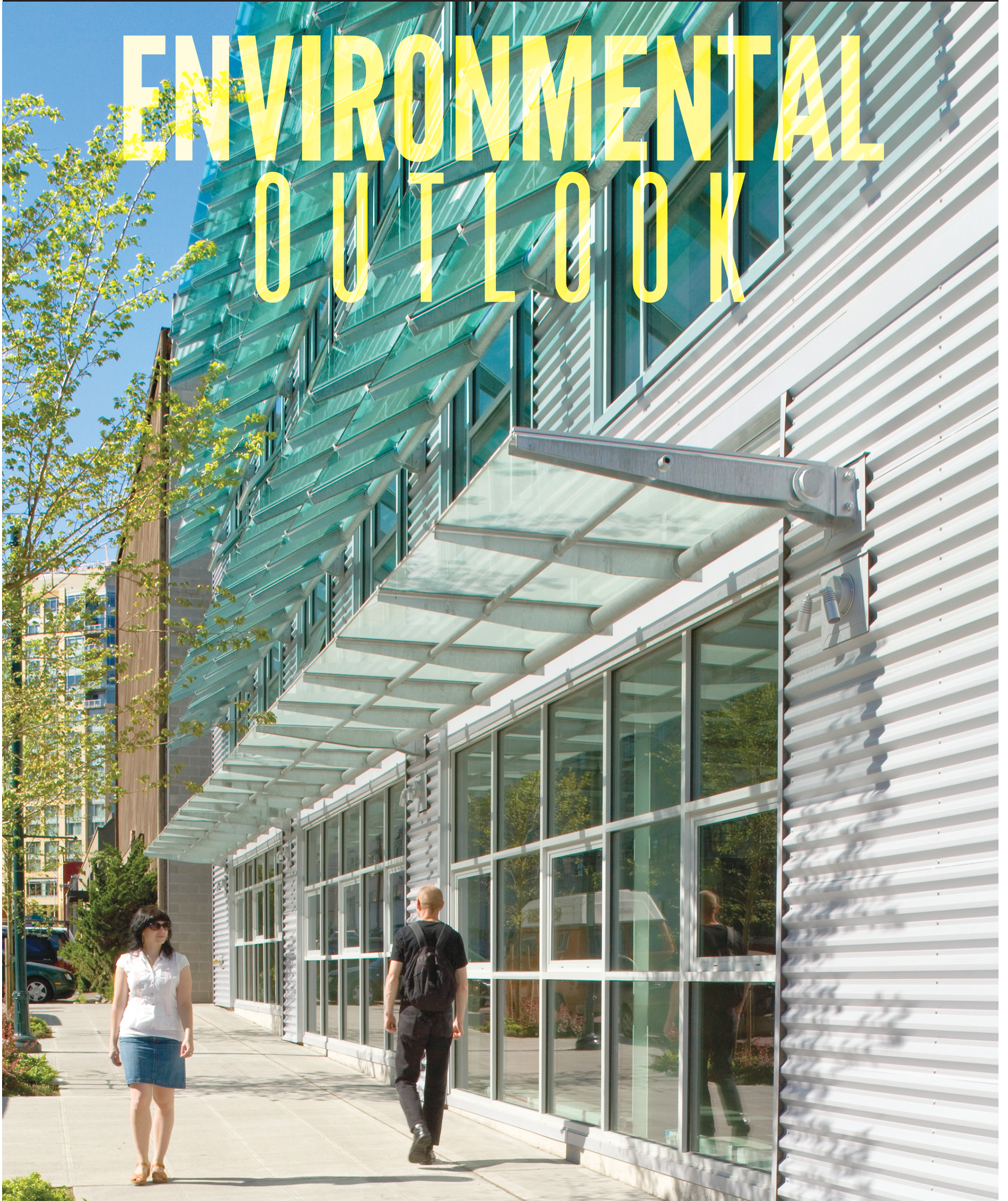


Seattle Daily Journal of Commerce · September 27, 2018

# ENVIRONMENTAL OUTLOOK





# INFILTRATION MAPS STREAMLINE LAND-USE PLANNING

Developers can now assess a parcel's water quality requirements in hours rather than days.

Developers are looking for guidance that is fast and efficient, while city planners are charged with ensuring parcels and lots are developed with the community and environment in mind.

Of the environmental factors cities must consider for land use, planning for where stormwater runoff is discharged is crucial to mitigate its impact on water quality. Municipal NPDES permits require low impact development (LID) for all Phase I and II municipalities, which include the most populated areas of the state.



BY EMELIE CRUMBAKER  
ASPECT CONSULTING

LID approaches for managing rainfall use natural vegetation and landscape design to infiltrate, filter, store and evaporate stormwater runoff. Using these strategies helps to reduce flash flooding and erosion, improves

water quality, helps groundwater recharge and is aesthetically pleasing.

But in today's increasingly urbanizing world, how can municipalities make it easier to create housing and encourage development while protecting water bodies? One new approach led by the city of SeaTac at the early development stage may have some intriguing possibilities.

The city has been proactive in adding new regulated LID stormwater requirements into its building permitting process and has eased the path by producing an online map-based tool that screens for infiltration requirements and infeasibility across the 10 miles of the city's boundaries. This web map is the first of its kind to screen infiltration potential citywide.

## Triggering a new approach

The city's Phase II municipal stormwater permit requires that LID be implemented when feasible. The city's LID design follows King County's 2016 Surface Water Design Manual. To minimize the impact of increased

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stormwater runoff from new development projects, LID best management practices (BMPs) are required to reduce impervious area and piped stormwater runoff from development.

Aspect Consulting and Robin Kirshbaum Inc. partnered with the city to develop 10 LID "infeasibility" maps — essentially showing the known areas where LID projects would not be possible because of a range of factors, such as closeness to steep slopes, proximity to



Bioretention facilities like this one are a LID feature that Ecology and King County are nudging municipalities towards adopting.

CITY OF SEATTLE PHOTO

surface water and wetland buffers, or presence of impervious surfaces.

By reviewing the infeasible parcel areas, developers can easily identify potential project sites that are exempt from needing field infiltration rate testing and LID design elements.

## Map methodology

Unlike many projects where the more data we can use the more developed the story becomes, in this project the methods used had a different requirement: adhering to the code behind the analysis.

Within the surface water manual, each LID BMP — the key design practices — has a set of criteria under which the BMP is considered infeasible to implement and therefore is not required or allowed. To synthesize the relevant infeasibility criteria, hundreds of subsurface, land-use and citizen-sourced data points were reviewed, including over 30 GIS datasets, 45 hard copy or electronic geotechnical reports, 203 service requests from citizens, and 104 recorded drainage problem areas from city staff.

From that, lists of datasets by BMP were created and then fed into GIS analysis to assess 10 different criteria singled out by the surface water manual and city codes as key for good water quality management.

These 10 flow-control BMPs were: full dispersion, basic dispersion, limited infiltration, full infiltration, bioretention, permeable pavement (asphalt), per-

meable pavement (concrete), permeable pavement (concrete interlocking), perforated pipe and soil amendment.

## The result

The synthesized data sets then were used to build each of the LID infeasibility maps into web map form that developers and city planners can use in the design of their projects and the assessment of the building permit applications.

The city encourages developers and property owners to review the property areas within each web map and print out and include each of the LID infeasibility maps when submitting their application packet. Areas not shown as red on those maps are subject to site infiltration assessment.

With these new maps, developers can assess a parcel's water quality requirements in a few hours rather than a few days. City planners can answer permitting questions efficiently and save upfront time and costs by giving applicants a more defined understanding of the expectations for managing stormwater runoff from the start.

The maps help each group reach the same goal: successful development that's compliant with regulations and protective of Puget Sound's waterways.

*Emelie Crumbaker is a senior GIS analyst in Aspect Consulting's Seattle office. For more than 17 years, she has specialized in spatial problem solving through GIS tools.*

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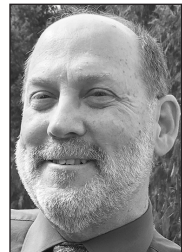
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# STATE HELPS TURN BROWNFIELDS INTO AFFORDABLE HOUSING

The Healthy Housing Remediation Program takes the cost of cleanup out of the development equation.

The state departments of Ecology and Commerce are partnering to work with local governments and communities across the state to promote redevelopment of former contaminated cleanup sites into much needed affordable housing.



BY BOB WARREN  
DEPARTMENT OF  
ECOLOGY

For more than 30 years, Ecology has been cleaning up contaminated properties — nearly 7,200 completed cleanups thus far.

Removing toxic threats helps protect human health and the environment, and opens the door to put properties back into use.

Ecology is developing the Healthy Housing Remediation Program, which aims to make it easier for affordable housing developers to redevelop once-contaminated properties into housing that communities can afford.

## Why it matters

As we all know, Washington — particularly in urban areas — is experiencing a development boom and an affordable housing crisis. And it's not just larger cities that are experiencing this



The Maddux in Seattle's Mount Baker neighborhood was the inspiration for the state's pilot program.

MITHUN IMAGE

demand, there is a dire need for affordable housing across the entire state. The state Affordable Housing Advisory Board notes that housing supply and affordability affect all Washington communities, and rents are growing faster than low and middle incomes.

Land availability is a key issue. As Washington's urban and suburban communities continue to rapidly grow, much of their developable land has already built up into residential and commercial areas. Less densely populated areas face their own housing

issues, through their own growth and as people who are priced out of urban centers move outward.

Ecology manages a portfolio that includes more than 13,000 cleanup sites, nearly 6,000 of

which still require cleanup activities. Many of these sites represent opportunities to provide residents with safe, affordable housing without displacing them from the communities they call home.

Another key issue is the cost of cleanup and its impact on housing costs. Cleaning up contaminated properties is expensive and often gets embedded in

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## ON THE COVER

Architectural firm Weber Thompson takes a look at its green headquarters after a decade of use. Details are on page 6.

IMAGE BY LARA SWIMMER PHOTOGRAPHY

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# MORE BUILDINGS SET THEIR SIGHTS ON NET ZERO

The cost of small-scale solar power systems has declined more than 70 percent in the last 20 years.

In June, the U.S. Conference of Mayors adopted a resolution calling for incremental steps in building energy efficiency towards net-zero energy.

While their net-zero target year is still decades away, this organization of major American cities joins the state of California, the fifth-largest economy in the world, that has much more ambitious goals: all new homes will be net-zero energy by 2020; and



BY CHRIS FLINT  
CHATTO  
ZGF ARCHITECTS

all new commercial construction will be net-zero energy by 2030, with half of existing commercial buildings retrofitted to net-zero energy by 2030.

The growth of net-zero energy buildings is not just in policy, either. New Buildings Institute has tracked buildings that are targeting or achieved this benchmark — from a mere handful in



The Rocky Mountain Institute's Innovation Center, designed by ZGF, achieved net-zero energy in its first year of operation.

IMAGES FROM ZGF ARCHITECTS

the year 2000 to nearly 500 projects across the U.S. and Canada this year.

It's clear that net-zero energy buildings, an idea born of experimental and remote cabins, have arrived for good reason: Net-zero energy is effective, economic and a compelling societal goal.

A net-zero energy building, at its simplest, generates as much renewably sourced energy as it uses over the course of a year, typically from on-site or rooftop photovoltaics (PVs) used to balance an extremely efficient energy demand. Given that buildings consume nearly half the energy

used in the U.S., and account for a proportional share of our carbon footprint, net-zero energy addresses the single policy action to put our economy on path to carbon neutrality.

Net-zero energy has additional benefits, in that it bridges the divide between design, construc-

tion and operation of buildings. It is not enough that architects and engineers plan for energy-efficient envelopes and mechanical systems; the building must be constructed well, with an attention to detail and a tight envelope that minimizes outside infiltration of air, and commis-



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sioned to ensure its systems operate as designed.

And, importantly, occupants must do their part. Not only to help manage the heating and cooling of the space, whether by mechanical or passive means, but to be cognizant in how they use energy for various tasks.

Most successful net-zero energy buildings in operation meet their energy targets by keeping occupants informed of energy use, and studies have found occupants to be much more responsible in energy usage with real-time feedback.

### A cheaper green

Perhaps the most exciting development in renewable energy is the general downward trend in PV costs, making net-zero energy much more cost effective. Costs for small-scale installed systems have declined by over 70 percent in the last 20 years, so that the old green building mantra of "energy efficiency first" is not always true.

With paybacks under 15 years, PVs are starting to not only rival some building efficiency strategies, but they pay for themselves within the lifespan of the panels and the building.

To be sure, there are conditions which can make net zero uneconomical, such as heavily shaded sites, tall buildings with limited roof area, and/or energy-

intensive programs. But regulations can make exemptions or, even better, provide alternatives.

The 11-story downtown Sacramento office building we are designing for the state of California is predicted to be in the top 1 percent of office building energy efficiency, but because of its small footprint and local height regulations, can only generate about 7 percent of its annual energy through rooftop solar. The remainder of the building's renewable energy will be sourced from a dedicated array contracted through the local utility.

One of the most compelling aspects about net-zero energy is that the target is not only clear and understandable but motivating. An energy use of zero (or less than zero) is immediately understandable to the layperson, much more so than a building that achieves a percentage reduction against an energy code standard that is both complex and ever-changing. Zero energy is a target that people can get excited about and motivated toward.

Of course, net-zero energy only reflects one aspect of a building's environmental impacts — operating energy — and does not address water use, land use, or even the enormous amount of energy it takes to construct the building itself. But contin-

NET ZERO — PAGE 7



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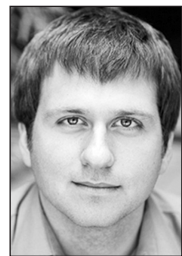
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# 10 YEARS LATER: WEBER THOMPSON'S HQ IS BETTER WITH NATURE

Biophilic design has connected workers with the natural world, making them healthier and happier.

This year Weber Thompson is celebrating the 10-year anniversary of The Terry Thomas, the award-winning, LEED gold, passively cooled office building we designed and have been inhabiting since it opened. As part of that celebration, we thought it worthwhile to back-check our project against two frameworks for biophilic design, equipped with new vocabulary, science and best practices.



BY MYER HARRELL  
WEBER THOMPSON

The building design started in 2003. As Weber Thompson was both the architect and prime tenant, the firm's leaders surveyed employees to elicit the "must-haves" in the core and shell building and interiors. The design strategies that rose to the top were ample daylight, natural ventilation and cooling via operable windows.

Like many LEED projects at

that time, we engaged an integrated project team and stakeholders early on, kicking off with an eco-charrette. The result of our integrated design process was a high-performance building with a minimal, modern aesthetic. During design and construction, most of us talked about the building using terms from LEED: energy savings, water efficiency, indoor air quality, materials toxicity and resource use.

The way we talk about our building has evolved since then. In addition to technical systems improvements, we now talk about how the building makes us feel, and often in relation to nature. Biophilia (literally "love of nature") was an intuitive aspect of our building design, even if we didn't call it that at the time.

## Two design frameworks

To introduce the first framework for our back-check: The Living Building Challenge is a deep green building certification administered by the International Living Future Institute. To certify a project, a biophilic plan must address how the project will deliberately incorporate nature and nature's patterns, be uniquely connected to place, climate and culture. It must also address how the project will provide sufficient and frequent human-nature interactions in both the interior and exterior.

The Terry Thomas is especially strong when we look at the Living Building Challenge biophilic design strategies dealing with light and space. The interior is flooded with abundant natural light and the courtyard with reflected light.

The building was designed from the beginning with daylight in mind, as an O-shaped floor plan increases the exposure of occupied space to windows. Filtered and diffused light enters the workstation areas and conference rooms through "sunglasses" (fixed, translucent glass shade fins) and operable exterior blinds — architectural features that block out the sun to prevent overheating.

Light and shadows track through the corridors and common areas throughout the day. Overhead lighting is tied to sensors on the roof to automatically dim when the sun is sufficiently lighting the space. Accent lighting and task lamps at desks round out a dynamically lit environment.

Planters filled with bamboo, maples and other vegetation soften the courtyard that was initially dominated by concrete pavers.



IMAGES BY LARA SWIMMER PHOTOGRAPHY

On the second framework: In 2014, the environmental consulting and strategic planning firm Terrapin Bright Green issued "14 Patterns of Biophilic Design: Improving Health & Well-Being in the Built Environment." This paper not only helps incorporate biophilic design into projects, it ties each strategy to scientific studies with tangible benefits to human beings.

From 14 Patterns, we learn that thermal and airflow variability is an asset to our building. Manual awning windows and automated louvers provide all our fresh air and cooling. Therefore, unlike most conventional office spaces, we are keenly aware of the outdoor air temperature, breezes and weather phenomena outside our building "skin."

While some might bemoan this variability, humanity evolved biologically with these changing conditions. This variability has been scientifically shown to positively impact comfort, well-being, productivity and concentration. It also provides an improved perception of temporal and spatial pleasure (also known as "allosthesia").

We were not meant to be in hermetically sealed boxes and until relatively recently didn't need sweaters in summer when we went indoors. So, we occupy The Terry Thomas like many of us live in our Pacific Northwest homes — we wear layers, crack

open windows and sometimes turn on desk fans.

## Building on biophilia

Some biophilic design strategies were not included in the original building design, but came about with later improvements. A few years after the building opened, we added courtyard planters filled with bamboo and maples, underplanted with autumn ferns, golden Japanese forest grass, fragrant sweetbox and other highly seasonal plants. In the short term, this softened a courtyard dominated by concrete pavers and provided additional privacy screening. In time, these plantings have functioned as animal habitat, specifically for hummingbird and junco nests.

Because of our floor-to-ceiling glass, every view into the courtyard give us a dose of nature.

The exterior feature stair in the courtyard was initially part of the building design to decrease energy use as an alternative to the elevator, and increases chance encounters between people. With the added dwarf aucuba and evergreen clematis vines, it became one more place to notice the seasons change.

The benefits to a visual connection with nature are lowered blood pressure and heart rate, improved mental engagement/ attentiveness, and positively impacted attitude and overall happiness. When we hear the

birds, we also receive benefits, as non-visual connections with nature have been shown to reduce systolic blood pressure and stress hormones, positively impact cognitive performance, and provide perceived improvements in mental health and tranquility.

So, here's the takeaway: Even our modern glass and steel office buildings can successfully incorporate biophilia and have a positive impact on people (the greatest asset of any company).

When we first occupied the building in 2008, we found evidence of a healthier environment. Our post-occupancy evaluation (required for our LEED certification) showed reduced sick days and symptoms compared to our previous space. In the survey, the overriding responses to "What do you like most about the space?" were variations on "connection to nature." Only later would we call this biophilia.

The next step for our firm is to apply these two frameworks early in our design process, building on lessons from the space where we've spent a lot of time over the last 10 years.

Myer Harrell, AIA, LEED AP, BD+C Homes, is a principal and director of sustainability at Weber Thompson focused on boutique, sustainable commercial office projects. He was with the firm when it moved into The Terry Thomas building in 2008.



Translucent glass shade fins and operable exterior blinds filter and diffuse sunlight.



## BROWNFIELDS

CONTINUED FROM PAGE 3

the price of redevelopment. This can create financial barriers to the redevelopment of properties into affordable housing. This program takes the cost of cleanup out of the equation, easing the way for the building of affordable housing.

### Legislative support

In support of the critical need for affordable housing, the 2018 Legislature directed Ecology to collaborate with the Department of Commerce and develop

a competitive process to fund recipients that restrict the use of their cleaned-up property to affordable housing. The Legislature continued its support of linking cleanups with affordable housing in three additional ways:

- Provided \$6.2 million in funding to support the nonprofit Mt. Baker Housing Association's cleanup of land for the development of The Maddux, a project expected to create 144 units of affordable housing in southeast Seattle.

- Provided funds for Ecology to

distribute to local governments to investigate and plan cleanup for potential affordable housing development.

- Instructed Ecology and Commerce to develop a program to carry out more of these cleanups.

We began developing the Healthy Housing Remediation Program in 2018. In June, we reached out to local government representatives and housing groups to begin building a list of possible cleanup projects.

### The Maddux

As a site contaminated by releases from a former gas station and dry cleaner, The Maddux development is made possible by a partnership between Mt. Baker Housing and Ecology. This innovative team will achieve multiple goals — including urban environmental cleanup, community redevelopment and transit-oriented affordable housing — and will serve as a catalyst for transforming the Mount Baker neighborhood. In fact, this project laid the groundwork for the idea of creating the pilot program.

The new residential complex

is an exciting example of the potential for turning contaminated properties into community- and transit-oriented housing opportunities. The property, while contaminated, occupies an otherwise desirable location — known as a “prominent corner” in real-estate parlance — which has easy access to mass-transit options and walkable green spaces.

Cleanup of the Mount Baker property means that this location will not only continue to serve the long-term neighborhood residents who have lived with the presence of contamination, but will also provide new affordable units and economic opportunities for small businesses by including ground-level commercial spaces in an area with limited retail services.

Ecology and Mt. Baker Housing have worked closely together. We helped our partners understand the cleanup process and funding opportunities available to support this work.

Ecology provided \$400,000 in early financial support through a prospective purchaser consent decree that helped Mt. Baker Housing investigate contamination on the site and plan cleanup

needs. The initial investment and Mt. Baker Housing's efforts secured \$56 million in private, federal and state housing funding, which the Legislature supplemented with \$6.2 million to pay for cleanup costs. These cleanup funds assisted Mt. Baker Housing in providing all 144 units in the new building at affordable prices. Final cleanup investigations were in process at press time, with cleanup construction expected to start in summer of 2019.

Ecology is proud of its work protecting Washington's human health and the environment, and — through cleanup grants to local governments — enabling economic development. Now, through partnerships like the Healthy Housing Remediation Program, we can also join with local governments and nonprofits to help turn contaminated properties into clean sites for affordable housing.

*Bob Warren is Northwest Regional Office section manager and interim program manager for the Washington Department of Ecology Toxics Cleanup Program.*

## NET ZERO

CONTINUED FROM PAGE 5

ued conversations in the building industry about net-zero energy have broadened to the related topic of “embodied energy” (or carbon) and life-cycle analysis — the inputs and impacts associated with the development, maintenance and eventual deconstruction of the physical infrastructure of a building over its lifetime.

The net-zero ethic has informed the Living Building Challenge, a comprehensive building sustainability metric developed by Seattle-based International Living Future Institute that recognizes truly sustainable buildings that are not only net-zero energy, but also net-zero water, net-zero carbon and eliminate their toxic materials.

### Comfortable too

In aspiring towards net-zero buildings, it is important that we do not lose sight of the reasons we have buildings and communities: to provide a safe, comfortable environment to live, work and play. Net-zero buildings that sacrifice occupant comfort or productivity will be counterproductive to their widespread adoption.

The Rocky Mountain Institute's Innovation Center, designed by ZGF, achieved net-zero energy in its first year of operation; but just as important as its exemplary energy usage is its success as a workplace. The building is rated in the top 1 percent for thermal and visual comfort in the Center for the Built Environment's industry database for occupant satisfaction. Extensive daylighting and natural ventilation do not just

reduce energy usage and contribute to net-zero energy, they make it a more comfortable — and productive — place to work; and contribute to the estimated four-year payback.

Ultimately, net zero, or zero impact, may not be enough. Net positive energy — generating more renewable energy than used annually — can allow one building to contribute something back to our society and environment, after centuries of environmental degradation.

Perhaps the biggest reason to focus on net positive is psychological: “zero” isn't always seen as an inspiring goal in the West, particularly in America, where we tend to associate success with abundance, and efficiency with austerity.

It may be more inspiring for people to talk about “net positive” rather than “net zero” buildings — so that the goal is buildings that contribute more to the local, regional and global ecosystems than they take.

Someday soon our buildings and cities — and those of our children, and their children — will truly be sustainable.

*Chris Flint Chatto, principal and integrated designer at ZGF Architects, has completed several net-zero energy projects, including the Rocky Mountain Institute Innovation Center and the administration center at Stanford University's Central Energy Facility.*

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# ACCELERATING CLEANUP WITH ADAPTIVE MANAGEMENT

Adaptive management may work best on large and complex sediment sites.

The cleanup and restoration of the Lower Duwamish Waterway and Harbor Island has been a long-time goal for the Seattle area.

Since the Harbor Island Superfund site was listed on the National Priorities List in 1983, cleanup efforts have bridged several stakeholders, multiple sites and decades of work. We are nearing the home stretch with cleanup decisions in place everywhere besides the East Waterway Operable Unit. Concurrently, natural resource trustees are evaluating restoration options, and issued an injury assessment plan in July.



BY CHRIS MOODY  
FARALLON  
CONSULTING

At this juncture, stakeholders have an opportunity to use a technique called adaptive management to accelerate cleanup and restoration.

Adaptive management has a long history of usefulness in evaluating complex resource systems to identify the ways in which complex food webs react to and overcome uncertainties in the cleanup process. Although stakeholders have raised objections about the uncertain costs and time frames inherent in this approach, these concerns can be alleviated by building trust and providing a specific path forward for further work based on monitoring.

In short, adaptive management reduces uncertainty with management decisions.

## What is adaptive management?

Adaptive management is used in business, environmental science and industrial ecology. Its approach is built on the concept that complex resource systems like those at Superfund sites are only partially understood at the outset. Rather than delaying action until "enough" is known about a system, adaptive management supports action in the face of the uncertainties and complexities of large ecosystems.

Adaptive management is not, however, a trial-and-error approach, nor is it classical experimental science. Essentially, adaptive management is a decision framework that describes one or more series of actions that are selected based on the previous cycle of study results.

There are 23 studies that need to be conducted in the Lower Duwamish Waterway to identify restoration alternatives. An adaptive management approach could speed that up.



PHOTO FROM FARALLON CONSULTING

Adaptive management has been formally used in environmental management theory since the late 1970s to evaluate forest management approaches, determine the impact of harvesting on fish populations, and identify the intersection of social and ecological systems.

Contaminated-site managers adopted the theory in the 2000s and it has been included in numerous guidance documents such as the 2002 U.S. Environmental Protection Agency Principles for Managing Contaminated Sediment Risks at Hazardous Waste Sites, and several EPA directives and memoranda. Adaptive management was also included in the restoration plan and guidance document for the Deepwater Horizon spill as recently as January.

## Why use it?

There are inherent uncertainties in large-scale cleanup and restoration projects. Uncertainties typically encountered in sediment sites include ongoing sources of contamination, estimates of bioaccumulation and magnification for ecological receptors, and the predicted effectiveness of restoration alternatives.

These and other uncertainties cause decision paralysis, when stakeholders believe there is only one chance to find the correct solution. The traditional

approach is to select a highly conservative remedy that seems most certain to achieve the objectives.

These conservative methods are less successful, however, in accounting for a project's inherent uncertainties. Even after a conservative remedy has been selected and implemented, the actual protectiveness of the remedy may not be known until construction is complete.

Adaptive management could support implementation of an active solution following a round or two of data collection, and could prevent or minimize the need to investigate further and postpone cleanup or restoration.

As an example, natural resource trustees identified 23 different studies that need to be conducted in the Lower Duwamish Waterway to identify restoration alternatives while recognizing that significant uncertainties could remain. An adaptive management approach could allow restoration to begin sooner, with studies then performed to reduce those uncertainties in the context of a particular restoration solution.

These actual measured effects make a much more compelling case to stakeholders than modeled effects.

## Implementation concerns

Although adaptive management is often the most efficient

and effective approach at sites with uncertainty, the dynamic nature of adaptive management can conflict with the desire for a firm schedule and cost. It can be difficult to convince the public and stakeholders to take

interim steps, especially if public resources are involved. Decision-makers resist committing time and money to a process that advocates action despite

ADAPTIVE — PAGE 13



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No southern resident orcas have been born and survived since 2015.

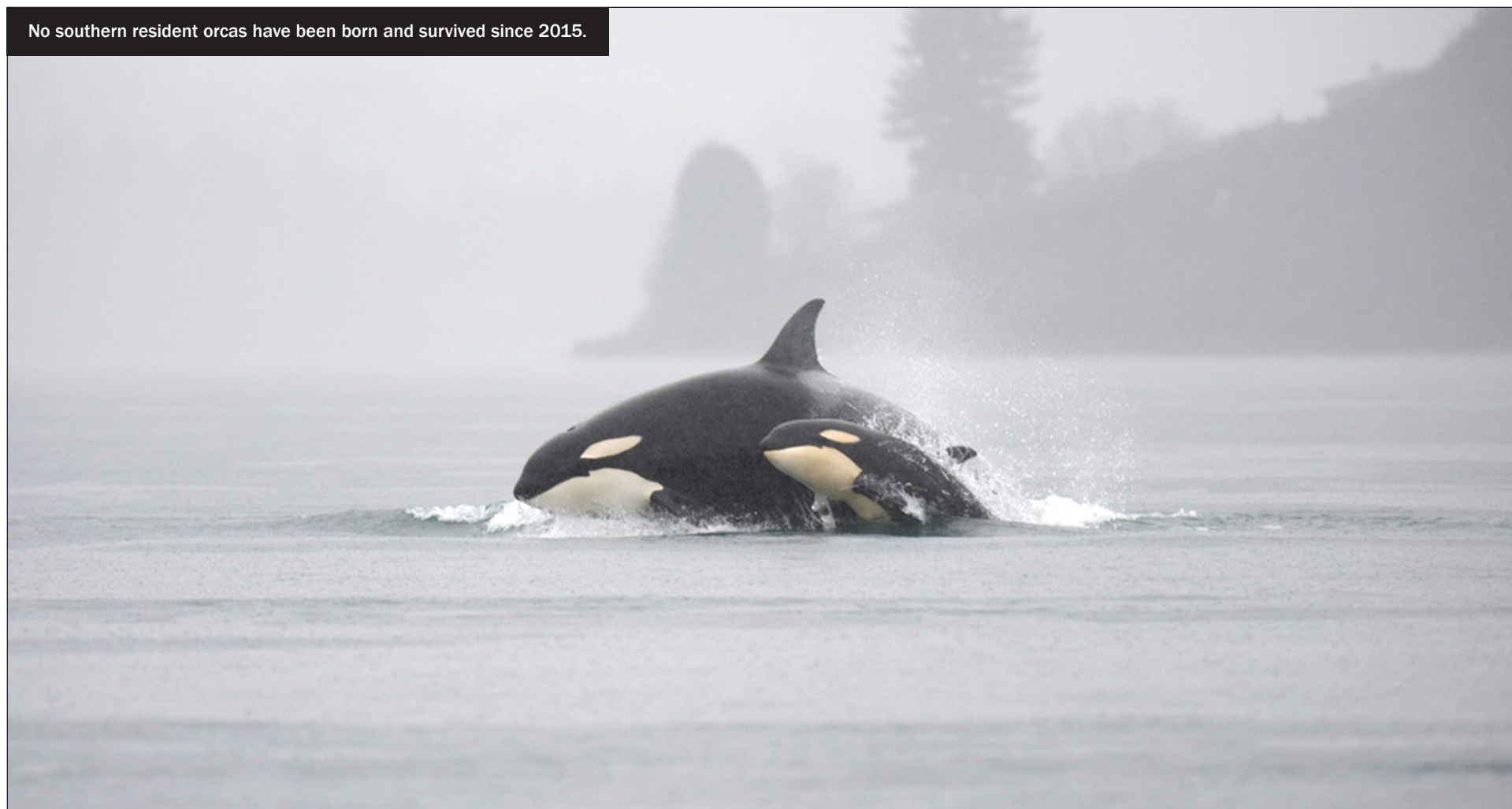


PHOTO BY MIKE CHAREST VIA FLICKR

# BOLD ACTIONS ARE NEEDED TO SAVE LOCAL ORCAS

The southern resident orca population is down to 74 whales – the lowest in 30 years.

The 2005 listing of southern resident killer (orca) whales as endangered under the Endangered Species Act was an urgent wake-up call that the health of our coastal waters was being impacted by humans to a degree that was inconceivable just decades earlier.



BY PAUL SCHLENGER  
ESA

Despite our love of Puget Sound and nearby marine waters, few people realized that the fate of the region's apex marine predator and cultural icon was being jeopardized by our actions.

Southern residents are a unique group of orca whales found in the waters of Puget Sound during summer months. Southern residents have a different diet than transient killer whales and are facing some of the most serious threats to their population. In the Puget Sound region, the southern residents' listing, coupled with the 1999 Endangered Species Act listing of Puget Sound Chinook salmon,

was a call to action to learn more about how our actions affect these highly social and long-lived mammals and commit to reducing our impacts on their survival.

Fast forward to 2018 and the southern resident population size – 74 individuals – is the lowest it has been in 30 years. The population's struggle has been front-page news this summer as we witnessed the death of an infant calf whose body was carried for 17 days by its mother, and the assumed death of a 3-year-old whale who had been critically emaciated.

According to the Orca Network, no southern residents have been born and survived since 2015.

Recognizing the critical state of the population, Gov. Jay Inslee signed an executive order in March to implement a series of immediate actions to benefit the orcas and establish a task force to identify, prioritize and support the implementation of a longer-term action plan.

The tragic situation over the summer further underscores the urgency needed to reduce threats to the whales.

## Primary factors of decline

NOAA Fisheries has identified

three primary threats to the population's survival: prey availability, high levels of chemical contaminants, and disturbance from vessels and sound.

**Prey availability:** Chinook salmon are the preferred prey of southern residents, comprising most of their diet throughout the year. In summer, Chinook salmon comprise nearly 80 percent of the southern residents' diet.

Between April and October, southern residents stay in and around Puget Sound and the southern portion of the Strait of Georgia in Canada. During winter months they have been sighted in coastal waters as far north as Alaska and as far south as San Francisco.

Southern residents feed primarily on Chinook salmon originating from the rivers throughout the extent of their range. Within the U.S. portion of the range of the southern residents, nine West Coast Chinook salmon populations are in decline and are listed under the Endangered Species Act.

Chinook salmon recovery and their availability as a food source depends upon several factors often referred to as the four H's: harvest, habitat, hydropower and hatcheries. Each of the four

H's has a significant influence on the sustainability of Chinook salmon populations. While the influence of each of the four factors varies among watersheds, Chinook recovery depends on coordinated and complementary improvements in all H's.

Another important factor affecting Chinook salmon populations is predation by marine mammals, notably sea lions. In some river systems, predation by California sea lions has taken a significant toll on Chinook salmon numbers. In the Lower Columbia River, the Washington Department of Fish and Wildlife describes the predation problem as "especially acute" below Bonneville Dam, the lowest dam on the river.

**Chemical contaminants:** Chemicals such as pesticides, motor oil and other household chemicals are introduced to our coastal waters through stormwater runoff and wastewater. Fish and other marine life ingest these chemicals, which become stored in their tissue. Animals higher in the food chain tend to accumulate the chemicals found in their prey. As a result, top predators like the southern residents have higher accumulated levels of chemicals.

Whales store the chemicals in their fat. These chemicals are released when they are not getting enough to eat, affecting the animals' reproductive success among other health concerns.

## Vessel disturbance and noise:

The presence and noise associated with boats of all sizes are known to affect southern residents' behavior. Southern residents make sounds for communication with one another and to locate prey when hunting. Larger vessels such as ferries and cargo ships generate low-frequency noise that interferes with their communication. The high-frequency sounds generated by small boats tend to mask the sounds southern residents use when hunting. It is also understood that echo sounders used by boaters for navigation and/or when fishing impairs the ability of southern residents to locate prey.

## Executive order

Gov. Inslee's executive order identifies nine immediate actions involving six state agencies. The actions include agency coordination and planning to improve agency effectiveness in alleviating the primary threats.



Example actions include identifying the highest priority watersheds to focus Chinook restoration to provide prey for southern residents, developing strategies to quiet state ferries in areas most important to the southern residents, and developing criteria to prioritize stormwater projects that benefit southern residents.

Many of the immediate actions have been completed and their reports are available online at <https://tinyurl.com/WA-gov-Orcas>.

The governor's task force is composed of three workgroups focusing on the primary threats of prey availability, chemical contamination and vessel disturbance. They will recommend additional actions for 2019 and 2020. These recommendations are expected to be large-scale actions that will have an immediate and positive impact on the southern residents.

The task force will release a comprehensive final report by November that details the recommended actions toward recovery. A report discussing the progress made as a result of those actions is expected in October 2019 (after which the task force will end).

**Potential bold actions**

Addressing the primary threats to southern residents will require significant changes to our man-

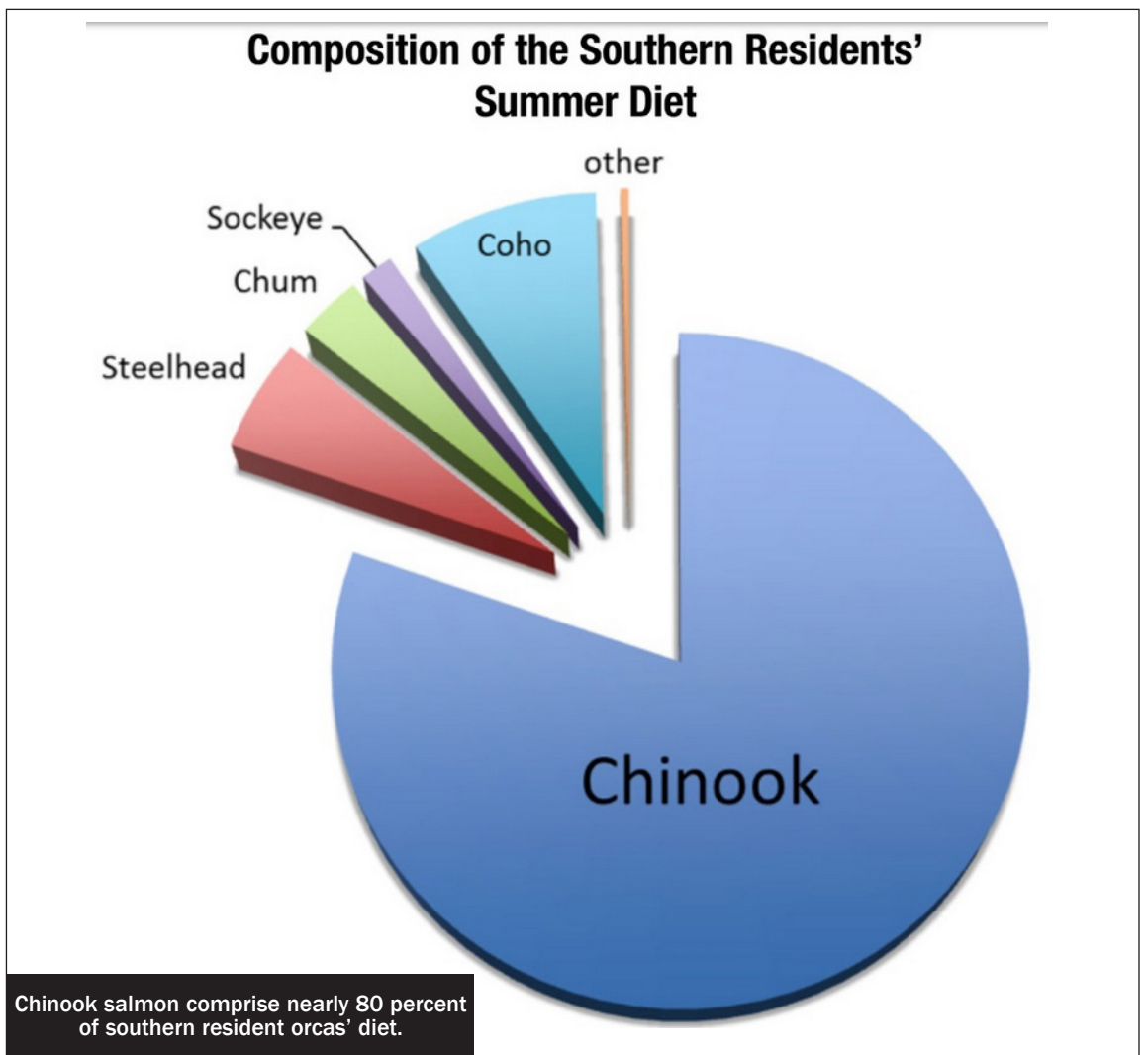
agement of natural resources and even our way of living, and the task force is expected to recommend several bold actions to address the factors affecting southern residents' survival.

The region may need to commit to improved stormwater management and "no-go zones" for boats. The region may also need to step up efforts to restore rivers and estuaries, as well as the Puget Sound shoreline, if we hope to increase the numbers and availability of Chinook as prey.

The task force may also recommend changes to hatchery operations, such as the number, timing and age of fish released. This will require a delicate balance to ensure no detrimental impacts to our wild salmon populations. Changes to the management of marine mammals such as sea lions may also be necessary given their active predation on Chinook salmon.

The work of the task force and the successful implementation of the immediate actions identified in the governor's executive order are important first steps toward recovering southern residents. Ultimately their fate is in all our hands.

*Paul Schlenger is a senior fisheries biologist at Environmental Science Associates. He has over 20 years of experience working on salmon restoration and watershed planning projects.*



GRAPHIC FROM NOAA

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Arbor Blocks consists of two 200,000-square-foot buildings that face each other on Eighth Avenue North.

IMAGES FROM VULCAN REAL ESTATE

# FACEBOOK'S NEW HOME WILL HAVE 1ST SALMON SAFE WOONERF

Private developers must own both sides of the street to build a woonerf in Seattle.

In modern-day cities, streets and alleys, which are generally the purview of automobiles, make up the largest portion of public property, comprising a quarter to a third of the total land area. As our cities continue to densify and green space disappears, many planners are asking if it isn't time to start applying the right size and right values to our roads.



BY LORI MASON CURRAN  
VULCAN REAL ESTATE

Whether referred to as woonerfs, festival streets, home zones or some other name, shared streets are quickly becoming a popular strategy for reclaiming the street right of way by signaling that cars are the guests, and that the street is truly designed for people. In Seattle, it's rare to see a woonerf built into private development because it requires the developer to own both sides of the street.

However, the Arbor Blocks,

Eighth Avenue between the buildings is being developed into a one-block woonerf that will connect to Thomas and Harrison streets.



soon to house Facebook, provided Vulcan Real Estate with just such an opportunity. Made up of two city half-blocks that face each other on Eighth Avenue

North, the project gave Vulcan the unique ability to create an outdoor living room right in the middle of the booming South Lake Union neighborhood and

in doing so, prioritize the street for people first.

Targeting LEED gold, the two buildings at Arbor Blocks will each contain approximately

200,000 square feet with six stories of commercial office space, four stories of underground park-

WOONERF — PAGE 13



## WOONERF

CONTINUED FROM PAGE 12

ing and a combined total of 4,100 square feet of retail space at the ground floor.

Vulcan worked with Graphite Design Group and Hewitt, as well as general contractor Lease Crutcher Lewis, to incorporate sustainability features throughout the project. As the team initially began planning the site, it discovered that the property was framed by a mature canopy of sweet gum trees that created the perfect opportunity to not only provide the site with additional greenery, but to also emphasize the naturally formed public space between the Arbor Blocks buildings.

Through a public-private partnership with the city of Seattle, the section of Eighth Avenue North between the two Arbor Blocks buildings is being developed into a pedestrian-friendly one-block woonerf, which will connect to Thomas and Harrison streets. Bikes and vehicles will still be able to access the road between the two buildings, but the design of the meandering pathway for the narrowed street, the absence of curbs, the specialty paving pattern and the incorporation of numerous vegetated, seating and walking surfaces will discourage its use as a through street for automobiles.

In addition to minimizing the roadway width to prioritize pedestrian and bike use, a primary hardscape plaza takes advantage of southwest sunny exposure to create an open area filled with sculptural seating beneath

the preserved sweet gum trees where employees and passers-by can bask in the sun. A secondary plaza, in the form of a deck surrounded by lush vegetation, sits farther north in shady contrast.

The Eighth Avenue woonerf will also feature approximately a dozen planting areas ranging from 100 to 2,000 square feet. Coupled with the buildings' green roofs, these planting areas represent a sizable increase in urban habitat and natural public space. In addition, porous pavement is used to filter stormwater.

The western building has cascading bioretention cells along its north and south frontages, while the eastern building opens pocket seating areas. Both buildings have lower level and roof level terraces designed to balance lush plantings with a highly functional outdoor workspace, so Facebook employees will be able to work from virtually anywhere in their new South Lake Union buildings.

Tenant amenities will include a cafeteria, fitness center and showers, and bike lockers to accommodate various commuter needs.

Arbor Blocks is yet another Vulcan project to qualify for Salmon Safe certification. To be certified, Salmon Safe projects must adhere to strict development principles such as protecting habitat and water quality during construction, incorporating strategies that treat and disperse stormwater on-site, providing ecologically functioning habitat,

and a commitment to water conservation methods.

Through its incorporation of green roofs, bioretention planters and water-efficient irrigation, the design of Arbor Blocks effectively encourages low-impact practices that go beyond environmental regulations. In fact, Facebook's new campus will be home to the world's first Salmon Safe-certified woonerf.

Construction of both buildings is slated for completion in early 2019.

The benefits of sustainably designed projects extend beyond reduced material use or energy consumption. Employee retention and recruitment are boosted by green practices as well. Not only do highly recruited employees expect employers to be environmentally conscious, they want work spaces that foster a strong culture of purpose and amenities that enable flexibility and creativity.

Investments into the city's public space and preservation of the environment will benefit Seattle for generations to come. When developers, and their clients, see the benefits of incorporating environmentally sound practices and features into their projects, the results leave lasting impressions on employees and the communities in which they live, work and thrive.

*Lori Mason Curran, LEED AP, is real estate investment strategy director at Vulcan Real Estate.*

## ADAPTIVE

CONTINUED FROM PAGE 9

uncertainty or may view an admission of uncertainty as an admission of weakness.

Typical concerns about the use of adaptive management include:

- **Uncertain time frame.** How many cycles of active management and monitoring events are needed before the work is complete?

- **Uncertain costs.** Actions selected on the first round of work may or may not be enough.

### Solutions

**Problem:** Lack of trust between stakeholders leads to a push for a more final solution.

**Solution:** Create a work group approach with a central goal of preparing and using a conceptual site model to discuss how risk-management decisions should be addressed. The framework of a conceptual site model provides a common base around which to focus the discussions and allows a more cooperative approach.

**Problem:** Potentially responsible parties are often reluctant to agree to a settlement when the total cost of the remedy is uncertain.

**Solution:** Cost and timing uncertainties can be bounded by providing a specific path for-

ward based on phased cycles of monitoring. Early or interim records of decision can specify the process to be followed in later stages. Records of decision must include a preferred alternative, but also can "provide a commitment for further analysis and selection of long-term response measures within an appropriate time frame."

### Powerful tool

Adaptive management is a powerful tool that has the potential to reduce the time to clean up and restore large sediment sites.

Once common concerns are addressed, adaptive management has demonstrated successes, including the Berry's Creek site in New Jersey and the South River site in Virginia.

If the process is structured appropriately, adaptive management may also offer early off-ramps for areas of the Lower Duwamish Waterway, so that these areas can get back into full productive use.

*Chris Moody, R.G., is a principal geologist in Farallon Consulting's Portland office. He has over 25 years of experience with remedial investigations/feasibility studies, remedial design/construction, sediment strategy development, and allocation and litigation support.*

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## SURVEYS

# LANDAU ASSOCIATES

**Specialty:** Environmental remediation and engineering, geotechnical engineering, permitting and compliance services

**Management:** Jerry Ninteman, principal, remediation services director; Chip Halbert, principal, environmental permitting director; Calvin McCaughan, principal, geotechnical services director

**Founded:** 1982

**Headquarters:** Edmonds with offices in Seattle, Tacoma, Olympia, Spokane, Portland

**2017 revenues:** \$16 million

**Projected 2018 revenues:** \$17 million

**Current projects:** Geotechnical and industrial wastewater system design, air quality permitting and construction management for a central Washington data center campus; environmental investigation for cleanup and redevelopment of an airport property owned by Snohomish County; design and monitoring of a stormwater system at a Seattle aerospace facility

Jay Bower, principal and CEO of Landau Associates, answered questions from the DJC about his company and the industry. Answers have been edited for length and clarity.

**Q: What is the biggest environmental issue in real estate?**

**A:** Uncertainty. Real estate purchase and development is largely a strategic and financial decision. Potential environmental issues that may introduce uncertainty to a real estate project include unidentified or poorly characterized contamination, the presence of hazardous building materials in existing structures, lack of a clear process and timeline for regulatory agency interactions, and/or not having clearly allocated environmental liabilities.

We apply our experience and agency relationships to help clients accurately define potential liabilities, which minimizes uncertainty and helps them to make informed decisions.

**Q: Your website says Landau is interested in teaming with WMBE firms. Why?**

**A:** We have completed more than 300 projects since 2007 that involved a directly contracted WMBE teaming partner.

Some clients specify goals or requirements for participation of women- and minority-owned businesses to qualify for work so we need to have a grasp of the WMBE expertise available to build a winning team. Many WMBEs are not that known in the business community because they get plenty of work from just

a few key clients. So we encourage them to contact us.

We want to develop relationships in advance of building project teams; the better we know each other, the more effective we'll be. As importantly, people with the initiative to start small businesses, including WMBEs, frequently make great partners and mesh well with our collaborative, team-based approach to projects.

**Q: What are trends in your industry locally and with your company?**

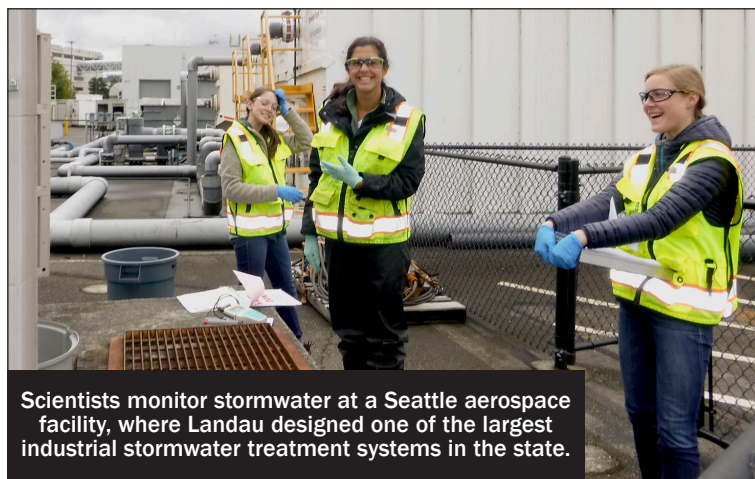
**A:** The availability of talent to meet the demand for environmental services in this vibrant economy is an increasing constraint on growth — I'm unaware of any firm that isn't hiring. Retention of talented staff is critical and competition for seasoned professionals is fierce.

As a 100 percent employee-owned firm, we focus on creating an environment where our staff can excel professionally and be rewarded financially as co-owners, with the result that we enjoy longer-than-average tenures. But we do not assume today's employees want the same workplace experience as those in the past.

The focus on employee experience is increasingly critical to the success of environmental firms.

**Q: Which services are most in demand and where do you see growth in the next five years?**

**A:** Demand continues for ser-



Scientists monitor stormwater at a Seattle aerospace facility, where Landau designed one of the largest industrial stormwater treatment systems in the state.

PHOTO FROM LANDAU ASSOCIATES

vices related to legacy environmental issues at brownfield and operating sites associated with re-use of underused land or expansion at existing facilities, to management and protection of land, water and air resources is growing more rapidly.

The regulatory environment for these projects is increasingly complex, and in some cases restrictive, and tends to create uncertainty from the owner's perspective. Uncertainty can kill a project if there is too much perceived risk or a lack of confidence in the development schedule. However, the ability to mitigate for uncertainty through expertise and relationships with regulators and other stakeholders can create a competitive advantage for our clients.

Given the long-term trend in

regulatory development and stakeholder interest, we expect to see continued growth.

**Q: Is the rise of infill development in the Seattle area affecting what your firm does?**

**A:** Most of our clients' operations and development activities are outside of Seattle. There is likely some shift in the competitive environment related to the intensity of development in Seattle, but the overall economy has a much larger influence on our firm.

From our perspective, the vibrant economy has provided a wealth of work for everyone and it engages all our services, from managing legacy environmental issues to geotechnical engineering and permitting for new construction.

# PALADINO & CO.

**Specialty:** Sustainability and green building consulting firm that aligns sustainability strategies to measurable business value

**Management:** Deborah Hanamura, executive director of sales and marketing

**Founded:** 1994

**Headquarters:** Seattle

**2017 revenues:** N/A

**Projected 2018 revenues:** N/A

**Projects:** Pursuing Well Certification for HAPO Credit Union in Vancouver; sustainability consulting for Forza Tower in Columbia

The DJC asked Wendy Walters, marketing specialist at Paladino, about trends and issues in the industry. Answers have been edited for length and clarity.

**Q: What types of projects has Paladino focused on recently?**

**A:** The past year has shown an exciting diversity in rating systems and third-party back-checks. Highlights include the LEED EB O+M project for Cam-

den Yards, the Well Certification effort to help HAPO Credit Union become the healthiest credit union in the world, being selected to provide sustainability consulting for Forza Tower, which will be the tallest building in Latin America.

These projects demonstrate that sustainability, wellness, and resilience reach across geographies, business types and budgets. We love the diversity of work and the challenges it brings.

**Q: Has Paladino changed any services in the last year?**

**A:** The biggest addition to our services has been a rapid escalation in our work with wellness, including Fitwel and Well Certification work. We are also seeing increased interest in sustainability's link to climate resilience.

**Q: You service architects, developers, corporations and the public sector — are you focusing more on any of these?**

**A:** We work in partnership with



HAPO's Mill Plain branch in Vancouver is the first credit union to pursue Well Certification.

PHOTO FROM DBIA

architects to deliver a high-value asset to the project owner or developer. How that value is measured is based on the business circumstances of each owner and how they evaluate their pro forma. Our increased focus is on the link between sustainability and business value, with the certification functioning as a back-check on the decisions made.

**Q: What regions where Paladino operates have picked up?**

**A:** There is a general spike in

secondary markets around the U.S., and we are seeing that in our business. We are particularly busy in Seattle, Washington, D.C., and Boston.

**Q: Are you staffing up or down in response to changes in your business?**

**A:** We are growing. Our firm is a boutique, and our aim is to carefully manage our growth. We are actively adding key positions in both Seattle and D.C.

**Q: As sustainability evolves,**

**are clients still receptive to new tech?**

**A:** Absolutely. There is always a curiosity about new technologies combined with a healthy skepticism about being the first to deploy it. If you can bring the data, market proof and business case for a technical approach, a client will typically consider it. In terms of climate resilience, we are also seeing innovative solutions that come from passive strategies — using less technology with smart design can also be the right answer.



## SURVEYS

# SHANNON & WILSON

**Specialty:** Geotechnical and environmental engineering

**Management:** Gerard Buechel, president

**Founded:** 1954

**Headquarters:** Seattle

**2017 revenues:** \$61.5 million

**Projected 2018 revenues:** \$65 million

**Projects:** Lower Dungeness River floodplain restoration and levee realignment, Sequim; Lower Baker Dam seepage reduction, Concrete; Lower Duwamish Waterway allocation support

Katie Walter and Meg Strong, both vice presidents at Shannon & Wilson, discussed what's new and what's ahead for the company. Answers have been edited for length and clarity.

**Q: Where do you see growth in the next five years?**

**A:** Infrastructure-related projects continue to be a strong market for our firm. Shannon & Wilson's strengths in transportation (road, bridges, transit, railroad, tunneling), water/

wastewater, dams/levees and design-build means that we are well positioned to realize growth through these opportunities and provide our staff interesting and challenging work.

**Q: What are some ways your industry is changing?**

**A:** Consolidation of consulting engineering companies through acquisitions and mergers has created threats and opportunities for Shannon & Wilson.

While some teaming opportunities have decreased, our long-term clients continue to rely on us to solve large and difficult challenges. Our firm is a mid-size organization, so we are nimble enough to adapt to market changes as they emerge.

**Q: How well are you meeting your staffing needs?**

**A:** Recruiting quality staff is an industrywide challenge and has become more difficult in recent years, especially in this strong economy. However, both our natural resources and remedia-



Shannon & Wilson is working on a seepage reduction project at Lower Baker Dam.

IMAGE PROVIDED BY SHANNON & WILSON

tion groups have doubled in size over the last year. This reflects the strong market and our ability to win interesting projects that attract talented staff.

**Q: What's a cool or innovative project you're working on?**

**A:** The Baker River project consists of Upper and Lower Baker Dam — two concrete hydroelectric dams — and West Pass Dike,

a large earthfill dam.

Shannon & Wilson is working with Puget Sound Energy at Lower Baker Dam to design and develop permit applications and documentation for seepage reduction. The project proposes to construct a grout curtain upstream of the Lower Baker Dam to significantly reduce seepage through the dam foundation and along the contact

of the dam structure with the foundation bedrock.

Permitting this project is complicated by significant in-water construction over a long period in a difficult environment. To facilitate the grouting operations, we are assisting with the acquisition of property in the area of the dam, including site investigation work.

# O'BRIEN & CO.

**Specialty:** Consulting to create a sustainable built environment; policy, planning, programs, projects and education

**Management:** Principals Elizabeth A.D. Powers, Alistair Jackson, Donna Trost

**Founded:** 1991

**Headquarters:** Seattle

**2017 revenues:** N/A

**Projected 2018 revenues:** 10 percent growth

**Projects:** Sitka in South Lake Union, developed by Vulcan; Red Cedar in the Yesler Terrace redevelopment by Seattle Housing Authority

The DJC asked O'Brien & Co. principal Elizabeth Powers about trends and issues in the industry. Answers have been edited for length and clarity.

**Q: What recent projects are you most proud of?**

**A:** O'Brien & Co. is providing technical assistance and verification services on two exemplary multifamily projects: Sitka in South Lake Union, developed by Vulcan; and Red Cedar, a Yesler Terrace redevelopment project by Seattle Housing Authority.

We are also providing LEED certification support to the University of Washington, which has several outstanding projects: North Campus Housing; Population Health Facility, which is the first LEED version 4 project

on campus; and West Campus Utility Plant, which earned gold certification under Envision, a rating system for sustainable infrastructure.

**Q: How have you diversified your business in response to increasing workload?**

**A:** The field of sustainable building is expanding its focus on how the built environment influences public and individual health and O'Brien & Co. is actively working with many clients on this topic. In terms of sectors, we are more engaged in existing buildings than ever before. As the largest portion of the building stock by far, existing buildings represent the best opportunity to create change.

**Q: Are clients requesting more technological advances as the sustainability industry matures and evolves?**

**A:** Our field is continuously raising the bar because we still have a way to go before the built environment is creating a positive impact by which to offset previous negative impact. Technologically, a lot of the solutions already exist. It is more about applying them consistently at scale.

**Q: Can you cite improvements in sustainability technology used in your recent projects?**

O'Brien & Co. is providing technical assistance and verification services for Vulcan's Sitka apartment complex in South Lake Union.



IMAGE BY RUNBERG ARCHITECTURE GROUP/NEOSCAPE

**A:** Some examples are electric vehicles, on-site renewable energy production (which is getting very cost effective with the drop in the cost of solar systems), and approaches to energy-efficient buildings such as passive house and heat pumps combined with direct outdoor air supply and heat recovery.

**Q: Are your clients still focused on the bottom line when considering sustainable design practices and standards?**

**A:** Clients pursue sustainable building for many different reasons, but all the reasons

related to a value they ascribe to sustainability. Mission-based companies and public agencies need to walk-the-talk and often want to lead or set an example.

Many organizations find a commitment to sustainability necessary for recruitment and retention, from colleges and universities trying to attract students to tech companies seeking the best talent.

Some projects are motivated primarily by incentives such as additional funding or FAR. These projects are primarily focused on lowest first cost sustainability features, whereas others are interested in overall life-cycle

cost reduction because they will maintain and operate the building.

Another value that could relate directly to the bottom line soon is carbon reduction. Organizations that made commitments to address climate change are finding that they need to set specific standards for their buildings to meet the greenhouse gas reduction targets they set. Meanwhile, both the public and the state government are pushing for some sort of regulation on carbon emissions which could impact almost every business' bottom line.



## SURVEYS

## PARAMETRIX

**Specialty:** Water, transportation, community building, environmental planning and compliance  
**Management:** Jeff Peacock, president and CEO; Roger Flint, COO; Holli Moeini, CFO

**Founded:** 1969

**Headquarters:** Seattle

**2017 revenue:** \$86.96 million (firmwide); \$32.61 million (environmental only)

**2018 projected revenue:** \$95.7 million (firmwide); \$35.8 million (environmental only)

**Current projects:** Managed design and construction of the Calistoga Setback Levee in Orting; designed, permitted and oversaw construction of a 2,600-gallon-per-minute groundwater pump and treatment system at the Port of Vancouver USA; designed two precast concrete box culverts and stream restoration to improve kokanee habitat in Zackuse Creek, King County

Jeff Peacock, president and CEO of Parametrix, answered questions about his company and trends in the industry. Answers have been edited for length and clarity.

**Q: What is happening with funding for large infrastructure projects?**

**A:** Demand for large infrastructure projects will continue to grow. The public's willingness to fund those programs, however, may become increasingly strained.

Washington state's reliance on the gas tax and voter approval for transit and roadway programs can only go so far. It is also unclear how tolling, congestion pricing, ride connecting and sharing programs, and emerging technologies like autonomous vehicles and artificial intelligence may influence future infrastructure projects.

The private sector is increasingly stepping forward to finance these types of programs and I think we'll see more projects using public-private-partnership approaches so they can get built in a timely manner. We're seeing this at the national level and it's coming up here in Washington, too.

**Q: What are trends in your industry locally and with your company?**

**A:** The biggest trends today are driven by the strong economy generating increased demand for environmental and engineering services. Of course, that



Parametrix managed the design and construction of the 1.5-mile Calistoga Setback Levee in Orting to reduce the effects of flooding in the Puyallup Valley and restore 101 acres of salmon habitat.

PHOTO FROM PARAMETRIX

comes with a heightened need to keep and find the best talent. Effective retention and recruitment programs are critical.

Regarding specific markets, the Puget Sound region is in the middle of an unprecedented boom in transportation-related work. With that, related work in support disciplines like environmental assessment and cleanup, fish passage and utilities is also required.

On a larger scale, we're seeing increasing realization of the impacts of climate change in the natural environment and its effect on the built environment. That growing trend will inevitably lead to stronger demand for integrating environmental and infrastructure services.

Overarching all this is the trend toward more and more projects being delivered through design-build or general contractor/construction manager approaches. Within that, owners are increasingly pushing project risks to the engineering and construction industry, something we're all trying to manage in a thoughtful manner.

**Q: Parametrix does sustainability planning and develops strategies for climate change adaptation. Which projects are you working on?**

**A:** Parametrix is working with the Quileute Tribe of La Push to plan the tribe's Move to Higher Ground program, out of the flood plain and tsunami zone. The impacts of climate change are felt deeply along the Washington coastline, as sea levels rise, and winter storms intensify — and the seasonal floods they cause — increase. The first relocation project is the Tribal School — currently just 20 feet above sea level, located precariously between the Pacific Ocean and the Quillayute River. The new 60,000-square-foot K-12 school will be out of harm's way, on higher ground.

We helped the city of Orting mitigate the effects of climate change by designing and constructing a 1.5-mile-long setback levee, which also restored 101 acres of salmon habitat. Seven federally declared floods had impacted the city since 1990 and in 2006, the Puyallup River levee

overtopped and ran through a nearby housing development, impacting hundreds of homes, three schools, businesses and city infrastructure. The new Calistoga Setback Levee survived its first big test in November 2014 when the fourth-largest flow since 1962 moved down the Puyallup River.

**Q: You've been principal-in-charge of the Central Link and Lynnwood Link light rail projects. What's the most important lesson?**

**A:** Parametrix was the lead firm for the environmental impact statement for the Central Link. On the Lynnwood Link, it did the alternatives analysis and EIS in a joint venture with Parsons Brinkerhoff, now WSP.

The strongest lessons learned are to stay actively involved with what the project team is doing, where they are having the greatest challenges, and to regularly communicate with the client about their view of how things are going. Perhaps even more important, is to understand the client's greatest concerns about

the project and find ways to mitigate those concerns.

There is no substitute for active engagement with the team's progress. When there are project issues or deadlines, I remind the team of our greater purpose — building the future of transportation and shaping communities within our region. Our partnership with Sound Transit to deliver the ST3 program is a prime example of this.

**Q: Which services are most in demand? Where will growth be in the next five years?**

**A:** Environmental and engineering services are in high demand now and barring an unforeseen shift in the economy, that will continue over the next five years. The services in high demand are related to exceptional project delivery, no matter what the technical discipline or delivery method may be. People and firms that consistently deliver projects on time, within budget and with no surprises will have as much work as they can handle.