

## **Introduction**

In 2009, Architecture for Humanity, a nonprofit network of design professionals, in coordination with the City and County of San Francisco, developed a conceptual traffic-calming, community building, and street-greening project for the 1700 block of Newcomb Avenue in San Francisco's Bayview district. These concepts became a capital project through a joint effort of various City agencies. The Newcomb Model Block project was funded in part by a \$492,500 2010 grant from the Environmental Protection Agency for the San Francisco Bay Water Improvement Fund and with contributions from the San Francisco Redevelopment Agency and the San Francisco Public Utilities Commission (SFPUC).

The Department of Public Works made major roadway renovations on Newcomb Avenue between Newhall and Phelps Street. The improvements included planting of 23 new street trees, and construction of raised crosswalks, corner bulb-outs, curb ramps, and midblock chicanes to promote pedestrian safety. The project also installed stormwater management facilities, such as biofiltration planters, and transformed 20,000 square feet of impermeable surfaces to permeable paver and planting areas to minimize stormwater runoff into the combined sewer system. Also included was replacement of the main sewer line and installation of conduits for future improvements to street lighting.

Neighbors were involved throughout design and construction. The project was as much about community engagement and environmental justice as it was a pilot for new streetscape design and stormwater management practices.

## **Goals**

The project aimed to:

- Demonstrate the feasibility and effectiveness of green streets to provide multiple benefits in order to encourage a broad acceptance of green stormwater infrastructure concepts
- Document a comparison of treated and untreated stormwater flows and volume; the maintenance costs of a green street; changes in traffic speed; and changes in value of adjacent properties
- Reduce stormwater flows and volume
- Support community engagement

## **Location**

The Newcomb Model Block project is located on the 1700 block in San Francisco's Bayview neighborhood. The block terminates at a T-intersection with Phelps Street on the western end and crosses Newhall Street on the eastern end. It is a residential block with mostly single family and two-unit homes. The community is 33% Asian and 32% African American. The median household



income is \$44,962, compared to an overall citywide median household income of \$70,416.<sup>1</sup>

### **Project scope**

Prior to receiving the EPA grant, the City invested \$158,921 in Community Challenge Grants towards the design of capital improvements. To augment the EPA grant, the San Francisco Redevelopment Agency allocated \$807,500 to construction, and the SFPUC allocated \$250,981 to construction in the form of a Low Impact Development (LID) and Non-Potable Reuse Grant. The groundbreaking ceremony was held in May 2011, and six months of construction followed. Capital improvements included:

- Installation of 6,816 square feet of sidewalk landscaping; 23 trees; 13,052 square feet of permeable paving in the parking strip and courtesy strip; 487 square feet of chicane islands; 536 square feet of bioretention rain gardens
- Replacement of the sewer main
- Roadway paving
- Installation of new ADA curb ramps
- Installation of porous concrete unit pavers that will enhance the aesthetics of the block and improve drainage
- Installation of raised pedestrian crosswalks at both ends of the block

The original scope included five tasks: 1) Project Management, 2) Develop a Quality Assurance Project Plan (QAPP), 3) Conduct Monitoring, 4) Design Completion and Construction Support, and 5) Final Project Evaluation. In March 2013, we added two tasks: 6) Maintenance Detail and 7) Public Resources. Those tasks were funded with cost savings achieved in other task items. Each task accomplished the following.

#### *Task 1. Perform Project Management*

Planning Department staff

- Prepared and submitted invoices and financial statements; provided accounting services during grant period; and executed work orders with other city agencies.
- Prepared and submitted quarterly progress reports to the contract manager within 25 days of the end of each Federal fiscal quarter. Reports discussed project activities during the quarter and progress towards milestones, environmental outcomes, problems encountered and their resolution, and activities planned for the next quarter.
- Prepared and submitted this project report to document activities over the entire project period and include monitoring data, maps, plans, outreach materials, and discussion of environmental outputs and outcomes as well as an assessment of achievement of the project's purposes and objectives.

#### *Task 2. Develop Monitoring Protocols, including a QAPP*

The SFPUC and the San Francisco Estuary Institute (SFEI) established monitoring protocols by developing a QAPP as required by US EPA. A QAPP provides a tool to document the type and quality of data needed for environmental decisions and to describe the methods for collecting and assessing those data. The ultimate use of a QAPP is to support scientific research and regulatory decision making.

#### *Task 3. Conduct Monitoring*

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<sup>1</sup> San Francisco's Neighborhoods: Socio-Economic Profiles (American Community Survey 2005-2009). May 2012. <http://www.sf-planning.org/modules/showdocument.aspx?documentid=8779>

The SFPUC and SFEI monitored the project in accordance with the protocols outlined in the approved QAPP. Pre-construction monitoring of the stormwater runoff from the block began in 2009 and continued for one year prior to construction. Post-construction monitoring occurred over three seasons. Continuous flow meters were installed in the catch basins at the western end of the block, and flow reduction was determined by comparing runoff rates and volumes under post-construction conditions against pre-construction conditions.

Monitoring the project helped to quantify reductions in stormwater runoff attributed to green infrastructure improvements and to develop a template for future projects. The results of this project are intended to help inform the integration of green infrastructure into redevelopment projects in San Francisco. Monitoring results per SFEI's analysis are summarized in a separate report.

#### *Task 4. Construction*

The Planning Department and the Department of Public Works completed design for development (DD) and construction drawings. We completed interagency review, produced topographic surveys and cost estimates, then acquired necessary permits and secured required street improvement authorizations. The City completed capital construction in December 2011.

Following construction, the Department of Public Works and the SFPUC identified a number of necessary construction fixes related to the two rain gardens at the intersection of Newcomb and Phelps, which were addressed in 2012. The rain gardens were originally constructed with the overflow drain at grade such that the facility did not pond water. Also, the curb-cut inlets were graded such that the majority of stormwater bypassed the raingarden inlet and flowed directly into the combined sewer system. The raingarden inlets were re-graded and the overflow drains were raised after the 2012 wet season. Additionally, an extension was placed at the curb cut inlet to each rain garden to direct flow into the facility. In addition, DPW replaced one tree that died and other planting materials as needed.

#### *Task 5. Prepare Project Evaluation*

SFEI and the SFPUC produced a final monitoring report, which includes data on monitoring pre/post stormwater runoff rates and volumes. The Planning Department completed this final project report, which includes information on maintenance costs of LID improvements and data on monitoring pre/post traffic volumes and speeds.

#### *Task 6. Maintenance*

From early 2012 through summer 2014, City staff regularly inspected the site, maintained sidewalk planters, including tree and plant maintenance, replaced dead or damaged trees and plants, and maintained LID elements, such as the planted infiltration bulb-outs. Specifically, City staff spent four hours a week from 2012 until the end of summer 2014 doing maintenance site visits to replace dead and dying plants; in an urban environment, this is the standard maintenance schedule. The following plants were replaced during the maintenance period:

- Achillia millefolium/Yarrow 25-1 gallons
- Anigozanthos sp./Kangaroo Paw 25-1 gallons
- Carex divulsa/Berkely Sedge 25-1 gallons
- Carex testacea/Orange New Zealand Sedge
- Phormium tenax 'Jester'/Flax 25-1 gallons

- Phormium C. 'Tricolor'/Flax 25-1 gallons
- Iris longipetala/Coast Iris
- Lupinus albifrons/Silver Bush Lupine 25-1 gallons
- Leucadendron salignum 'Red Devil' 25-1 gallons

*Task 7. Public Engagement & Community Involvement*

Numerous meetings were held during the Design Phase where design team members presented design concepts, refinements, discussed materials, proposed traffic and parking change options/required legislation, street elements such as planting, lighting, and tree selection.

During construction, DPW Public Affairs served as a community liaison, visited the site frequently, and communicated construction activity outlooks to residents.

We used several tools to maintain public engagement in the project, including designing and installing two 2'x2' signs at the project site with information about the project and building a Web page (<http://www.sf-planning.org/index.aspx?page=3645>) with information about the project goals, deliverables, and outcomes.

But perhaps the most important public engagement tool was the face-to-face communication and subcontracting with Literacy for Environmental Justice (LEJ), a local nonprofit organization. As we closed out the project in summer 2014, City staff and LEJ attended a block meeting at the home of a resident. This was a productive conversation about outstanding issues and what residents needed from the City. This was followed by two community events on May 31 and June 28.

May 31<sup>st</sup> was the first Newcomb Ave Block Party. More than 25 neighbors contributed more than 75 volunteer hours to help LEJ and City staff pick up garbage from the planters and the street. Rodney Hampton, a Public Service Officer with the Department of Public Works, distributed vests, and tools. LEJ brought all the provisions for a BBQ so that everyone was able to celebrate their accomplishments together.

The second Block Party, on June 28<sup>th</sup>, was attended by neighbors and volunteers, LEJ staff, and City staff. The District 10 Supervisor, Malia Cohen, and the Director of the Department of Public Works, Mohammed Neru, also attended the event.

Before the event, LEJ met with residents and identified two block captains who would store shared tools in their garages and help organize future clean up events. LEJ also conducted outreach to neighbors to get them to show up at the event. Early the morning of the event, DPW crews laid out plants and gravel in the planting beds. DPW also sent a gardening crew to the event to help the residents plant plants and assist with remove garbage.

The event itself was a success. Roughly 30-40 people attended, including residents and volunteers with LEJ, and a DPW gardening crew. They contributed more than 120 volunteer hours to the project that day. Rodney Hampton from DPW gave a brief welcome speech to thank project sponsors and residents, and brief volunteers on how to safely plant plants and pick-up garbage.

Residents and volunteers weeded and removed trash. LEJ organized a community barbecue and provide games for the kids. Mohammed Nehru, the DPW Director, handed out certificates of appreciation signed

by Supervisor Cohen. Supervisor Cohen made an unexpected appearance at the tail end of the event. Both the Supervisor and the residents seemed pleased with the process.

Following the events, LEJ staff offered their thoughts on the project.

*I felt that we made some real solid connections with many people on the block as well as renewed people’s interest in caring for the project. Also it was great to see people on the block make new friendships with each other. Several of them opened their homes to us and treated us well – even fed us. The street looks great with all the plants and trees. San Francisco should do this for every neighborhood. The educational value of taking care of the plants and learning about nature could start in one’s front yard. Green infrastructure and permeable surfaces could revolutionize Bioregional philosophy towards people re-inhabiting their areas. Little by little you see people checking out how good it looks. I hope they continue with cleanings every week and don’t let things pile up on that one corner where the litterbugs hang out. If they can do one planter box a week or spend an hour or so out there beautifying the area a day. (It’s a meditation) I was happy to be a part of the meeting at Michelle’s house. Great to see such a multicultural alliance break bread and solve the environmental problems of the street. Continued success on stewardship efforts. Happy to meet such talented and wise people. We hope we stay in touch.*

### Project Area Improvements

Site Summary	Project Features	Newcomb North	Newcomb South
The 1700 block of Newcomb Avenue in the Bayview District of San Francisco was redeveloped as a model “Green Street”. Stormwater runoff from this residential city block is now retained within or passes through green infrastructure elements prior to entering the combined sewer system. The north and south sides of this city block were monitored before and after implementation to assess green infrastructure effectiveness at reducing stormwater runoff to the combined sewer system.	Year Constructed	2012	
	GI Elements	Permeable Pavers, Bioretention Planters	
	Drainage Management Area (ft <sup>2</sup> )	23,750	25,050
	% of Impervious Area Converted to GI	29%	27%
	% of Impervious Area Converted to Traditional Landscaping	14%	14%
	Monitoring Period	2009-10 pre-construction; 2012-13 post-construction	2012-13 post-construction

### Stormwater monitoring results

The San Francisco Public Utilities Commission monitored stormwater runoff, and the San Francisco Estuary Institute analyzed those monitoring data to evaluate the stormwater management performance of the green infrastructure elements. Preliminary monitoring results indicate that total flow reduction is around 81% compared to a calibrated simulation of pre-construction conditions, with runoff volume decreasing from approximately 91% of the total rainfall volume down to around 17%. Peak discharges in each storm event are reduced between 43 and 100%, depending on storm size, intensity and saturation condition of the catchment. The average peak flow reduction is between 73% and 80% (average for the

southern subcatchment is 82% and for the northern subcatchment is 73%). The lag time between the start of rainfall and the start of detectable flow in the catch basins were slowed from less than one minute under pre-construction conditions to over 15 minutes post-construction. The largest rainfall event that produced no detectable runoff was a 0.25-inch storm.

After the first year of observation and monitoring, two construction fixes were implemented. The planter was originally constructed with the overflow drain to be flush with the ground, below the curb level so that the planter did not pond water. Also, the curb-cut inlets to the rain gardens were oriented so that the majority of stormwater reaching the planters bypassed the inlet and flowed directly into the combined sewer system. The facilities were re-graded and the overflow drains were raised after the 2012 wet season. At the beginning of December 2012, an extension was placed at the curb cut to force flow into the rain garden.

The monitoring results of these corrections showed that the curb extension improved the volume retention during smaller events (less than 0.35 inches of rainfall). All events showed 100% retention during events of 0.25 inches of precipitation or less. Due to the few number of rain events during the monitoring period, there wasn't enough data to ascertain the effectiveness of these improvements on larger events.

**Traffic speed**

The speed reduction is significant. Our goal was to get the vehicle 85th percentile within 5 mph of the speed limit. The volume reduction is also significant and a little hard to explain. Our thought is that Newcomb was used as a minor cut through street but was not critical for most users. The drop in volume could be attributed to the long construction period and that motorist then developed new patterns. The following table summarizes the pre and post construction average daily trips and speeds.

<i>Newcomb Avenue between Phelps and Newhall Streets</i>	<i>Before Construction 6/12/2007</i>	<i>After Construction 12/11/2013</i>
Average Daily Trips (bi-directional)	1431	609
Westbound 85th Percentile	31.2 MPH	28.2 MPH
Eastbound 85th Percentile	29.1 MPH	26.4 MPH

**Partnership**

The project is a result of a partnership between San Francisco Planning Department, the San Francisco Department of Public Works, the Redevelopment Agency, and the San Francisco Public Utilities Commission working with the San Francisco Estuary Partnership, San Francisco Estuary Institute, and the local nonprofit Literacy for Environmental Justice (LEJ). The partnership helped leverage funds and decrease some redundancies.

Partnerships can come with challenges as well. During the eight years from project conception in 2006 to grant end in June 2014, a number of changes, from staff to the loss of Redevelopment, impacted the project. Project knowledge was lost with each change in staff. When the project was conceived in 2006, there were no other streetscape greening projects in San Francisco. Since then, greening and stormwater management design practices have become a common feature of streetscape improvements and the City continues to improve the process for designing, constructing, and maintaining these spaces.

## Recommendations and Lessons Learned

Based on our experience, we offer the following recommendations to municipalities considering green infrastructure projects.

- If needed, provide green infrastructure specific training and education to the construction management staff (resident engineer, construction inspector), and contractor management, supervision and field crews to help them develop a better understanding of green infrastructure concepts and construction techniques and practices.
- Ensure that the contractor who is awarded the project is properly qualified to construct streetscape and green infrastructure type projects.
- Complete a thorough utilities survey and condition analysis to help minimize unforeseen subsurface conditions that may interrupt the project and create added costs.
- Incorporate flow testing into the construction inspection process to identify flaws and improper grading during construction, so mitigation measures can be taken before contractor demobilization occurs.
- Partner with a local nonprofit experienced in community greening. Working with LEJ at the end of the project was hugely successful. They were able to engage the community in ways that DPW and Planning simply don't have the capacity to do. For example LEJ was able talk to neighbors, identify block captains, and find a garage space to store tools. They were able to support the neighbors in specific ways that large City agencies cannot.

