

Seattle Washington

June 21–26, 2015



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Strategic Advice for Urban Resilience on the
Lower Duwamish River

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About the Urban Land Institute

THE MISSION OF THE URBAN LAND INSTITUTE is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. ULI is committed to

- Bringing together leaders from across the fields of real estate and land use policy to exchange best practices and serve community needs;
- Fostering collaboration within and beyond ULI's membership through mentoring, dialogue, and problem solving;
- Exploring issues of urbanization, conservation, regeneration, land use, capital formation, and sustainable development;
- Advancing land use policies and design practices that respect the uniqueness of both the built and natural environments;
- Sharing knowledge through education, applied research, publishing, and electronic media; and

- Sustaining a diverse global network of local practice and advisory efforts that address current and future challenges.

Established in 1936, the Institute today has more than 36,000 members worldwide, representing the entire spectrum of the land use and development disciplines. Professionals represented include developers, builders, property owners, investors, architects, public officials, planners, real estate brokers, appraisers, attorneys, engineers, financiers, academics, students, and librarians.

ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice. The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

Cover photo: ULI/Thomas W. Eitler

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About ULI Advisory Services

THE GOAL OF THE ULI ADVISORY SERVICES program is to bring the finest expertise in the real estate field to bear on complex land use planning and development projects, programs, and policies. Since 1947, this program has assembled well over 600 ULI-member teams to help sponsors find creative, practical solutions for issues such as downtown redevelopment, land management strategies, evaluation of development potential, growth management, community revitalization, brownfield redevelopment, military base reuse, provision of low-cost and affordable housing, and asset management strategies, among other matters. A wide variety of public, private, and nonprofit organizations have contracted for ULI's advisory services.

Each panel team is composed of highly qualified professionals who volunteer their time to ULI. They are chosen for their knowledge of the panel topic and screened to ensure their objectivity. ULI's interdisciplinary panel teams provide a holistic look at development problems. A respected ULI member who has previous panel experience chairs each panel.

The agenda for a five-day panel assignment is intensive. It includes an in-depth briefing day composed of a tour of the site and meetings with sponsor representatives; a day of hour-long interviews of typically 50 to 75 key community representatives; and two days of formulating recommendations. Long nights of discussion precede the panel's conclusions. On the final day on site, the panel makes an oral presentation of its findings and conclusions to the sponsor. A written report is prepared and published.

Because the sponsoring entities are responsible for significant preparation before the panel's visit, including sending extensive briefing materials to each member and arranging for the panel to meet with key local community members and stakeholders in the project under consideration, participants in ULI's five-day panel assignments are able to make accurate assessments of a sponsor's issues

and to provide recommendations in a compressed amount of time.

A major strength of the program is ULI's unique ability to draw on the knowledge and expertise of its members, including land developers and owners, public officials, academics, representatives of financial institutions, and others. In fulfillment of the mission of the Urban Land Institute, this Advisory Services panel report is intended to provide objective advice that will promote the responsible use of land to enhance the environment.

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About Urban Resilience Panels

WITH MUCH EXTREME AND DAMAGING weather occurring in recent memory, leaders in cities around the world are thinking about how to become more resilient in the face of those challenges. Resilience has taken on many meanings in different contexts. The Urban Land Institute has joined a number of partner industries to create a shared definition of resilience: the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events. Implied in that definition is the ability not just to recover and bounce back but also to bounce forward and thrive.

The Kresge Foundation has provided generous funding support to ULI to undertake a series of Advisory Services

panels to assess how cities can better prepare for changes deriving from global climate change. These changes range from rising sea levels and exacerbated drought and air temperatures to more extreme conditions, such as floods and wildfires.

The objective of such panels is to offer advice and guidance to communities that will assist in their formulation of plans and policies and that will, in turn, create stronger responses to and recoveries from such events.

Acknowledgments

THE PANEL THANKS THE CITY OF SEATTLE for its support in sponsoring this panel, particularly Janet Shull and Tracy Morgenstern, who ensured the panel's access to critical information and perspectives and facilitated an excellent, seamless week of work. Thank you for inviting us into your community to share your challenges and to work toward solutions.

The Kresge Foundation also deserves sincere thanks for its generous support of ULI's Urban Resilience Program—support that has made these panels possible. The panel

would also like to thank the many stakeholders from Georgetown, South Park, the Port of Seattle, the greater Duwamish area, and greater Seattle. This group of interviewees included elected officials, local business owners, community members, and municipal staff members. Throughout the week, the ULI panel was continually impressed by Seattle's entrepreneurial and rich cultural history and commitment to improving the city.

Contents

ULI Panel and Project Staff	8
Background and the Panel's Assignment	9
The Case for Resilience.....	13
Site-Specific Recommendations.....	26
Conclusion	38
About the Panel	39

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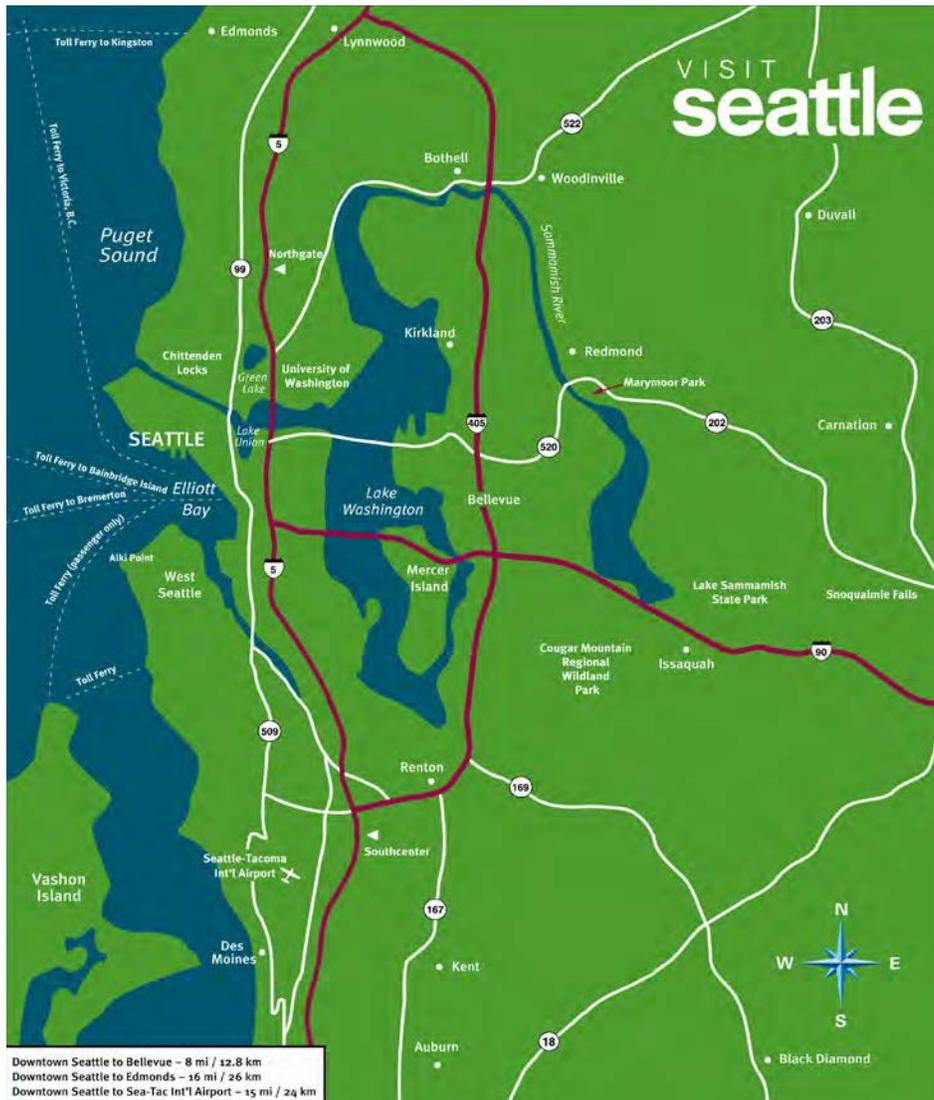
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Background and the Panel's Assignment

THE LARGEST CITY IN THE STATE of Washington, Seattle has a population of about 662,400 (2015 estimate). The city lies on a narrow strip of land between the salt waters of Puget Sound and the fresh waters of Lake Washington. Beyond the waters lie two rugged mountain ranges, the Olympics to the west and the Cascades to the east.

Seattle's climate goals are to become a carbon-neutral city and prepare for the projected effects of climate change to protect the community's health, economy, and infrastructure. The most significant changes projected for the region involve temperature, precipitation, and sea level.



A regional map of Seattle and neighboring cities.

Climate Scenarios for the Lower Duwamish River

Frequency	Climate scenario	Today		2035		2060	
		Water level (distance above)		Water level (distance above)		Water level (distance above)	
		NAVD 88 (0.00')	Mean high water	NAVD 88 (0.00')	Mean high water	NAVD 88 (0.00')	Mean high water
100-year surge	High	12 feet	3 feet	13 feet	4 feet	14 feet	5 feet
	Mid			n/a	n/a	13 feet	4 feet
Annually	High	11 feet	2 feet	12 feet	3 feet	13 feet	4 feet
	Mid			n/a	n/a	12 feet	3 feet
Monthly	High	n/a	n/a	11 feet	2 feet	12 feet	3 feet
	Mid	n/a	n/a	n/a	n/a	11 feet	2 feet
Daily	High	n/a	n/a	n/a	n/a	11 feet	2 feet
	Mid	n/a	n/a	n/a	n/a	n/a	n/a

Source: City of Seattle.

Note: North American Vertical Datum of 1988 (NAVD 88) is a leveling system on the North American continent as determined by the National Oceanic and Atmospheric Administration (NOAA) National Geodetic Survey. A vertical datum is a surface of zero elevation to which heights of various points are referred in order that those heights be in a consistent system.

n/a = not applicable.

The frequency and magnitude of coastal flooding will increase over time because of sea-level rise, with existing annual events projected to become monthly events by 2035 and daily events by 2060 (see figure). Compared with many other communities in the United States, a relatively small percentage of Seattle's land area is expected to be affected by increased flooding from sea-level rise; however, this land includes economically significant areas

and some of Seattle's most overburdened and under-resourced communities.

Study Area

Seattle's largest land areas at risk of increased flooding from sea-level rise are along the Duwamish River, home to lower-income communities and communities of color, as well as a significant manufacturing industrial area. Located south of downtown is Harbor Island and the two channels on either side that form the mouth of the Duwamish River. Upriver on the Duwamish, toward the southern city limits, are the study area neighborhoods of South Park on the west bank of the Duwamish and Georgetown on the east bank of the Duwamish. In addition to the sponsor's defined scope, the panel investigated the Port of Seattle (facilities on Harbor Island) and the SoDo (South of Downtown) neighborhood.

The Duwamish Valley, which comprises about 12 square miles, flanks the lower Duwamish River through South



A satellite view of the study area neighborhoods (outlined in blue).

Seattle and into parts of Tukwila and unincorporated King County. The river is a tidally influenced estuary that extends approximately 5.5 miles south from Harbor Island. Today, it is a mostly armored channel, because much of the original river was filled and replaced to accommodate shipping and industry by the U.S. Army Corps of Engineers in the early 1900s.

The Duwamish area is a significant economic driver for the city of Seattle. At the same time, it is a region interlaced with significant challenges, including physical connectivity, environmental exposure, socially disadvantaged populations, historic tribal uses, and encroaching risk from land use changes.

The South Park and Georgetown neighborhoods are ethnically diverse. The two neighborhoods combined are home to approximately 5,160 people, many of whom are at the greatest risk of suffering as a result of climate change impacts. In comparing residents of the Duwamish Valley to those of King County, the Duwamish residents are more likely to live in poverty, to be foreign born, to lack health insurance and leisure time, and to have health issues. The Georgetown neighborhood has a lower percentage of children than the city average, whereas South Park has a much higher percentage of children living in the neighborhood than does the city overall.

The Panel's Assignment

The panel was tasked with finding recommendations for enhancing the resilience of Georgetown and South Park to flooding caused by sea-level rise and changes in precipitation. This assignment was expanded by the panel to include the Port of Seattle and the SoDo neighborhood. This expansion helped produce various strategies to promote the growth of the industrial area for the regional economy and highlight short- and long-term needs of the neighborhood residents.

The sponsor asked the following series of strategic questions:

- What are recommended strategies for preparing for increased flooding caused by sea-level rise, including those related to protecting the area, accommodating increased coastal flooding, and retreating to some extent from the at-risk lands? How can the public sector partner with the private sector to fund these investments?
 - Levees or walls;
 - Building code changes and other resilient building techniques;
 - Zoning changes, including rolling easements or buffer zones; and
 - Stormwater system improvements and investments.
- How might Seattle best integrate various recommended strategies into a holistic approach to resilience, considering risks from flooding as well as earthquakes, the importance of the area to the economy and the community, and the best use of at-risk land, if strategies such as buffer zones were recommended?
- The South Park and Georgetown neighborhoods include vibrant and diverse communities of color and lower-income residents, many of whom have limited English proficiency. What are recommended strategies for enhancing the resilience of these communities, including engaging residents in leadership and decision-making roles in climate-preparedness planning?

The Panel's Primary Recommendations

In addition to defining and articulating a set of ideal conditions (see pages 13–14) and approaches for consideration, the panel made the following recommendations:

- *Create an Urban Resilience District.* Consider modifying some of the restrictions on nonindustrial uses in SoDo, and channel some of the developer investment toward retrofitting parts of Georgetown and South Park. This could be accomplished by creating an “urban resiliency fund” to help assist in developing needed parks and to

support a land bank, roads, sewer, water treatment, utility, and redundancy needs, particularly in the lower-income South Park and Georgetown neighborhoods. The panel suggests using a form of community revitalization financing, a city-based local revitalization financing, or new markets tax credits for financing improvements. Although the panel recognizes the geographical limitations of community revitalization financing, it suggests creating a similar model for not only the creation of business, but also the improvement of public infrastructure.

- *Identify impact districts.* The ULI team identified 12 areas that have differing “impact characteristics.” Individual areas need varying responses and strategies to address short- and longer-term resilience needs, including both gray and green infrastructure. These strategies range from locks and hardened bulkheads to riverside parks and berms, bioswales, and rain barrels. The panel’s presentation addressed these approaches in more detail.
- *Improve stormwater drainage.* Divert some of the existing flow from Beacon Hill around the Georgetown neighborhood, and raise the level of some of the critical intersections to ensure traffic mobility during extreme storm events.
- *Create a coordinating hub focused on Georgetown and South Park.* This targeted effort should be overseen by a lead agency or organization with the capacity to facilitate a holistic, collaborative effort. It can also help leverage funding from federal, state, and local governments and philanthropists, as well as allow participatory budgeting. A gap/needs analysis could be conducted as part of this coordination.
- *Hold an annual State of the Duwamish Summit.* Planning an annual community-wide convening at a time and place that is welcoming and sensitive to language, work schedule, accessibility, and child care needs of the area at large should be considered. This State of the Duwamish Summit would share critical information about economic trends, development prospects, environmental remediation, and opportunities for civic engagement.

- *Review and update zoning codes.* A review, modernization, and rationalization of zoning codes would lead in time to an increased mix of housing, industrial types, and business uses, thereby allowing the private market to respond to opportunities within the area. Some controls (e.g., “planned manufacturing districts”) may be necessary to maintain land values to support some current or desired future industrial and manufacturing uses.

- *Increase transportation options.* Such options could include additional pedestrian, bike, and vehicular bridges; staircases up the bluffs; enhanced bike paths and sidewalks; water taxis; and more transit stops and frequency to increase connectivity and resilience.

The remainder of this report elaborates on these and other approaches to address urban resilience in the lower Duwamish River.

The Case for Resilience

THE COST OF PREPARING for a hard-to-see, long-range event can play second fiddle to immediate, day-to-day operational challenges—particularly when competing capital needs exist. However, shocks and stresses can be an opportunity to bounce forward and address issues that are not related just to climate change.

Resiliency strategies play a huge role in long-term viability and economic value both for public entities and for individual businesses and residents. The objective is to future-proof against a potential downside while priming to take advantage of opportunities. What region or business would leave its long-term fate to the vagaries of the environment when reasonable, prudent, and proactive measures can be taken to avoid property and profit losses?

As defined by the Rockefeller Foundation's 100 Resilient Cities program, urban resilience can be divided into four basic dimensions:

- Health and well-being;
- Economy and society;
- Infrastructure and environment; and
- Leadership, strategy, and community engagement.

The objective is to proactively make cities and communities increasingly capable of overcoming both the day-to-day and catastrophic stresses placed upon them. This capability is measured in terms of economic value: increased revenue, avoided cost, community cohesion, environmental health, and resident physical and social well-being. Each of these contributes to a desirable, future-ready city.

Developing a plan for a resilient community involves a large and diverse number of stakeholders spanning the domains of economic development, industry, social equity, urban

planning, design, and engineering. Some of the focal points include establishing leadership structures, finding launching points to gain traction, and engaging the business and residential community to help drive appropriate investments. It is not enough for a community merely to return to normal after a shock or stress; rather, shocks and stresses can be an opportunity to bounce forward.

Ideal Conditions and Approach

The recommendations that follow were informed by interviews with local and regional stakeholders, data analysis, and site visits. However, to provide a holistic framework for resilience and internal coherence between policy and operational and infrastructure recommendations, the panel developed the following six “ideal conditions” to serve as aspirational targets for the future of the greater Duwamish area.

- *High internal cohesion and external connectivity:* This condition addresses the importance of having both physical connectivity (via roads, bridges, and trails) and social networks (developed through civic organizations and community organizing) to enhance political relationships with the broader region.
- *Improving the area's welfare, health, and economy through the built and natural environment:* Future policies, design considerations, and land use patterns should support mobility, improved air quality, and biodiversity.
- *A diversified portfolio of land uses, building types, and infrastructure investments to make the area shock-resistant:* The greater the diversity in any sector, the greater is the resistance to threats such as environmental disaster, increasing housing costs, and shifts in the economy.

- *Increased self-reliance and internal investment:* Overall improvement of the Duwamish area needs to come from within the community. It need not comprise only coordinated investments and activities by external partners.
- *Low life-cycle cost and high cobenefit investments, with nature-based principles, where prudent:* Investments should be made with a longer time horizon in mind, eyeing future maintenance costs and providing a fuller array of possible benefits. Nature-based systems should be used in situations where a high degree of confidence exists about their long-term effectiveness.
- *Investments that build future-oriented multithreat preparedness that also improve day-to-day quality of life.* Investments such as increasing water access, food

access, or neighborhood parks support healthier living. They also support longer-term resilience strategies.

The panel believes these ideal conditions would exist in a future scenario in which the greater Duwamish area can withstand, manage, or avoid effects of rising sea levels as well as other existential threats. Both near-term and longer-term recommendations were selected based on their alignment with these conditions and, to the greatest extent possible, multiple conditions simultaneously.

Health and Well-Being

Both the Georgetown and South Park neighborhoods are proximate to the Lower Duwamish Waterway Superfund Site. South Park, in particular, experiences significant

Identified Resilience Needs within the Duwamish Complex

Direct or cataclysmic event	Indirect climatic aspects	Everyday resilience
Sea-level rise: rising of water levels above current mean high-tide level	Extreme heat and large temperature swings	Equity of city services, including emergency services
Exacerbated by “king tide” or tsunami (tidal surge inland)	Alternative of too little rain and snow cap	Access to healthy food and health care
Pollution spill/contamination from the force of moving water	Power grid challenges with reduced snow and increased demand	Safe sidewalks, pedestrian environments, and safe streets
Torrential downpours from the “atmospheric river” (or pineapple express) leading to local flooding, surface flow from bluffs, and potential collapse of bluffs	Uncertainty of food flow: port and transit effect of food shortages (growth of port imports), or alternatively if the region becomes a global breadbasket (the attendant increased exports of foodstuffs)	Intercommunity bike trails
Torrential downpours leading to enlarged flows from Green River catchment through the river	Rising Duwamish River Valley water table unleashing more soil contaminants	Healthful personal lifestyles
Wind events	Fire storms in dry green “tinder” zones	Adjacencies of residences to manufacturing services
Seismic liquefaction	Dust storms from dry lands and urban debris	Noise and vibration from heavy truck and ship traffic
Volcanic flow or lahars	Rapidly increasing population with climate refugees	Airborne diesel impacts on health from manufacturing, harbor craft, and highway system
		Contaminated soil and river water impacts
		Aging building stock with indoor environmental quality issues
		Aging urban infrastructure with decreased funds for maintenance of vital services
		Lack of predictable transportation in conjunction with increased congestion

Source: ULI panel.

health effects caused by airborne, soil, and water-based contaminants. In 2013, the *Duwamish Valley Cumulative Health Impacts Analysis: Seattle, Washington* found that the level of patients admitted to area hospitals for childhood asthma is the highest in King County and that residents have a 13-year shorter lifespan than residents of the rest of the city. The city data show that the area has disproportionate rates of obesity. But residents in both communities are committed to their neighborhoods and creating a healthier environment for their community and for the Duwamish River wildlife corridor. Environmental stewardship is present and reflected in the annual Duwamish Alive! community cleanup events.

Design and development practices can significantly increase opportunities for physical activity in daily life. Multiple studies show that people who live in places with good pedestrian amenities, bicycle infrastructure, and access to trails have higher rates of physical activity and lower body weights. Park and playground access is also critical, because people who live within a half mile of a park tend to exercise more than people who lack park access. The design of buildings can also affect physical activity habits

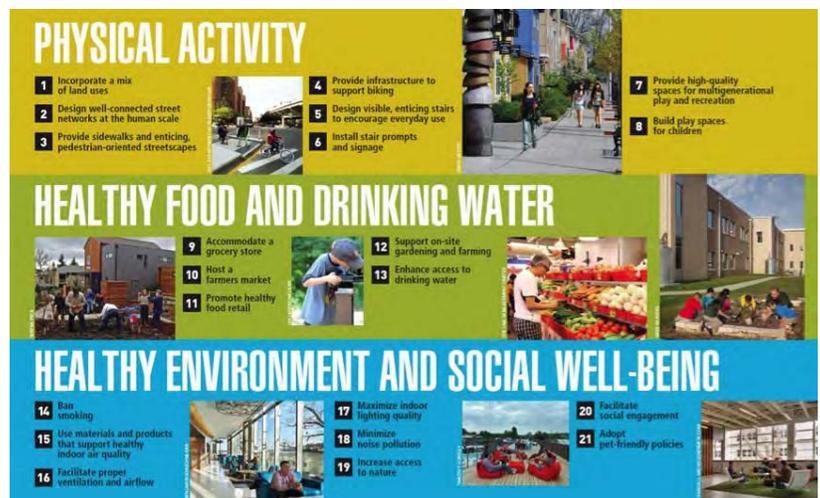
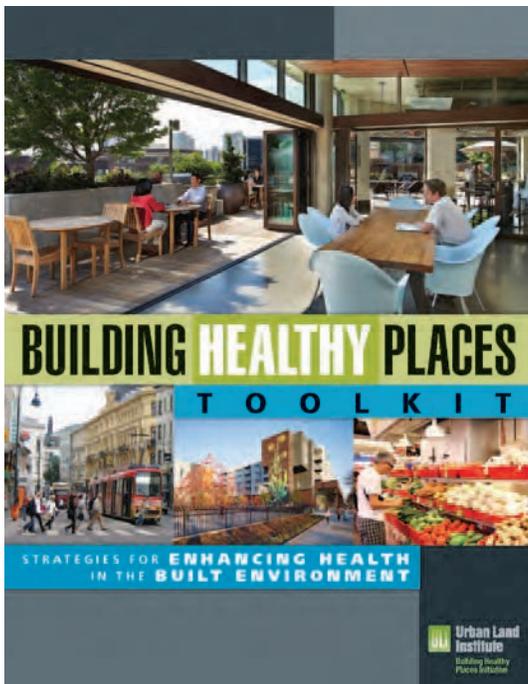
by encouraging active circulation within the site. Regular stair use provides numerous health benefits, including reduced stroke risk, improved cardiovascular health, and weight management.

Further compromising the area's resilience is its lack of access to sufficient primary retail facilities. The City of Seattle Office of Sustainability's *Food Action Plan* (October 2012) mapped food access in Seattle and noted the following:

Healthy food is integral to the health and well-being of our communities. Healthy food is defined as food that is fresh and nutritious and grown without harming its producers or our air, water, or soil. In a healthy food system, healthy food is available and accessible for all community members; there is a strong network of successful and culturally appropriate businesses that produce, process, cook, transport, and sell that food; there are opportunities to produce food locally; and food waste is prevented.

The report shows that the neighborhoods of South Park and Georgetown have limited retail food access, compounded by limited transportation services. Seattle has a rich retail food environment with other store types offering

A flyer ULI's Building Healthy Places Initiative (below) highlights 21 tasks to improve the physical activity, food, water, environment, and social health of a place. More detailed examples can be found in ULI's Building Healthy Places Toolkit (left).



staples and fresh foods; however, only a handful of small stores in the South Park neighborhood sell basic food products plus some specialty foods (not found in traditional grocery stores). The Carlton Avenue Grocery is a small neighborhood grocery in Georgetown that is a community favorite and stocks the basics. The neighborhood of South Park also has the only working farm within the city limits. Marra Farms provides fresh, organic produce to the community and the city. However, neither community has a major grocery store.

According to Esri data, the one-mile radius of 7500 West Marginal Way reflects a retail gap of \$25 million, indicating a need for about 70,000 square feet of retail space for grocery and food stores. At a 20 percent capture rate, the panel estimates about 15,000 square feet of food retail space could be supported by the area.

Having access to healthy food matters in people's everyday lives, their long-term health, and their ability to fully engage in their communities. Preventable health outcomes affect not only the individual but also the community at large. New and improved healthy food retail in underserved

communities creates jobs, helps revitalize low-income neighborhoods, and reduces health care costs.

In the event of some type of catastrophic environmental crisis, this community would have insufficient capacity to provide for itself and would need to rely on external sources to deliver food and other resources.

The ULI team recommends creating the following:

- *Healthy living amenities:* The Duwamish River itself, the street grid, and available open space have minimal infrastructure to support healthier living. The north bank of the Duwamish has very few access points, and little formal infrastructure exists to support water sports. Neighborhood parks may not have amenities that present-day residents need or want. The June 2014 South Park Green Space Vision Plan has provided a needs assessment for recreational and public health amenities to improve the neighborhood's day-to-day and long-term health. The panel endorses these surveys done in the neighborhood to ensure a comprehensive understanding of the type of work needed to be done in the neighborhood.
- *Access to healthy food and groceries:* Access to healthy food can bring a multitude of benefits to communities—better health, new jobs, and a revitalized economy. Bringing healthy food retail into the South Park and Georgetown neighborhoods is one way to increase healthy community outcomes and revitalize the economic vitality of the neighborhood.



Economy and Society

During climate-related events (such as an especially high tide or prolonged precipitation), significant economic losses would be incurred. Lost wages, property damage, and business interruption would reverberate throughout the local, regional, and national economies.

Although the actual amount is difficult to assess, a comprehensive commercial-level assessment in the Green River—Duwamish River Valley shows total property value exposure between \$30 billion and \$50 billion. Given that

the Duwamish area accounts for about 30 percent of total sales and property taxes and 10 to 20 percent of total employment in the overall Green River Valley region, the panel estimates about a \$10 billion exposure in property value in this area. Business interruption, for days or weeks, would add exponentially to this cost. Even though many companies carry property damage and business interruption insurance, the downtime and inability to deliver a product or service in a timely manner have long-term ramifications—for the firms, their employees, and their clients. Moreover, flooding is generally excluded from coverage in most insurance policies.

Costs associated with resiliency measures must be viewed in conjunction with the avoided effects: loss of property, business and economic exposure, and critical life and safety mitigations. At the same time, value associated with a stronger, more resilient neighborhood and quality of life must be incorporated. Communities rely heavily on linked networks. The loss of one critical component of infrastructure can have cascading effects throughout a myriad of systems.

In 2012, \$24.4 billion in total wages were paid out by industrial activities on industrial lands in the Puget Sound region. Overall, the annual earnings from industrial jobs on industrial lands averaged \$80,000 in 2012. Wages associated with industrial jobs on industrial lands equaled 23.2 percent of all wages paid out across the region in 2012. The Puget Sound Regional Council (PSRC)'s recent Duwamish–North Tukwila Subarea Profile forecast shows industrial jobs on the region's industrial-zoned lands increasing from 305,100 in 2012 to 389,000 by 2040. Regionwide, this represents an addition of 83,900 industrial jobs through 2040, yielding a compound annual growth rate of 0.9 percent. In comparison, nonindustrial jobs on industrial lands in the region are forecast to grow at a compound annual rate of 2.3 percent.

According to the same PSRC report, the proportion of industrial to nonindustrial jobs is forecast to experience a pronounced change. The total percentage of nonindustrial jobs is projected to grow from 36 percent of total jobs on

industrial lands in 2012 to 44 percent by 2040, reflecting the potential for major changes in land use and opening up the opportunity for redevelopment in certain areas.

The manufacturing, wholesale trade, transportation, warehousing, and utilities industries in these areas generate at least 50,000 family-wage jobs. According to the Economic Policy Institute, the family-wage job in the Puget Sound region equates to \$70,212, which indicates the area is generating an economic benefit to the larger community of approximately \$3.5 billion.

Data from the Port of Seattle suggest a climate-related event could have serious repercussions throughout the state economy: 2013 figures indicate marine cargo imports account for about 11.6 percent of Washington state's gross domestic product. Most of the cargo is destined for the Midwest and the East. Freight lines based in or going through the Duwamish area are at risk. Goods manufactured in this region or transferred at the port are transported and used nationally.

Critical local supplies also move through the area. These include food into the region and city waste out from the local transfer station. For example, the city consolidates waste at the Rabanco Recycling Company, Eastmont Transfer Station, and the South Transfer Station, and then transfers it out via rail six times per week. Damaged infrastructure would severely compromise Seattle's ability to move waste out of the region. The potential exists for lack of food and other necessities getting into or through the region at the same time that garbage is piling up.

Land Use

The diverse uses of property in the South Park and Georgetown neighborhoods provide an equal number of challenges and opportunities for the area. From the ULI team's research, competing priorities among residential, commercial, and industrial uses of the properties in this area clearly require thoughtful approaches and solutions involving zoning. Community concerns about residential displacement, for instance, as well as competing priorities between residential and industry community members

Study Area Land Uses

Rank	Category	Acreage
1	Warehouse	832
2	Air terminals and hangars	596
3	Industrial (heavy)	591
4	Terminal (marine/commercial fishery)	475
5	Vacant (industrial)	413
6	Right of way/utility, road	348
7	Industrial (general purpose)	326
8	Terminal (marine)	305
9	Terminal (rail)	150
10	Industrial (light)	134

Sources: King County Assessor; CAI.

make land use a high-priority issue to address—and one that should involve comprehensive stakeholder outreach and engagement.

Variable growth among different industrial subsectors could usher in changes in the composition of employment and use types on existing industrial lands. The warehousing and wholesale sector is projected to grow as a share from 17 percent in 2012 to 21 percent in 2040, whereas the share of manufacturing jobs is expected to decline (55 percent in 2012 to 46 percent in 2040). Other industrial activities—largely composed of industrial services—have the highest forecast growth rate and are projected to increase as a share of total industrial jobs from 8 percent to 13 percent by 2040.

The Duwamish area is presently home to a strong manufacturing district. Based on its recent survey, the PSRC considers the Duwamish area as one of strong demand but limited capacity in which a continuing need for industrial use exists. In the Greater Duwamish Manufacturing and Industrial Center, over 30 percent of all industrial space is found in 29 buildings that are larger than 150,000 square feet; 42 percent of rentable building space is in buildings larger than 100,000 square feet. Only 25 percent of rentable building area is in buildings smaller than 30,000 square feet.

South Park covers just less than 240 acres. Of the industrial-zoned land, 75 percent is in active manufacturing and warehouse use or in communication, utility, and transportation facilities. The industrial areas are located on the north and south sides of the neighborhood with residential and commercial uses clustered along Cloverdale Street and 14th Avenue South.

The Georgetown area covers over 1,750 acres—half in public or railroad ownership. Eighty percent of this area is in some type of industrial use.

The ULI team recommends the following actions:

- *Review and update zoning codes:* A review, modernization, and rationalization of zoning codes would lead in time to an increased mix of housing, industrial, and business types, thus allowing the private market to respond to opportunities within the area. Some controls—such as planned manufacturing districts—may be necessary to maintain land values to support some current or desired industrial future uses.
- *Refocus existing land uses:* To further solidify the workforce neighborhoods and industrial mix and to avoid displacement in the South Park and Georgetown areas, identify underused land and support additional 21st-century light or clean industry infill; select mixed uses such as “makers” (studios and workshops) and affordable housing. Allow street vacations when certain locational and programmatic criteria can be met to promote larger industrial users in exchange for reduced city maintenance costs and an increased tax base. Promote efficient use of industrial land to reduce the construction footprint, thereby allowing natural surfaces to accommodate stormwater flooding and increased tidal surges.
- *Establish a land bank vision:* A land-banking plan for the Duwamish Valley should be established to identify parcels for future acquisition and development as open space or recreational facilities, land assembly for larger developments, trail development, or other investments, including developing a range of riverfront uses. An example of successful land banking to regenerate an area

is the Genessee County Land Bank in Flint, Michigan, which spurred \$60 million in private investment.

Access

Perhaps one of the most striking characteristics of the South Park neighborhood is its lack of access and sense of isolation. Between the geographic barrier created by the natural bluff and the river, and the poor transit service, sidewalk network, bike system, and water access, stakeholders conveyed an exacerbated sense of disenfranchisement. Although the Georgetown neighborhood lacks these same geographic boundaries, the absence of a light-rail stop, street crossings for pedestrians, and other amenities prevents ease of movement around the close community. In terms of both resilience and evacuation or emergency preparedness, strong investments must be made in increasing the access of these communities to both each other and outside assets such as grocery stores, places of employment, and health care centers.

The ULI team recommends the following:

- **Additional bridges:** Improve physical connections within the Duwamish area by constructing an additional local bridge for auto traffic as well as bike and pedestrian crossings in one or more locations. This will relieve some local street congestion, provide healthier transportation options in the near term, and create increased evacu-

With driving, biking, and walking, encouragement of multimodal transportation links will increase mobility for residents in these neighborhoods.



PORTLAND BUREAU OF TRANSPORTATION

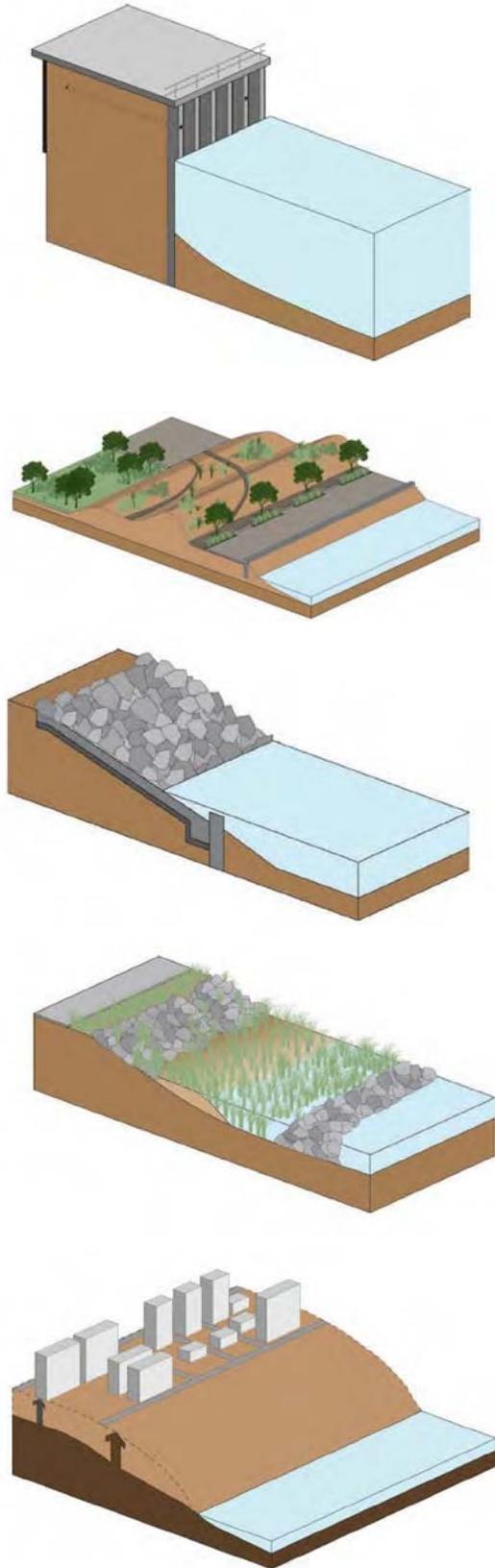


ation options during emergency situations. In addition, these bridges provide a non-auto-dependent evacuation option in emergency situations.

- **Staircases up the bluff:** Build multiple staircases up the bluff to West Seattle. They will provide an exercise option, employment access for Duwamish and West Seattle residents, and river access for West Seattle residents.
- **Enhanced bike paths and sidewalks:** Although the South Park community benefits from a recently installed bike path, stakeholders voiced concerns over the safety of the route overall. Additional paths should be explored in both communities from a safety and accessibility standpoint to provide greater connections and transportation alternatives to residents. The Pronto bike-share service should be expanded to SoDo, Georgetown, and South Park, thereby enabling commuters and residents to move back and forth between the Duwamish area, employment, and transit opportunities and downtown. This will relieve congestion, improve public health, and again, provides another option for evacuation. Implementation of Complete Streets policies in these neighborhoods would ensure appropriate bike and pedestrian networks better connecting stakeholders to outside amenities as well as to one another.

The panel has identified potential locations of bridges, walkways, and other paths. The specific locations are subject to a more comprehensive study and survey of the area. For example, locations of the pedestrian bridges focus on increasing connectivity between Herring's House Park and the Federal Center site. Any additional pedestrian bridge must accommodate river traffic on the Duwamish.

These pictures illustrate adjustments that can be made to strengthen the shoreline. The changes include installing a hardened bulkhead, creating a riverside park or berm, raising the land, and installing a revetment.



DEPARTMENT OF CITY PLANNING, CITY OF NEW YORK

- **More transit stops and greater frequency:** Although bus service is available in both South Park and Georgetown, the frequency is not convenient for community members. In addition, the light-rail line runs adjacent to Georgetown but does not stop within the community. The ULI panel fully appreciates the lack of density in both of these neighborhoods and the correlation to increased transit service: however, the panel is also sensitive to the equity considerations and specific income makeup of these neighborhoods, which necessitate increased transit service. Additional rapid-transit service to and from the Duwamish area should be explored, including but not limited to rapid bus service and off-peak service. Furthermore, given the lack of grocery and retail amenities in the Georgetown and South Park neighborhoods, a ride-share system, jitneys, shuttles, or other flexible transit options may require less capital investment to provide residents with access to fresh food, pharmacies, or other necessities missing from the neighborhood.
- **Additional boat launches and a water-taxi service:** Establish multiple boat launches along the Duwamish, including at least one dock sufficient for a larger water-taxi service. In time, this amenity may support more recreational options, including cultural tourism, but it also provides additional evacuation options.

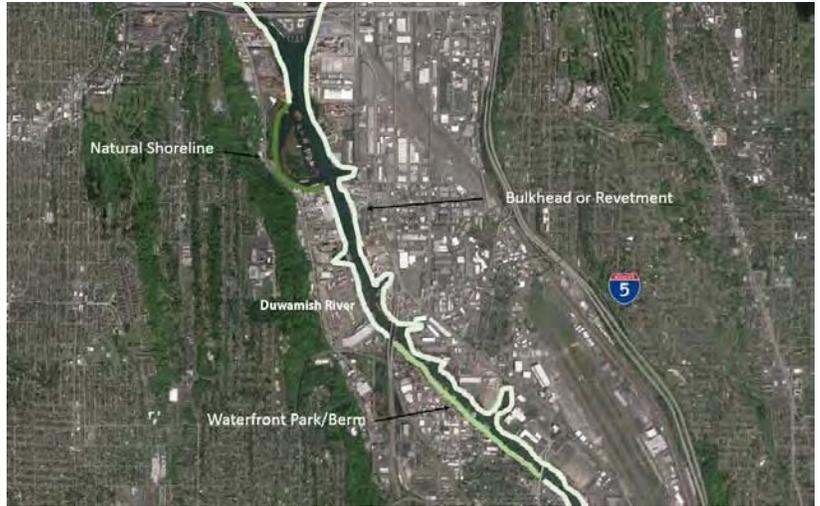
Infrastructure and Environment

Resiliency of a community can only be as strong as its infrastructure and amenities: without systems of water management and protection, as well as tools for community health and vitality, resiliency will suffer. In both South Park and Georgetown, various opportunities to fortify and improve the infrastructure and assets of the neighborhoods present themselves and in many cases provide avenues for better quality of life for residents today as well as emergency management in the future. These improvements include both gray and green infrastructure, depending on specific topographical characteristics and contaminated soils.

Additional improvements include bioretention facilities, micro-bioretention, enhanced street-tree grates, roadside bioswales, and rain barrels. These strategies can be implemented throughout the Duwamish area.

In-water improvements include artificial reefs, groins, or constructed wetlands. These nature-based systems could help increase biodiversity for terrestrial and aquatic plants, animals, and other wildlife.

Land should be raised to a minimum elevation of 14 feet above sea level or plus four feet above the 14 feet for storm surge and water protection at critical intersections and select locations. Following the Shoreline Master Program codes, the river edge should be buffered at select locations (indicated in the illustration at right). Gray infrastructure should be improved in areas where green infrastructure may contribute to spreading contaminated soils. To decrease the need for some of this gray infrastructure, a lining could be included under some bioswales or bioretention facilities to ensure that water does not touch the soil. Georgetown is the site of negative environmental externalities, such as toxic waste pollution, that affect the health and safety of the community. However, efforts from the Duwamish River Cleanup Coalition have helped and are continuing to improve the situation. The panel commends the work that has been done so far and encourages



ULI/STEVEN GU

further cleanup in the Georgetown and South Park areas to decrease harmful industrial waste.

From the port to south of South Park, different types of shoreline enhancements are needed along each side of the Duwamish.

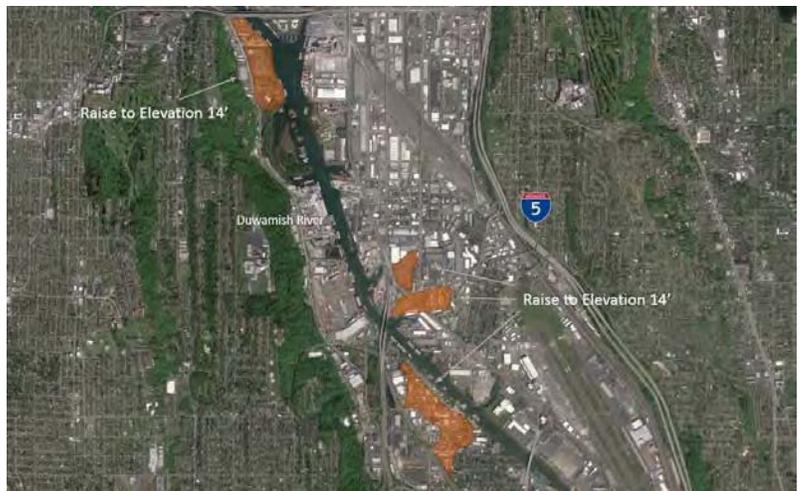
The ULI team recommends the following:

- **Collaborative approaches to control flooding:** The Duwamish community, the city of Seattle, and private landowners should develop redundant and flexible flooding solutions for both day-to-day precipitation and expected tidal surges.
- **Innovative infrastructure:** The city of Seattle should encourage functioning green and gray infrastructure



ULI/STEVEN GU

Shaded areas show future sewer and gray infrastructure improvements.



ULI/STEVEN GU

and should build future-oriented systems, as well as systems that provide multiple benefits. These include “smart” infrastructure with adaptive capabilities such as earthquake early-warning systems and nature-based systems. Moreover, area stakeholders should have a direct participatory role in budgeting and planning capital improvements.

- *Incentives and requirements for green infrastructure:* Improve the environmental performance of buildings, infrastructure, and habitat by balancing incentives (i.e., grants, expedited permitting, fee waivers, etc.) with requirements for measures such as tree-canopy management, low-albedo surfaces, and enhanced stormwater management.
- *Greater consideration of these communities in capital planning:* Streets, sidewalks, bridges, pipes, open spaces, and other public infrastructure are deficient throughout the area in both industrial and residential areas. Area improvements must receive greater consideration in capital planning.
- *Agricultural opportunities:* Because the South Park neighborhood is described by residents as a food desert, a scan for appropriate agricultural opportunities should be undertaken. The Marra Farm provides an excellent model already in place. In addition, larger-scale agriculture, including use of hydroponics, vertical farming, and closed-system waste processing, should be explored as a viable industrial use that could add environmental benefits to existing industrial land.

Leadership Strategy and Community Engagement

The Duwamish area benefits from the attention and efforts of a multitude of agencies, plans, projects, and strategies. Through the work of these federal, state, regional, county, and city authorities, progress has been achieved in the cleanup of the Lower Duwamish River Superfund Site and management of stormwater systems. However, as a result of the complex cleanup efforts and crowded landscape of entities, coordination between these agencies has been

difficult, and leveraged opportunities for restoration and remediation, as well as broader community engagement, are being missed. Community residents, businesses, industries, and nonprofits in the area expressed varying levels of confusion over the lack of transparency. Although some stakeholders were aware of—and grateful for—the progress being made, many were frustrated and concerned about the ongoing environmental issues and lack of available information. To propel progress and align resources for the benefit of all stakeholders, ULI created a suite of recommendations building on existing momentum in the region.

The ULI team recommends creating the following:

- *A coordinating hub focused on Georgetown and South Park:* Although efforts such as the Green/Duwamish Watershed Strategy will provide a holistic approach and platform for coordination—and include an impressive array of relevant stakeholders—the ULI team recommends a specific effort in addition to this overall strategy that will focus on the South Park and Georgetown communities. This targeted effort should be overseen by a lead agency or organization with the capacity to facilitate a holistic, collaborative effort and ensure the following:
 - Leveraging of agency efforts, when appropriate, to maximize impact and potentially conserve time and resources. For example, if one agency is conducting a river cleanup, attempts should be made to align that undertaking with bulkhead removal efforts by other agencies.
 - Involvement and awareness of diverse community leaders and representatives in visioning and planning exercises.
 - Incorporation of community concerns and priorities by various agencies and authorities undertaking efforts within the community: this hub should serve as a liaison between the community members (residents, businesses, and industries) and government entities.

- *A community-driven resilience planning process:* Creation of a clear, coordinated strategy for the Georgetown and South Park areas is essential in achieving full buy-in by the community (residents, business, and industries alike) around resilience. This strategy should include all pollution and environmental remediation efforts, as well as economic development strategies, industrial growth plans, equity protections, quality-of-life recommendations, and climate adaptation programs. This plan should be driven by the community—specifically by a designated community group or coalition—and coordinated and supported by the hub. As Seattle embarks on its own citywide resilience plan, this neighborhood-driven process could offer a model to be replicated within the overall city plan and in communities across Seattle.

Public Engagement

With a significant percentage of the population representing foreign-born nonwhite and Hispanic residents in both the South Park and Georgetown communities, diversifying community outreach and ensuring ample translation opportunities are available are critical to better engaging these traditionally underserved neighborhoods. As noted in the Race and Social Justice Initiative three-year plan, the city of Seattle has made great strides in amplifying its public outreach and engagement efforts, including implementing new policies offering translation and interpretation services. However, through stakeholder interviews, the communities' distrust of government and longstanding feelings of neglect and disenfranchisement were clearly communicated—exemplifying the need for stronger connections between the previously mentioned agencies, residents, and community groups.

With booming growth in Seattle spurring the mayor to create a new Office of Planning and Community Development, ongoing coordination with the Department of Neighborhoods and continued focus on underserved communities are critical. The city must maintain a focus on the neighborhoods of Georgetown and South Park despite the small voting bases and intense population growth in other parts of town. As the City Council moves from an

at-large system to a district-based framework, which will place Georgetown and South Park in separate districts, focus by the city is more relevant now than ever. Through stakeholder interviews, the ULI team identified specific opportunities for the city to enhance community engagement in strategic ways to increase long-term community resilience.

The ULI team recommends the following:

- *An annual State of the Duwamish Summit:* Planning an annual community-wide event convening at a time and place that is welcoming and sensitive to language, work schedule, accessibility, and child care needs of the area at large should be considered. This State of the Duwamish Summit would share critical information about economic trends, development prospects, environmental remediation, opportunities for civic engagement, and more. As noted, more stakeholder engagement in capital improvement planning is needed: the State of the Duwamish Summit could readily be a part of that planning process. Models for such a summit exist in the New England town meeting tradition, as well as the Chicago area Calumet Summit.
- *Cohesive communication around resilience for low-income communities:* Creating aligned messages and language around resilience that include sea-level rise, earthquakes, and volcanic eruptions is essential to framing resilience. In addition, special attention should be paid to the creation of value statements around sea-level rise and resilience that connect future threats to existing stresses: disenfranchised populations are often grappling with immediate concerns—from food security, to health, to job loss—which impede long-term thinking about abstract concerns such as sea-level rise. Exploring meaningful ways of communicating current opportunities to mitigate current and long-term risks will increase the likelihood of resilience adaptations.
- *Tailored, culturally specific outreach strategies:* As stated in the Race and Social Justice Initiative report, progress has been made in better engaging communities of color across Seattle. To continue building on these successes,

the Department of Neighborhoods should be fully leveraged in outreach to the Georgetown and South Park neighborhoods to provide interpreters at public meetings, hold public meetings in other languages, and produce all collateral communications in various languages. In addition, nonprofits and existing community groups should be engaged in the creation of culturally sensitive outreach strategies to ensure maximum participation from cultures that do not fully engage in traditional public meetings. Last, outreach must be conducted at multiple times of the day—including in the evenings (outside working hours)—and in the neighborhood, ideally offering child care and food for maximal participation.

- *Creation of direct financial and in-kind assistance for low-income residents to enhance personal resilience:* Although some adaptation measures for climate change are simple and low cost, many often require significant resources. In either case, climate change adaptations can be financially burdensome on cash-strapped families in struggling communities. Because both Georgetown and South Park are on the front lines of sea-level rise in Seattle, and both residents and businesses often lack the necessary community frameworks to organize effectively, supporting resilience through structured programs at the city level would make the most impact in propelling these communities toward implementation. Such programs could focus on the following adaptation measures:

- Home elevation and hardening assistance;
- Greater transit access;
- Enhanced workforce opportunities within neighborhoods; and
- Relocation or evacuation assistance in event of catastrophe.

- *Identification and use of existing and applicable communication channels for neighborhoods groups, residents, and business:* In both South Park and Georgetown, neighborhood associations, merchants associations, and business groups are already engaged and active. Identifying

these stakeholder communication channels and requesting dissemination of announcements, updates, and information is a simple way to better engage these areas. For example, the South Park community has an active listserv that can be used to further the preceding recommendations. Social media should be fully explored as well—especially given the nearly 25 percent of residents under age 18 in the South Park neighborhood: youth outreach and creation of multigenerational behavioral approaches around resilience should not be overlooked in these communities. These channels provide necessary platforms not only for resilience adaptation, but also for evacuation and emergency management preparation and communication.

- *Need/gaps analysis for the South Park and Georgetown communities:* An advantage of consolidating and coordinating the work underway in South Park and Georgetown through the previously described hub is the opportunity to identify gaps and shortcomings in the various processes affecting the community. Working with stakeholders to compile an inventory of projects, plans, and actions will shed light on further opportunities—especially around equity—that need philanthropic or public/private partnership support.
- *Formal engagement of existing nonprofit network:* Seattle benefits from a strong nonprofit community, and interviews illustrated a robust network of organizations with diverse missions and areas of expertise—including social equity, community outreach, and environmental justice—who were working in these neighborhoods. The city should consider providing enhanced grant support to these existing nonprofit organizations to supplement its own outreach efforts. Funding various organizations with community ties, issue awareness and expertise, and grassroots credibility to support outreach efforts will heighten resiliency awareness across the community and provide greater levels of engagement and buy-in for proactive climate change adaptations. Moreover, this outreach will build on the momentum already established through the city's successful environmental justice initiatives.

- *Philanthropic outreach and engagement strategy:* Based on the preceding work, building strong relationships with local and national philanthropic organizations and familiarizing these organizations with the needs of Georgetown and South Park are essential. The involvement of organizations such as the Bullitt Foundation and Seattle Parks Foundation in both Georgetown and South Park are indicators of early success in this regard.

Site-Specific Recommendations

RESILIENCE IS CRITICALLY IMPORTANT to Seattle at large and the Duwamish area in particular. Several sites found between the port and the base of the river are vital to the region's short- and long-term health and viability.

The recommended resilience infrastructure improvements are necessary to maintain and support increased health and vibrancy of the Duwamish area. Land use throughout the area should be reevaluated. The funding necessary to ensure safety and resiliency of the city, and these areas in particular, should be incorporated into land use decisions.

Urban Resilience Fund/Urban Resilience District

The panel recommends modification of the restrictions on nonindustrial use in the SoDo district to allow a mixed-use district, including commercial and hospitality development, high-rise living along with a mix of market housing, and the possibility of entertainment venues. This change in land use can be supported only if the recommended resilience measures are undertaken throughout the entire Duwamish area.

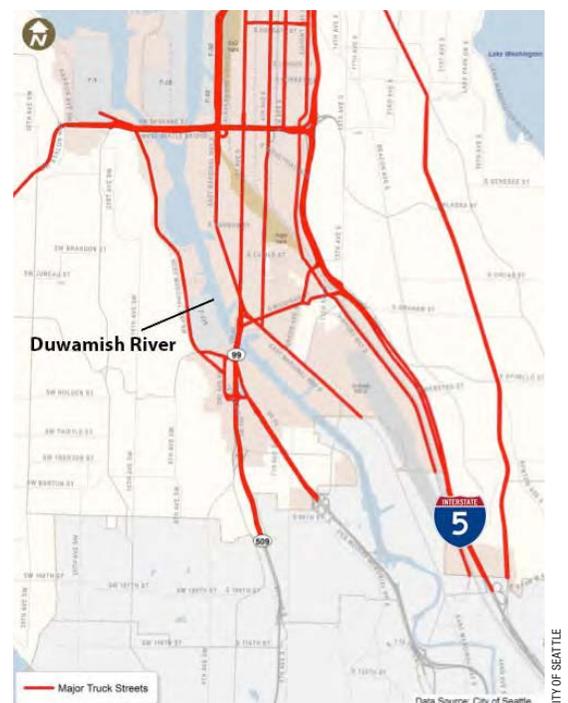
Consequently, in conjunction with the land use modification in the SoDo district, the panel recommends the increased value of these properties be used to facilitate the identified resilience recommendations. Locally controlled funds would be used to facilitate climate and resilience improvements throughout the Duwamish area, shoring up areas at risk and enhancing overall infrastructure. Funding for the resilience measures could be accomplished by creating a Resilience Enhancement Fund. The financial obligation to support these Duwamish area resilience improvements would rest primarily with the SoDo district.

The panel recognizes that the state of Washington does not allow tax increment financing (TIF) in its commonly

known form. Standard TIF allows local governments to borrow against the increases created in property value by new development. A local government using TIF can take the property tax increases caused by a development in a discrete area and use those proceeds (which would ordinarily flow to the general fund) to service the debt it incurs to pay for nearby infrastructure, such as roads, drainage, sidewalks, and parks, to accommodate the growth created by density around transit. The baseline property taxes, before the development, still flow to the general fund.

The state legislature has approved Community Revitalization Financing (CRF), the Local Infrastructure Financing Tool (LIFT) program, and Local Revitalization Financing (LRF) under statutes RCW 39.89, RCW 39.102, and RCW

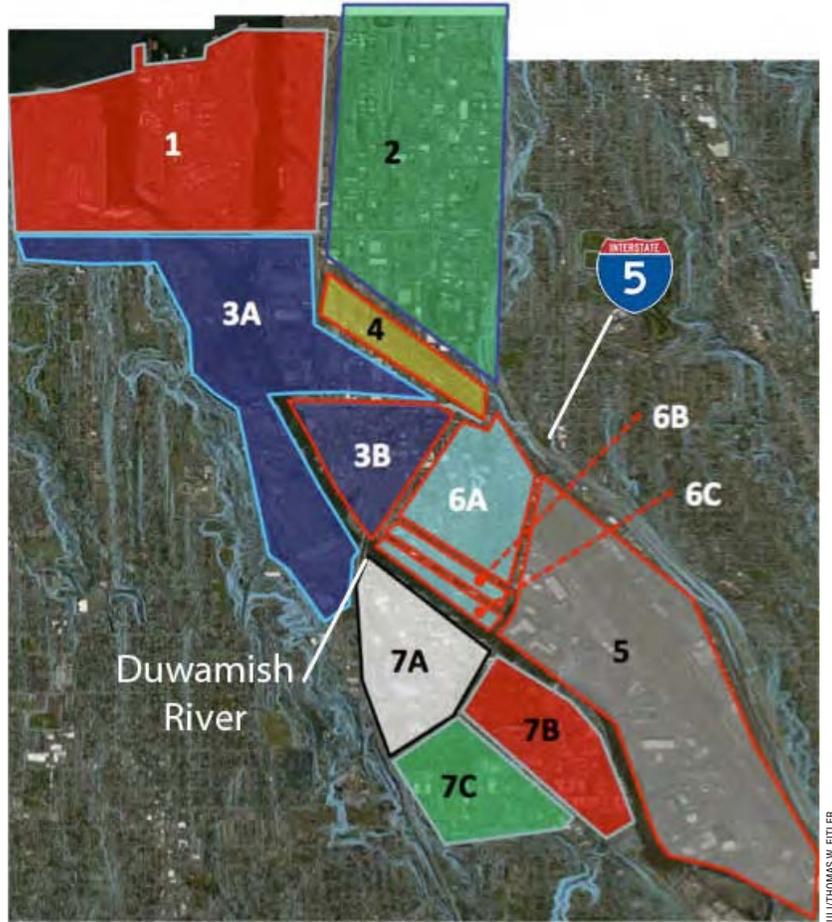
This map highlights current truck routes in the study area.



39.104. The panel recognizes the geographical limitations of where LIFT and CRF can be used. The panel is suggesting that the city explore new variations of the concept that would allow funds generated in SoDo to be collected and invested in the larger study area. The state notes, “Public investment stimulates business activity and helps create jobs, stimulates the redevelopment of brownfields and blighted areas in the inner city, lowers the cost of housing, and promotes efficient land use.” The city of Seattle, the Port of Seattle, and King County International Airport/Boeing Field are eligible sponsoring agencies. Local governments are allowed to “raise revenue to finance public improvements designed to encourage economic growth and development in geographic areas characterized by high levels of unemployment and stagnate employment and income growth. The construction of necessary public improvements in accordance with local economic development plans will encourage investment in job-producing private development and expand the public tax base.”

The land use changes could first be incorporated in northern SoDo then later adapted to southern SoDo. Significant industrial land should remain but can be densified. A planned manufacturing district or enterprise zone may be necessary to maintain some of the manufacturing, industrial, and Port of Seattle land uses. The major truck routes of Airport Way South, Alaskan Way Viaduct, West Seattle Bridge and the Spokane Street Viaduct, West Marginal Way, and East Marginal Way must be maintained and improved to ensure the continued existence of the Port of Seattle and its potential future expansion of operations. In addition, First Avenue South, Fourth Avenue South, Sixth Avenue South, and South Holgate Street need to be maintained as truck thoroughfares. Although freight should be seen as a priority, incorporating safer pedestrian and bicycle mobility is important.

Priority for investment from the Duwamish Resilience Enhancement Fund would be given to resilience projects in the lower-income South Park and Georgetown neighborhoods. These funds would be collected and used within the Duwamish Urban Resilience District specifically to assist in the development of resilience-based improvements,



The panel divided the study area into 12 impact districts.

such as needed parks; funding to support a land bank; and upgraded roads, sewer, water treatment, utility, and redundancy needs to manage sea-level rise in conjunction with especially high tides and stormwater runoff.

Impact Districts

The previous recommendations within this report apply more broadly to the entire Duwamish area. To address tailored resilience measures, the panel divided the Duwamish area into 12 impact districts with differing impact characteristics. This strategy allowed the panel to take a more fine-grained approach in addressing each district’s unique resilience needs or “brittle point.” The seven impact districts are numbered from the mouth of the Duwamish River, moving upstream. The residential districts of Georgetown and South Park have three subcomponents each, based on variation of land use types.

These recommendations are not exhaustive but rather suggestive of the multidisciplinary life-cycle strategies necessary to address the compound implications of con-

Overview of Impact District Recommendations

Impact Districts		Description	Recommendations
District 1	Port of Seattle	This district is a very large, open, substantial paved space for cargo offloading with a container and bulk-cargo focus.	The port area lies above the critical forecast storm-surge elevation of 14 feet above sea level. Urban stormwater management practices should be considered to control water quantity and provide quality improvements. The existing shoreline in the port area is a bulkhead and as such is expected to be maintained and enhanced as necessary to address sea-level rise.
District 2	SoDo	This district will support the current and future multimodal transit movement into and through downtown and to the north.	The district has good-quality infrastructure for the transition but will likely need increased capacity in the future. The panel recommends that the SoDo area transition from industrial use to mixed use.
District 3A	Maritime, Food, and Construction Industry	This district straddles both banks of the Duwamish River and contains large-scale industry on large, flat lots.	Storm drain and sanitary sewer within the maritime area should be dedicated to storm drain conveyance only and sized accordingly.
District 3B	East Side of Duwamish River only	South of Dawson and north of Georgetown, this district contains smaller industrial lots mixed with some legal nonconforming residential sites.	Storm drain and sanitary sewer within the maritime area should be dedicated to storm drain conveyance only and sized accordingly. As future improvements and revisions are made to the small-lot industrial area, urban stormwater management practices should be considered to control water quantity and provide quality improvements.
District 4	Rail Yards	This district incorporates the the rail yard, which serves as the primary access point for goods and services entering and leaving Seattle and the region by rail.	Conveyance of stormwater from surrounding areas may necessitate the lifting of certain segments of track, which can be done during the course of regular track maintenance and replacement.
District 5	Boeing Campus	This district includes the airport, which has an economic impact of \$3.5 billion in terms of local business sales.	The future shoreline in the Boeing Field area should be armored by either bulkhead or revetment design and be maintained and enhanced as necessary to address sea-level rise.
District 6A	Georgetown Mixed Use with Residential	Bounded by the highway to the east, the rail to the north, manufacturing to the west, and Boeing Field to the south, the business district on the north-south axis has a direct link to the highway.	Storm drain and sanitary sewer within the Georgetown residential area should be dedicated to storm drain conveyance only and sized accordingly. As future improvements and revisions are made to the Georgetown residential area, urban stormwater management practices should be considered to control water quantity and provide quality improvements.
District 6B	Georgetown Light Industry	South of the Georgetown residential district (District 6A), this district includes many smaller lots mixed in with some legal or noncompliant residential.	Storm drain and sanitary sewer within the maritime area should be dedicated to storm drain conveyance only and sized accordingly.
District 6C	Georgetown Maritime Industry Edge	This district comprises port and watercraft production, including aluminum and materials fabrication, and assembly plants.	Storm drain and sanitary sewer within the maritime area should be dedicated to storm drain conveyance only and sized accordingly.
District 7A	South Park Industrial Area	Bounded by the river and the highway, this district comprises small-scale businesses focusing on port support industry and manufacturing, which need truck access.	The panel suggests improving the storm drain, sanitary sewer, stormwater management, and shoreline enhancements in this district.
District 7B	South Park Residential East	This low-lying residential area is on both sides of Marginal Way, bounded by the highway to the west and industry and manufacturing to the north and south.	This district needs a key strategic approach to acquire primarily residential lands along the river over time for green space, recreation, urban farming, and flood control.
District 7C	South Park Residential West	This district is residential area to the west, sandwiched by two highway systems that provide relatively easy links for commuting.	The panel has no specific stormwater or sewer recommendations.

Source: ULI/Steven Gu.

current climate events. The panel's recommendations are organized by the identified six ideal conditions.

District 1: Port of Seattle

District 1 is an area of very large, open, substantial paved space for cargo offloading with a container and bulk-cargo focus; speed of offloading and direct rail or truck distribution mean large-scale spaces, lots of equipment movement, and 24/7 operations, including in night lighting. The port district has large cargo-container stacks for storage or return. Ships require a long water shoreline with bulkheads and structural paving for large loads: the shoreline has been engineered with no natural amenity. Ongoing stabilization and maintenance to resist tidal wear are key. A few water edges have a permanent dry dock, fueling barges, and other floating apparatus (either permanently moored or not). The district has both internal and proximate warehousing, cold storage for food, and machine shops; it depends on robust, 24/7 rail and truck access.

Particularly on Harbor Island, large-scale ship fuel supply and regional oil and chemical product offloading take place, with attendant tanks, manifolds, pipes, rail and ship interconnects, pumps, and controls. A large amount of equipment tends to be parked or stored and used on various port sites:

- Forklifts of varying scales;
- Cranes and container towers;
- Tractor trailers and trailers;
- Fueling vehicles;
- Staff commuter vehicles;
- Other port authorities' vehicles;
- Switch railroad engines; and
- Various ship tendering and supply vehicles.

The Harbor Island area is isolated from neighborhoods and other businesses, but a pinch point for traffic exists at the rail and bike lanes of the southernmost access bridge

(Southwest Spokane Street). Traffic and bike fatalities have occurred at this location.

The port areas to the west and east of Harbor Island are closer to city uses and have everyday impacts: western bluff residential overlooks terminal 5, and terminals 25, 30, and 46 are east of the SoDo district. These adjacencies will be variously affected by diesel fumes, noise, and traffic.

Storm drain. The port area lies above the critical forecast storm-surge elevation of 14 feet above sea level (North American Vertical Datum 88), so in general the port facilities are safe from inundation by possible storm surge. However, drainage of stormwater may become an issue as rising sea levels interfere with the storm drain outfall. Any necessary improvements are expected to be incorporated into future facility enhancements made by the Port Authority.

Sanitary sewer. The port facility is served by a dedicated sanitary line; no improvements are recommended.

Stormwater management. As future improvements are made to the port facilities, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Bioswales and micro-bioretenement facilities are examples of facilities that can be added to port facility design to provide critical stormwater quality control with limited impact on the function of the port.

Shoreline enhancements. The existing shoreline in the port area is a bulkhead and as such is expected to be maintained and enhanced as necessary to address sea-level rise. Small pocket parks should be considered along the shoreline at key locations such as street terminus points or pedestrian intersections to provide places to interact with the river and possible points of access.

District 2: SoDo

The potential real estate value here can be the economic engine to drive the entirety of the Duwamish area climate response. The proposed Urban Resilience District will en-

tail a transition from port and port support, manufacturing, and storage to more mixed use, moving to a downtown density. This district will support the current and future multimodal transit movement into and through downtown and to the north.

Port terminals 25 and 30 and support facilities to the west of rail and Alaska Way easements should remain and may necessitate an addition of a dedicated, grade-separated haulage road to either railhead or select highway access. Future use of this port edge may shift, depending on many global, economic forces, so future-planning approaches warrant a flexible approach. The new development will continue to be served by light rail and highway access to the east. Additional district trolley or shuttle service will follow.

For the most part, a good street grid exists with walkable block scales. The district has good-quality infrastructure for the transition but will likely need increased capacity in the future. The panel recommends that the SoDo area transition from industrial use to mixed use. This transition will require significant modifications to all the existing infrastructure serving the area, including but not limited to roads, water, sewer and storm drain, and power and telecommunications.

Storm drain. The storm drainage system within the proposed redevelopment of the SoDo district should be dedicated to stormwater conveyance only and sized accordingly.

Sanitary sewer. Sanitary sewer within the proposed redevelopment of the SoDo district should be dedicated to the conveyance of sanitary wastewater only and sized accordingly.

Stormwater management. As future improvements and revisions are made to the SoDo district, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Street-side bioswales, enhanced tree grates, and micro-bioretenion facilities are examples of facilities that can be added to the street and small pocket parks to improve the

quantity and quality of the stormwater reaching the sound while providing an aesthetically pleasing edge.

District 3A: Maritime, Food, and Construction Industry

This district straddles both banks of the Duwamish River and contains large-scale industry on large, flat lots. Both the businesses and the lots are often owned by international corporations. Manufacturing includes steel (a large electricity grid user with its electric arc furnaces for recycled steel) and concrete, as well as food product warehouses and trucking support. Many of the sites are characterized by single-story storage, cargo offloading, truck logistics, or production facilities with large portions of open-air, hard- or impervious-surface storage for containers, marine apparatus, vehicles and trailers, and products. Many parts of these sites appear to contain inactive uses or long-term storage.

Most of the businesses need rail connections (the east zone is better accommodated) and truck access for both sides of the watercourse. The southern edge of this district on the west side of the watercourse (north of Highland Parkway SW and District 7A) contains port terminal 115, similarly characterized as in District 1.

The rail yard (District 4) forms the eastern edge of this district, where most of the rail lines converge. The North Delridge neighborhood bluffs form the western edge and are close to river; seismically shaped topography is visible here. On this western slice is the city's Herring's House Park, along the water and along the bluffs above.

The District 3A manufacturing sites potentially have processes that use, store, and produce various chemical components. Facilities along the river and in any floodplains should be required to protect the river from hazardous materials by raising all material storage to an elevation of 14 feet above sea level or higher.

Where appropriate, explore replacing commuter surface lots with parking structures to create surplus land use. Capture this underused land (defined as surface storage, large active or inactive parking) for the following:

- Surface detention (river and stormwater detention) with green-space presence (east and west of river);
- Additional 21st-century light and clean industry infill (east and west);
- Select mixed use and makers (east and west); and
- Affordable housing (east only).

Although current zoning policies do not allow affordable housing on the east side, the panel suggests the city explore options to rezone this area. In addition, at any time a property owner substantially changes the coverage of its site or occupancy, the owner should be required to modify to bring hazardous materials up to code. Substantial improvement should be consistent with current city code requirements, such as the following city zoning policies:

- Allow maintenance of existing nonconforming structures where no expansion, redevelopment, or replacement is proposed (i.e., no sunset provisions).
- Seek increasing conformity, particularly for overwater structures and high-impact activities, when replacement or substantial redevelopment occurs.
- Allow reasonable use of property in all cases.

In addition to adjusting nonconforming structures, the panel suggests the city consider rezoning where important strategic unilateral rezoning can be accomplished.

The east side of the maritime district is composed of large-lot industrial users with sanitary sewer lines that feed directly into the sewer main. Separate storm drain lines provide service for the lots.

The eastern edge of the district includes the Federal Center South, which houses federal offices, including the Bureau of Indian Affairs. Designed by Albert Kahn and built in 1932 as the Ford Motor Assembly Plant, the Federal Center South building is considered a historic building.

Storm drain. The stormwater system within the maritime area should be dedicated to stormwater conveyance only and sized accordingly.

Sanitary sewer. Sanitary sewer within the maritime area should be dedicated to the conveyance of sanitary wastewater only and sized accordingly.

Stormwater management. As future improvements are made to the maritime area, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Bioswales and micro-bioretenion facilities are examples of facilities that can be added to the maritime area that will act as amenities with limited impact on the function of the industries and provide critical stormwater quality control.

Shoreline enhancements. The future shoreline in the maritime area should be armored by either bulkhead or revetment design and be maintained and enhanced as necessary to address sea-level rise. Small pocket parks should be considered along the shoreline at key locations such as street terminus points or pedestrian intersections to provide areas to interact with the river and possible points of access.

District 3B: East Side of Duwamish River Only

South of Dawson and north of Georgetown, District 3B contains smaller industrial lots mixed with some legal nonconforming residential sites. The primary use is small-scale industrial businesses employing 30 or fewer staff members. The uses seem to be a mix of port support, general manufacturing, and craft industries.

Highway, truck route, and industry placement proximate to these residential sites (and worker general health) necessitates strategies to mitigate noise and air quality issues. North–south truck routes are maintained, but many lateral streets are less well maintained. Similarly, the subsurface utility infrastructure is in varying levels of decay (see below).

Facilities along the river and in any floodplains should be required to protect the river from hazardous materials by raising all materials storage to four feet above the 14-foot elevation.



The Civic Center parking structure in Santa Monica, California, the first LEED-certified building of its type, is an excellent example of a sustainable parking option.

Where appropriate, explore replacing commuter surface lots with parking structures to increase land use options. Capture underused land (defined as surface storage, large active or inactive parking) for the following:

- Surface detention (river and stormwater detention) with green-space presence;
- Additional 21st-century light and clean industry infill;
- Select mixed use and makers; and
- Affordable housing.

The area between the rail lines, South Fidalgo Street and East Marginal Way, comprises smaller commercial lots served by combined sanitary sewer line and storm drain lines that flow toward the trunk line at East Marginal Way. Consider improving the intersection of South River Street and East Marginal Way by elevating East Marginal Way to be above the critical forecast storm-surge elevation of 14 feet.

Storm drain. Storm drain within the maritime area should be dedicated to storm drain conveyance only and sized accordingly.

Sanitary sewer. Sanitary sewer within the maritime area should be dedicated to storm drain conveyance only and sized accordingly.

Stormwater management. As future improvements and revisions are made to the small-lot industrial area, urban stormwater management practices should be considered

to control water quantity and provide quality improvements. Street-side bioswales, enhanced tree grates, and micro-bioretenion facilities are examples of facilities that can be added to the street and small pocket parks to improve the quantity and quality of the stormwater reaching the sound while providing an esthetically pleasing edge.

District 4: Rail Yards

The rail yard serves as the primary access point for goods and services entering and leaving Seattle and the region by rail. This includes Seattle's waste, and in the event of a disaster the rail yard would serve as the way to remove debris from the city. The movement of crude oil makes installing an earthquake early-warning system that can stop rail movement before an event important.

The rail lines do not rely on or generate sanitary sewer service and have limited exposure to areas below an elevation 14 feet above sea level. Conveyance of stormwater from surrounding areas may necessitate the lifting of certain segments of track, which can be done during the course of regular track maintenance and replacement.

District 5: Boeing Campus

The airport's economic impact is \$3.5 billion in terms of local business sales, which support 16,336 jobs and create \$1.8 billion in labor income in the county. The airport's 150 tenant businesses also directly support 5,209 jobs in the local economy. Some of the tenants include multinational corporations, such as Boeing, production including aluminum and materials, and warehouses and hangars. The site requires rail connection and truck access. The Boeing campus is historically a source of much of the area's soil and water contamination.

Most of King County International Airport/Boeing Field lies above the 14-foot elevation benchmark but for a small area in the northwest corner of the airfield. Selective fill is recommended for those areas below elevation 14. The sanitary sewer and the storm drain lines are separate and are identified as private. No recommendation is made for alterations or improvements.

Shoreline enhancements. The future shoreline in the Boeing Field area should be armored by either bulkhead or revetment design and be maintained and enhanced as necessary to address sea-level rise. Small pocket parks should be considered along the shoreline at key locations such as street terminus points or pedestrian intersections to provide places to interact with the river and possible points of access.

District 6A: Georgetown Mixed Use with Residential

Bounded by the highway to the east, the rail to the north, manufacturing to the west, and Boeing Field to the south, the business district on the north–south axis has a direct link to the highway. Parking is an issue for destination visitors. The district contains residential areas that are primarily rental in both single-family detached and small apartment buildings. The eastern highway alignment provides relatively easy links for commuting and business visitors. This highway placement necessitates strategies to mitigate sound and air quality issues. The proximity to industry and rail yards creates similar impacts.

The district’s mixed and residential uses vitally necessitate improved recreation, as well as pedestrian and bike safety through sidewalk and crossing design. Health care and food sources do not necessarily need to be located in the district; however, access to them through public transportation is vital. Improved mass-transit access to the community is also desirable and can be obtained by adding usable bus routes.

A community college resource exists on the boundary of Districts 6A and 6B.

Additional environmental degradation includes soil toxicity issues from historical local industry, sewage backup and street flooding issues, proximity to rail operations, unreinforced masonry buildings, and aging housing stock with indoor environmental quality issues.

Storm drain. Storm drain within the Georgetown residential area should be dedicated to storm drain conveyance only and sized accordingly. As development improvements

occur, separating the combined sanitary sewer and storm drain should be a priority. The conveyance capacity of the existing storm drain lines can be augmented by intercepting the sewer/storm drain outfall from Beacon Hill. Consider a parallel relief sewer for the effluent for the South Albro Place outfall from the Beacon Hill neighborhood to bypass the Georgetown neighborhood, thus freeing up needed conveyance capacity. Street-side green stormwater management can also provide limited stormwater detention and quality control.

Sanitary sewer. Sanitary sewer within the Georgetown residential area should be dedicated to sanitary sewer conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority in areas that are physically and financially feasible. The conveyance capacity of the existing sanitary sewer lines can be augmented by intercepting the sewer/storm drain outfall from Beacon Hill.

Stormwater management. As future improvements and revisions are made to the Georgetown residential area, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Street-side bioswales, enhanced tree grates, and micro-bioretenement facilities are examples of facilities that can be added to the street and small pocket parks to improve the quantity and quality of the stormwater reaching the sound while providing an esthetically pleasing edge.

District 6B: Georgetown Light Industry

South of the Georgetown residential district (District 6A), these are smaller lots mixed in with some legal or noncompliant residential. The primary use is small-scale, mom-and-pop industries employing 30 or fewer staff members. It seems to be a mix of port support, general manufacturing, and craft industries.

Truck road and industry placement proximity to these residential sites (and worker general health) necessitates strategies to mitigate sound and air quality issues. North–south truck roads are maintained, but many lateral streets

are less well maintained. Similarly, the subsurface utility infrastructure is in varying levels of decay (see below).

Facilities in any floodplains should be required to protect the river from hazardous materials by raising all material storage to an elevation 14 feet above sea level.

Where appropriate, explore replacing commuter surface lots with parking structures to create surplus land use. Capture underused land (defined as surface storage, large active or inactive parking) for the following:

- Surface detention (river and stormwater detention) with green-space presence;
- Additional 21st-century light or clean industry infill;
- Select mixed use, including retail and makers; and
- Affordable housing.

Storm drain. Storm drain within the Georgetown small manufacturing area should be dedicated to storm drain conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority. The conveyance capacity of the existing storm drain lines can be augmented by street-side green stormwater management to provide limited stormwater detention and quality control.

Sanitary sewer. Sanitary sewer within the Georgetown small manufacturing area should be dedicated to sanitary sewer conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority.

Stormwater management. As future improvements and revisions are made to the Georgetown small manufacturing area, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Street-side bioswales, enhanced tree grates, and micro-bioretenion facilities are examples of facilities that can be added to the street and small pocket parks to improve the quantity and quality of the stormwater reaching the sound while providing an esthetically pleasing edge.

District 6C: Georgetown Maritime Industry Edge

This district comprises port and watercraft production, including aluminum and materials fabrication, and assembly plants. The sites are much larger than neighboring manufacturing sites in District 6B. They are an equal mix of buildings and open sites with boat materials and full ship storage (seemingly both long and short term).

Highway, truck road, and industry placement proximity to Georgetown residential sites (and worker general health) necessitates strategies to mitigate sound and air quality issues.

Storm drain. Storm drain within the Georgetown maritime area should be dedicated to storm drain conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority. The conveyance capacity of the existing storm drain lines can be augmented by street-side green stormwater management to provide limited stormwater detention and quality control.

Sanitary sewer. Sanitary sewer within the Georgetown maritime area should be dedicated to sanitary sewer conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority.

Stormwater management. As future improvements and revisions are made to the Georgetown maritime area, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Street-side bioswales, enhanced tree grates, and micro-bioretenion facilities are examples of facilities that can be added to the street and small pocket parks to improve the quantity and quality of the stormwater reaching the sound while providing an esthetically pleasing edge.

Shoreline enhancements. The future shoreline in the Georgetown maritime area should be armored by either bulkhead or revetment design and be maintained and enhanced as necessary to address sea-level rise. Small pocket parks should be considered along the shoreline at



The panel recommends changes to the industrial land (left) in South Park. The proposed changes (right) include removing streets to combine lots, decreasing surface parking for increased land use opportunities, and increasing green space.

key locations such as street terminus points or pedestrian intersections to provide places to interact with the river and possible points of access.

District 7A: South Park Industrial Area

Bounded by the river and the highway, this district comprises small-scale businesses focusing on port support industry and manufacturing, which need truck access. Some riverfront access is less important for shipbuilding south of the city. Lots are small, but a good bit of open, impervious materials storage still exists. If the industrial land reduced its footprint by densifying, additional residential options and park space could be increased.

Flood maps indicate this district is among those with the highest flooding in the area. As such, it warrants mitigation of storm surge and regional flooding by raising properties.

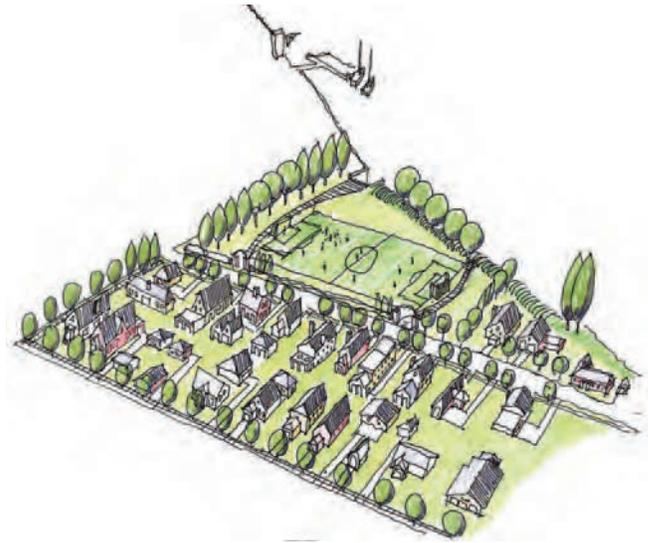
Development along the river and in any floodplains should be required to protect the river from hazardous materials by storing all materials inside or raising outside storage to an elevation of 14 feet above sea level. The city might explore deeding public streets to private users to promote larger industrial users.

Where appropriate, explore replacing surface lots with parking structures to create surplus land use. Capture underused land (defined as surface storage, large active or inactive parking) for the following:

- Surface detention (river and stormwater detention) with green-space presence (east and west);
- Additional 21st-century light or clean industry infill (east and west);
- Select mixed use and makers; and
- Affordable housing.

Storm drain. Storm drain within the South Park industrial area should be dedicated to storm drain conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority. The conveyance capacity of the existing storm drain lines can be augmented by street-side green stormwater management to provide limited stormwater detention and quality control. Construction of the Seventh Avenue flood control pump station in the South Park neighborhood (an existing city program) will be critical for the performance and conveyance capacity of the storm drain system.

Sanitary sewer. Sanitary sewer within the South Park industrial area should be dedicated to sanitary sewer conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority.



The panel recommends changes to the residential land (left) in South Park. The proposed changes (right) include creating a soccer field, which acts not only as a neighborhood amenity but also as a buffer between the Duwamish River and the neighborhood for flood prevention.

Stormwater management. As future improvements and revisions are made to the South Park industrial area, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Street-side bioswales, enhanced tree grates, and micro-bioretenion facilities are examples of facilities that can be added to the street and small pocket parks to improve the quantity and quality of the stormwater reaching the sound while providing an esthetically pleasing edge.

Shoreline enhancements. The future shoreline in the South Park industrial area should be armored by a waterfront park and berm design and be maintained and enhanced as necessary to address sea-level rise. The waterfront park and berm will provide critical protection for the area while forming an esthetically pleasing and usable space for residents and other users of the area.

District 7B: South Park Residential East

This low-lying residential area is on both sides of Marginal Way, bounded by the highway to the west and industry and manufacturing to the north and south. This highway and industry placement necessitates strategies to mitigate sound and air quality issues.

The neighborhood needs both city service equity (from dietary and wellness services, public transit, and road maintenance) and restoration of basic necessities such as a local grocer in the commercial area. A public grade school, recreation center, and public library branch exist in the walkable district, although improved pedestrian and bike safety through sidewalk and crossing design is needed. A well-respected health clinic exists in this neighborhood.

This district needs a key strategic approach to acquire primarily residential lands along the river over time for green space, recreation, urban farming, and flood control. Mass-transit access to the community should be improved by adding usable bus routes.

The area has some bike and trail access but needs an enhanced bike and trail system through South Park to West Seattle and across the bridge to Georgetown as well as a pedestrian connection west, up the bluffs. Additional environmental degradation includes soil toxicity issues from historical river and local industry uses, sewage backup and street flooding issues, and aging housing stock with indoor environmental quality issues.

Storm drain. Storm drain within the South Park east residential area should be dedicated to storm drain conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority. The conveyance capacity of the existing storm drain lines can be augmented by street-side green stormwater management to provide limited stormwater detention and quality control. Construction of the existing city projects, such as the 14th and Concord Combined Sewer Improvement Project, will be critical for the performance and conveyance capacity of the storm drain system.

Sanitary sewer. Sanitary sewer within the South Park east residential area should be dedicated to sanitary sewer conveyance only and sized accordingly. As development improvements occur, separating the combined sanitary sewer and storm drain should be a priority.

Stormwater management. As future improvements and revisions are made to the South Park east residential area, urban stormwater management practices should be considered to control water quantity and provide quality improvements. Street-side bioswales, enhanced tree grates, rain barrels, rain gardens, and micro-bioretenion facilities are examples of facilities that can be added to the streets and small pocket parks to improve the quantity and quality of the stormwater reaching the sound while providing an esthetically pleasing edge.

Shoreline enhancements. The future shoreline in the South Park east industrial area should be armored by a waterfront park and berm design and be maintained and enhanced as necessary to address sea-level rise. The waterfront park and berm will provide critical protection for the area while forming an esthetically pleasing and usable space for the residents and other users of the area and provide access to the river itself.

District 7C: South Park Residential West

This district is residential area to the west, sandwiched by two highway systems that provide relatively easy links for commuting. This highway placement necessitates strategies to mitigate sound and air quality issues. The residential lots are adjacent to industry, warehousing,

construction staging, and open and enclosed storage at the northern end. The business lots encompass much impervious paving that potentially increase as sheet water flow to residential neighborhoods downhill. This area has the social amenity of Marra Farm, which includes a community garden and park (augmenting many residential lots that are growing food). Some discussion indicated soil contamination in the area.

A single elementary public school exists to the east in District 7B. In District 7C is Concord International School (K–8) with its playing fields.

The panel has no specific stormwater or sewer recommendations.

Conclusion

IN 2015, SEATTLE'S COMMUNITIES within the lower Duwamish River area are faced with a series of urban resilience issues—such as sea-level rise, extreme storm events, economic and mobility inequalities, and social cohesion—that if left unchecked could significantly affect the city as a whole and the area's residents and businesses in particular. The broader issues raised within this report are not unique to Seattle. The Urban Land Institute's position is that these issues are not insurmountable: through focused consideration and bold leadership from the city and community stakeholders, the area's everyday and longer-term issues of health, economy, and infrastructure can be improved.

A more focused and consolidated Duwamish area could exist that includes more dense industrial buildings, residential buildings, and parks while being more prepared for the threats of a changing climate. This report has outlined both a basic framework within which to consider these challenges and specific actions that will begin to help solve these imbalances. By addressing resilience through a holistic lens, each recommendation aims to improve the environmental, economic, and social potential of the Duwamish area. The panel hopes these concepts prove useful.

About the Panel

James M. DeFrancia

*Panel Chair
Aspen, Colorado*

DeFrancia is a principal of Lowe Enterprises Inc., a national real estate development company engaged in residential, commercial, and resort development activities, and president of that company's national Community Development division. He is also president of Weston Capital Corporation, a privately held firm engaged in real estate asset management and development on behalf of private investors, banks, government agencies, and insurance companies. Previously, he held several positions with ITT Corp., including being president of its Levitt homebuilding subsidiary in Puerto Rico and having responsibility for the restructuring and sale of ITT/Levitt's international land assets. Before joining ITT, DeFrancia held executive positions with an international investment group in Venezuela. Before his private sector experience, DeFrancia served as an officer in the U.S. Navy. His postings included Naval Headquarters, Saigon; aide to the commanding Rear Admiral NSC San Diego; Office of the Chief of Naval Operations; and the U.S. Embassy in Caracas, Venezuela.

He recently served as an adviser to the Secretary of the Navy on maritime strategy in the Western Pacific, as well as U.S. Navy energy policy, and was awarded the Navy's Distinguished Civilian Service medal for those efforts. He has also served as an adviser on growth and development policies to the Governments of Bermuda, Mexico, the Netherlands, the United Kingdom, the United Arab Emirates (Dubai), and Saudi Arabia, as well as the Vatican. He has similarly advised several U.S. cities and the Port Authority of New York and New Jersey.

He recently served as the receiver of the Dancing Bear project in Aspen, as the receiver of the Mountain Sage Townhomes in Carbondale, Beaver Run Ranch, in Pitkin County, and as managing director for the corporate receiver of Base Village in Snowmass, Colorado. He also served by British court appointment as the receiver and manager of Shanghai Links Executive Community Inc., a British company holding land use rights in China and actively engaged in community development in Shanghai. He held a resident visa in China.

DeFrancia is a life trustee of the Urban Land Institute. He is a past director of National Association of Home Builders, former Virginia representative to the Southern Growth Policies Board, and former member of the board of the Metropolitan Washington Airports Authority. He served as a member of the Defense Department's Marsh Panel and was appointed by the Secretary of Defense specifically to contribute residential development expertise in restructuring the housing systems of the Department of Defense. He also served as a member of the Housing Advisory Group to the Committee on Banking, Finance and Urban Affairs (U.S. House of Representatives) and has been a guest lecturer or panelist for the Urban Land Institute; the Bank Lending Institute; the Lincoln Institute of Land Policy; the Graduate School of Design, Harvard University; George Mason University; and the George Washington University.

DeFrancia is a graduate of the U.S. Naval Academy with a degree in engineering and executive studies in business and finance at the University of Michigan and the Wharton School. He has also completed strategy and policy courses at the Naval War College. He is a member of the Atlantic Council and the U.S. Naval Institute.

Angelo Carusi

Atlanta, Georgia

Carusi joined Cooper Carry in 1983 and has been a key contributor to Cooper Carry's Retail Specialty Practice Group, serving as principal since 2000. He has directed the design of retail-dominant mixed-use centers, shopping centers, department stores, urban retail centers, restaurants, and individual tenant spaces. He specializes in assisting clients in the evaluation, relocation, renovation, and strategic allocation of retail uses for new and existing centers.

Many of Carusi's projects have been honored, including the Mercato, a vertically mixed-use office, residential, and retail project, which was awarded a 2011 International Council of Shopping Centers (ICSC) Design and Development Award.

Carusi is a Leadership in Energy and Environmental Design (LEED) Accredited Professional, a Certified Design Professional, and a Certified Retail Property Executive of ICSC. He is a member of the Urban Land Institute and the American Institute of Architects. He holds a bachelor's degree in architecture from the University of Tennessee and is licensed to practice in 15 states.

Josh Ellis

Chicago, Illinois

Ellis has been with Metropolitan Planning Council (MPC) since 2006. He directs MPC's sustainability initiatives, most notably in the fields of stormwater mitigation and water supply management. Through on-the-ground initiatives such as the Milwaukee Avenue Green Development Corridor, technical assistance to the Northwest Water Planning Alliance, and facilitation of diverse stakeholder groups—such as the Calumet Stormwater Collaborative—he leads MPC's multiple strategies to sustainably manage Illinois's finite water resources and reduce the harmful impacts of stormwater.

He leads many of MPC's research projects, including Immeasurable Loss: Modernizing Lake Michigan Water Use, Bus Rapid Transit: Chicago's New Route to Opportunity, and Before the Wells Run Dry. He also coordinates MPC's research assistant program, of which he is an alumnus.

Ellis is a member of the Midwest Leadership Council of the National Parks Conservation Association, the Cook County Sustainability Advisory Council, and the advisory committee exploring the future of the Chicago Area Waterway System. He is president of the board at PODER, which serves adult immigrants with a mission to provide the necessary academic tools to promote human dignity, increase employment potential, and facilitate participation in the larger community.

A New Hampshire native, he resides in Chicago's South Loop where he is a board member of the Greater South Loop Association. He managed a small school in Japan before his graduate studies in public policy and Middle Eastern Studies at the University of Chicago.

Molly McCabe

Bigfork, Montana

Founder and president of Hayden Tanner, McCabe is a management consultant and strategic adviser to real estate investors, nongovernmental organizations, government agencies, and global organizations. An innovator in the field of finance, sustainability, and the monetization of deep energy retrofits, she has a comprehensive and quantitative understanding of the triple bottom line, grounded in more than 25 years of experience in commercial real estate finance and business consulting. Taking a systems approach, she cultivates practical solutions and strategies to accelerate the emergence of resilient buildings and vibrant, sustainable cities. Her work focuses on game-changing innovation—innovation that changes how we live and work and the resources we use. Her work centers on bold and creative solutions that enhance both profit and livability.

McCabe's work incorporates real estate economics, policy, strategy, and finance. Projects span residential, suburban office, urban mixed use, and diverse land development.

She wrote the book *Practical Greening: The Bottom Line on Sustainable Property Development, Investment and Financing* as well as several research reports. A trained mediator and business coach, she is the incoming chair of the Urban Land Institute's Responsible Property Investment Council and on its Sustainability Center Advisory Board. She is an instructor at the Boston Architectural College and a Research Fellow for the Responsible Property Investing Center. She has an MBA from the University of San Francisco and an undergraduate degree in economics from the University of California at Davis. Before starting her entrepreneurial career, McCabe spent several years in banking, real estate investment, and corporate finance. Originally from San Francisco, she now lives with her family in the Pacific Northwest.

Lacy Strohschein

New Orleans, Louisiana

Strohschein is responsible for relationships and coordination between product and business development as it relates to coastal restoration, water management, and community resiliency. In this role, she acts as a liaison between business community stakeholders (including restoration and water firms), government agencies (such as the Regional Planning Commission, City of New Orleans, Jefferson Parish, and Coastal Protection and Restoration Authority), and environmental nongovernmental organizations (such as the Environmental Defense Fund, Coalition to Restore Coastal Louisiana, and National Wildlife Federation). Through this position, Strohschein is able to effectively manage Greater New Orleans Inc.'s Coalition for Coastal Resilience and Economy—an unprecedented cadre of business leaders championing holistic coastal restoration—and guide appropriate policy and outreach actions for the group. In addition, she works with municipal stakeholders to advance and implement the Greater New Orleans Urban Water Plan, specifically assisting in public and private funding pursuits, including the U.S. Depart-

ment of Housing and Urban Development's recent National Disaster Resiliency Competition.

Before joining Greater New Orleans Inc., Strohschein was the special initiatives manager with the nonprofit organization the Center for Planning Excellence, where she oversaw an innovative transportation, land use, and housing policy and advocacy campaign. She has unique branding and communications experience as well from several years living and working abroad in both India and Paris, France. She holds a BA from the University of Georgia's Grady School of Journalism and an MA in global communications from the American University of Paris and is nearing completion of her MBA through Tulane University's Executive program.

Rives Taylor

Houston, Texas

Taylor directs Gensler's firmwide design performance teams and global design performance initiatives at all scales. He is a recognized expert in resilient, high-performance, and sustainable design. He has more than 30 years' experience in institutional and commercial architecture with 20 years spent focusing on strategic planning, programming, and sustainable design, scaled from facility operations to campus and city planning. Rives casts a wide net in elevating both the why and how of resilient and sustainable design, including students, faculty, professionals, public officials, and the general public.

The approaches Rives developed for Gensler not only affect the firm's extensive practice but also influence clients' building decisions worldwide. For example, design and construction standards for clients such as ExxonMobil, Deloitte, PNC, and Toyota are embedded in those clients' protocols and are followed worldwide.

As a faculty member of both Rice University and the University of Houston for 25 years, he has engaged in both universities' centers on sustainable and resilient design as well as urban and regional planning.

Rives has written 150 articles for diverse publications such as *Urban Land*, *WIRED*, *Fast Company*, and *Texas Architect* and has been an invited speaker at symposiums on five continents. He founded the Houston chapter of the U.S. Green Building Council and recently received the Center for Houston's Future's Impact Award. A member of the prestigious American Institute of Architects Fellowship, Rives holds a BA in architecture from Rice University and a master's degree from MIT.

Kraig Walsleben

Germantown, Maryland

Walsleben joined Rodgers Consulting Inc. (RCI) in 1989. Through his tenure at RCI, he has worked as a planner, surveyor, natural resource specialist, team leader, and project manager. Assigned as the leader of an Engineering Team in 2000, Walsleben has directed the planning and engineering effort of multiple award-winning mixed-use developments in the Washington, D.C., metropolitan area, creating thousands of residential lots and millions of square feet of employment space. Since 2013, these projects have conformed to the strict new Environmental Site Design regulations for stormwater management in Maryland. As a project manager, Walsleben continues to use his broad industry knowledge to guide his clients' projects through the challenging engineering and regulatory environment.

A member of multiple citizen and professional advisory boards, Walsleben was a founding member of the Water Quality Advisory Group for Montgomery County, Maryland, which helped guide the county in its adoption of the state-mandated Environmental Site Design guidelines. A licensed landscape architect, he holds undergraduate degrees in fish and wildlife management and landscape architecture as well as a master's degree in planning from the University of Virginia.

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