Currently, the travel lane of southbound Hicks abuts the BQE retaining wall, leaving no space for bridge access. Consequently, the existing pedestrian bridge at Summit Street crosses Hicks as well as the BQE. It rises 14' to clear Hicks Street traffic, and begins to descend via a stepped ramp once it reaches the BQE. The ramp ends directly in line with the trench perimeter fence at northbound Hicks Street, which obstructs the view of pedestrians trying to cross the road.

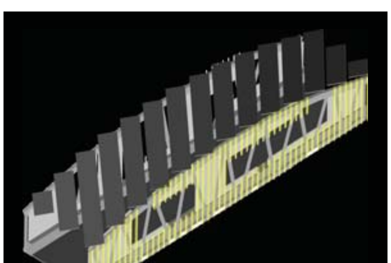


Expanding Maximum Green's trench buffer from 6' to 12' between President and Summit Streets would create sufficient space beside the trench for bridge access, removing the need for bridges to clear traffic on Hicks Street. In order to clear BQE traffic, the Summit Street bridge would need to climb only 7' above the surface of Hicks Street (see diagram, below). The lower rise would make ramp access possible, and eliminates steep slopes on the bridge. With ramps to the north and stairs to the south, the new Carroll and Summit Street bridges would provide ADA-accessible connections across the southernmost part of the BQE trench.



Existing and proposed pedestrian bridges at Summit Street. Bottom: the existing bridge rises 14' above traffic on southbound Hicks before reaching the BQE. With the entrance beside the trench (as seen in diagram, middle), a new bridge need rise only 7' to clear traffic on the highway below. This would allow access by ramp, and eliminate the bridge's steep slope.




LED at night

Optional Elements

While participants at the second workshop responded positively to the idea of reconnecting severed streets, some wanted the bridges to be more environmentally productive. To that end, the design team worked to develop options that could turn simple box-truss bridges into a series of distinctive landmarks with ecological benefits, nicknamed "Green Machines."

Lighting

While all the bridges would be equipped with interior, DOT-approved pedestrian lighting for night use, Green Machine bridges could be equipped with external, decorative lights. If used as a prototype project for LED lights (not yet approved by NYCDOT), the bridges could become visual landmarks identifying the neighborhood to drivers on the BQE below.

Photovoltaic Panels

Costs of additional decorative lighting on the bridges could be offset by income, if the bridges were equipped with photovoltaic panels (PVs). These panels, arranged to form canted roofs above the bridges, would collect solar energy throughout the day and feed it back to the electrical grid for a profit. Income from such an enterprise would likely exceed the PV maintenance costs.

Vine Screen

Angled PVs would catch falling rain and direct it to the edges of the bridges; this runoff could be channeled into planters running along the bridge decks and used to water a screen of vines. Vines could grow on an armature of mesh attached to the bridge walls, creating a living, breathing structure that would filter the air for passers-through.

Acoustic Panel

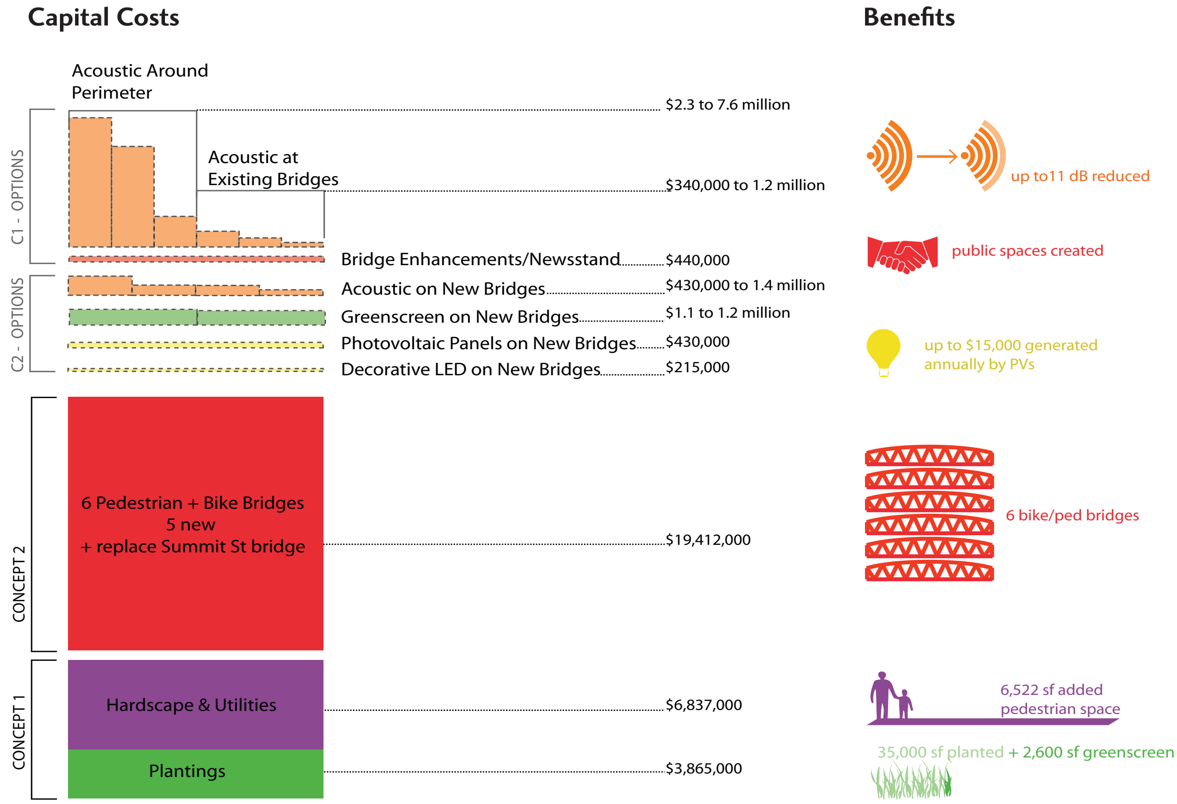
Alternatively, the bridges could be equipped with infilled acoustic panels that would dampen highway noise for pedestrians and cyclists using the box truss bridges. Acoustic panels may conflict with a vine screen; further analysis would be necessary to determine whether vines could thrive in the enclosed space created by the acoustic barrier.

Costs

All costs are approximate, estimated in 2010 dollars, and based on conceptual designs only. The purpose of the estimates is to provide preliminary figures that may facilitate the identification of future funding. Actual costs may vary with design changes and through the development of more detailed designs.

Capital Costs

Connections would include hardscape and planting treatments explored in Maximum Green. Hardscape reconfigurations needed to create bridge entrances are not expected to substantially alter the estimated cost, which was $10.7 million. Box truss bridges, including lights; sidewalk connections; and allowances for new traffic signals, crosswalks, traffic protection and maintenance (during installation), and contingencies, are estimated to cost $2.9 million each. Accessible ramps, steps, and handrails are estimated at $36,000 per bridge, and demolition of the existing Summit Street bridge would cost another $1.8 million. Total cost for hardscape, planting, and 6 bridges (including accessible bridges at Carroll and Summit): $30 million. Green Machine treatments (photovoltaics, decorative lighting, acoustic panels, and/or greenscreen) could add up to another $343,000 per bridge.



Maintenance Costs

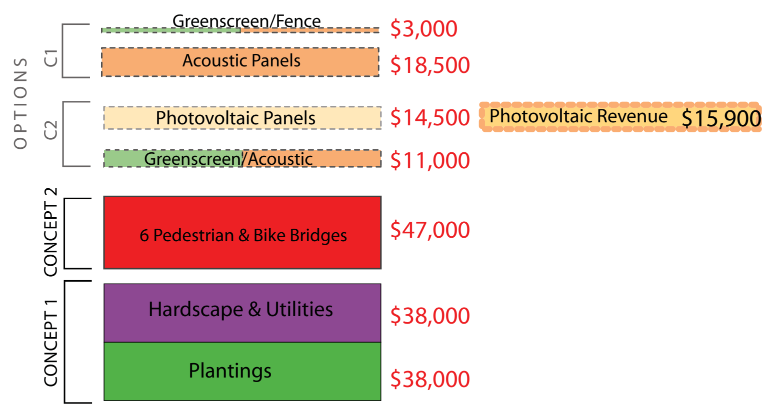
In its basic configuration (without Green Machines), Connections would incur very few maintenance costs. Bridges require biennial inspections, maintenance, and intermittent painting, and repairs. Over the first 25 years, those costs are assumed to be minimal; anticipated annualized maintenance is $14,200. As part of agency review for the publication of this report, both NYSDOT and NYCDOT agreed that the maintenance associated with any newly built bridges or bridge infrastructure would be the responsibility of the agency initiating their construction.

Green Machine elements would require additional maintenance. Vines would need watering and horticultural maintenance, while an acoustic panel would need cleaning and graffiti removal, totaling another $13,500 annually. Photovoltaic panels would require biannual cleaning, estimated at $15,750. This cost could be offset by the PVs' predicted annual income of $15,900. In the long term, replacement of PVs (warrantied lifespan of 25 years) could prove costly, perhaps adding up to $60,000 (if 25% of the panels needed replacement in

25 years). Decorative LEDs would require electricity and maintenance, although these costs are difficult to approximate, as the fixtures are not currently approved for use by NYCDOT. Estimating $5,000 for LED maintenance/replacement every 5 years, and $185 annually for electricity, the total annualized maintenance cost for Connections with green machine bridges comes to $60,000. Maintenance for elements from Maximum Green are additional.

Maintenance costs were developed by Starr Whitehouse based on estimates from VJ Associates that were modified using information from several sources. The resulting figures are preliminary only, and should be refined in the future in coordination with the appropriate agencies.

Annualized Maintenance Costs & Income



Incremental Implementation

Depending on the overall project goals, Connections can be completed with box truss or pony truss bridges. Box truss bridges (rigid tubes with overhead members) are somewhat lighter, less expensive, and easier to install, but do not smoothly integrate with Green Canopy. Pony truss bridges (see pg. 41) integrate with the Canopy, have internal beam members and open tops, are slightly heavier, and might require a more labor-intensive installation. Pony truss bridges preclude addition of photovoltaic panels, but might be preferred based on their profile and aesthetics.

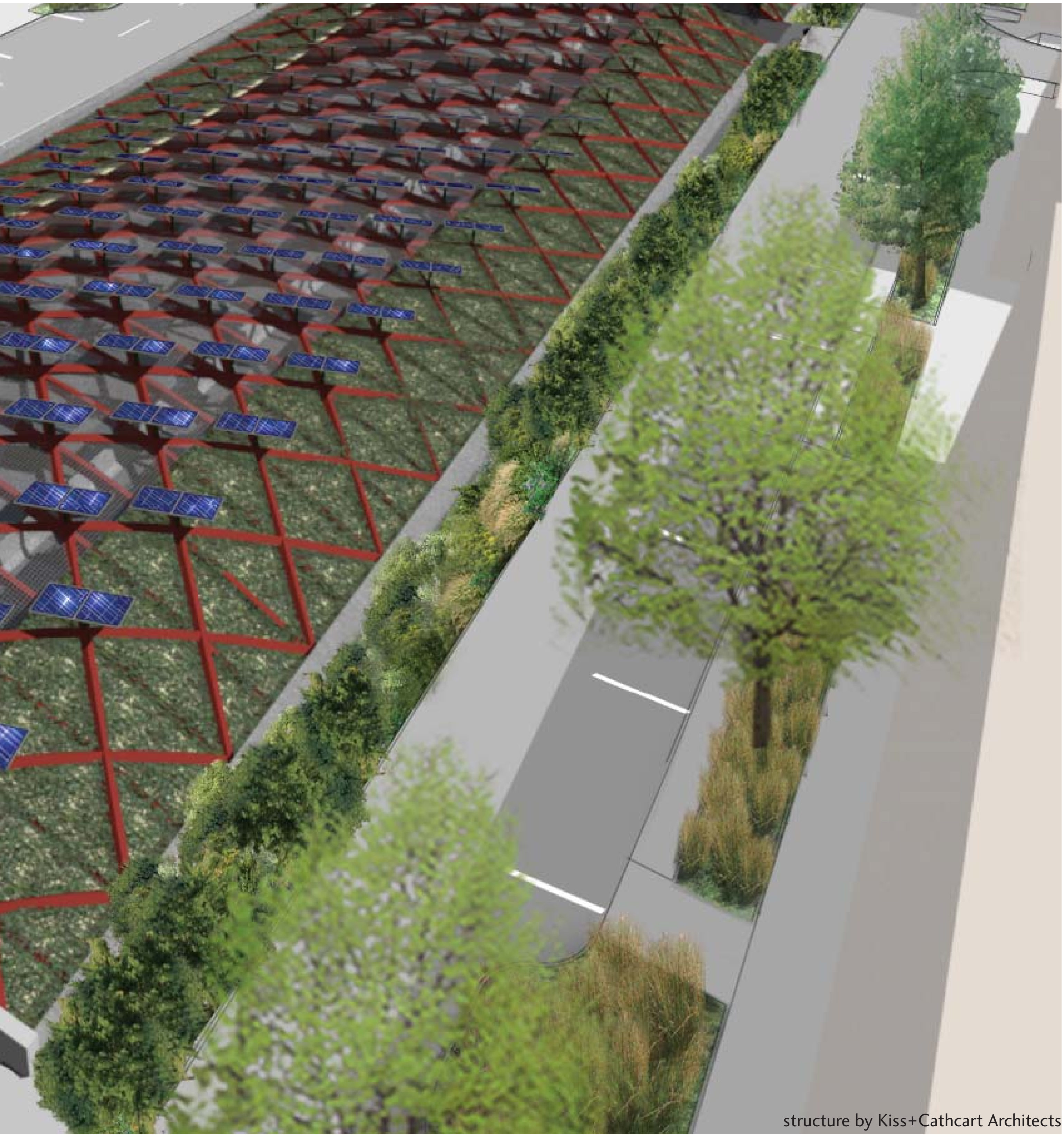
The cost of a box truss bridge, without ADA ramps or stairs, is estimated at $2.93 million. A pony truss bridge might be marginally more expensive. An ADA-accessible bridge at Carroll Street would cost $2.96 million, and a bridge at Summit Street (including removal of the existing bridge) would cost $4.76 million. Green machine add-ons could add up to $343,000 per bridge. Hardscape and plantings from Maximum Green cost roughly $890,000 per block.


Connections

CONCEPT 3: GREEN CANOPY

Visually screening the highway with a low-rise metal trellis augmented with subsurface acoustic panels, an armature of vines, and photovoltaic panels, Green Canopy would turn the entire BQE trench into an environmentally productive, architecturally distinctive landscape amenity.

Green Canopy


structure by Kiss+Cathcart Architects

Canopy

Kiss+Cathcart Architects' Green Canopy, a curved steel lattice, would span the BQE, rising up to 8' above street level over the trench and hiding it from view. The canopy's undulating form would create a visually arresting architectural landmark, while photovoltaic cells, passively irrigated vines, and sub-surface acoustic panels would make it an ecological enhancement to the neighborhoods.

Structure

The canopy structure would be made of 10" wide by 10" deep flange sections restrained laterally by a series of crisscrossing, curved, 8"x8" angles, with ties at the baseline. Ties and flanges would connect at the springline, which would rest on the existing (slightly modified) BQE walls. The structure would be overlaid by structural mesh, allowing limited access for NYCDOT inspectors and individuals performing maintenance on the structure or its components. An 8' high security fence around the perimeter would prevent unauthorized access.

An 8' high security fence (here shown as chain-link) surrounds the trench perimeter, preventing unauthorized access to the canopy.

Designed to be prefabricated in 40' sections, the canopy would be installed in segments from above, similar to the box truss bridges. The segments could be slotted together in situ, without undue disruption to the BQE below. Ties across the structure would eliminate thrust into the existing BQE abutments, and ensure the lightest possible structure and minimal effect on existing elements.

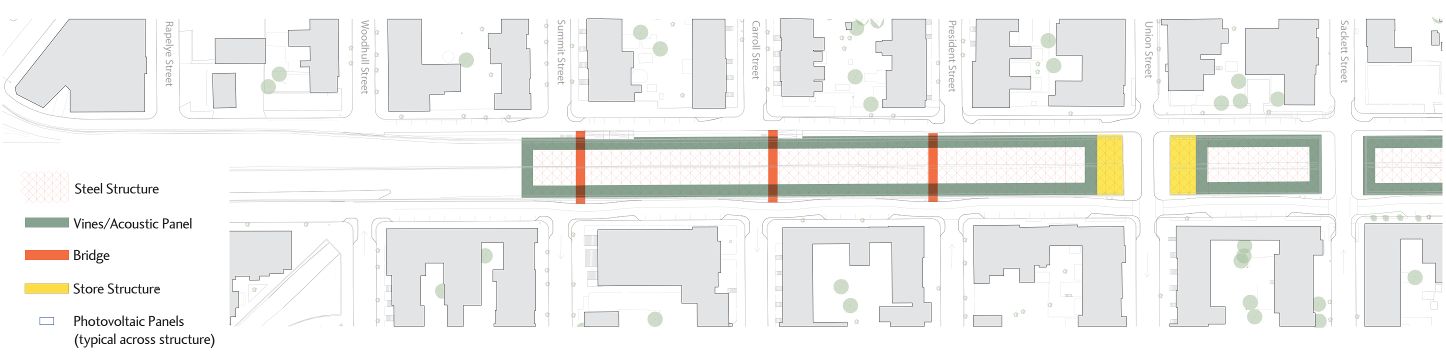
The six bridges proposed in Connections would be incorporated into the Green Canopy. Because box truss bridges would rise above the top of the canopy, the canopy would instead feature pony truss bridges with curving profiles.

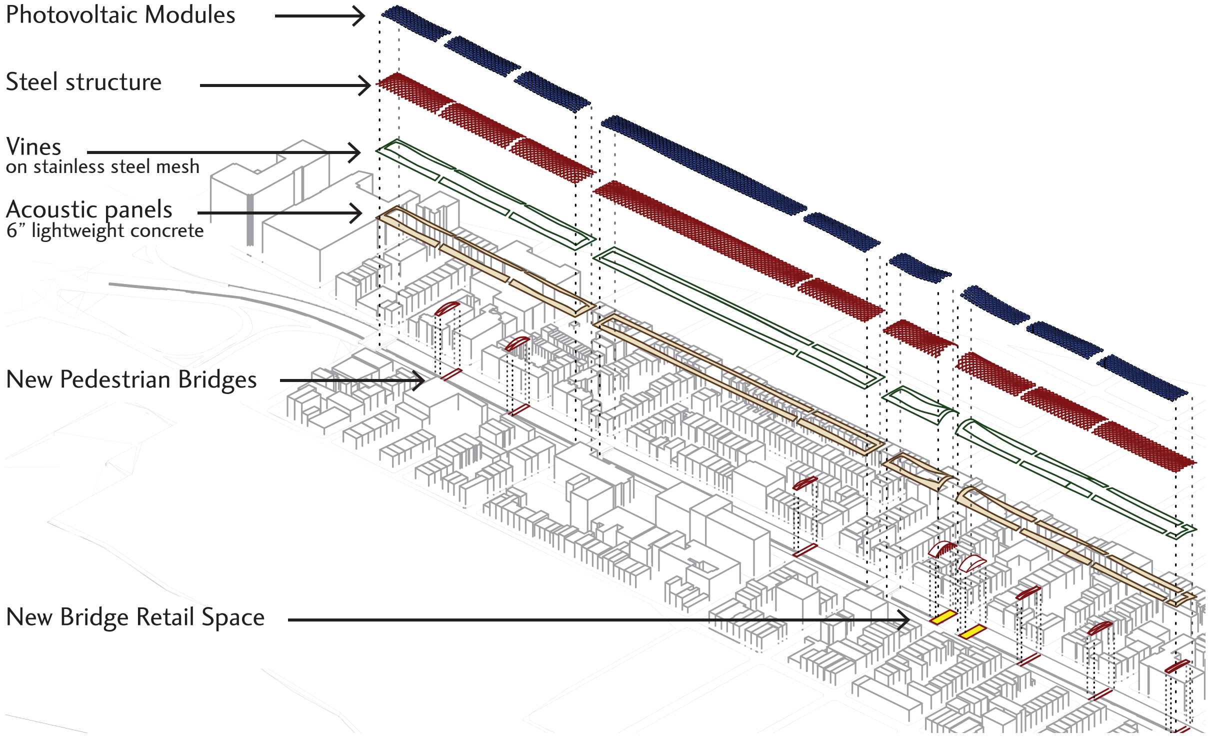
The canopy would support a host of environmentally productive elements: sub-surface acoustic panels, a layer of vines, and an array of photovoltaic panels. These elements ensure that the canopy would be not only an exciting architectural feature that removes the trench from view - it would be a landmark that gave back to its community.

Acoustic Panels

Concrete acoustic panels suspended from the canopy structure would reduce noise at street level by 9 decibels without creating a visual obstruction, although the panels (similar to Maximum Green's

CONCEPT 3: GREEN CANOPY - Extent of Structure





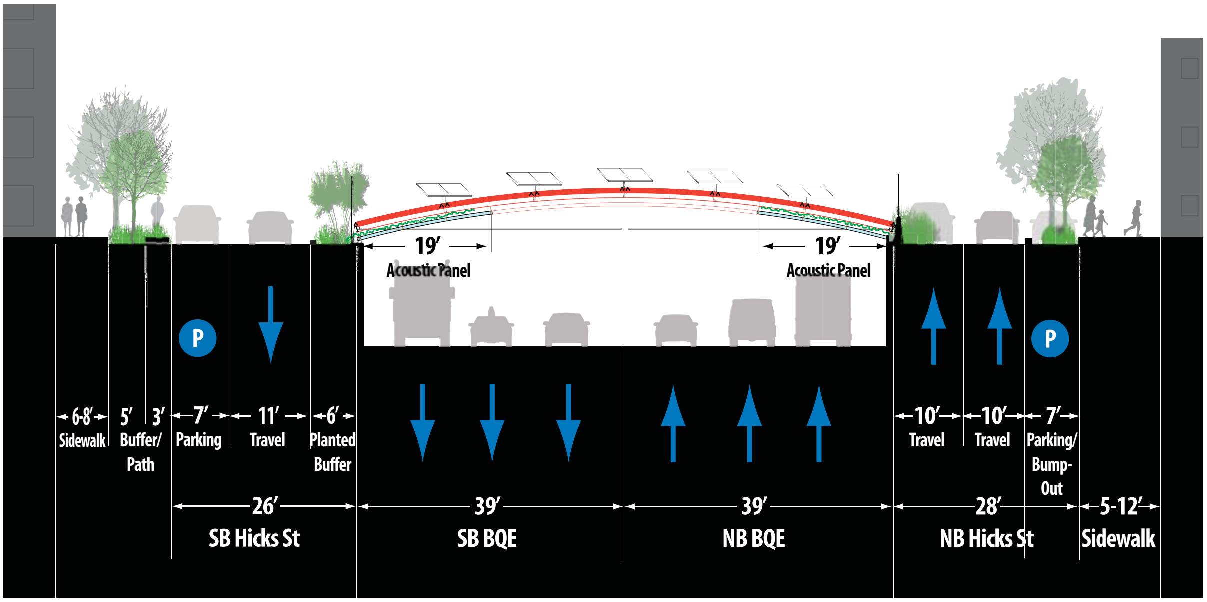
Green Canopy components

perimeter acoustic barrier) would provide little benefit to upper-story residents, reducing noise levels by less than 1dB 40' above the street. Current designs for the canopy show acoustic panels covering 38' of the 80' wide highway; by covering less than 50% of the roadbed, designers hoped to avoid the need for active mechanical ventilation of the highway. Final coverage area and acoustic panel dimensions should be determined by air quality analysis conducted during a future design phase.

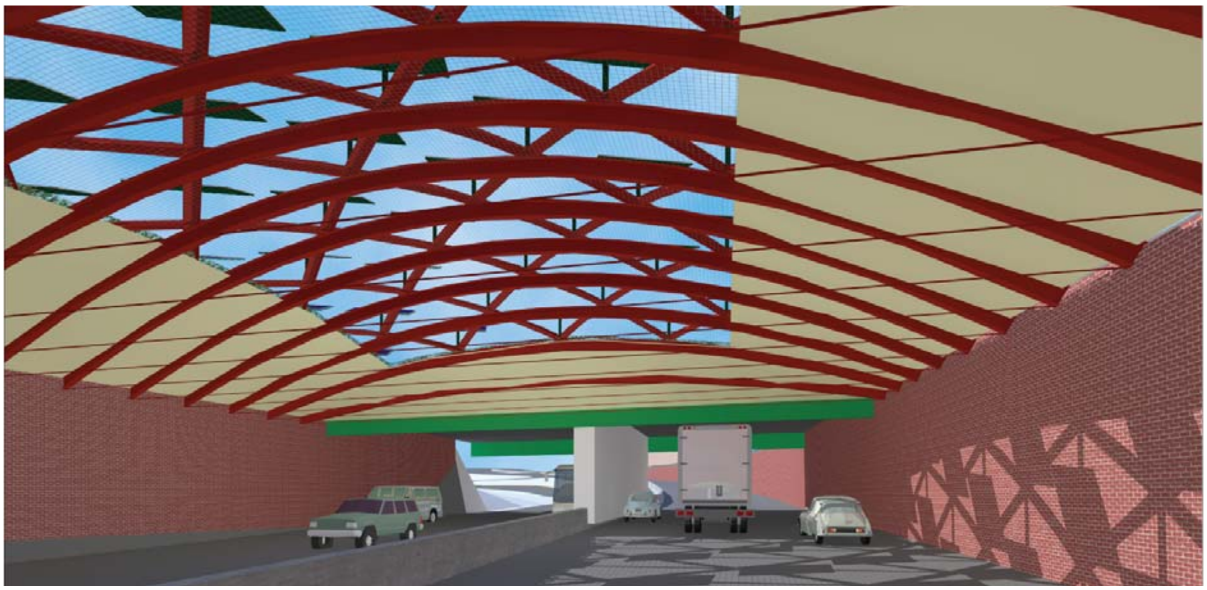
The acoustic panels, designed to slant away from the BQE centerline, would provide a second environmental benefit: by catching rainwater and funneling it to the canopy edges, they would reduce storm water runoff in the trench and provide passive irrigation for vines.

Vines

Above the acoustic panels, a layer of mesh would support a growing blanket of vines. Rooted in planters in the base of the trellis abutment, the plants would be passively irrigated by rainwater running off the acoustic panels. The vines would increase greenery along Hicks Street, assist in masking the BQE, and help filter pollutants from the air emanating from the trench.



Not a complete cover: acoustic panels and vines extend only 19' over the BQE from the east and west sides, leaving 50% of the trench open to the air, and ensuring adequate ventilation. Above, section view of the canopy; below, the canopy from the BQE.



Photovoltaic Panels

Photovoltaic panels mounted atop the steel structure would generate electricity and, along with it, a potential revenue stream to offset some of the canopy's maintenance costs. Fully equipped with panels, the canopy could produce up to approximately 1.25 million kilowatt-hours per year, for potential annual income of $312,000.

Optional Elements

Union Street west of the BQE is a lively strip with many neighborhood businesses. One option for creating a seamless connection between the neighborhoods involves extending this commercial atmosphere over the BQE by creating retail space along the Union Street bridge.

For this option, two parallel bridges would be set atop the trench, flanking the existing Union Street bridge. The Canopy would grow to encompass the two bridges, creating an interior space to house shops.

In Columbus, OH, a bridge over a freeway masquerades as a retail strip. A view of the bridge from above makes its true nature clear; from a driver's perspective, the bridge appears as a seamless extension of the commercial street. See pg. A-6 for larger images.

(See rendering, pages 57–58.)

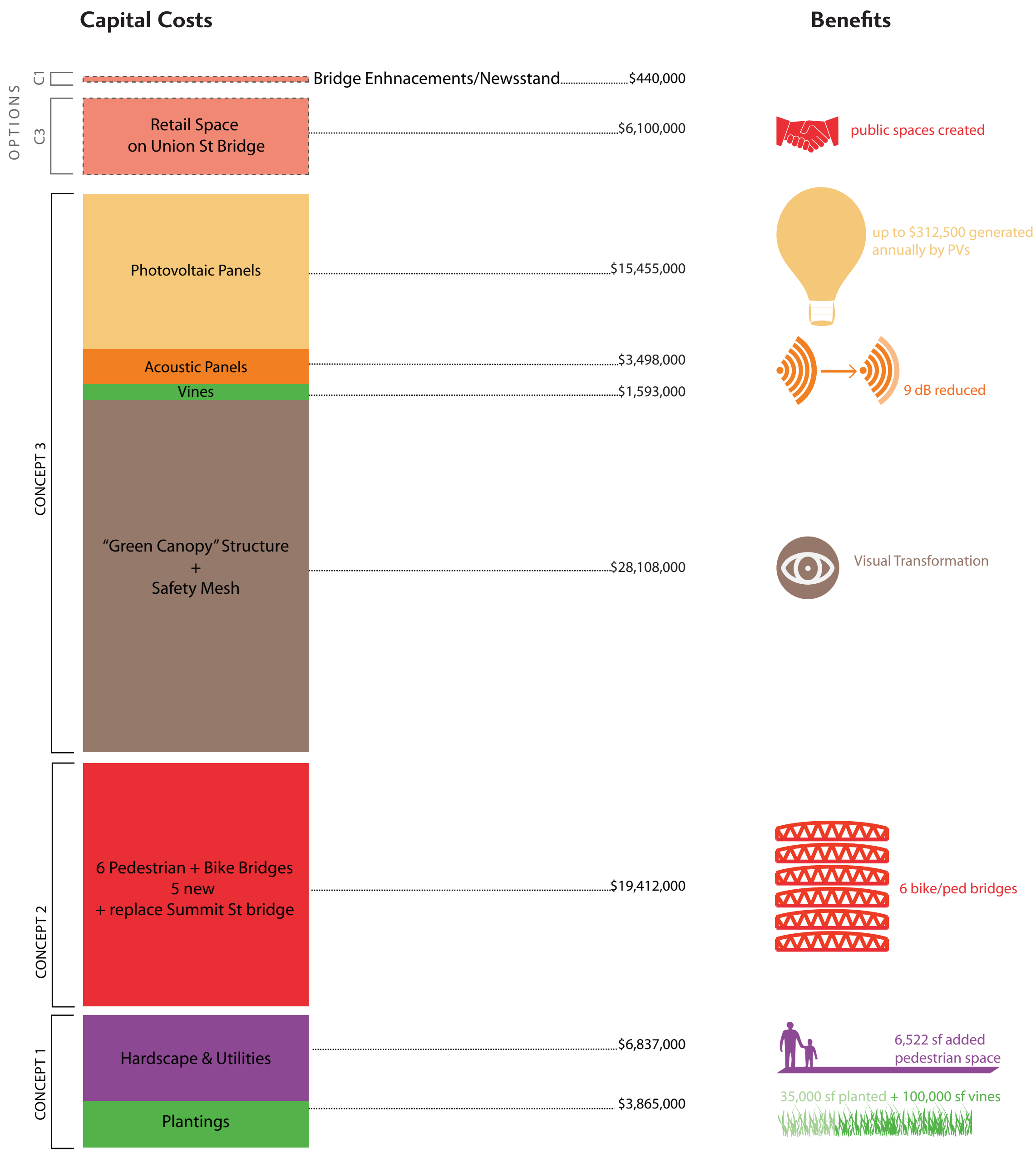
This option would create unique structures that would require custom concession agreements with NYCDOT and zoning discussions with DCP, but could have the effect of completely obscuring the BQE from individuals crossing at Union Street.

Costs

All costs are approximate, estimated in 2010 dollars, and based on conceptual designs only. The purpose of the estimates is to provide preliminary figures that may facilitate the identification of future funding. Actual costs may vary with design changes and through the development of more detailed designs.

Capital Costs

Construction of the full canopy is estimated to cost $28 million. This would include modification of the BQE wall; construction of the



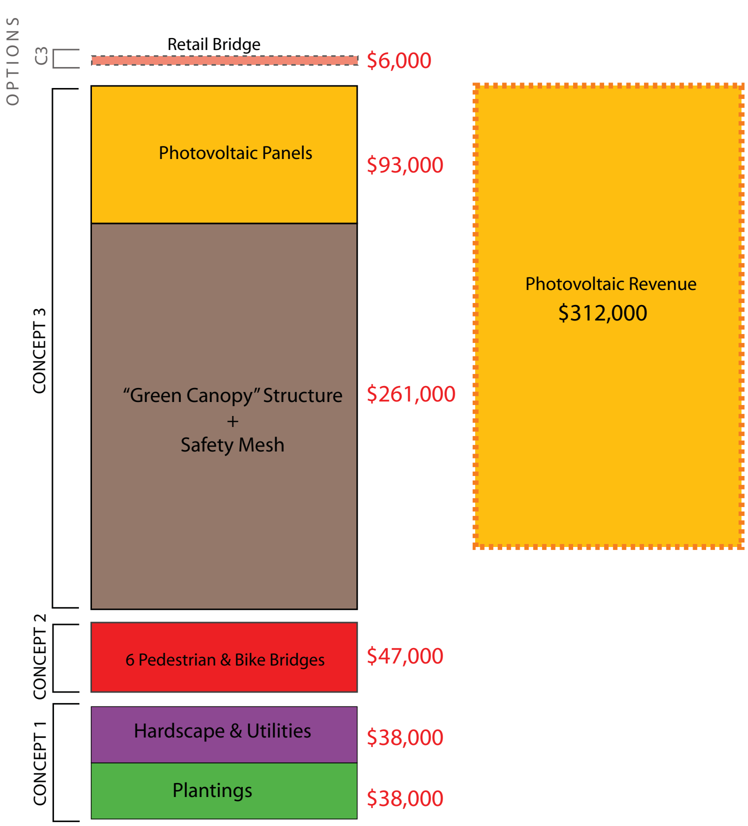
canopy including structural steel and abutments; heavy-duty mesh for maintenance access; an 8' security fence for the trench perimeter; traffic maintenance costs; and a cost allowance for electrical installation and connections for the PV. Structure add-ons are estimated as: acoustic panel - $3.5 million; vines - $1.6 million; photovoltaic panels - $14.5 million. Although the PV is a costly add-on, it has the potential to generate solar electricity, estimated to be worth $312,000 per year. Retail bridges at Union Street would cost another $6.1 million for construction and utility hook-ups.

Maintenance Costs

Green Canopy would require maintenance items similar to Connections'. The structure itself would require biennial inspection, as well as eventual repairs and painting. The additional elements - vines and photovoltaic panels - account for most of the maintenance costs. On the whole, income from the PV could counterbalance regular annual maintenance for the Canopy. Repainting (estimated to occur on a 10-year cycle), repairs to the mesh screen supporting the vines (also estimated to occur every 10 years), and replacement of the PV (25% replacement estimated in 25 years) are expected to be more expensive.

Annual income from the PVs is anticipated at $312,000. Annual costs (not during years 10, 20, or 25) are estimated to fall between $40,000 and $200,000 (the difference covers 2-year inspection costs for the structure and the retail bridges), leading to a profit in most years. In years 10 and 20, repairs and painting costs lead to a net maintenance cost of $630,000. In year 25, structural repairs (if

Annualized Maintenance Costs & Income



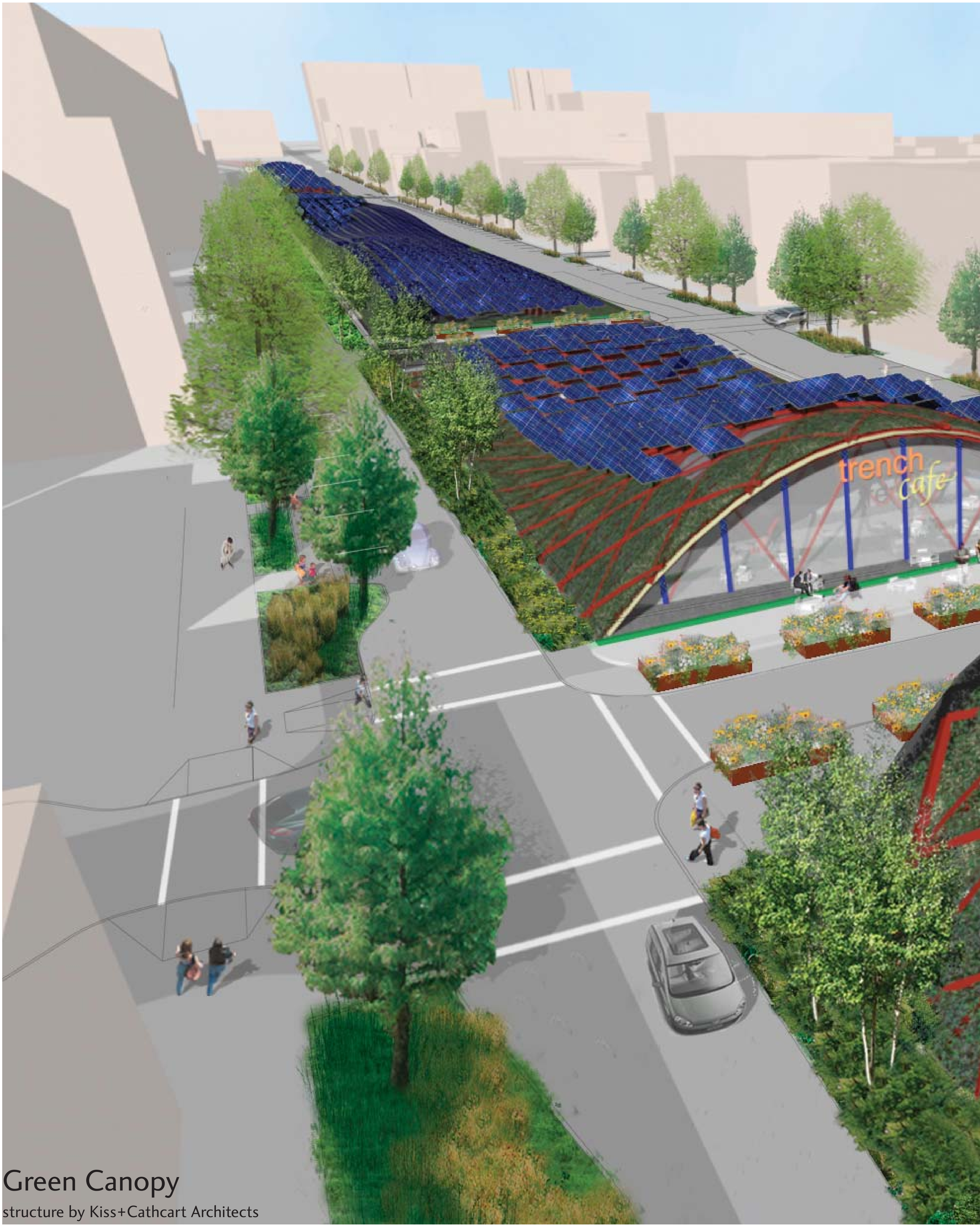
needed) and PV replacement could add another $7.5 million. Overall, the anticipated net cost of maintenance for the Canopy over 25 years is $2.6 million, with annualized costs of $106,000. Added to these would be maintenance costs incurred by elements from Maximum Green or Connections.

Maintenance costs were developed by Starr Whitehouse based on estimates from VJ Associates that were modified using information from several sources. The resulting figures are preliminary only, and should be refined in the future in coordination with the appropriate agencies.

Incremental Implementation

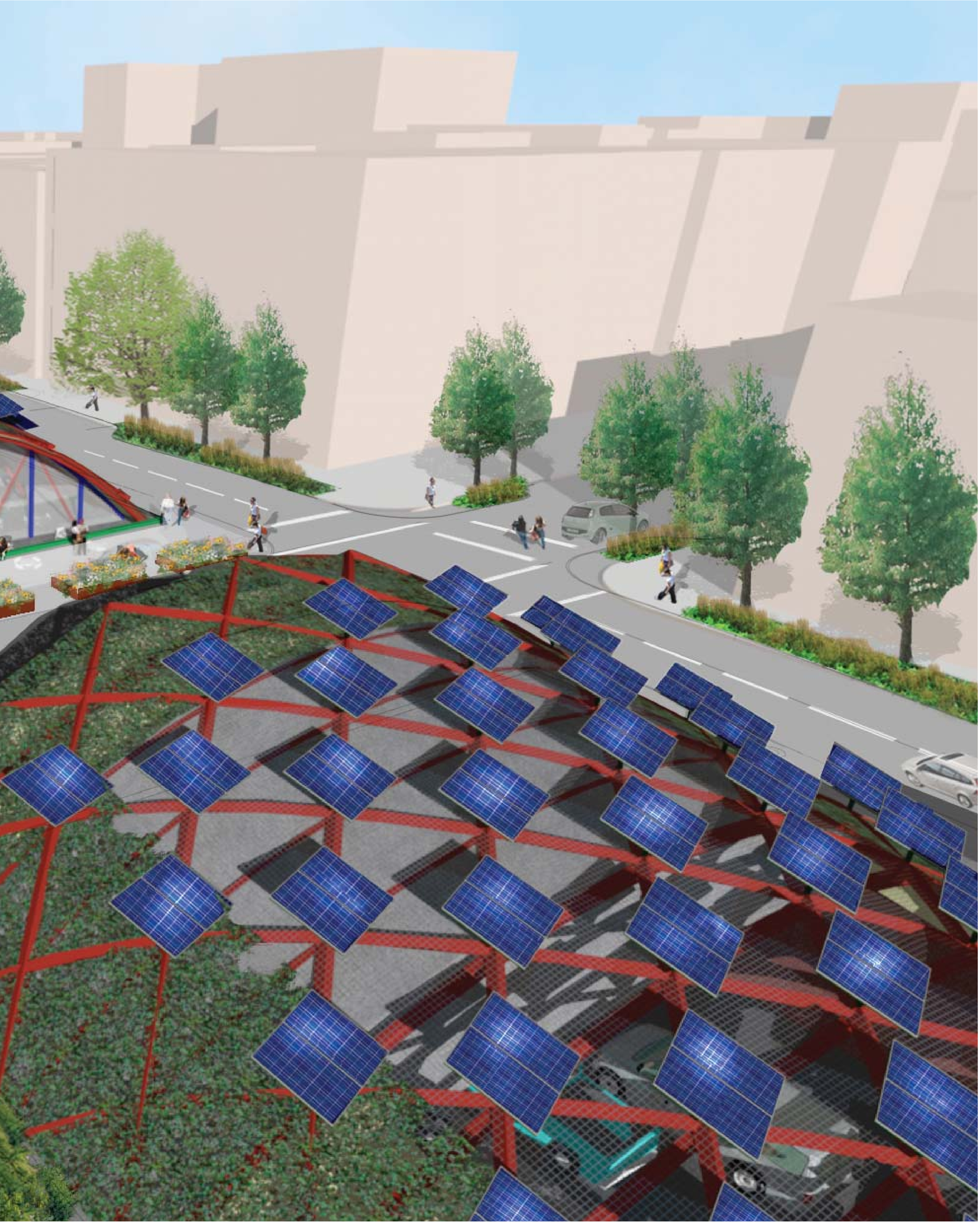
The canopy could be implemented on a per-block basis. Per-block costs, including acoustic panels, vines, and PV, but not bridges, are $4.1 million. Bridges are estimated to cost $2.9 million each, and hardscape and planting treatments from Maximum Green are anticipated at $890,000 per block.

Incremental implementation of the canopy would require some forethought. Its abutment and fence details do not integrate with the acoustic barrier, decorative fence, or greenscreen from Maximum Green, so if the overall goal is to implement the canopy, these options should not be added. Because Green Canopy incorporates all five new bridges discussed in Connections, it requires the same hardscape and planting modifications discussed there. Finally, if the plan is to move from Connections to Green Canopy, Connections should make use of pony truss bridges, rather than box truss bridges.



Green Canopy

structure by Kiss+Cathcart Architects

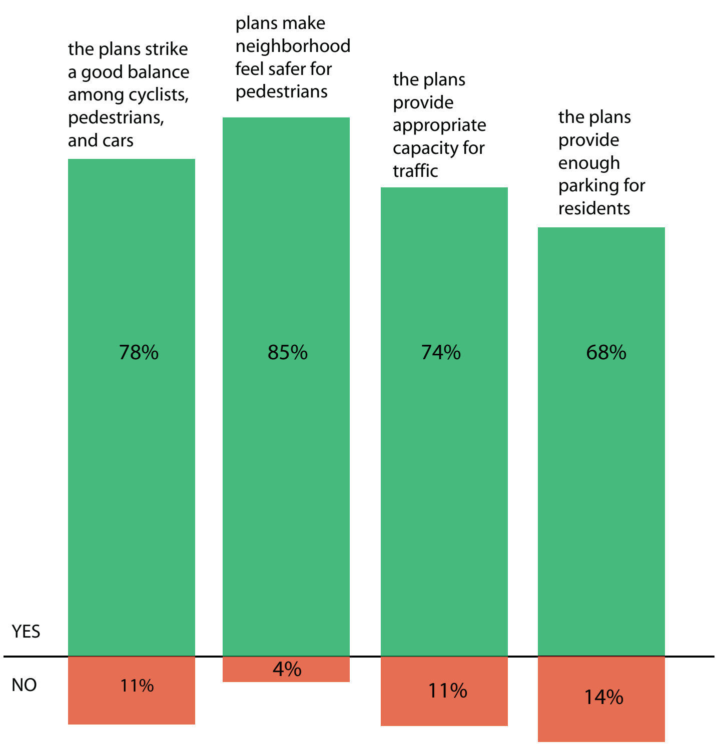


COMMUNITY RESPONSE

Members of the community, along with representatives of City agencies and elected officials, gathered on November 15, 2010, to evaluate the final three design concepts. After listening to the presentation and participating in a short question and answer session, attendees were invited to communicate their opinions of the concepts via surveys. Of the 51 people in attendance, 60% completed surveys.

Following the workshop, NYCEDC posted the final presentation on its website and included a link to an online version of the survey. An additional 44 people took the online survey. Of those, seven had attended at least one of the community design workshops; the remainder had viewed the project on NYCEDC's website. The results of the two surveys are represented below; full documentation can be viewed on pg. A-17.

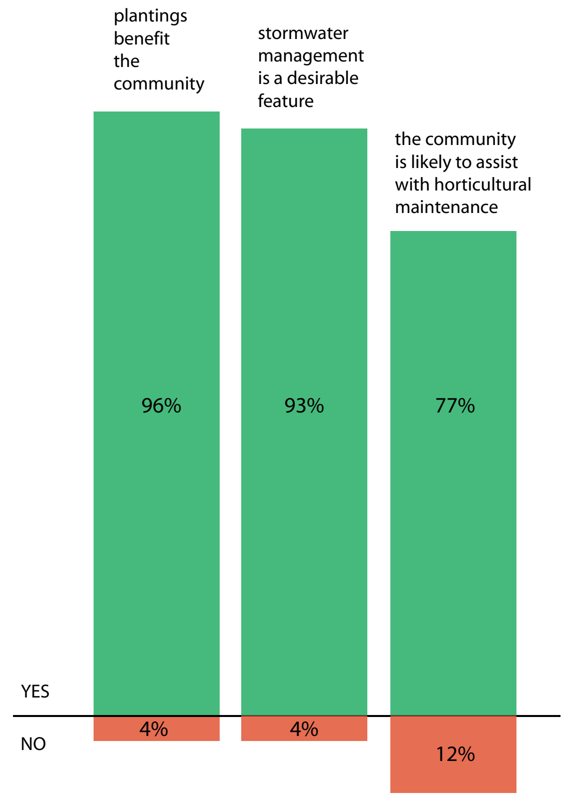
Maximum Green: Hardscape



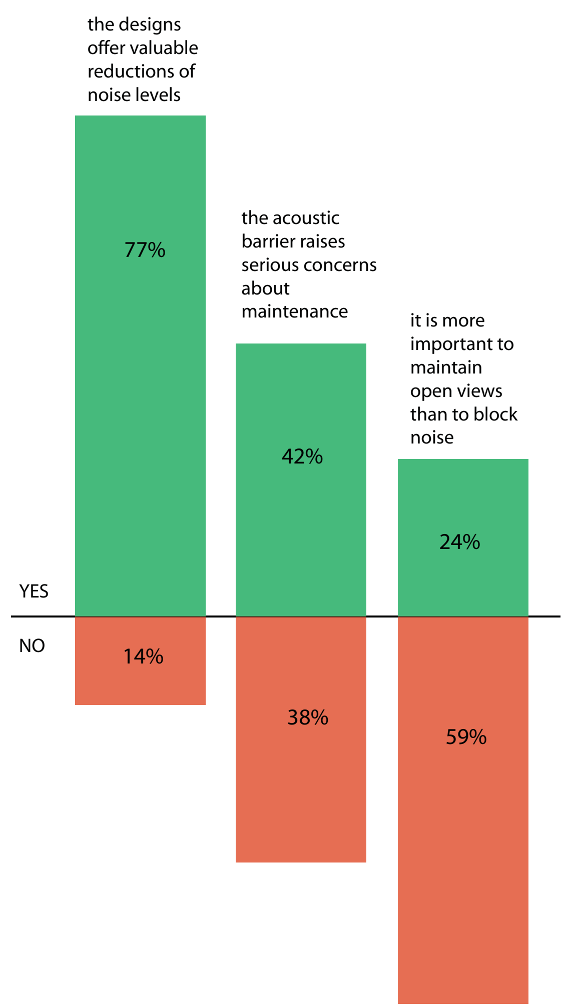
Maximum Green's hardscape modifications received high marks across the board, with positive assessments of its capability to balance different user groups, create a safer pedestrian environment, and provide appropriate capacity for traffic. The majority of respondents found that the plans, which do reduce the number of feet of available parking space on Hicks Street (see pg. A-13), provide enough parking for residents.

Planting treatments (facing page, top) were very positively received, while the perimeter acoustic barrier's reception was more mixed (facing page, bottom). Multiple survey respondents wrote in to say that they are affected by vibrations from the BQE in addition to noise; evaluation of those issues was beyond the scope of this study.

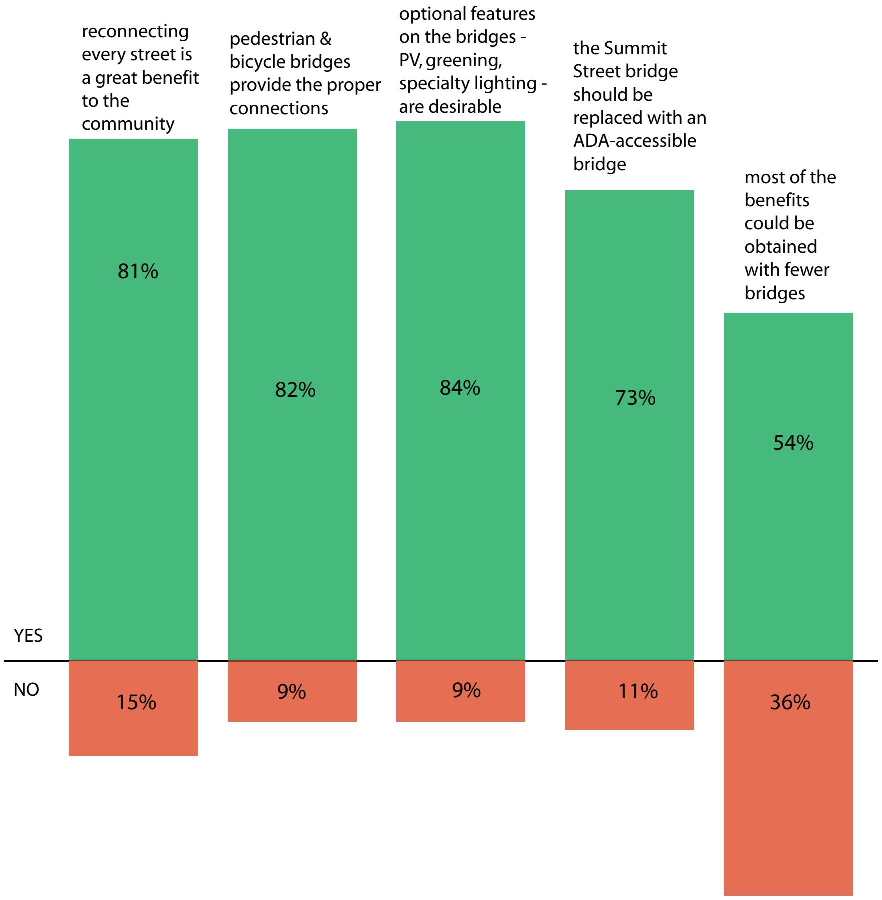
Maximum Green: Planting



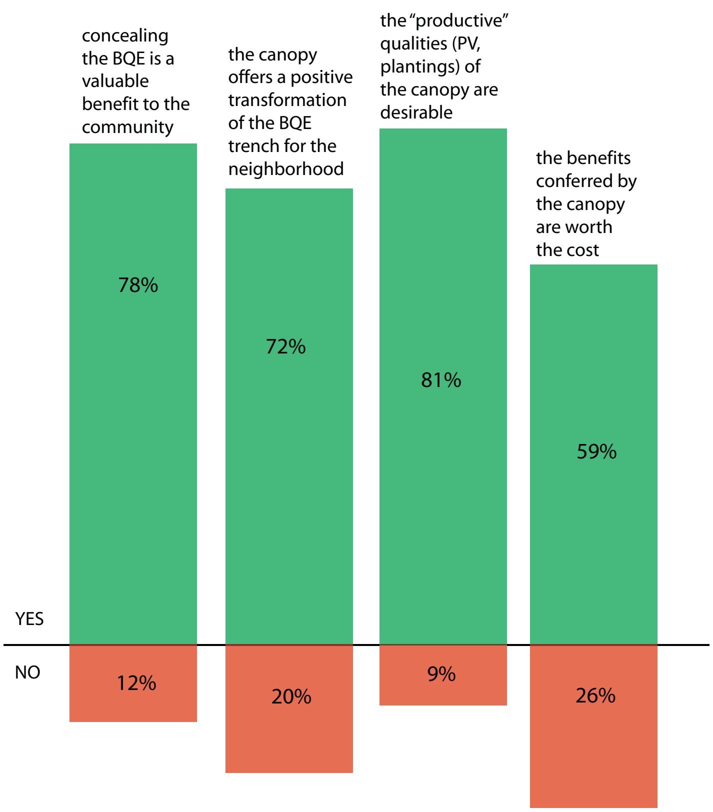
Perimeter Acoustic Barrier



Connections



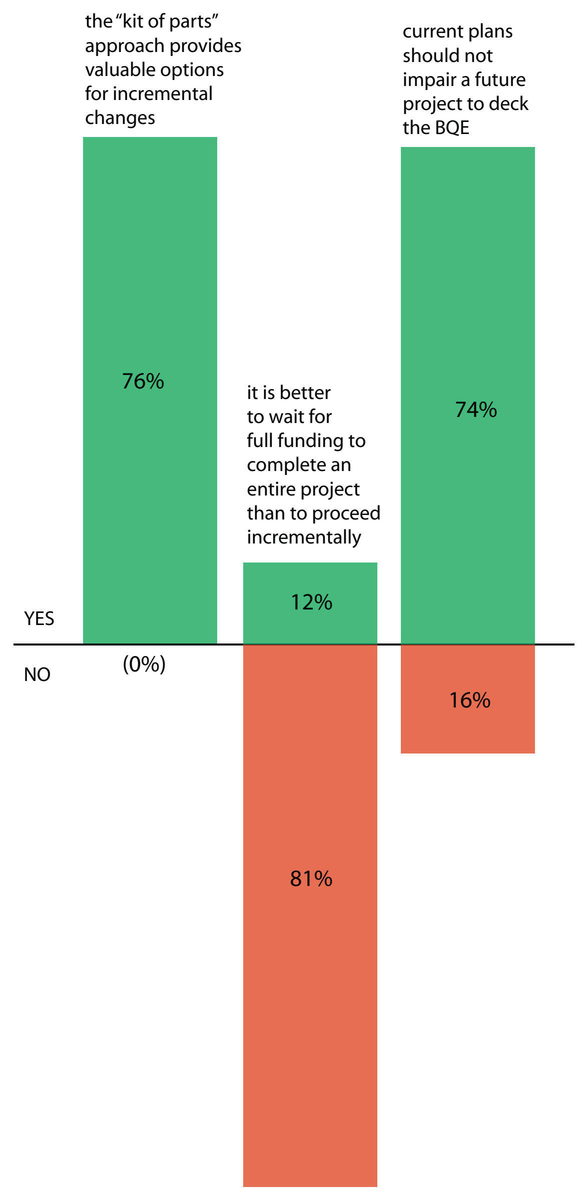
Green Canopy



Connections and Green Canopy received largely positive reviews. Some respondents wondered whether the benefits from Connections could be realized with fewer bridges; this decision can be made easily at a later date due to the ease with which Connections could be implemented incrementally. Respondents agreed that Green Canopy conferred great benefits on the neighborhoods, but wondered if those benefits were worth the concept's costs.

Finally, respondents were overwhelmingly in favor of incremental implementation, especially when contrasted with waiting for full funding before proceeding. Respondents also revealed a preference not to preclude the possibility of eventually decking over the trench.

Incremental Implementation



IMPLEMENTATION

While the three concepts are designed to build off of each other, some optional elements are mutually exclusive. Consequently, stakeholders will have to make two decisions early in the project planning process.

Decision 1: Box Truss or Pony Truss Bridges?

Connections can be completed with either box or pony truss bridges, but pony truss bridges integrate better with Green Canopy. If the eventual goal is to complete the canopy, pony truss bridges should be installed from the outset.

Decision 2: Acoustic Barrier or Green Canopy?

The perimeter acoustic barrier is incompatible with the abutment of the canopy. Therefore, if the community intends to build the canopy, Maximum Green's acoustic barrier, greenscreen, and artistic fence should not be implemented.

NEXT STEPS

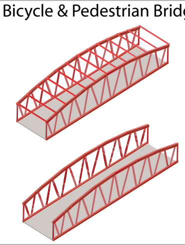
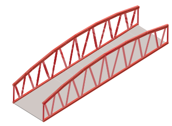
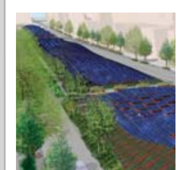
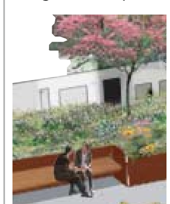
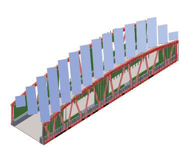
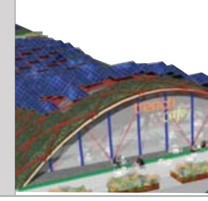
While surveys and stakeholder comments did not reveal a clear preference for one design over the others, the design team recommends that the following easy and affordable steps be taken to improve the bicycle and pedestrian environment in the study area:

- Implement recommended traffic calming measures by reconfiguring lanes and designating future chicanes with markings or flexible bollards.
- Install proposed swales as part of NYCDEP's storm water management pilot program.
- Add bicycle lanes to Congress and Amity Streets to create a clear and direct connection between existing lanes in eastern Brooklyn and the waterfront (see page A-15 for more information).

These steps have the advantage of being inexpensive to implement, falling within agencies' current agendas and programs, carrying relatively limited maintenance costs, and having an immediate, visible impact on the neighborhood. Data collected before and after implementation could lay the groundwork for moving forward with permanent interventions.

NYCEDC will continue to work with involved agencies (DPR, DEP, NYCDOT, NYSDOT), key community stakeholders, and elected officials to craft next steps and advance toward implementation.

KIT OF PARTS

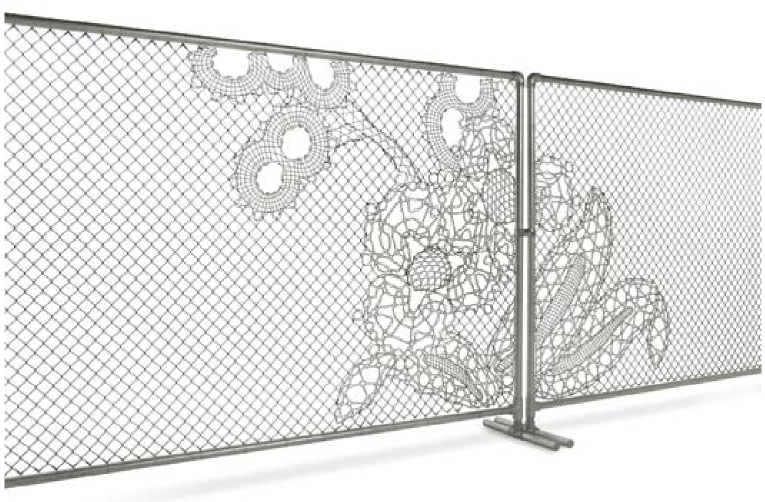
	Maximum Green	Connections	Green Canopy
BASE ELEMENTS	Planting & Traffic Calming  Includes: Traffic calming Plantings (412 Trees) Storm water reuse Irrigation system Expanded sidewalks	Planting & Traffic Calming  Modifications: Curb cuts at bridges	Planting & Traffic Calming  Modifications: Curb cuts at bridges
		Bicycle & Pedestrian Bridges  Includes: 6 new box truss or pony truss bridges Ramps & stairs at Carroll & Summit Streets	Bicycle & Pedestrian Bridges Modifications: Pony truss bridges 
			Green Canopy  Includes: Steel canopy Photovoltaics Vine screen Acoustic panel
OPTIONAL ELEMENTS	Bridge Public Spaces  Can Include: Benches Trash Receptacles Newsstand Hookups	Bridge Public Spaces 	Bridge Public Spaces 
	Acoustic Barrier  Can Include: Plexiglass acoustic barrier Greenscreen Artistic Fence Extent: - perimeter - bridges only	Acoustic Barrier 	Canopy includes acoustic
		Green Machine Elements  Can Include: Photovoltaic Panels Vine Screen or Acoustic Decorative Lighting	Canopy includes photovoltaics
			Retail Bridge  Includes: 2 parallel bridges Construction Utility hookups

APPENDICES

VISUAL GLOSSARY OF TERMS

Acoustic Barriers

Artistic Fences

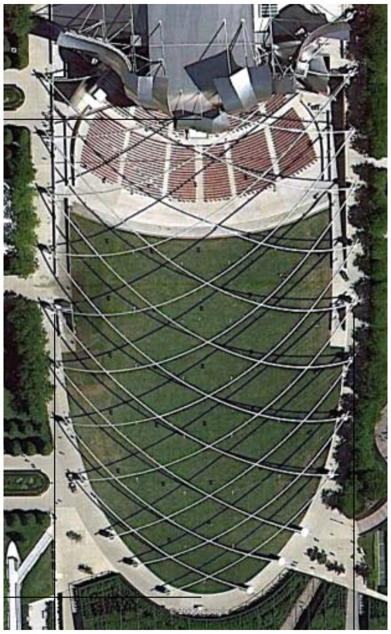


An artistic fence, featuring custom design, can be used to shield an acoustic barrier from graffiti. A fence could be an opportunity to distinguish crossings from one another, or display local residents' handiwork through a community design competition. The fence can double as a security fence for the trench perimeter, and could be combined with greenery.

Bump-Outs

By extending sidewalk or planted space out into the travel lane, bump-outs narrow pedestrian crossing distances and create pinch points that force traffic to slow. In conjunction with appropriate regulations, they can be used to create protected parking lanes (see pg. A-6)

Canopy

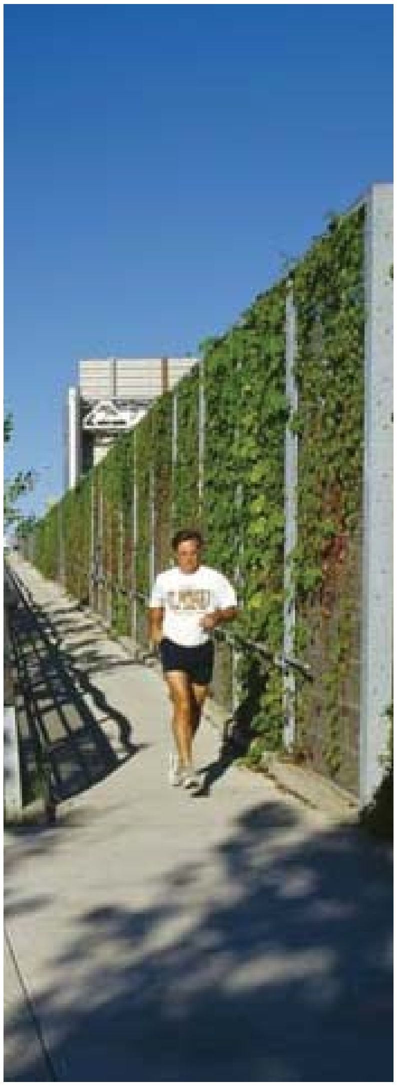


A covered highway in Santiago, Chile (above) and the crisscrossed open canopy above Chicago's Millennium Park (left). The proposed Green Canopy would feature crisscrossed steel members over a highway, but would not be fully enclosed.

Chicanes

Chicanes combine traffic calming elements like extended sidewalks and bump-outs to briefly shift travel lanes to the side. This forces drivers to pay more attention to the road and to slow down. Here, a suburban example (top), and an urban example (bottom).

Greenscreen



Photovoltaic Panels (PVs)

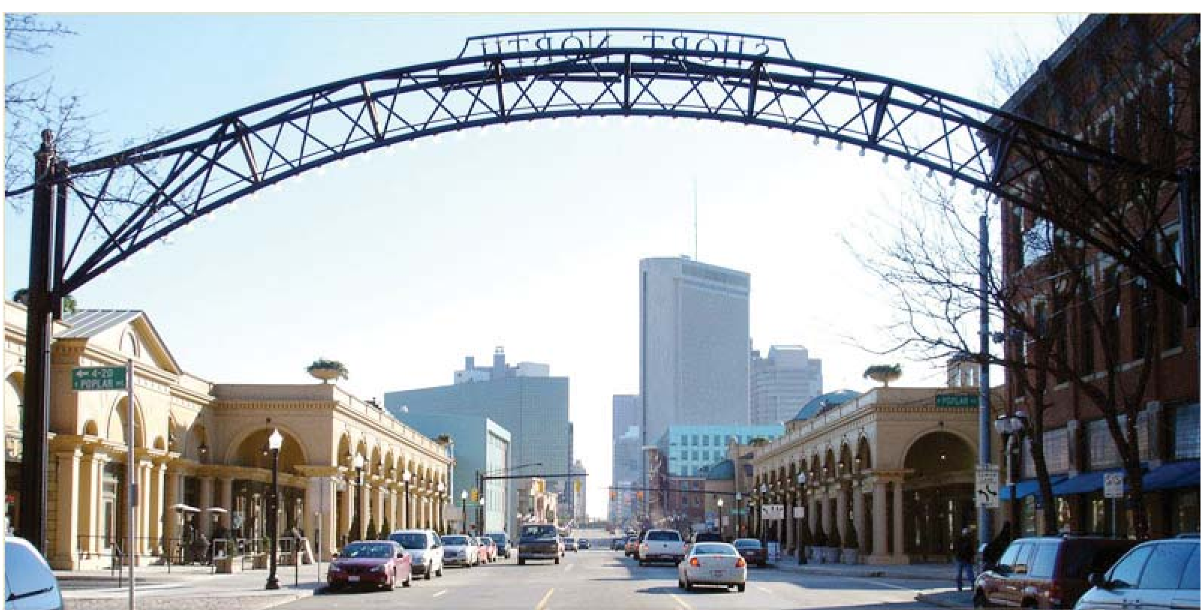
Planters / Container Plantings

Protected Parking Lane

Bump-outs, together with appropriate regulations, create protected parking lanes. In addition to creating full-time parking capacity, the lanes frequently slow traffic, and place a physical buffer between pedestrian sidewalks and moving vehicles.

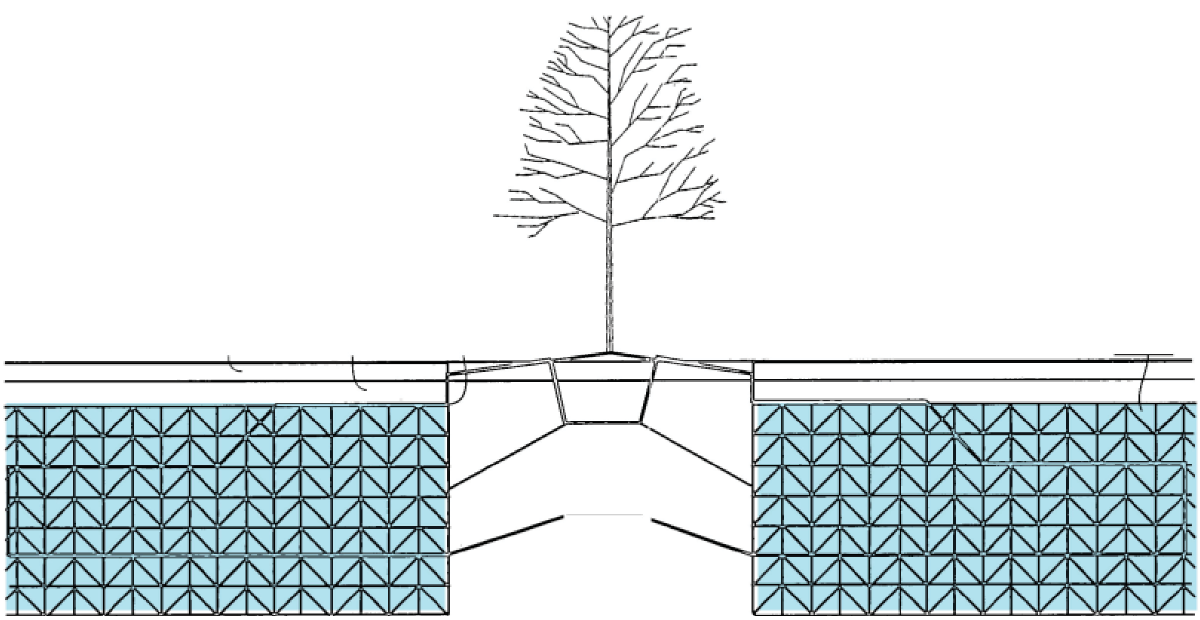
Retail Bridge

Green Canopy proposes an option for adding retail space to the Union Street bridge. In order to do so, designers would add two truss bridges flanking the existing bridge. Retail space created on those bridges would extend the sense of the street wall over the BQE. A highway bridge in Columbus, Ohio, shows the results of a similar treatment. The original bridge (above left) was a typical overpass. Two bridges were built flanking the original structure (left). When retail spaces were erected on the flanking bridges, the street wall was extended. Today, a driver might not realize he or she was on a bridge at all (below).



Swales & Storm Water Retention

Street-side swales constructed in bump-outs and sidewalk extensions collect and retain storm water that otherwise would contribute to sewer overflows. Underground storage tanks (diagram, bottom) collect water that runs off the streets through inlet grates (middle left). The water is stored and used to irrigate trees and other plants.

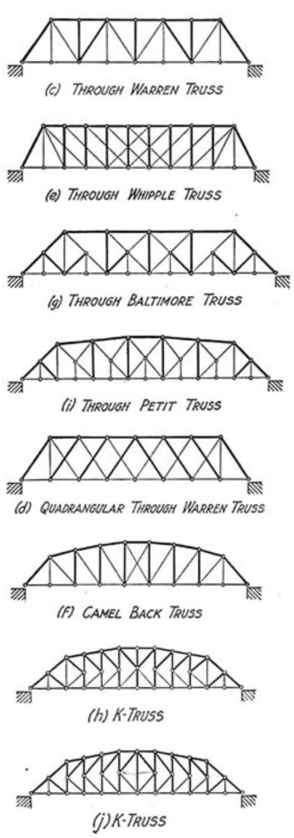


Truss Bridges (box truss, pony truss)

Pre-fabricated truss bridges, 80' long by 13' wide (interior dimension) could reconnect the five streets interrupted by the BQE trench. Above, a box truss bridge at Ohio State University; right, a box truss bridge with infilled acoustic panels in Manchester, England. Below it, a red pony truss bridge with security panels in Indianapolis; bottom, a multicolored pony truss bridge.

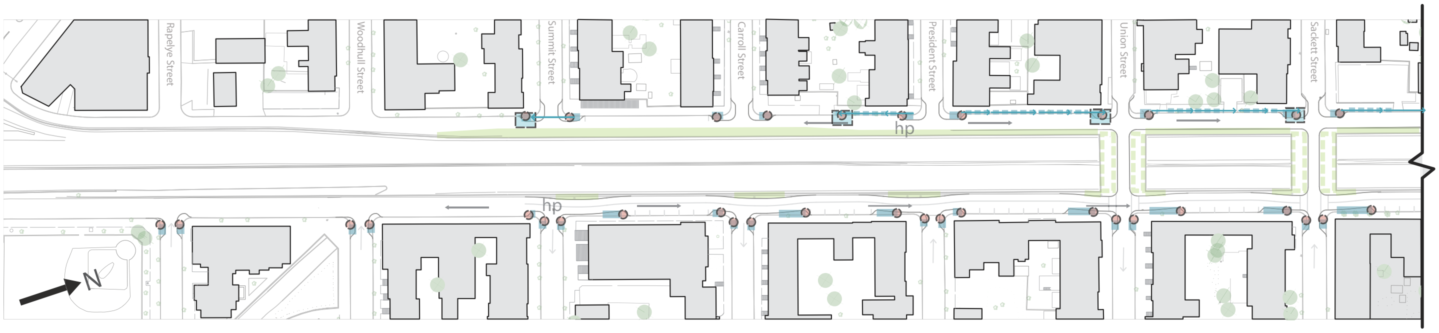
Box truss bridges are likely to be the lightest and least expensive to install; pony truss bridges fit best with the Green Canopy.

To differentiate the connections from one another, it might be possible to have each bridge use a different kind of truss; see examples, below.



STORM WATER MANAGEMENT

MAXIMUM GREEN - Collected Stormwater and Storage



New Catchbasin/ Overflow to sewer

Subsurface Storm water Storage w/ Overflow to sewer

Perforated Pipe to Water Storage

Storm water Street Edge Zone

Storm water Bump-out Zone

Storage & Reuse

In addition to calming traffic and improving the pedestrian and cyclist environment above the BQE, the three concepts each function to detain, filter, and reuse storm water.

Currently, storm water on both sides of Hicks Street sheets across the road surface from the trench edges to the sidewalk curbs, where it enters the sewer system through catchbasins. Sewers in the area are combined, and collect both sanitary effluent and storm water. The combined streams flow out to the river. In prolonged or heavy rain events, the sewer system can back up and lead to localized flooding.

Storm water collection and use, as through the systems proposed below, can, depending on capacity, help to reduce flooding and sewer backups. Using rainwater to irrigate plants also reduces costs to the City of maintaining street-side plantings.

Maximum Green

Storm water systems established in Maximum Green would underlie Connections and Green Canopy, and would have the greatest impact on the site.

Swales at corner bump-outs and along the street edge on southbound Hicks are poised to intercept storm water. The water, entering the swales through inlets in the curb, would flow into sub-surface detention tanks. Water form the tanks would irrigate plants in the bump-outs and along the street edge.

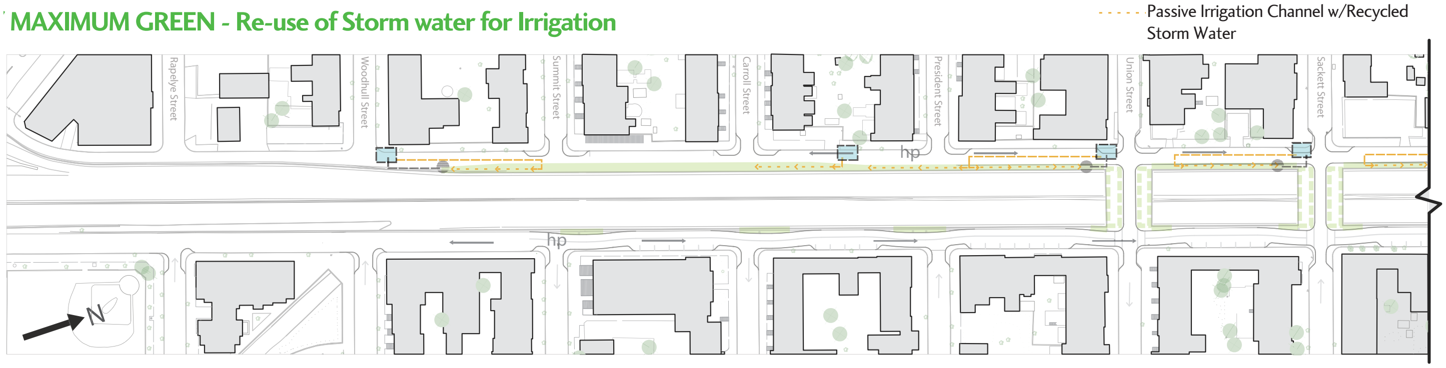
Drain/Return to Subsurface Storage

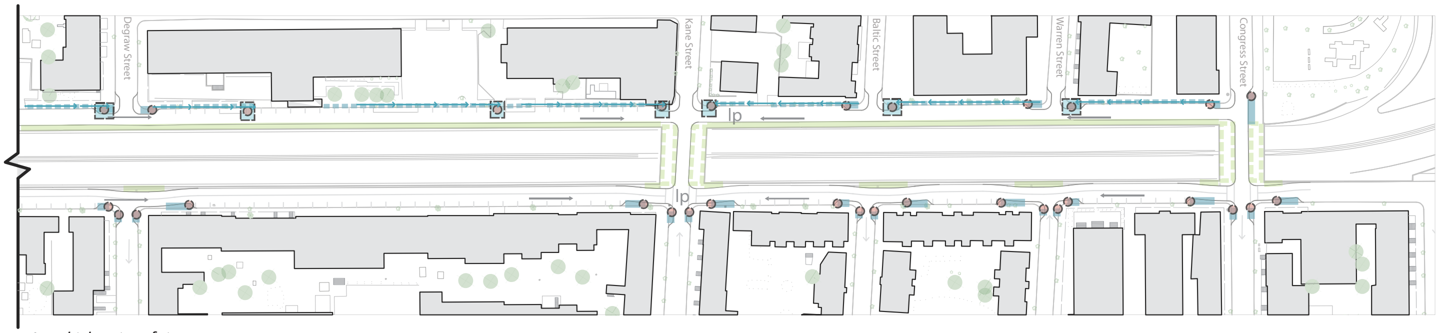
Subsurface Storm water Storage w/ Overflow to sewer

Pumped line w/Recycled Storm Water

Passive Irrigation Channel w/Recycled Storm Water

MAXIMUM GREEN - Re-use of Storm water for Irrigation





hp high point of site

lp low point of site

direction of slope

All swales and sub-surface tanks would be located upstream (up slope) of standard catchbasins, to ensure that excess water would flow into the sewer system, rather than pooling on streets or sidewalks. Construction of bump-outs and chicanes on Hicks Street would necessitate moving and reconstruction of some catchbasins (see diagram, above), as well as relocation of some water mains.

Connections

In its basic configuration, with non-modified pedestrian bridges, Connections would not address storm water collection other than through the interventions from Maximum Green. Green Machine bridges, however, would expand the storm water collection effort.

If topped with canted roofs of photovoltaic panels (PVs), the Green Machine bridges could intercept their share of rainwater. Water, sheeting across the PV toward the bridge edges, could be directed into planters running along the floor of the bridges, where it would irrigate vines growing on the bridges.

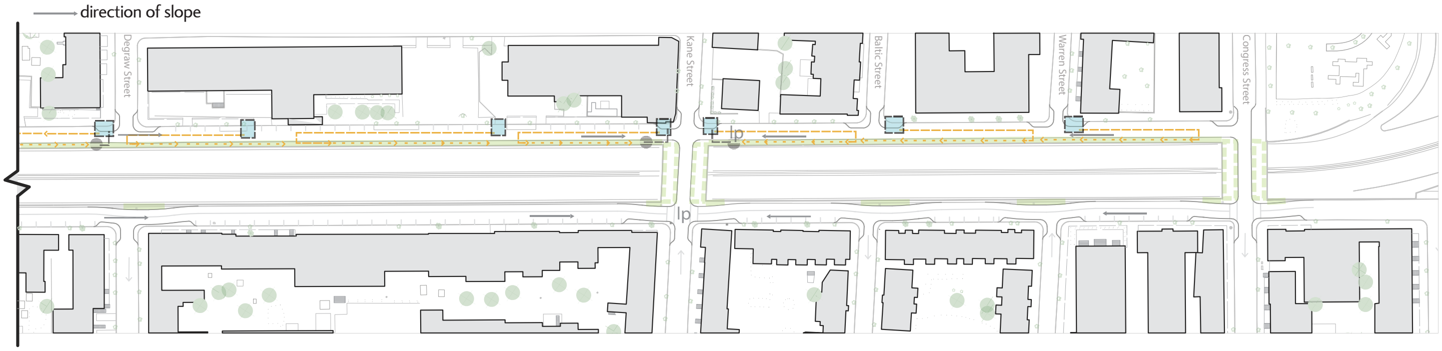
Green Canopy

Green Canopy would begin to intercept water that falls on the BQE. Currently, all water falling on the BQE, which slants in toward its centerline, is collected via drains in the center of the highway and mechanically pumped up into the collecting sewer. Acoustic tiles integrated in the Green Canopy would intercept some of this water and channel it into planters in the structure’s abutments. These planters are intended to support the 100,000 square feet of vines that would twine along the canopy’s members.

hp high point of site

lp low point of site

direction of slope



Scale 1:150

0′ 50′ 150′ 300′

Irrigation

Swale Plantings: Passive Irrigation

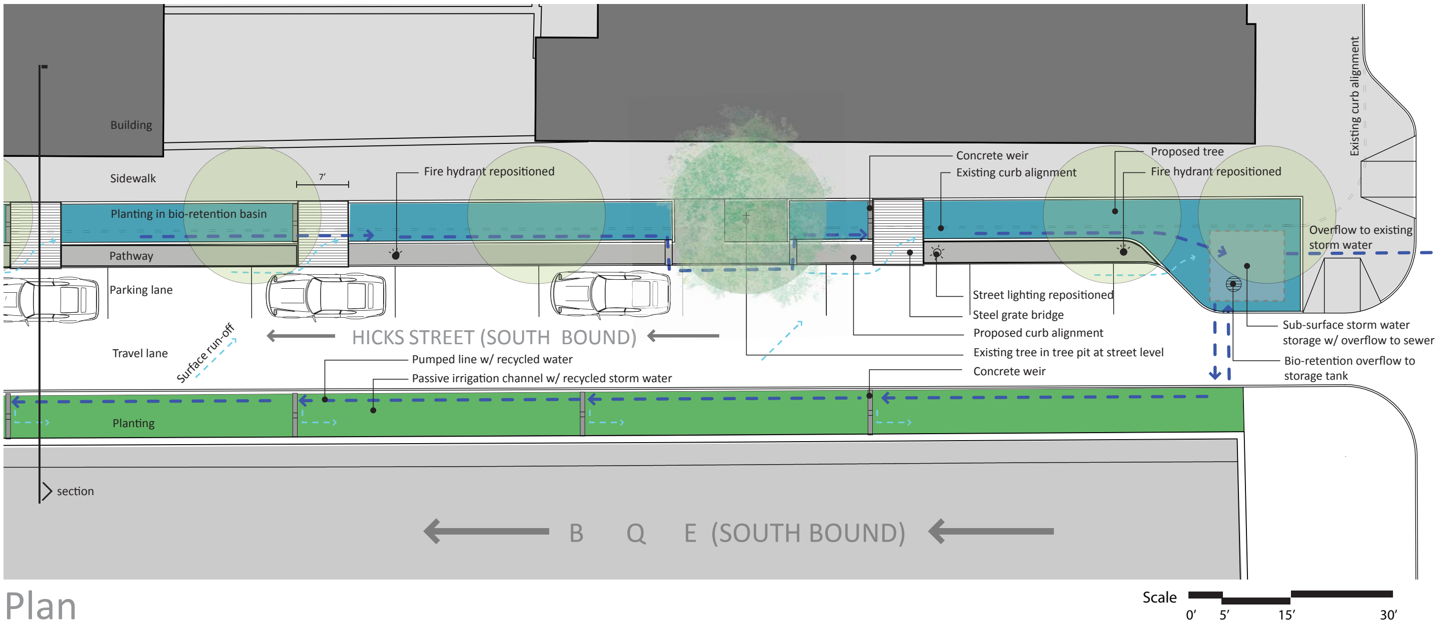
Where possible, plants on the site are intended to be passively irrigated. Plant typologies reflect the amount of water plants are expected to receive. Because curbside swales would collect water from the entire roadbed of Hicks as it runs down slope to the curb, the features would be populated with plants that thrive in wet environments. Thanks to their subsurface water storage tanks, the swales would rarely need water from additional sources.

Trench Buffer: Passive and Mechanical Irrigation

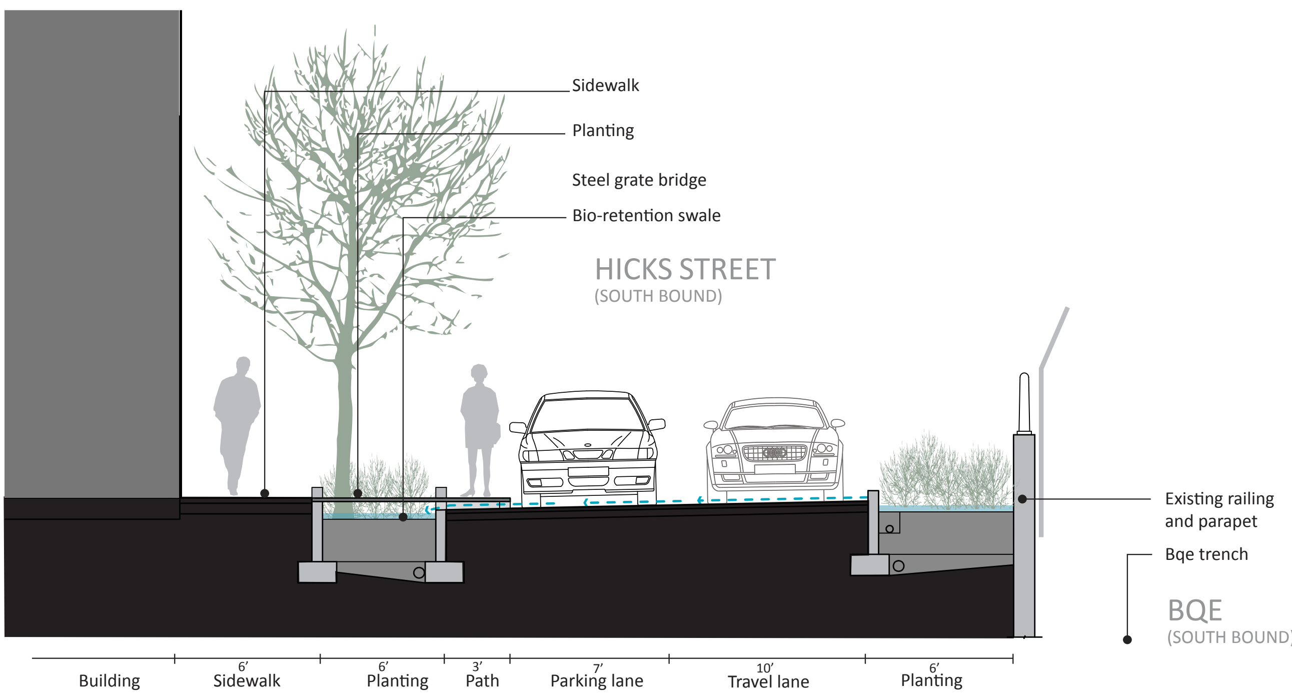
Although the west-side trench buffer strip would feature hardy, drought-tolerant plants, and would receive some pasive irrigation from rain, it would be wise to plan for additional irrigation. Because of this area's proximity to traffic, designers strove to develop an irrigation plan that could provide adequate water without manual watering. Excess water collected by swales could be pumped, below ground, across Hicks Street to flow through a perforated pipe below the buffer strip and provide irrigation (see diagrams, right). This system would require subterranian mechanical pumps and some reconstruction of the roadway. Another, less efficient alternative could be to install water service connections and rely on manual watering.

Container and Bridge Plantings: Manual Irrigation

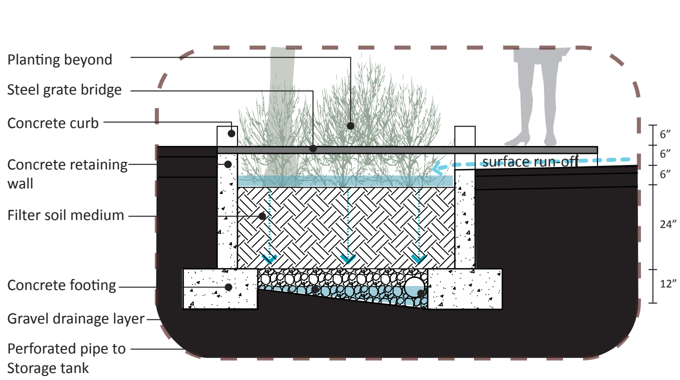
Some of the planting areas would be impossible to hook up to mechanical irrigation. Container plantings must be moveable, in order to accommodate NYC DOT's biennial bridge inspections. This makes connection to mechanical irrigation impossible. Planters on proposed pedestrian bridges would receive some irrigation from rainwater, but would require additional watering. In both cases, the opportunity could exist for partnership with a community organization willing to volunteer their time to maintain the plantings. To facilitate manual irrigation of these areas, designers designated appropriate points for water service connections.



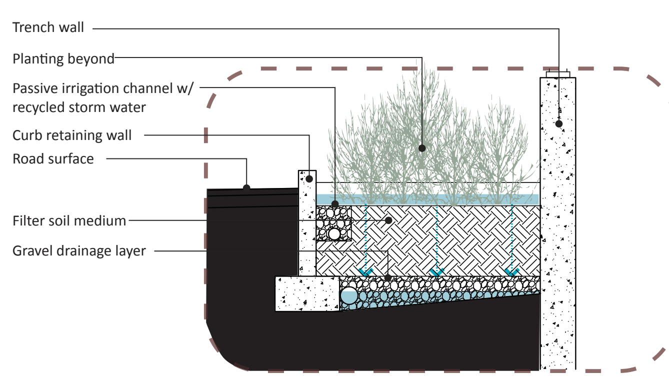
Plan



Section



Detail



Detail

PARKING

Traffic calming solutions introduced as part of Maximum Green (chicanes, bump-outs) will affect parking conditions on Hicks Street.

Southbound Hicks

Currently, southbound Hicks Street features a parking lane and a travel lane. The parking lane functions on a once-weekly street sweeping system. The 2,025 linear feet of the parking lane are available for use for 158 hours per week, which is equivalent to saying that southbound Hicks currently has 318,938 foot-hours of available parking per week. (Because cars are able to parallel park more tightly than conventional parking space dimensions would allow, foot-hours is used as a measure of parking availability for on-street parking, instead of number of spaces.)

Proposed bump-outs on Southbound Hicks will reduce the amount of parking available per week by 11.75%, leaving 281,453 foot-hours.

Southbound Hicks

	Existing	Proposed
Linear feet of parking	2,025	1,787
Available parking hours/week	158	158
Foot-hours of parking/week	318,938	281,453

Southbound Hicks Change

% decrease in linear ft	11.75%
% increase in hrs of parking	0.00%
% decrease in foot-hours	11.75%

Northbound Hicks

Existing conditions on northbound Hicks are more complicated. Currently the road features two full-time travel lanes and a third lane that is a travel lane during peak times and a parking lane the rest of the time (see parking regulations diagram, next page). Maximum Green traffic calming plans call for creation of chicanes on northbound Hicks Street. The chicanes serve multiple purposes: they shorten pedestrian

Northbound Hicks

	Existing	Chicanes at Existing Bridges	Chicanes at Proposed Bridges
Linear feet of parking	2,574	2,094	1,730
Available parking hours/week	153	165	165
Foot-hours of parking/week	393,822	345,510	285,450

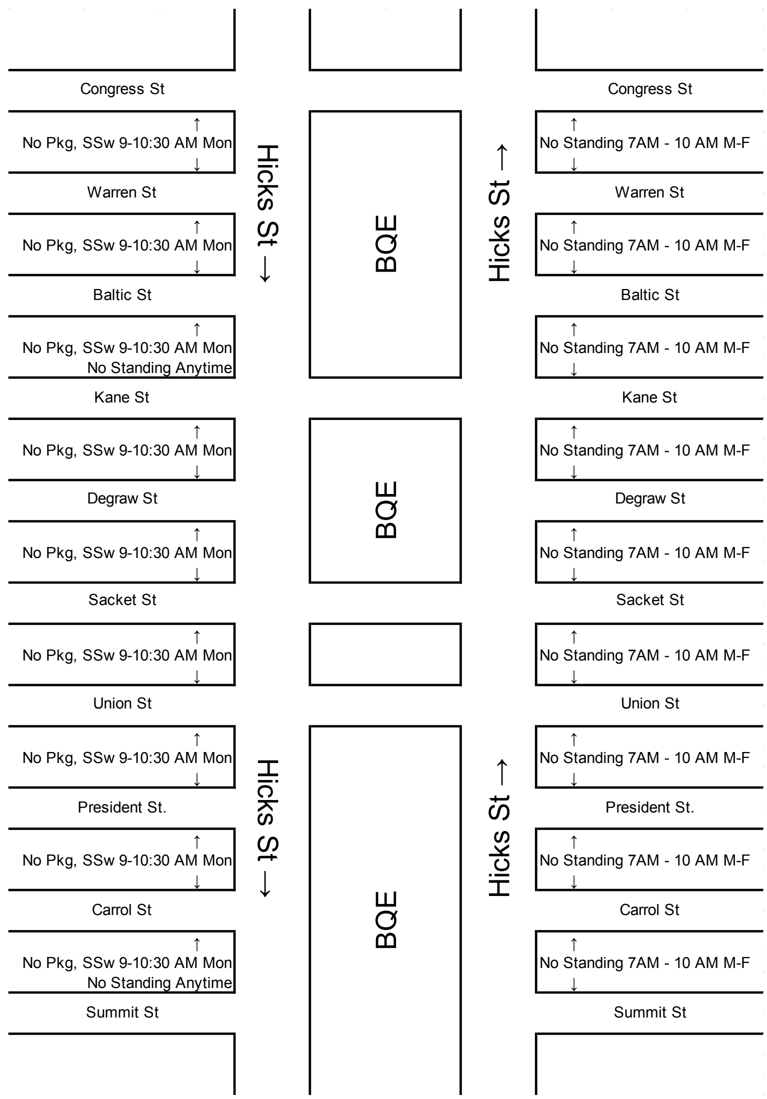
Northbound Hicks Change

	Chicanes at Existing Bridges	Chicanes at Proposed Bridges
% decrease in linear ft	19%	33%
% increase in hrs of parking	8%	8%
% decrease in foot-hours	12%	28%

crossing distances, use the rhythm of the street grid to slow traffic, create a protected parking lane, and prepare the site to accommodate bicycle and pedestrian bridges if Connections is implemented.

The chicanes have a mixed impact on parking. Because the protected parking lane cannot be used for travel, existing “no standing” parking regulations for the street can be rewritten with a normal street sweeping schedule, expanding the available hours of parking. Residents would need to move cars only once a week, rather than once a day. The chicanes also take up space, reducing the linear feet available for parking.

Addition of chicanes at every intersection would result in an increase of 12 hours of parking per week and reduction of 844 linear feet of parking space, for a net 28% decrease in available parking foot-hours. Addition of chicanes only at intersections with existing bridges would have a reduced impact on traffic calming, and would reduce available parking by 12%.

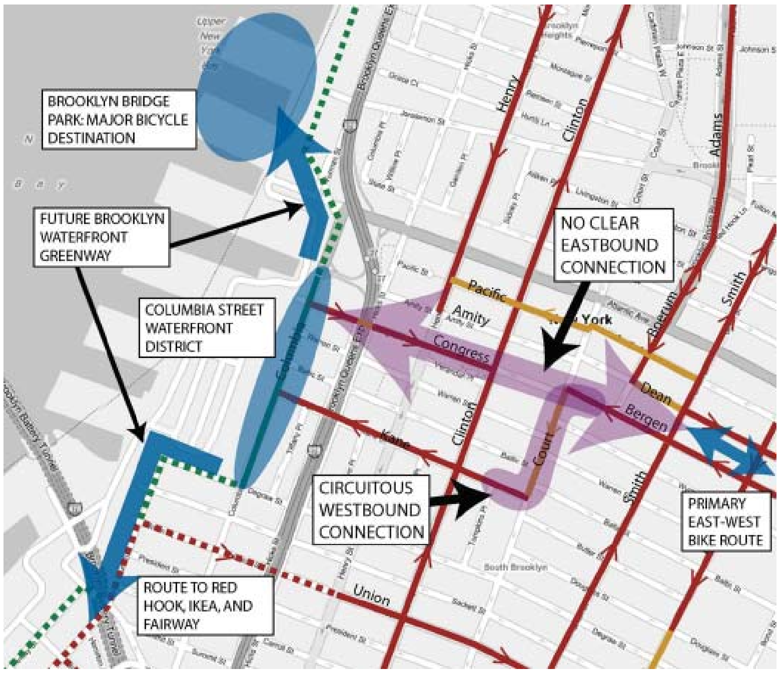


Parking regulations on Hicks Street. Source: Sam Schwartz Engineering.

EAST-WEST BICYCLE CONNECTION

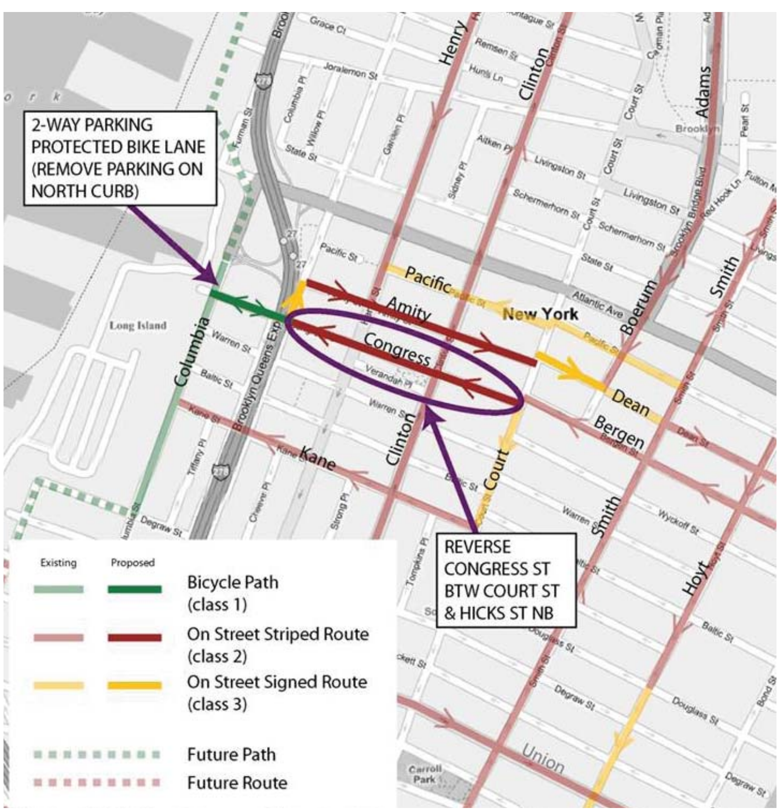
Current Conditions

Dean and Bergen Streets carry striped, class 2 bike lanes for 3.5 miles across Brooklyn. The striped lane on Dean Street (eastbound traffic) stops at Smith Street; the lane on Bergen (westbound) stops at Court. At Court Street, Bergen dead ends; a short jog across the road south, Congress Street begins, but its traffic is eastbound, so cyclists must circle south on Court for 3 blocks to Kane before completing their trip west. Westbound, cyclists currently have a striped lane on Congress Street that ends at Clinton. From Clinton, there is no clear (striped



The current configuration of bike lanes is confusing and circuitous, making it difficult for cyclists to get between the waterfront and points east in Brooklyn. When complete, the Brookyn Waterfront Greenway (now in construction) will be a popular destination. Improivng bicycle traffic flow will contribute to an improved cycling environment in the area.

Reversing the direction of Congress Street and adding a striped bicycle lane to Amity Street would create a streamlined, logical bicycle network that connects to the waterfront.



Traffic diverters, like those pictured above, can create protected bicycle space.

Sharrows, like the one below, alert drivers to the presence of bicycles, and can be used to mark bicycle routes.

or signed) connection to the eastbound lane on Dean Street. This creates difficulties for cyclists in the area. The Brooklyn Waterfront Greenway, currently under development, will bring more cyclists into the neighborhood; a more logical connection for the bike routes is essential to improving the environment for cyclists.

Proposed Changes

Westbound

Switching the traffic direction on Congress Street from eastbound to westbound and extending the striped bike lane onto the block between Clinton and Court Streets would create a simple, direct, logical route for westbound cycle traffic. Diverters could be used to restrict westbound traffic flow, if necessary.

Eastbound

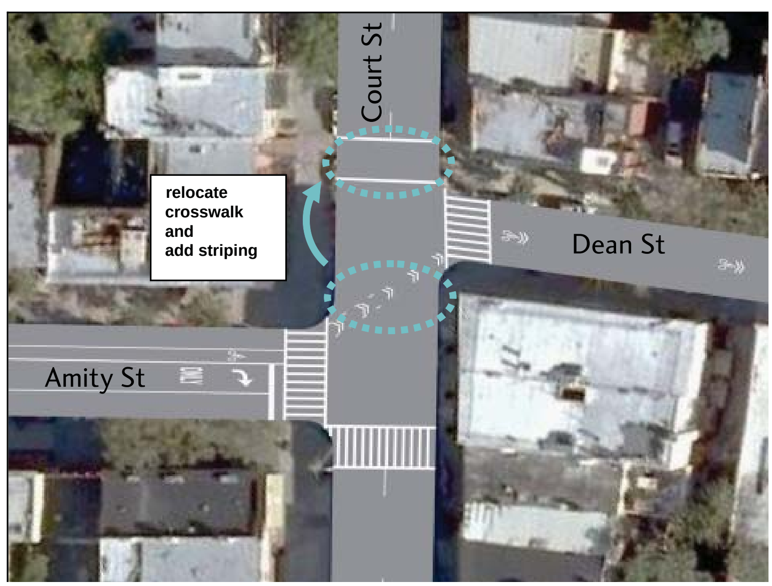
Designating Amity Street as the official route and adding a striped bike lane between Hicks and Court Streets would, in turn, create an intuitive and direct eastbound route. On Dean Street, between Court and Smith, signs or sharrows would indicate continuation of the bike route.

Crossing Court Street

The connection between Amity and Dean Streets would require a short jog on Court Street; road striping could alleviate confusion.

Bidirectional Connector

The final link in the revised bike system would be a bidirectional, class 1 bicycle path on Congress Street between northbound Hicks Street and Columbia Street. Westbound cyclists continue straight on Congress Street; signs on northbound Hicks direct eastbound cyclists north 1 block to Amity.



Adding a bike lane to Amity Street, moving an existing crosswalk, and striping a path for cyclists crossing Court Street would create a simple solutoin for eastbound cyclists.

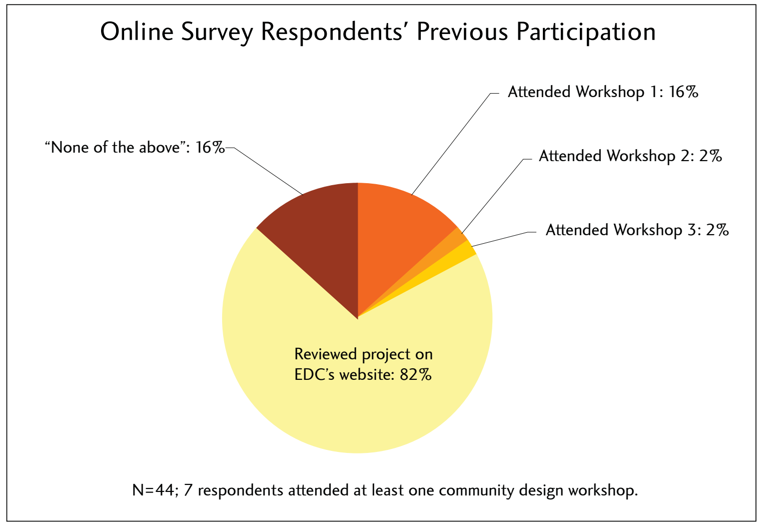
SURVEY RESULTS

	All Responses: N = 74			Workshop Responses: N = 30			Online Responses: N = 44		
	agree or strongly agree	disagree or strongly disagree	not enough info or skipped question	agree or strongly agree	disagree or strongly disagree	not enough info or skipped question	agree or strongly agree	disagree or strongly disagree	not enough info or skipped question
The plans make the neighborhood feel safer for pedestrians	85%	4%	11%	90%	0%	10%	82%	7%	11%
The plans strike a good balance among pedestrians, bikers, and cars	78%	11%	11%	90%	3%	7%	74%	17%	10%
The plans provide appropriate capacity for traffic	74%	11%	15%	83%	7%	10%	71%	14%	14%
The plans provide enough parking for residents.	68%	14%	19%	77%	3%	20%	64%	21%	14%
The plantings benefit the community.	96%	4%	0%	100%	0%	0%	93%	7%	0%
Stormwater management is a desirable feature.	93%	4%	3%	100%	0%	0%	91%	7%	2%
The community is likely to assist with horticultural maintenance.	77%	12%	11%	73%	3%	23%	80%	18%	2%
The deisgns offer valuable reductions of noise levels.	77%	14%	9%	90%	10%	0%	70%	16%	14%
The acoustic barrier raises significant concerns about maintenance.	42%	38%	20%	57%	27%	17%	32%	45%	23%
It ismore important to maintain open views than to block noise.	24%	59%	16%	37%	50%	13%	17%	69%	14%
Reconnecting every street is a great benefit to the community.	81%	15%	4%	83%	10%	7%	81%	19%	0%
Pedestrian & bicycle bridges provide the proper connections.	82%	9%	8%	90%	3%	7%	79%	14%	7%
Optional features on the bridges - PV, greening, specialty lighting - are desirable.	84%	9%	7%	80%	3%	17%	86%	14%	0%
Most of the benefits could be obtained with fewer bridges.	54%	36%	9%	40%	47%	13%	64%	30%	7%
The Summit Street Bridge should be replaced with an ADA-accessible bridge.	73%	11%	16%	77%	10%	13%	72%	12%	16%
Concealing the BQE is a valuable benefit to the community	78%	12%	9%	83%	17%	0%	79%	10%	12%
The "productive" qualities (PV, plantings) of the canopy are desirable.	81%	9%	9%	83%	7%	10%	83%	12%	5%
The canopy offers a positive transformation of the BQE trench for the neighborhood	72%	20%	8%	67%	30%	3%	77%	14%	9%
The benefits conferred by the canopy are worth the cost	59%	26%	15%	57%	30%	13%	64%	24%	12%
The public workshops were engaging and productive*	97%	0%	3%	100%	0%	0%	49%	3%	49%
The plans reflect the community outreach process.*	89%	0%	11%	93%	0%	7%	59%	5%	36%
Future plan development should include similar public participation.*	97%	0%	3%	100%	0%	0%	85%	0%	15%

* counts only responses from those who attended at least one workshop.

The "kit of parts" approach provides valuable options for incremental changes.	76%	0%	24%	93%	0%	7%	70%	0%	30%
It is better to wait for full funding to complete an entire project than to proceed incrementally	12%	81%	7%	7%	90%	3%	16%	77%	7%
Current plans should not impair a future project to deck the BQE	74%	16%	9%	60%	40%	0%	88%	0%	12%

Survey results broken out by source. Green indicates over 90% agreement. Yellow indicates less than 60% agreement.



74 individuals completed surveys evaluating the three design concepts. 30 of those completed surveys in person at Workshop 3, and the remaining 44 completed the online survey linked to NYCEDC's website.

Survey takers indicated, for every statement, whether they strongly agreed, agreed, disagreed, strongly disagreed, or needed more information. The summarized results (opposite page) aggregate positive and negative responses.

In some cases there were notable differences of opinion between workshop attendees and online survey-takers, only 7 of whom had attended any of the workshops in person. Online survey takers had the opportunity to review project documents on the NYCEDC's website, but did not have access to the same detailed information as workshop attendees.

Online survey takers were geographically distributed. 30 respondents were from the New York area; 22 of those lived in Brooklyn. Other responses came from residents of Chicago; Concord, CA; Detroit; Houston; Lexington, MA; Westfield, NJ; Woodhaven, NY; and York, PA.

Each conceptual design received positive reviews. Plantings in Maximum Green were almost universally embraced; bridges were generally viewed as positive; the advantages of Green Canopy were documented. However, aspects of each received mixed reviews, and the surveys cannot be used to substantiate a public mandate to proceed with one design above the others.