

RESPONSE FOR THE DEVELOPMENT OF

Climate Action and Adaptation Plans

FOR PORTLAND AND SOUTH PORTLAND, ME
RFP #19006

[COPY]

Linnean Solutions • Integral Group • Kim Lundgren Associates
Woodard & Curran • Milone & MacBroom



Image by Leonardo Dasilva

SEPTEMBER 5, 2018

GUARANTEED TO THE CITIES OF PORTLAND AND SOUTH PORTLAND FOR 90 DAYS

THIS PAGE IS INTENTIONALLY LEFT BLANK



Matthew Fitzgerald, Purchasing Manager
City of Portland City Hall, Room 103
389 Congress Street
Portland, ME 04101

Date: August 28, 2018

Re: Request for Proposals for Development of Climate Action and Adaptation Plans for the Cities of Portland and South Portland, Maine.

Dear Mr. Fitzgerald,

Thank you for the opportunity to respond to the RFP for Development of Climate Action and Adaptation Plans for the Cities of Portland and South Portland, Maine. Linnean Solutions LLC has read the Request for Proposal (RFP) #19006, the correlating addenda: #1 - #3, and the Standard Contract in full. We propose no exceptions to the three aforementioned documents. We state, with this letter, that the proposal herein is firm for 90 days from the Proposal Due Date (September 5, 2018).

Linnean Solutions, LLC is a leading sustainability and resilience consulting firm, founded in 2011, that guides communities in climate adaptation, sustainability planning, and regenerative thinking. We are partnering with both internationally-recognized and locally-based experts to provide a talented and experienced team for this process—and one that, in contrast to other firms, brings a hands-on, “high-touch,” and collaborative style of working on the ground with community partners and City staff.

Integral Group, Inc. is an internationally known deep green engineering and consulting firm focused on sustainability and resilience outcomes, bringing expertise in low-carbon policy solutions, high performance building design, and energy system transformation. Woman-owned benefit corporation, Kim Lundgren Associates, Inc. (KLA), has worked across the United States to provide local governments with the tools and resources to engage diverse communities in climate action and adaptation planning. Woodard & Curran, Inc. brings nationally-recognized engineering, science, and operations consulting, as well as context-specific familiarity with Portland’s and South Portland’s flood risks and opportunities to improve infrastructure resilience. Likewise, Portland-based Milone & MacBroom, Inc. offers expertise in multimodal and low-carbon transportation and land-use planning, as well as fluency in local transportation data and regional plans. As a team, we include professionals with successful experience working together, through climate action and adaptation plans as well as forums and working groups designed to advocate and promote leadership in forward-thinking resilient and sustainable municipal applications and practices.

We are committed to working with City staff to co-develop an approach that best suits the Cities of Portland and South Portland’s needs, and bring great enthusiasm for supporting Portland and South Portland in becoming increasingly thriving, prosperous, equitable, low-carbon, and resilient cities. We look forward to discussing the opportunity further. Please do not hesitate to contact us for additional information.

Sincerely,

Jim Newman, Principal and Founder
Linnean Solutions | Cambridge, MA & Portland, ME
jim@linneansolutions.com | 617-699-7323

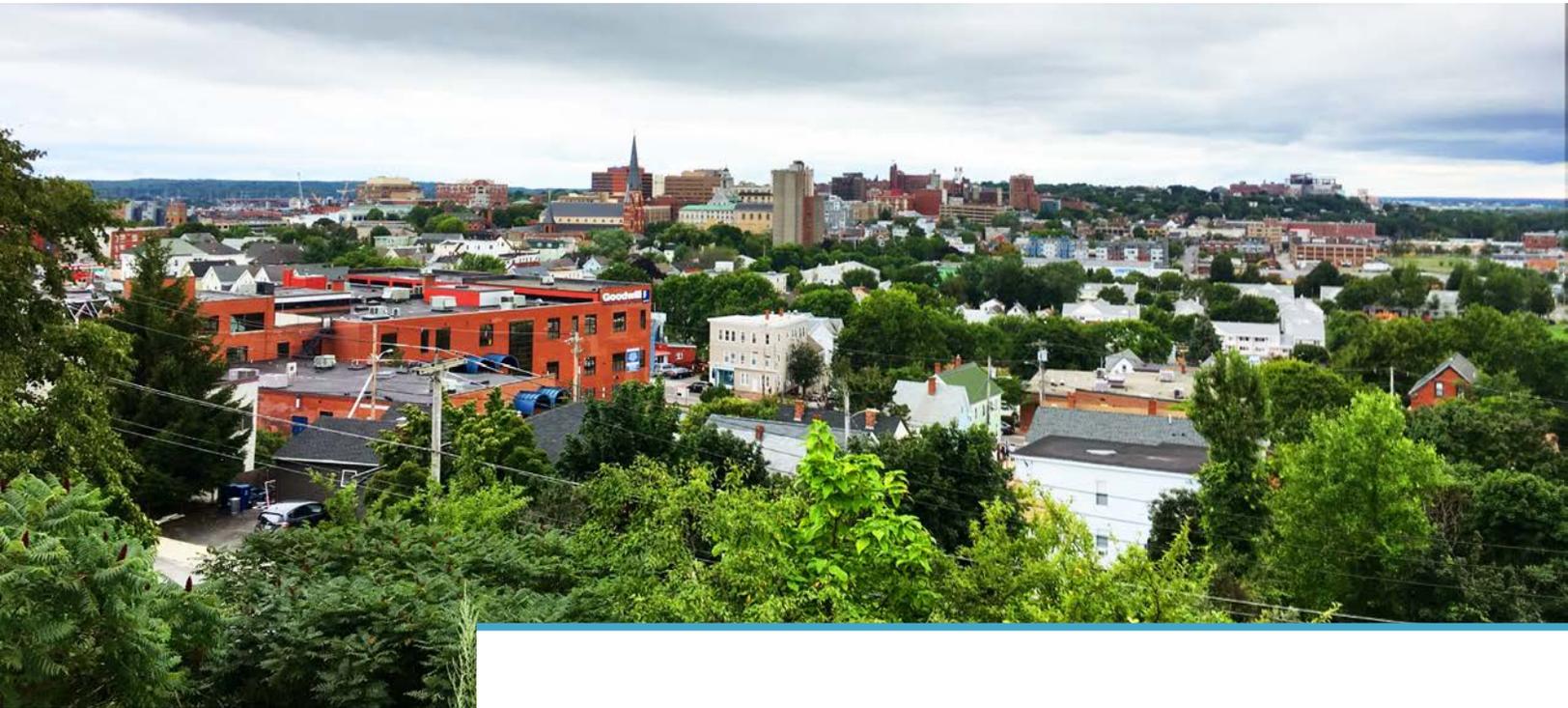


CONTENTS

PART A: A Plan for Two Cities	5
Introduction	5
Progress and Pathways	6
Transforming Systems	7
PART B: About the Team	9
The Team	9
Working Together	13
Project Advisors	14
PART C: Qualifications	15
Experience and Expertise	15
PART D: Approach and Workplan	18
Team Organization and Roles	18
1. Community and Steering Committee Engagement	20
2. Baseline Assessments	28
3. Vision and Framework Development	30
4. Strategy Development	32
5. Report Production	40
6. Other Technical Assistance	40
Timeline and Schedule of Deliverables	41
PART E: Past Performance	42
Project Examples	42
References	60
PART F: Project Personnel	61
Organizational Chart	61
Team Personnel	62
PART G: Cost Proposal	73
Staff Rates	73
Project Budget	74
APPENDIX	76
Required Documentation	77
Resumes of Personnel	81

A

PART A: A PLAN FOR TWO CITIES



Portland, viewed from the Sumner Park overlook (August 2018)

Introduction

It is evident that the Cities of Portland and South Portland recognize that the **future is now** when it comes to mitigating and preparing for climate change. The Cities' commitments to reducing community-wide greenhouse gas emissions 80% by 2050, and to running municipal operations on 100% clean energy by 2040, set Portland and South Portland among global cities seeking ambitious system change.

The investments in solar power, energy benchmarking ordinances, aggressive waste reduction and recycling programs, electric vehicles and charging stations, the Bayside Adapts resilience project, and resilience assessments for the working waterfronts are some of the many projects setting Portland and South Portland on that path. The work and initiatives of local committees, businesses, and nonprofits to enhance local food sustainability, reduce manufacturing waste, support walkable and bikable trails, and maintain the health of Casco Bay ecosystems, for example, further bolster these efforts. These municipal, institutional, and grassroots initiatives all demonstrate the degree to which the Cities of Portland and South Portland have been forward-looking and forward-moving in addressing the causes and impacts of climate change.

The upcoming development of the Cities' Climate Action and Adaptation Plans (CAAPs) will have the opportunity to build on that momentum. Specifically, these plans will map out implementable short-term and long-term pathways for reaching Portland and South

Portland's goals. They can bring together the many complementary City and community initiatives into a coherent framework for climate action, as well as create coordinated plans for Portland and South Portland that are aligned in their visions and efficient in their execution.

The process will engage a Steering Committee, subject experts, and the movers and shakers in the sustainability and resilience spheres, as well as create a high-touch process for engaging and connecting with the values and priorities of Portland and South Portland residents. It will aim to build enthusiasm, illustrate the clear opportunity and benefits from this work, and set the cities' sights on what it means for a low-carbon, resilient future. This is a vision for thriving, innovative, and inclusive Southern Maine economies, ecosystems, and communities.

Portland, viewed from the Summer Park overlook (August 2018); Shoreway Arboretum, South Portland (Image by Daderot, 2010); Post Office Park, Portland (August 2018)



Progress and Pathways

Energy and High-Performance Buildings

In recent years, both Portland and South Portland have begun efforts to move away from a fossil fuel-based economy. Both cities have made notable investments in renewable energy: South Portland installed the state's largest municipal solar array on the city's capped landfill, and Portland has begun installation of a similarly sized solar array on its landfill site this year. In addition to converting existing streetlights to energy-efficient LEDs, Portland has also signed on as a 2030 District, and both Portland and South Portland have enacted energy benchmarking ordinances. Despite these strong moves towards reduced fossil fuel consumption, many buildings currently under construction fall short of "high performance" standards. Increasing air-tightness and insulation requirements and requiring high efficiency mechanical systems will be significant steps towards energy independence, as will strategies such as net zero incentives, solar ready requirements, energy stretch code initiatives, and custom retrofit programs.

Transportation and Land Use

Over the last decade, the Greater Portland region and particularly the cities of Portland and South Portland have initiated the necessary steps to reduce their transportation related emissions and begin to mitigate the transportation contributions to climate change. The efforts so far have been focused on municipal vehicles, improved transit facilities, or increased transit service. While significant strides have been made in the private automotive fleet, through mostly hybrid technology, the majority of motorized vehicles in Portland and South Portland are still burning carbon-based fuels that contribute to climate change. Transportation Demand Management (TDM), electric vehicle charging networks, and enhancing infrastructure for non-motorized transit will be key strategies for reaching a low-carbon future.

Waste Reduction

Both Portland and South Portland have driven policies and implemented strategies for reducing waste and increasing recycling efforts. Through issuing 65-gallon recycling carts to each residence, the City of Portland made substantial progress in increasing the city's



North Street, Portland (August 2018); South Portland waterfront (Image by Paul VanDerWerf, 2015)

capacity for recycling (while also keeping recyclables from blowing out of the open bins and littering the streets). In addition, both Portland and South Portland have added bag ordinances that charge customers 5 cents for each single use bag, banned polystyrene foam use, and increased food waste reduction programs and zero waste events. Next steps to reduce waste going forward might include eliminating plastic packaging, regulatory changes to reduce construction waste, increasing education for reduction and reuse of items, and creating “take back,” “repair,” as well as “sharing economy” programs that can all facilitate a cleaner and healthier tomorrow.

Climate Preparedness and Resilience

The Greater Portland region has been assessing future impacts from climate change for over a decade. Much of the work has been focused on flooding and sea level rise, and more recent research and planning efforts, including Portland’s Bayside Adapts, South Portland’s Adapting to Sea Level Rise in South Portland, and the Urban Land Institute’s Waterfronts of Portland and South Portland Maine, have addressed vulnerabilities to particular communities, economic hubs, and/or natural resources. Both Portland and South Portland have been working to manage flood risk through stormwater infrastructure upgrades. The Climate Action and Adaptation Plans will be an opportunity to develop more robust adaptation strategies through resilience-based ordinances, design standards, and building codes that will connect adaptation to the overall growth planning for the cities. It will also be an opportunity to address other climate hazards such as increasing temperatures and higher storm intensity, as well as resilience strategies that extend beyond infrastructural solutions to include environmental and social resilience approaches.

Transforming Systems

To reach these ambitious goals, this team proposes using this climate adaptation and mitigation planning process to drive forward a truly regenerative development model for the Cities of Portland and South Portland. As one of the leading perspectives in climate mitigation and adaptation planning, this approach shifts our thinking from solely “mitigating harm” to “transforming systems” in a way that can lead to much more productive approaches and outcomes. Three guiding principles help to shape the way we design and implement climate adaptation and mitigation strategies:

- 1 Think at the whole-system level:** Our efforts to mitigate or adapt to climate change will not be effective with only piecemeal interventions. Those small points of intervention must be implemented in a way that act as levers for transforming the broader local and regional systems, whether in climate, energy, transportation, water, or market transformations.
- 2 Recognize emergent patterns:** Emergent patterns are derived from the effects of many different influences acting at once, making them inherently hard to predict or model in isolation. Recognizing these patterns helps us to understand complex systems, and thus helps us to predict, for example, how chronic stresses in our communities will impact our vulnerability to acute climate hazards.

- 3 Start with potential, not problems:** All too often planning efforts start by identifying problems, a formula which then leads to one-dimensional, “stop-gap” solutions. By starting with potential—i.e., the potential for Portland and South Portland to become increasingly vibrant, low carbon cities that model the future of Maine’s sustainable economy—the solutions derived will be equally as targeted and implementable, but with more holistic impact.

While these principles appear conceptual, they present a level of thinking that is essential when planning for climate change. Our team looks forward to working with the Cities of Portland and South Portland to ensure that the resulting Climate Action and Adaptation Plans become frameworks for the cities to aim towards their highest potential within the context of a changing economy, landscape, and climate.

While these regenerative principles seem conceptual, they present a level of thinking that is essential when planning for climate change.

B

PART B: ABOUT THE TEAM



*Linnean-led community workshop
(August 2018)*



The Team

Linnean Solutions is partnering with Integral Group, Kim Lundgren Associates, Inc. (KLA), Woodard & Curran, and Milone & MacBroom to bring Portland and South Portland sophisticated and complementary expertise. Linnean Solutions, Integral Group, and KLA staff have extensive experience in leading climate action and adaptation planning processes for local governments across the country—both as external consultants and in City staff roles. Woodard & Curran and Milone & MacBroom bring national-scale engineering expertise as well as an established knowledge base on current conditions, data availability, and ongoing infrastructure efforts within Portland and South Portland. Linnean Solutions, Woodard & Curran, and Milone & MacBroom have offices based in Portland; all project team members are invested in an on-the-ground, high-touch, and collaborative approach to climate action and adaptation planning.

Linnean Solutions

Climate action and adaptation planning • Process facilitation • Regenerative approach

Linnean Solutions is a mission-driven firm founded in 2011 that guides local governments and communities in reaching ambitious resilience and sustainability goals. Through a mix of technical and stakeholder facilitation processes—including climate adaptation and resilience



strategy development, hazard vulnerability assessments, carbon mitigation and climate action planning, community-driven planning workshops, goal setting and project facilitation, carbon accounting and life cycle analyses, green and resilience certification development, and regenerative development training—Linnean helps communities chart a path to a vibrant future with a smaller environmental impact.

We believe that every one of those approaches can capture co-benefits. As specialists in regenerative development, Linnean works with local governments to not only mitigate harm from climate change, but to create opportunity to advance health, wellbeing, economic vitality, and community vibrancy through planning and implementation. We work collaboratively with project stakeholders and community members to not only co-develop solutions, but to advance equitable processes that lead to a shared community vision and a collective capacity to transform ideas into action.

Linnean has worked with communities locally and across the United States to assess, develop, plan, and implement climate mitigation and adaptation strategies, including leading the Northampton, MA citywide Climate Resilience and Regeneration Plan; conducting the first large-scale, comprehensive resilience assessment for multifamily affordable housing in Philadelphia, PA; and facilitating sustainability and resilience planning through a public-private EcoDistrict model in Cambridge, MA. We aim to develop solutions that are technically informed, feasible, innovative, and community-driven.



Integral Group

*Carbon mitigation strategies; Energy policy and system transformation;
Greenhouse gas inventories and modeling*

Integral Group is a global network of Engineering, Architecture and Planning professionals all collaborating under a deep green engineering and consulting umbrella that aspires to be the best in the world. We are a mission-driven corporation that seeks out clients interested in pushing the boundaries of resilience, regenerative design, and deep carbon emissions reductions. With a staff of over 500 located in 15 offices across the United States, Canada, Australia, and the UK, Integral Group is widely regarded as a pioneer in high performance building design, integrated sustainability, and energy system transformation.

In addition to deep green building design and low-carbon energy system expertise, Integral Group's Sustainability Research and Planning Team specializes in the development of strategic plans and policies for cities, college and university campuses, and neighborhood scale development projects seeking to achieve carbon neutrality, regenerative sustainability, and resilience. We have worked with some of the most ambitious cities and organizations in North America and have won awards for not only pushing the bounds of sustainability but also providing solutions that are actionable and implementable.

Notable projects include: the District of Columbia's Comprehensive Energy & Climate Plan (Clean Energy DC); Roadmaps to Net Zero Carbon Emissions for both Cambridge and

Lexington, MA; an Energy Systems Transformation Playbook for the Cities of Boulder, CO, Seattle, WA, and Minneapolis, MN on behalf of the Carbon Neutral Cities Alliance; a Zero Emissions Building Strategy for Vancouver, BC; a Green Building Standard for Toronto, ON; a Zero Emissions Building Framework for Canada; and recently leading the London Energy Transformation Initiative for the City of London, UK, among others. Our competitive advantage is that we combine creative problem solving, thoughtful engagement, and comprehensive qualitative research all with the technical rigor expected of a best-in-class engineering firm.



Kim Lundgren Associates, Inc.

Public engagement for climate action and adaptation; Graphics and online tools; Frameworks for goal setting and measuring progress

KLA is a small, woman-owned, benefit corporation that partners with local governments to build the sustainable community they envision. We do this by delivering affordable tools and services to assess, plan, implement, evaluate, and communicate climate and sustainability goals and programs. KLA excels in the local climate & sustainability arena because it's all we do. Led by an early municipal sustainability pioneer, the KLA team delivers excellence through agile project management, continuous innovation, and high caliber performance.

The KLA team has expertise in strategic climate action and sustainability planning, sustainability indicator identification and reporting- including the STAR Framework, climate change vulnerability assessments, greenhouse gas accounting, communications and marketing, equity-driven community and stakeholder engagement, change management, facilitation, and training.

Kim and the entire KLA Team are thrilled to have the opportunity to work again with the City of Portland and for the first time with the City of South Portland to lead the public engagement aspects and support the overall design and implementation of this important planning project.



Woodard & Curran

Infrastructure planning and implementation; Technical modeling; Climate change and hazard mitigation; Floodplain and stormwater management

Woodard & Curran is an integrated engineering, science, and operations company. Privately held and steadily growing, we serve public and private clients locally and nationwide.

Woodard & Curran has been working as a trusted partner to the City of Portland since being selected for a General Engineering Services Contract in 2005. With City staff, we've led efforts initiating its first green infrastructure projects to reduce combined



sewer overflows (Clifton Street upstream of CSO #8 and #9) and helped drive changes in the City's water resources programs including revisions to City Code of Ordinances and Technical Design standards. In addition to green infrastructure, Woodard & Curran has worked with the City to successfully implement many grey infrastructure projects identified as part of its Tier II CSO Abatement Implementation Plan. We also assisted the City in successfully developing and providing technical support to the City Council-appointed Task Force to implement your Stormwater User Charge. We authored the City's EPA approved Sanitary Sewer System CMOM and the City's Drainage System Master Plan, firsts for the City as comprehensive evaluations of its infrastructure for asset management programming. Driven by flooding in the City's Bayside neighborhood and Council commitment to assessing climate change, we prepared Bayside Adapts, the City's first climate change adaptation Plan. We've developed Watershed Management Plans to improve water quality within the City including Capisic Brook, and successfully implemented award-winning projects within those Plans. We serve as the City's Consultant representing its engineering interests in the City's Planning Office development review process. In 2015 we worked to establish a shared vision for the new Water Resources Division within the City and developing a summary document and schedule of the City's Clean Water Act (sanitary sewer, combined sewer and stormwater) obligations through a series of facilitated workshops. We are currently working on the City's first publicly procured design-build project for wastewater pump station upgrades.

Woodard & Curran was selected in 2015 for the City of South Portland's multi-year General Engineering Services. Woodard & Curran was identified as the City's primary service provider for water resources and MS4 compliance, asset management, instrumentation and controls (SCADA), and wastewater treatment and conveyance. In addition, we serve as a peer review consultant to the Planning Office when the City's primary engineering consultant for these services is the applicant's engineer, or otherwise conflicted. Since our selection, much of our work has been focused on supporting the Water Resources Division with performance improvement projects, including development of an asset management program and procurement of enterprise-wide asset management/CMMS software, completing a valuation of the City's wastewater assets including 27 pump stations and treatment facility for municipal financial accounting purposes, upgraded the City's wastewater SCADA system, and process upgrades at the wastewater treatment facility.



Milone & MacBroom

*Transportation and land use planning; Multimodal and low-carbon transit;
Greenhouse gas modeling for the transportation sector*

Milone & MacBroom is a privately-owned, multidisciplinary consulting firm that has offered professional services across a wide range of disciplines, serving both public agencies and private companies, since 1984. Milone & MacBroom combines the expertise of engineers, environmental scientists, landscape architects, planners, and support staff to apply a collaborative and holistic approach to our work. Our corporate office is located in Cheshire, Connecticut, with regional offices across New England.

Our professional services include:

- Transportation & Traffic Engineering
- Civil Engineering
- Water Resources Engineering & Environmental Science
- Water & Wastewater Engineering
- Planning
- Landscape Architecture
- Survey & Mapping
- Geotechnical
- Construction Administration & Inspection

Milone & MacBroom is committed to the core principles and values that define our company. We recognize that the sum of our collective efforts will always be greater than our individual strengths and contributions. Our team of professionals is committed to building strong partnerships with our clients and delivering technically sound, cost-effective, and environmentally sensitive designs through the integration of the firm's disciplines on every project we undertake.

Over the firm's history, we have developed a reputation for technical innovation and award-winning design. The depth and breadth of our highly experienced staff allows the firm to meet complex project requirements and challenging schedules. Our success and future growth is founded on respect for our clients, colleagues, and the communities in which we live, work, and play. We are proud of the diversity of our client base and the strong reputation we have built.

Working Together

The Linnean Solutions team brings together professionals with experience in successfully working together. Integral Group and Linnean Solutions worked together in supporting the Kendall Square EcoDistrict pursue district-scale sustainability projects, and served together on the Cambridge, MA Net Zero Task Force. Kim Lundgren Associates and Linnean Solutions are currently working together on the development of the citywide climate action and adaptation plan for Northampton, MA. CEO Kim Lundgren and Linnean Principal Jim Newman also collaborate as part of an ongoing group of change leaders, working to develop strategies for creating greater impact in organizations and through the ways in which we work. Linnean has likewise worked on projects both formally and informally with many of the Team Advisors (see the following page for further information), including James Kostaras, Jay Waterman, Julie Wormser, Lorenzo Macaluso, and Lisa Fernandes.



Project Advisors

Additionally, this team includes a set of Project Advisors who bring expertise in subjects including waste reduction planning, economic development and sustainable development financing, affordable housing in Portland, equity and radical listening, energy policy, resilient food systems and permaculture, and urban coastal flood resilience. Our intention is not to duplicate the project's Steering Committee, but rather draw on this expertise when needed for the development of particular strategies or approaches.

This team of advisors has agreed to support the project team, and will be engaged to varying degrees according to the direction taken by the Climate Action and Adaptation Plans and based on the interests of the Cities. Along with helping to shape and review strategy development and the community engagement approach, we foresee these Advisors as assets in the ways that they can...

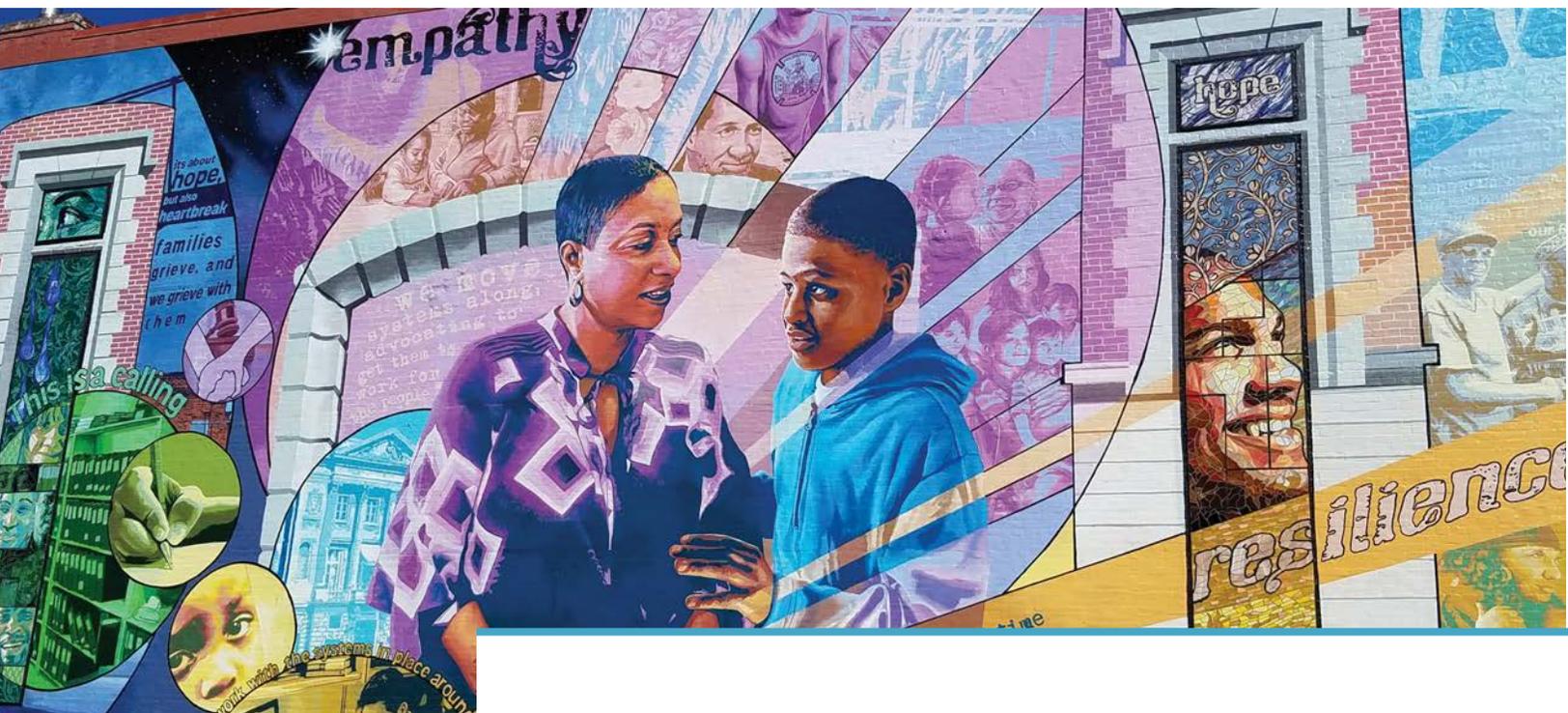
- Bring creative new thinking in highly-specific areas of expertise;
- Strengthen the team's understanding of diverse community concerns to better address South Portland and Portland-specific social equity issues;
- Extend the reach of the Climate Action and Adaptation Plans' development into community networks that are working to achieve similar goals through different means;
- Leverage a diversity of unique and informed perspectives to chart a pathway to the best possible future for Portland and South-Portland.

For further information on the Project Advisors, please see Section V. Project Personnel.



- A. Lorenzo Macaluso** | Waste reduction systems, programs, and policy
- B. Chanel Lewis** | Equity and inclusion, Radical listening, Climate change action
- C. Lisa Fernandes** | Sustainable food systems; Permaculture; Community resilience
- D. Julie Wormser** | Urban coastal flood resilience; Adaptation public policy
- E. James (Jim) Kostaras** | Economic and urban development; Financing urban resiliency
- F. Dylan Voorhees** | Clean energy policy and law; Energy efficiency programs
- G. Jay Waterman** | Affordable housing development; Green building strategies

PART C: QUALIFICATIONS



Mural adjacent to a Philadelphia Housing Authority property. Linnean conducted resilience planning for the agency, as well as conducted a resilience assessment for 47 of their affordable housing properties.

Experience and Expertise

Municipal Climate Action and Adaptation Planning

Linnean Solutions, Integral Group, and Kim Lundgren Associates (KLA) have supported local governments of all sizes across the country with planning and preparing for climate change. Collectively, our teams have worked with local governments across New England and North America—including Boston, MA; Cambridge, MA; New Bedford, MA; Medford, MA; Lexington, MA; Washington D.C.; Indianapolis, IN; Minneapolis, MN; Lewisville, TX; Boulder, CO; Seattle, WA; and Vancouver B.C.—to develop climate mitigation and adaptation plans. KLA CEO, Kim Lundgren, as well as the majority of Integral’s planning and research staff previously worked ‘in-house’ for municipal government on the development and implementation of sustainability and climate plans, including those designed for the first time. We thus can anticipate the challenges of introducing new plans, policies and processes both internally within the bureaucracy and externally at the level of the community. Linnean Solutions and KLA are currently working together to lead climate action and adaptation and sustainability planning for the City of Northampton, MA, resulting in the City’s Resilience and Regeneration Plan.

GHG Inventorying and Carbon Mitigation Planning

Integral Group brings considerable experience in municipal carbon inventory analysis, community-wide net zero carbon emissions planning, and municipal energy transformation. Integral’s Sustainability Research and Planning team specializes in the development



TEAM HIGHLIGHTS

A large number of our project team members have led climate action and adaptation planning from positions within local governments.

Integral team members Bill Updike and Marshall Duer-Balkind both worked at the D.C. Department of Energy and Environment, where they spearheaded green building and climate policy. Integral team member Rachel Mosovich worked for the City of Vancouver where she managed waste reduction policies.

KLA team member Kim Lundgren was hired as one of the first municipal sustainability directors in 2001, where she developed the first municipal climate action plan in Massachusetts.

of strategic plans and polices for cities, districts, towns, neighborhoods, and campuses to achieve regenerative sustainability outcomes, and we have worked to develop plans and polices for low-carbon built environments in municipalities of various sizes across North America. Through this work, we have acquired experience in all aspects of climate action and sustainability planning, from transportation solutions to waste and materials recovery programs, urban ecology, water, energy, and carbon. Milone & MacBroom Lead Transportation Planner, Carl Eppich, complements this experience with fluency in local and regional greenhouse gas emissions data for the transportation sector, as well as expertise in multimodal and low-carbon transit and land-use strategies. Carl was the project manager for the Destination 2040 Long-Range Transportation Plan Update (2010) for the 17-municipality Portland metro region, as well as the Portland-West Land Use and Transit Technical Assistance Plan.

Climate Vulnerability Assessments and Resilience Planning

Linnean Solutions and Woodard & Curran have helped communities at the forefront of resilience planning develop roadmaps for climate adaptation. In addition to supporting sewer and stormwater assessments and planning scenarios for sea level rise for Portland's Bayside Adapts project, Woodard & Curran has provided engineering, modeling, and infrastructural planning for stormwater management and resilience strategies against floods, storm surge, and sea level rise for cities and towns including Portland, ME; South Portland, ME; Provincetown, MA; Winthrop, MA; and Salem, MA, among others. Likewise, Linnean has conducted hundreds of site-specific vulnerability analyses, community needs assessments, and resilience planning processes, including national-level resilience planning for the public housing sector. Linnean is a key author on several influential resilience reports and tools, including Building Resilience in Boston and Enterprise Community Partners' Ready to Respond: Strategies for Multifamily Building Resilience manual.

Stakeholder / Steering Committee Engagement

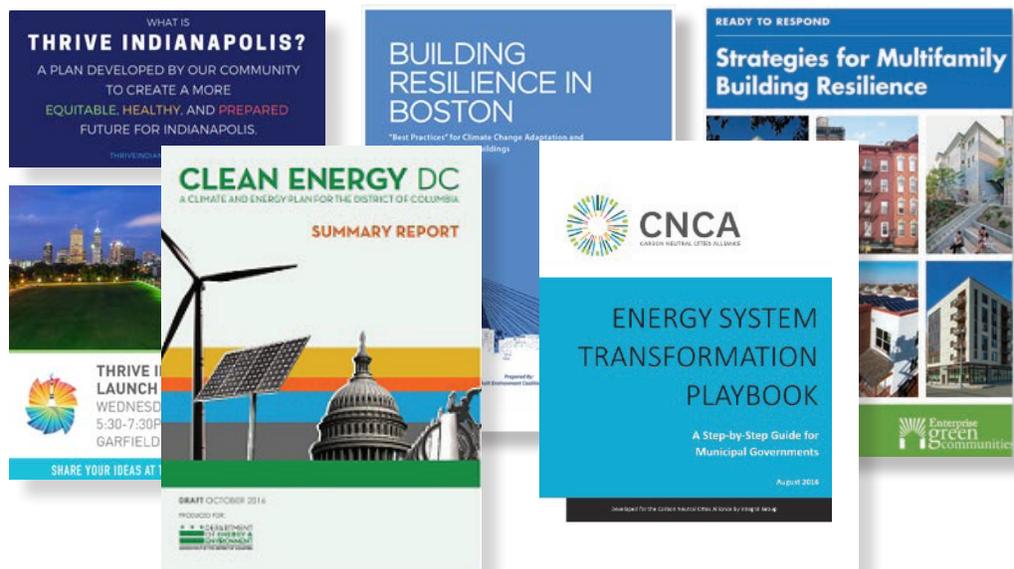
Through climate planning work across the country, Linnean, KLA, and Integral have facilitated mixed groups of local government, private, and nonprofit representatives to develop shared visions and methodologies for meeting climate action and adaptation goals. Linnean team members, in particular are trained facilitators under the Living Environments in Natural, Social, and Economic Systems (LENSES) framework, which uses facilitated stakeholder workshops to identify shared goals and actions for building thriving communities. As the process facilitator for the Kendall Square EcoDistrict, Linnean guided a group of local constituents—including the City of Cambridge, academic institutions, the local business association, nonprofits, and major developers—to develop and implement sustainability and resilience projects at a district scale. Along with guiding conversations with prepared research and data, Linnean produced a series of graphic tools that enabled the group to work through project options and converge on project goals.

Public Engagement

KLA CEO Kim Lundgren has spent the last 16 years working with local governments to design, secure funding for, implement, and evaluate sustainability and climate action programs, which has shaped the KLA Team's approach to supporting cities with new

and innovative tools and strategies for inclusive and effective community engagement. In addition to leading interactive public forums, the KLA team has developed a rich set of graphic and online tools, including surveys and online community dashboards to engage residents, gather ideas, and make data approachable to a wider audience. From trivia to gamification and interactive polling to kid-focused activities, a KLA engagement activity is always designed with the end user in mind. The KLA team also leads climate trainings with community partner organizations—such as libraries, homeless services, social justice nonprofits, among others—to learn about chronic stressors facing residents, and to find ways to integrate climate action and preparedness thinking into community organizations. This allows residents to hear about climate action and adaptation through trusted community partners, in addition to the information shared by the City.

Some of the climate change planning reports and tools developed by the consultant team



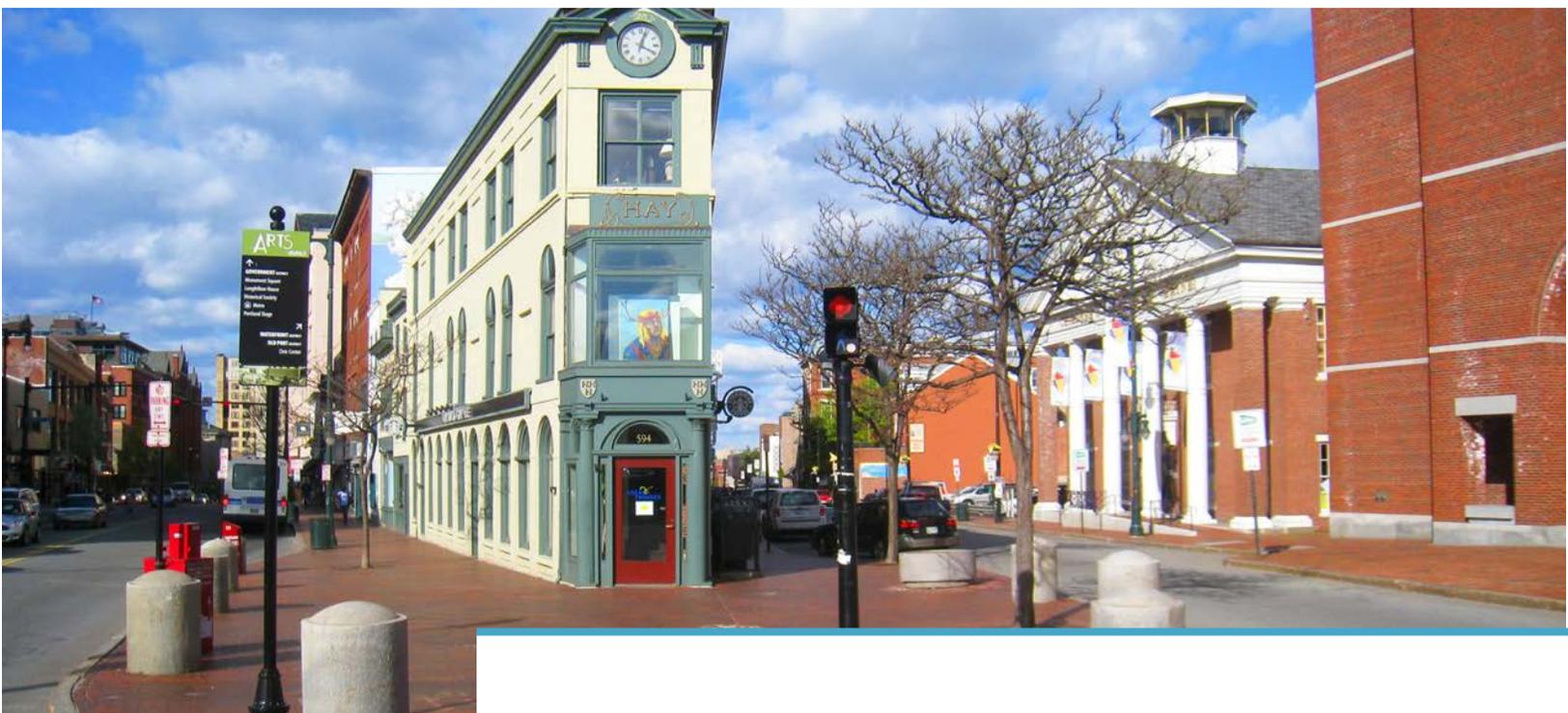
WHAT MAKES THIS TEAM UNIQUE?

We are mission-driven organizations. We are invested in every community's ability to adapt to climate change, and thus are committed to the advocacy, education, collaboration, and time necessary to make that possible. We are all deeply committed to sustainability, ecological health, and regenerative development, all of which goes hand-in-hand with a low-carbon future.

We do not just deliver plans. We focus on handing over the tools and frameworks, and building internal capacity so that local governments can continue to assess vulnerability, engage communities, track metrics, and measure progress over time.

We work with people for people. Our goal is both to meet your needs—as the local government—and develop a process that actively draws from the insight and motivations of your community members in an ongoing and fruitful way. Our work in regenerative development focuses on these processes as a way to foster even greater community benefits.

PART D: APPROACH AND WORKPLAN



Hay Building, Portland, ME.
(Image by Daderot, April 2010)

Team Organization & Roles

Linnean Solutions will serve as the overall Project Manager, and will lead the engagement with the Steering Committee; visioning, goal-setting, and metric development; climate adaptation strategy development; and the overall production of the Cities' Climate Action and Adaptation Plans.

Integral Group will bring energy policy and carbon mitigation expertise, leading the greenhouse gas inventories for the two cities and the development of climate action strategies.

Kim Lundgren Associates will lead the project's public engagement and the development of infographics and public messaging. The KLA team will also support the project's visioning, goal-setting, and metric development, and will support the development of the summary report to broaden the reach of the final plan.

Woodard & Curran will bring resilience expertise for infrastructural systems, leading the climate risk assessment and supporting the development of climate adaptation strategies.

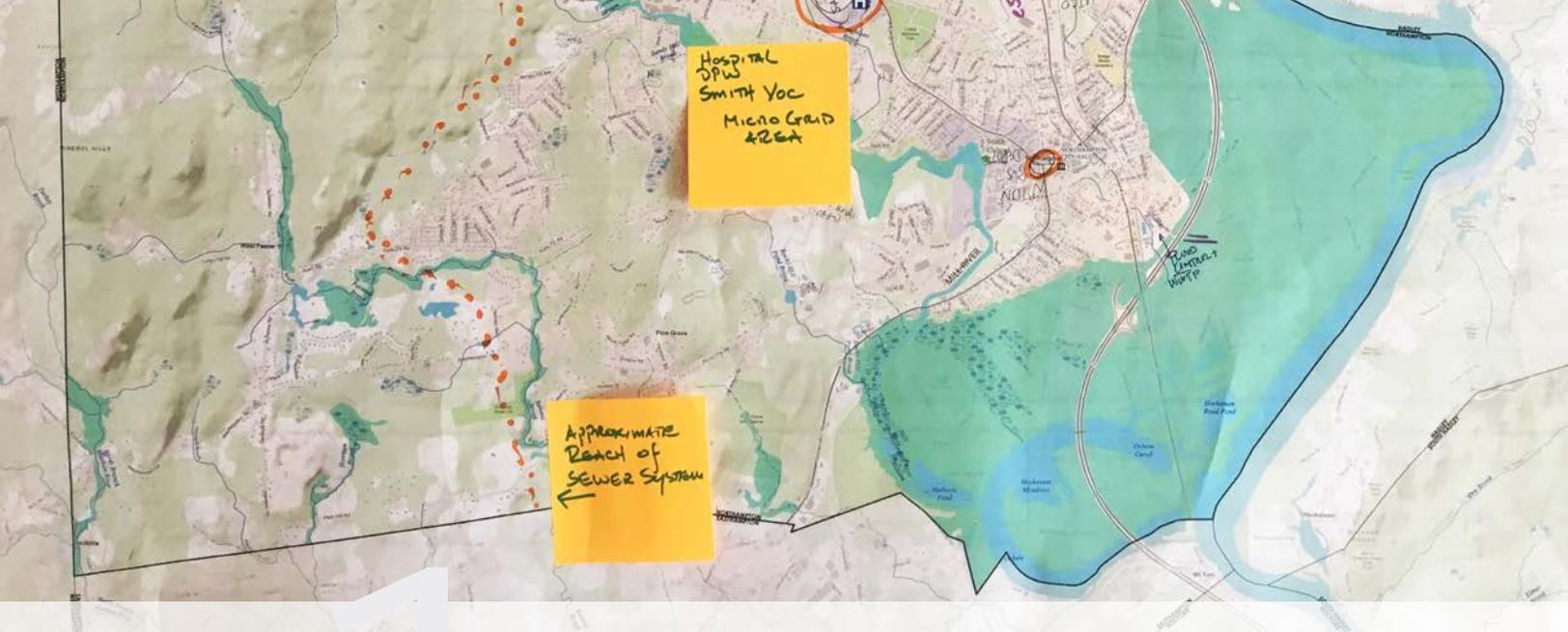
Milone & MacBroom will support the development of the greenhouse gas inventories and the development of carbon mitigation strategies, specifically with respect to low-carbon transportation and land use strategies.

See diagram on the adjacent page for further details regarding the breakdown of tasks.

		 LINNEAN SOLUTIONS	 INTEGRAL GROUP	 KLA KIM LUNDGREN ASSOCIATES	 WOODARD & CURRAN	 MILONE & MACBROOM
PROJECT MANAGEMENT		COMPONENT LEAD				
PROJECT MANAGEMENT AND COORDINATION WITH THE CITIES						
ENGAGEMENT				COMPONENT LEAD		
PUBLIC ENGAGEMENT						
STEERING COMMITTEE ENGAGEMENT						
DEFINING VISION, GOALS, METRICS		COMPONENT LEAD				
VISION AND GOALS FOR LOW-CARBON, RESILIENT FUTURE						
METRICS AND DECISION-MAKING FRAMEWORK						
CLIMATE ACTION PLANNING			COMPONENT LEAD			
GREENHOUSE GAS INVENTORIES						
DEVELOPMENT OF MITIGATION STRATEGIES	ENERGY & HIGH PERFORMING BUILDINGS STRATEGIES					
	TRANSPORTATION & LAND USE STRATEGIES					
	WASTE REDUCTION STRATEGIES					
CLIMATE ADAPTATION PLANNING		COMPONENT LEAD				
CLIMATE RISK VULNERABILITY ASSESSMENT						
DEVELOPMENT OF ADAPTATION STRATEGIES	BUILT & INFRASTRUCTURAL RESILIENCE STRATEGIES					
	ENVIRONMENTAL RESILIENCE STRATEGIES					
	SOCIAL RESILIENCE STRATEGIES					
PLAN WRITING AND GRAPHICS		COMPONENT LEAD				
PLAN AND SUMMARY REPORT PRODUCTION						
INFOGRAPHICS AND SOCIAL MEDIA CONTENT						

 LEAD ROLE  SUPPORT ROLE

Diagram depicting the roles of the Lead and Subconsultant teams



COMPONENT 1: COMMUNITY & STEERING COMMITTEE ENGAGEMENT

Our team firmly believes that the participation of a city's community members is fundamental to producing an effective city-wide plan. Goals, approaches, and an overall vision that are driven by community values, grounded in residents' perspectives, and backed by on-the-ground experiences will ultimately see better traction, lead to more informed strategies, and more effectively meet the needs of both the City and its communities.

Engagement with the public and the Steering Committee will start at the very beginning of the project and serve as an ongoing thread over the following 18 months. KLA will develop the public engagement strategy, including the public engagement content (e.g., surveys, plan overview flyers, monthly evaluation reports, and social media content) as well as the online engagement platform. Linnean Solutions will lead the Steering Committee meetings, including development of meeting materials, with support from the KLA and Integral teams.

Community Engagement Approach

Public engagement has become increasingly important in the development of climate action and adaptation plans. Specifically, because we now know that it will take everyone, everywhere, doing everything possible to reduce greenhouse gas (GHG) emissions to the levels that climate scientists say are necessary to avoid catastrophic climate disruption. To spark this level of change, we cannot rely on the same old engagement tactics of planning processes of the past. We must innovate and provide effective ongoing engagement in a way that will grab and keep the attention of your community members.

We are aware that the cities of Portland and South Portland take public engagement very seriously and are seeking an inclusive and equitable process for the development of the climate action and adaptation plan. Our team is prepared to deliver just that. The process is outlined below.

Create and Promote a Brand for the Plan

Creating a brand for a planning process can be a very effective way to attract attention and pull people into the discussion. It also makes it easier to demonstrate implementation efforts when you continue to use the brand, logo, colors, and messaging strategy.

The KLA Team will work with the cities to develop a name for the planning process, key messaging, color palette, style guide, logo, and icons that will be applied to all materials, allowing community members to connect with the information and recognize when something is associated with the process.



THRIVE INDIANAPOLIS

Example logos from climate action planning processes; Public flyers, using the project's branding for Indianapolis, share information on how the climate planning process considers energy transformation and economic development.

INDY'S PLAN FOR COMMUNITY RESILIENCE + SUSTAINABILITY

- resilient Indianapolis is better able to anticipate, adapt and flourish in the face of change.
- sustainable Indianapolis provides equitable services and supports inclusive, healthy and happy neighborhoods.

INDY'S PLAN FOR COMMUNITY RESILIENCE + SUSTAINABILITY

- resilient Indianapolis is better able to anticipate, adapt and flourish in the face of change.
- sustainable Indianapolis provides equitable services and supports inclusive, healthy and happy neighborhoods.

ENERGY

VISION: Energy comes from clean, renewable sources that are affordable for and accessible to all members of our community

WHAT DOES IT INCLUDE?

- The sources we use to generate energy for our homes, businesses and industries
- Backup energy sources, like microgrids, to increase resiliency
- Efficiency programs that reduce costs and energy use

WAYS OTHER COMMUNITIES CONNECT IT TO THEIR LONG-TERM RESILIENCE AND SUSTAINABILITY

- Promoting the use of renewable energy to improve air quality and reduce greenhouse gas emissions
- Implementing efficiency programs to help residents and businesses save money
- Installing microgrids to provide local backup generation in the case of emergencies

ECONOMY

VISION: Indianapolis is a world-class city with a resilient, diverse and inclusive economy that ensures good paying and fulfilling jobs as well as upward economic mobility opportunities for all

WHAT DOES IT INCLUDE?

- Quality job and educational opportunities for all
- Locally owned and staffed businesses
- Diverse industry makeup
- Individual knowledge and ability to budget finances

WAYS OTHER COMMUNITIES CONNECT IT TO THEIR LONG-TERM RESILIENCE AND SUSTAINABILITY

- Increasing equitable access to educational and vocational programs, services and opportunities to help everyone in the community reach his or her full potential.
- Building a resilient economy by supporting diverse industries
- Supporting local businesses and job growth to promote individual prosperity and well-being



Community engagement table top exercise (photo by KLA).

EXAMPLE VALUE PROPOSITION

Below is an example value proposition for an organization that works with seniors to support independent living:

“We see that your organization is focused on helping seniors stay in their own homes. We are hoping to use this planning process to help everyone in the community understand how climate change may impact us already and in the future. Seniors living alone are often victims of extreme weather events—how can this process help your community members be better prepared for extreme events? What are the items they need to have on hand, and who can they call for assistance? Is this something we can work together on?”

Develop and Implement the Public Engagement Strategy

Developing an effective climate action and sustainability plan requires an approach designed around equity, which is a cornerstone to KLA’s process. We will first work with the key staff in both cities to identify target populations that are often left out of these planning processes. For Portland and South Portland, we would anticipate this would include the cities’ East and Central African and other immigrant communities, low-income households, populations facing homelessness, youth, seniors, and certain economic sectors such as the fishing industry.

To engage these groups and the rest of the populations of Portland and South Portland in the process, we propose working with partner organizations, attending and hosting in-person activities, and creating a dialogue through online engagement tools. The goal is to cast a wide net to encourage several touchpoints in the hopes that we can reach as many people from different neighborhoods and backgrounds as possible. We believe this will result in a more robust and implementable final plan.

Working with Partner Organizations

For the target populations, KLA recommends identifying and working through existing organizations to engage them in the process. Organizations, such as the Opportunity Alliance or the Multilingual and Multicultural Center, have existing relationships and a vested interest in the populations they represent and are therefore far more likely to be successful at reaching these groups than the Cities or the consultants will be alone. We approach these organizations with a value proposition, developed by researching their mission and priorities to identify areas of alignment. As the vast majority of these groups will be non-profits, we cannot expect that they will have the time and resources to support the effort of the two cities without there also being notable value for the organizations.

Once the partner organizations are engaged, we are prepared to deliver a Partner Organization Training on climate change communication and how climate change vulnerabilities, mitigation, and adaptation strategies link to their existing priorities. This training kicks off the relationship between the organization and the consultant team, after which we will deliver content to each partner organization on a monthly basis. The content could include surveys, newsletter text, event details, fast facts, and other information that keeps the Cities’ partner organizations aware of and engaged in the planning process.

For each target audience, we will work with the Cities to identify the appropriate partner organizations, the best engagement tactics, and metrics of success, which will be tracked on a monthly basis. See an example of a Community Engagement matrix on the next page, detailing target populations, strategies for reaching populations, and metrics for making sure that the engagement process reaches its goals.

POPULATION	SCALE	VALUE PROPOSITION	PARTNERS	ENGAGEMENT TACTIC	TARGET ZIPCODES	METRICS OF SUCCESS
HOMELESS	+/- 1800 people	You have an important story and experience to share that is valuable to how we move forward as a resilient city. Your experience has shown you things about the city that many others do not know or do not understand.	<ul style="list-style-type: none"> • CHIP • Wheeler • IMPD/MESH • CoC • Horizon House • Food not bombs 	<ul style="list-style-type: none"> • KI will accompany trusted partner organization to two (2) key homeless camps to do oral history-type interviews with ten individuals • ES will conduct interviews with Continuum of Care providers 	46201 46205 46208 46218 46235	10 stories from homeless individuals
LOW INCOME	171,019	Your experience making ends meet in difficult times gives insight into focusing on necessities during a challenging time. You may also have good insights about how meaningful employment opportunities and public transportation options affect a community.	<ul style="list-style-type: none"> • IndyCAN • Kheprw • Urban League • Fair Housing Center of Central Indiana 	<ul style="list-style-type: none"> • Work with a partner organization to identify the best tactics • KI community forums • Incentivized surveys 	46201 46205 46208 46218 46235	40% of total people engaged
RE-ENTRY	2,300	Few people have had to manage under the constraints that you have just to get by day to day. You also understand how employment opportunities affect your ability to meet your needs. And how it affects individuals, families, and communities.	<ul style="list-style-type: none"> • Indy CAN • Indianapolis Re-entry Educational Facility 	<ul style="list-style-type: none"> • Work with a partner organization to identify the best tactics • Focus groups 	46201 46205 46208 46218 46235	10% of total people engaged

An example of a Community Engagement matrix, showing target populations, outreach strategies, and metrics for tracking progress in community outreach

Hosting In-Person Activities

We acknowledge the request by the Cities to host five climate action plan specific forums and we are happy to design and host these events for an approach that best fits the Cities’ needs. Our experience, however, has shown that there are a number of alternative approaches that can have more impact in reaching non-traditional audiences.

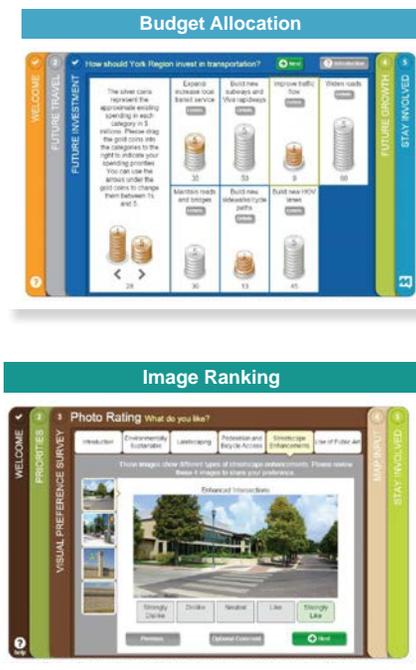
We recommend, for your consideration, a decentralized approach to in-person activities—one that truly goes where the people are. For example, working with various businesses to host brown bag lunches at their offices or facilities; riding the bus for a day to talk to people as they are traveling to school or work; or hosting a trivia night at a bar for young professionals. These smaller activities, hosted at places where people may already be going, have helped other cities truly reach out beyond their usual “choir.”

To keep costs reasonable, we would want to identify some activities for City staff to host and others to be hosted by the consultants. We suggest swapping out two to three of the five requested forums for a series of smaller engagement activities. We also suggest keeping two to three of the climate action specific forums to reach the community members who are interested in engaging through that type of civic forum. We will ensure that these public forums include fun and interactivity; methods could include securing the Immersed Virtual Reality program from FEMA to demonstrate what it is like in an extreme flood event, or “speed planning” which allows people to move from table to table talking about key topics in a fun and interactive environment.

Online Community Engagement

Online engagement is essential to supplement the in-person activities in order to reach a greater number of people and a broader cross-section of residents. However, online engagement is also something that needs to be consistently promoted. For Portland and South Portland's Climate Action & Adaptation Plan, we propose using MetroQuest as the online engagement platform and promoting it through social media. MetroQuest allows you to launch visually compelling sites that attract participants, educate them about your projects, and collect informed input for actionable results. KLA has partnered with MetroQuest because of their interactive tool and their track record for delivering high engagement numbers.

During the 18-month process, we propose two rounds of MetroQuest engagement, one to identify a community vision for the Climate Action and Adaptation Plans, including principles and actions to be taken, and the other to prioritize those actions. KLA will also work with the Cities to deliver a total of eight (four per city) social media posts per week during the core public engagement period, approximately 12 months, to ensure consistent promotion of the site and the planning process in general.



Example screenshots of MetroQuest tools for online survey-based community engagement.

Ongoing Evaluation of the Community Engagement Process

To ensure the identified public engagement targets are met, we will provide the cities monthly reports on the impacts of the public engagement. This will allow us to make adjustments throughout the process to ensure our target populations are reached. See an example of a community engagement monthly report for the Indianapolis climate change planning process below.

Example monthly report, sharing community engagement progress for the Indianapolis climate action planning process.



THRIVE INDIANAPOLIS

July Engagement Update

In July, Thrive Indianapolis deployed two new surveys as part of a series of eight surveys for each plan element. The Thrive team also continued to collect responses to Survey 3 on all of the plan elements. Surveys were distributed by the Thrive team at approximately 38 events around the community in July, bringing up the grand total to approximately 100 events. While the large majority of surveys were taken in-person, some were also taken online.

In addition to the surveys and presence at community events, the Thrive team hosted a public meeting in July, along with a meeting for environmental stakeholders. Thrive also held preparedness workshops at five different Partners in Housing locations, as well as a veterans focus group. The youth-focused, Thrive Community Day is scheduled for August.

Updates on how well we are meeting our engagement goals for the target populations are below.

HOMELESS

GOAL

10 stories from homeless individuals

LOW-INCOME

GOAL

40% of total people engaged

TOTAL SURVEY RESPONDANTS TO DATE

SURVEY 1
215

SURVEY 2
234

SURVEY 3
662

TRANSPORTATION & LAND USE
385

WASTE & RECYCLING
84

TOTAL
1580

Breakdown of Total Survey Respondents

Age

75+	4.8%
65-74	11.2%
55-64	16.3%
45-54	10.9%

Race/Ethnicity

Under 18	5.3%
18-24	9.9%
25-34	22.7%
35-44	17.9%
White/Caucasian	51.2%
Black or African American	18.1%
American Indian/Alaskan Native	0.1%
Asian/Pacific Islander	0.1%
Hispanic	0.1%
Multiple Ethnicities/Other	0.1%

*Based on the 95% of people who reported their age on the surveys.

*Based on the 94% of people who reported their race/ethnicity on the surveys

Quick Facts: Survey Response

28.83%* of survey respondents

Transportation & Land Use Survey

- 61% of respondents said they gasoline or diesel powered vehicles take more time. The second most popular mode of walking at 30%.
- Those who drive in a car say they use other forms of transit because they don't want to go and/or are not as far from work.
- If those concerns were addressed, 55% of people said they would use public transit more.
- 55% of people want more stores closer to neighborhood everyday necessities in their neighborhood.
- Other suggested actions:
 - "Help poor people get to work, without hours spent on a bus."
 - "Full build-out of a safe and effective bicycle network."
 - "More stores closer to neighborhood to encourage walking."

be recycled and the ToxDrop program.

Other suggested actions:

- "Ban single use plastic bags."
- "Create incentives for people to recycle and create less waste."
- "Neighborhood recycling bins."

*Based on the 91% of people who reported their zip code on the surveys. Zip codes analyzed were: 46201, 46205, 46208, 46218, and 46235 because of their high concentration of low-income individuals and families.



Steering Committee Engagement Approach

The Steering Committee, comprised of twelve regional experts, will help shape the vision and evaluate the approach for Portland and South Portland’s pathway to 80% greenhouse gas emissions reductions by 2050, as well as prioritize interim actions for mitigation and adaptation. The scope and frequency of Steering Committee meetings will be developed with City staff. As a starting point, however, the team recommends the following process, designed around six Steering Committee meetings. (Note that two of the meetings are numbered 4a and 4b for the two cities.)



Meeting 1. Setting the Vision

Participants: City staff and full Steering Committee

Description: Linnean and KLA will facilitate a conversation with the Steering Committee that will focus on transformative, regenerative thinking and setting a shared vision for the project. The group will discuss what they see as the biggest levers of change—infrastructurally, policy-wise, as well as community and behavioral. The goal of the meeting will be to align City staff, the Steering Committee, and the project team on a shared understanding of the project, the vision, and desired outcomes.



Meeting 2. Understanding the Baseline and the Largest Levers for Change

Participants: City staff and full Steering Committee, with breakout sessions afterwards in City-specific groups

Description: Linnean and Integral will facilitate a half-day workshop with City staff and the Steering Committee to look at the results of the Energy and Emissions Model and the contribution of all quantifiable strategies to the overall mitigation targets. Participants will test and refine the model using on-the-ground knowledge, first collectively and then in breakout groups by City. Based on the outcomes of the workshop, the model and mitigation strategies will be refined, and a gap analysis will be conducted to ensure that the strategies are meeting the Cities’ goals.

Stakeholder workshops led by the Linnean team.

Meeting 3. Assessing Vulnerabilities and Pathways for Action

Participants: City staff and full Steering Committee, with breakout sessions afterwards in City-specific groups

Description: Linnean and Woodard & Curran will facilitate a half-day workshop with City staff and the Steering Committee to look at the results of the Climate Risk Vulnerability Assessment and to discuss pathways for enhancing resilience. Participants will refine and/or corroborate the findings from the Assessment, as well as discuss priorities and level of concern. The workshops will be facilitated using exercises to align on ways to address particular infrastructural, environmental, and social risks, which will directly feed into the refinement of adaptation strategies.

Meeting 4a. Reviewing Strategies: Portland

Participants: Portland City staff, and relevant Steering Committee members

Description: The project team will facilitate a meeting with Portland City staff and relevant Steering Committee members to review and provide feedback on the mitigation and adaptation strategies that have been developed for Portland. Participants will discuss feasibility and implementation concerns, as well as the opportunity to adapt strategies based on equity concerns or to achieve greater co-benefits. Breakout sessions specifically for mitigation and adaptation strategies will be included as needed.

Meeting 4b. Reviewing Strategies: South Portland

Participants: South Portland City staff, and relevant Steering Committee members

Description: The project team will facilitate a meeting with South Portland City staff and relevant Steering Committee members to review and provide feedback on the mitigation and adaptation strategies that have been developed for South Portland. Participants will discuss feasibility and implementation concerns, as well as the opportunity to adapt strategies based on equity concerns or to achieve greater co-benefits. Breakout sessions specifically for mitigation and adaptation strategies will be included as needed.

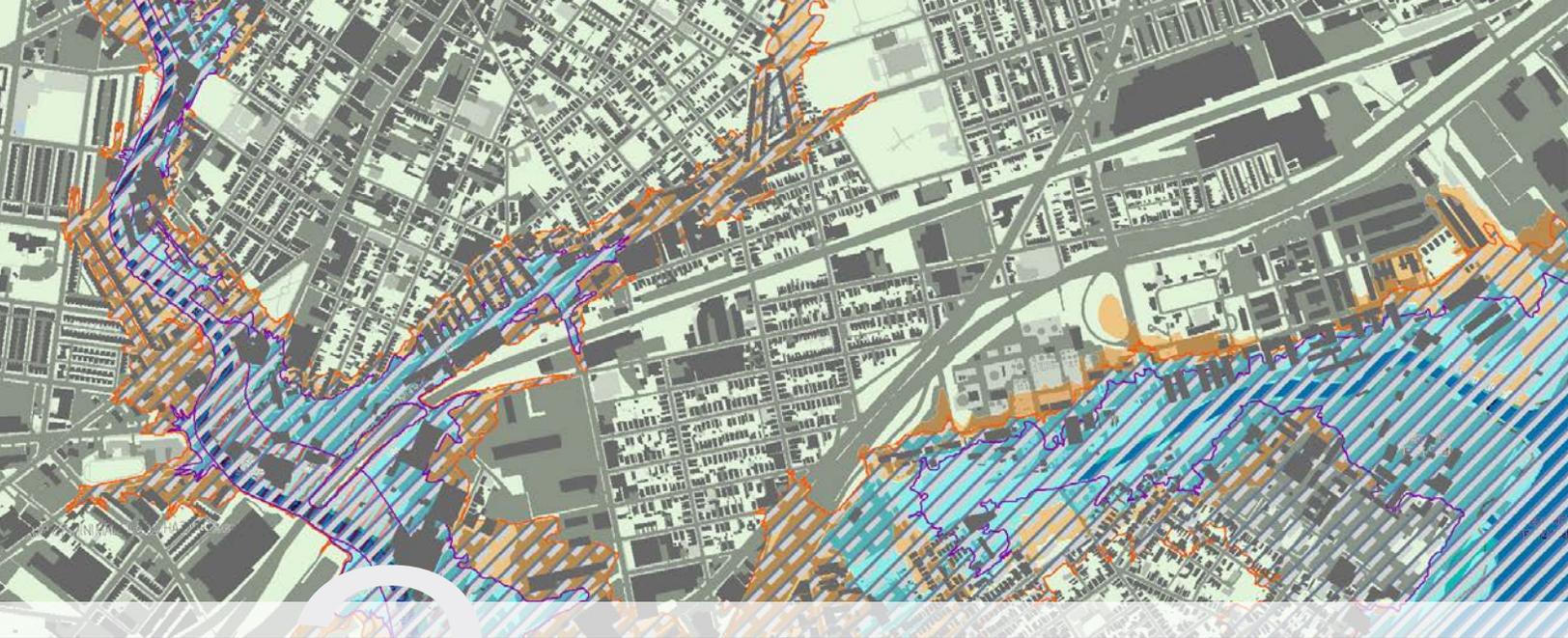
Meeting 5. Setting Our Sights on What's Next

Participants: City staff and full Steering Committee

Description: Linnean and KLA will facilitate a meeting with staff from both cities and the Steering Committee to look at the alignment between the two plans and to discuss how the cities will move forward with next steps and implementation. The participants will review an evaluation framework for tracking progress and develop an approach that outlines how the Cities plan to review progress. This tracking will be key to sharing progress with the community; it will also serve as a way to ensure that the plan evolves and that strategies are adapted if barriers are met in the coming years.

CONVERSATIONS OVER COFFEE

While these Steering Committee meetings are designed to be collaborative and dynamic, their objectives will be relatively structured. Sometimes the most innovative and productive thinking, however, comes from informal conversations. With much of the team based locally, we look forward to identifying ways to make these discussions possible—through relaxed platforms with easy and open communication. In other words, the Linnean Team is happy to grab a cup of coffee and chat individually with the Steering Committee representatives and City staff.



2

COMPONENT 2: BASELINE ASSESSMENTS

What's the baseline?

The greenhouse gas inventories and the climate risk vulnerability assessment will give a picture of Portland and South Portland's contributions to carbon emissions and current and potential risk from climate impacts if we stick with the status quo. In conjunction with these two studies, the team will use this phase to review current local and regional plans (e.g., comprehensive plans, transportation plans, municipal climate action plans, among others), which will provide a foundational understanding for the project.

Greenhouse Gas Inventories

Integral Group will conduct the baseline community-wide GHG inventories for Portland and South Portland. These inventories will comply with the requirements of the Carbon Disclosure Project and the Global Covenant of Mayors, and will use the Global Protocol of Community-Scale Greenhouse Gas Emission Inventories (GPC). We are assuming that the Cities use ICLEI's ClearPath reporting tool and can provide access.

Integral will ensure that the inventories are well-documented and provided in a format that is easy to update going forward. We will also provide benchmark comparisons for both Portland and South Portland with other peer cities. The most significant challenge to developing GHG inventories and simultaneously controlling the costs and timelines of creating the inventories is ready access to quality data. To help manage time, it will be optimal for each community to appoint a single point of contact for collecting data for each sector (buildings, energy supply, transportation, and waste). The results of the GHG inventory will inform the setting of target reduction goals and the development of a realistic but aggressive GHG reduction plan.

ABOUT THE IMAGE

The image on the previous page shows **flood mapping** as part of the Vulnerability Assessment for the Philadelphia Housing Authority. Linnean assessed 47 properties (hundreds of facilities as part of this citywide vulnerability assessment. The team also assessed a myriad of other climate, environmental, infrastructural, and human-induced hazards, as well as levels and distribution of social vulnerability and access to resources.

*Spring Point Ledge Light,
South Portland, ME
(Image by Daderot, 2010)*

Climate Risk Vulnerability Assessments

Linnean Solutions and Woodard & Curran will assess the Cities' vulnerability to climate risks including flooding from increased precipitation intensity, storm surge, and sea level rise; extreme weather; impacts from increased temperatures; drought; and increased exposure to non-native invasive species and vector-borne diseases. This will primarily be led through the synthesis of current studies and analyses, but augmented by additional mapping and assessment as needed.

Linnean Solutions conducts vulnerability assessments by simultaneously considering the level of risk from climate hazards as well as the vulnerability of infrastructure systems, ecosystems, and communities based on exposure and capacity to respond. The team has conducted vulnerability assessments at the building, neighborhood, and municipal scales, including analyzing physical as well as social and economic vulnerability. By also mapping resource *access*, this comprehensive approach offers city and agency staff a more nuanced indication of community vulnerability and the specific points for intervention. This assessment process includes analysis of climate data and trends, spatial analysis and data visualization, and interviews or workshops with stakeholders as needed.

Woodard & Curran will complement this approach for infrastructural systems through risk assessment, and subsequent Consequence of Failure and Likelihood of Failure Assessments as needed. The Consequence of Failure assessment focuses on how important the assets are to the community and the resulting impact in the case the asset is no longer functional. The Likelihood of Failure assessment gauges the probability of a failure taking place. Assessing the Consequence of Failure and the Likelihood of Failure through a quantitative ranking allows for certain assets' vulnerabilities to be prioritized, which thereby allows for a greater focus on climate adaptation strategies for the most vulnerable assets.

To address coastal flood risk in particular, Woodard & Curran will draw on sea level rise scenarios and data developed for the Portland Bayside work in conjunction with RPS ASA. In addition to identifying the planning scenarios for sea level rise, numerous Portland-specific storm surge and precipitation tables were developed to aid in future modeling and planning. These climate change tables, combined with sewer and drain system information, ground surface information, and other model inputs, will provide insight for the assessment of climate risk.





THE PATH TO A NET ZERO CAMBRIDGE

1 THE CLIMATE IMPERATIVE
Climate change poses a growing set of risks and challenges to cities.

80%

Combating climate change needs to start locally

4 THE 25-YEAR NET ZERO STRATEGY
The net zero action plan aims to cut energy demand significantly, and replace fossil fuels with renewable energy.

CAMBRIDGE NET ZERO PLAN

EMISSIONS

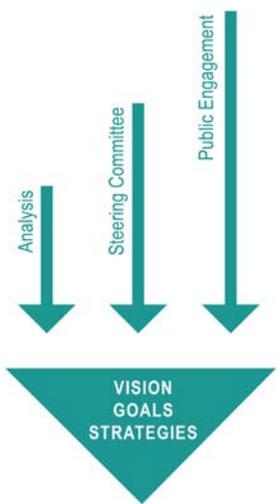
Achieve 70% reductions

3

COMPONENT 3: VISION & FRAMEWORK DEVELOPMENT

Where are we headed?

Setting a vision for the future and the targets to get there is an important part of a climate action and adaptation planning process. These project components are not necessarily separate from other phases; in fact, they will largely be developed through the community engagement, Steering Committee engagement, as well as the strategy development. The descriptions below, however, emphasize the degree to which vision development, metrics and indicators, and a framework for decision-making and/or measuring progress will be a key guiding structure to ensure that the plan meets the Cities' and communities' goals, and to ensure that implementation of strategies in the future meets the targets laid out in the plans.



Vision for the role of public engagement in plan development.

Visioning a Low-Carbon and Resilient Future

Developing a community vision for climate action and adaptation, in accessible language and with broad stakeholder buy-in, is an essential starting point for building success. Portland and South Portland have already set a number of carbon mitigation and waste reduction goals. This process of visioning—primarily executed through Steering Committee meetings and the public engagement listed above—will serve to reaffirm those goals, set any interim goals based on emissions data, as well identify any climate adaptation goals, principles, or desired co-benefits that may help to define the cities' visions for a low-carbon and resilient future.

Linnean and KLA will work with the Steering Committee and the public to define the parameters of this vision, as well as articulate it through accessible language and graphics in the final Climate Action and Adaptation Plans. Part of this process will include articulating what it will take for transformational system change, as well as the features specific to a neighborhood scale that will help create a low-carbon and resilient Portland and South Portland. These visions will be shaped both by community values, priorities, and ideas, as well as technical research. As an international leader in deep green engineering and ambitious climate planning, and the authors of the Carbon Neutral Cities Alliance’s Energy System Transformation Playbook, Integral will support the creation of a visioning process that meets the scale of the challenge and sets the stage for an effective planning effort.

Setting Metrics and Frameworks for Decision-Making

The climate action, adaptation, and community goals identified through the visioning process will help to define how the Cities and communities measure success. Linnean and KLA can work with the City and Steering Committee to develop a metrics-based framework that can serve as a tool for decision-making and/or evaluating progress.

To develop an evaluation-based framework, the team will work with the Cities and Steering Committee to identify priority areas and to establish specific goals for those areas. The team then develops a framework with assigned scoring for each goal. This framework will both serve as an evaluation tool for strategies within the Climate Action and Adaptation Plans (as a method of prioritization), and can be applied to existing and new plans, policies, and actions by the Cities to evaluate their ability to advance certain goals.

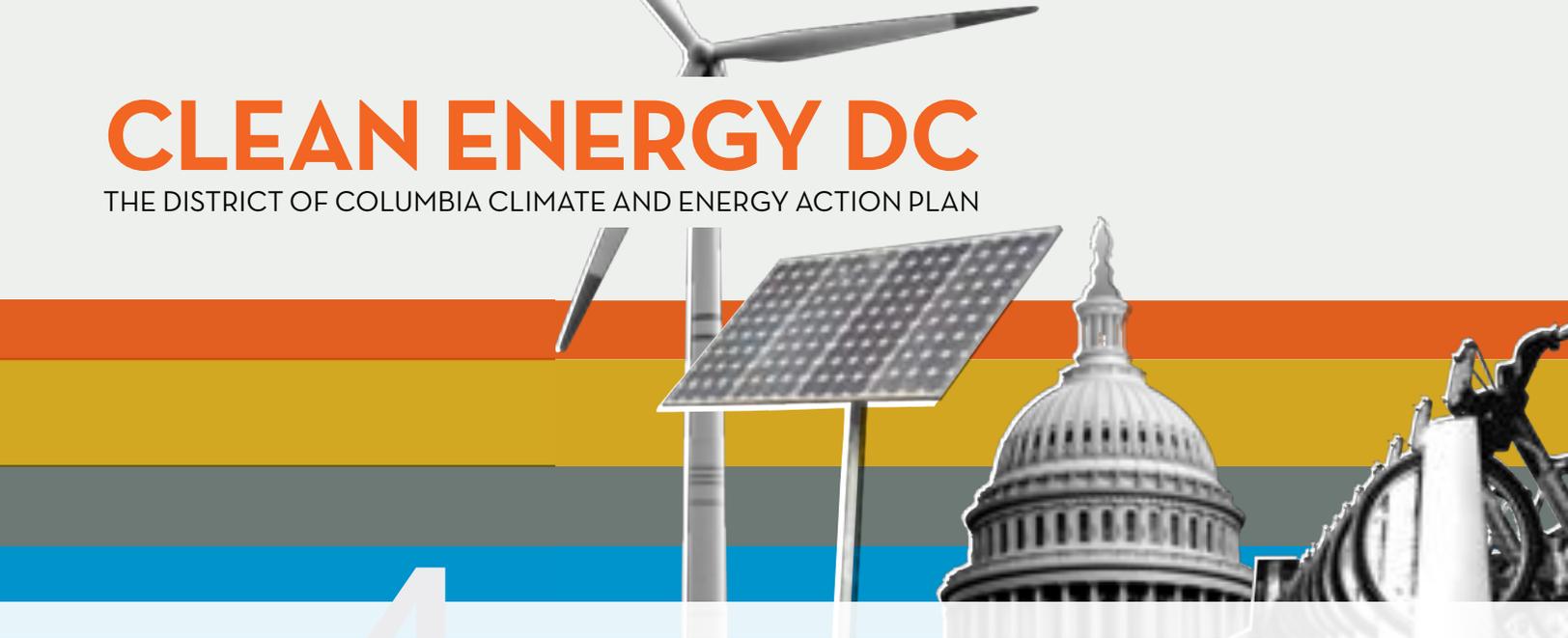
Framework for strategy development, developed for the City of Northampton to define sustainability and resilience goals, as well as goals for strategy co-benefits

We have found that these frameworks serve as a useful way to highlight co-benefits across strategies, as well as to identify any unintended negative consequences that work against community goals. Linnean and KLA have created a number of these frameworks for evaluation, prioritization, as well as to guide strategy development, and can work with the Cities to identify the most useful application based on City needs.



e.g., Equity Metrics

	Positive Contribution	Neutral Contribution	Negative Contribution
Equity	<p>7. Distributive Equity</p> <p>7a (+) The strategy enhances economic or educational opportunities (or reduces economic burden) for specific populations as identified and/or measured by those populations.</p> <p>7b (+) The strategy reduces disparities in accessing community assets and resources (e.g., parks, schools, transportation, public programs, etc.).</p> <p>7c (+) The strategy prioritizes reducing exposure to hazards for specific communities who experience the greatest disproportionate burden (e.g., from pollution, hazardous waste sites, climate change impacts, etc.).</p>	<p>7a (e) The strategy does not enhance or reduce economic or educational opportunities for specific populations as identified and/or measured by those populations, OR the strategy may be assumed to enhance opportunities, but has not been measured directly by those communities.</p> <p>7b (e) The strategy does not reduce nor increase disparities in accessing community assets or resources.</p> <p>7c (e) The strategy may reduce residents' exposure to hazards equally (e.g., for all Northampton residents), OR the strategy does not reduce exposure to hazards for any residents.</p>	<p>7a (-) The strategy may reduce educational opportunities or enhance economic burden for specific populations as identified and/or measured by those populations.</p> <p>7b (-) The strategy may potentially increase disparities in accessing community assets or resources.</p> <p>7c (-) The strategy may or may not reduce resident's exposure to hazards, but in doing so, increases the disproportionate burden experienced by specific communities.</p>
	<p>8. Procedural Equity</p> <p>8a (+) The strategy engages non-traditional stakeholders in decision-making.</p> <p>8b (+) The strategy engages the beneficiaries of the policy, program, or project in the measurement of its success.</p> <p>8c (+) The strategy ensures transparency in its development and implementation (i.e., the City has shared why and how decisions are made).</p>	<p>8a (e) The strategy does not engage non-traditional stakeholders in decision-making, and also does not disenfranchise these stakeholders through excluding them from decision-making.</p> <p>8b (e) The strategy does not include any measurement of success.</p> <p>8c (e) The strategy does not ensure transparency or reduce transparency in its development and implementation.</p>	<p>8a (-) The strategy disenfranchises non-traditional stakeholders by excluding them from decision-making or engaging them in a weak or superfluous way.</p> <p>8b (-) The strategy does not engage the beneficiaries of the policy, program, or project in the measurement of its success.</p> <p>8c (-) The strategy may reduce transparency in its development and implementation.</p>
	<p>9. Structural Equity</p> <p>9a (+) The strategy encourages diverse leadership of the project, policy, or program that is representative of the population served (e.g., race, gender, sexual orientation, etc.).</p> <p>9b (+) The strategy actively recognizes structural forces at play that have caused inequality (e.g., structural racism) and works to change them (e.g., reducing disparities through asset ownership and wealth generation).</p>	<p>9a (e) The strategy encourages some diversity in leadership of the project, policy, or program, but it is not representative of the population served.</p> <p>9b (e) The strategy may not actively recognize the structural forces at play that have caused inequality (e.g., structural racism), may or may not work to reduce inequality, and does not reinforce structural inequities.</p>	<p>9a (-) The strategy does not encourage diversity in leadership of the project, policy, or program and may reinforce non-diverse leadership.</p> <p>9b (-) The strategy does not recognize the structural forces at play that have caused inequality (e.g., structural racism) and may reinforce those structural inequities.</p>

The top half of the page features a collage of images: a wind turbine at the top, a solar panel in the center, and the US Capitol building on the right. The background is divided into horizontal bands of orange, yellow, grey, and blue. A large, light grey number '4' is positioned on the left side of the page.

CLEAN ENERGY DC

THE DISTRICT OF COLUMBIA CLIMATE AND ENERGY ACTION PLAN

4

COMPONENT 4: STRATEGY DEVELOPMENT

Climate Mitigation Strategy Development

We believe that in order to develop actionable and dynamic climate action plans, Cities need to shift to data-driven decision-making. To that end, we will develop a Community Energy and Emissions model of the baseline and business-as-usual GHG scenarios out to 2050. Integral Group has a spreadsheet-based Community Energy and Emissions modeling tool that we have built for other jurisdictions and adapt to the needs of each client. At a high level, the tool builds a bottom-up model of energy use in the jurisdiction which is then aligned against the top-down results from the inventory, and projects a business-as-usual scenario using real data from the city. We then apply carbon mitigation strategies to various sectors of the model, informed by our on-the-ground experience and data from leading cities around the world, along with our own expert knowledge. Many strategies and policies will be examined, in conjunction with the Steering Committee, to identify a path that can achieve the GHG reduction goals of Portland and South Portland. More specifically:

For the building sector: We propose to analyze Portland and South Portland's recently collected energy benchmarking data for private buildings to ensure that the model more accurately represents the current conditions and efficiency potentials of buildings in both cities. This will align with, and supplement, the analysis being conducted by GridSolar. Integral Group pioneered the use of ENERGY STAR benchmarking data to inform community energy and emissions modeling, and our project team includes national experts on energy benchmarking. With any self-reported dataset, especially one that was only recently collected, data quality and privacy are both serious concerns. We will apply robust, peer-reviewed data quality algorithms to ensure that the data does not yield inaccurate

results. Recognizing that the data is not yet public, we propose to enter into NDAs with the cities, to apply best-practice data security to any data received, and to disclose only modeled and/or aggregated data that has been informed by the real data, unless specially authorized by the cities to do otherwise. For buildings that do not report benchmarking data, we will fill the gap using national and regional datasets along with advanced algorithms that Integral Group has created.

For the transportation and waste sectors: We will use the data collected for the inventories, national and regional datasets, and any additional data available from City staff. If there is an absence of transportation data, assumptions and projections would need to be made in partnership with City staff. Milone & MacBroom team members have experience with MaineDOT Vehicle Miles Travelled (VMT) and Vehicle Hours Traveled (VHT) data sets which are excellent determinants of estimated vehicle emissions. Substantial future migration to zero-emissions vehicles can be compared against business-as-usual growth in driving conventional emitting vehicles. Team members have also worked with transportation data for the 2010 Cumberland County Climate & Energy Plan, and the PACTS metropolitan transportation plans (2010 and 2016) Regional Long Transportation plans. It will also be important to look at the data for existing hybrid and electric vehicle utilization in the cities, and forecasts for the transition to these modes which emit less or no GHGs. Likewise, the model will consider the fact that Portland and South Portland have existing transit services which have increasing ridership, and are on a path for growth in ridership, service, and geographic capture areas. Examples of growth include the METRO servicing the Portland High School population, and the current new route between the University of Southern Maine campus in Portland and connecting to the Gorham campus (students and employees).

Using this data, we will then develop a business-as-usual scenario using city data and regional data on building stock and land use change, population growth, transportation demand changes, and existing federal and state policies. Working in collaboration with City staff and the Steering Committee, our team will propose a set of GHG mitigation measures and build them into the model to quantify the GHG impact of each measure, where possible. Actions will be grouped into broad categories, with a mix of hard-hitting, quantifiable actions, and foundational or supporting efforts that are necessary to achieve the GHG reduction goal, but do not themselves reduce emissions.

The Integral team will apply our real-world expertise in creating ambitious climate plans and supporting their implementation, coupled with our engineering expertise, to ensure that the actions are feasible to achieve while still being as ambitious as needed. We will create and model a mix of short-, medium-, and longer-term actions, and will include a mix of areas where the cities can accomplish the actions on their own and areas that will require work by entities outside of direct city control. GHG reductions against the baseline and business-as-usual scenario will be the key measured metrics. However, we will also examine energy use reductions, fuel mix changes, and increased renewable energy deployment.

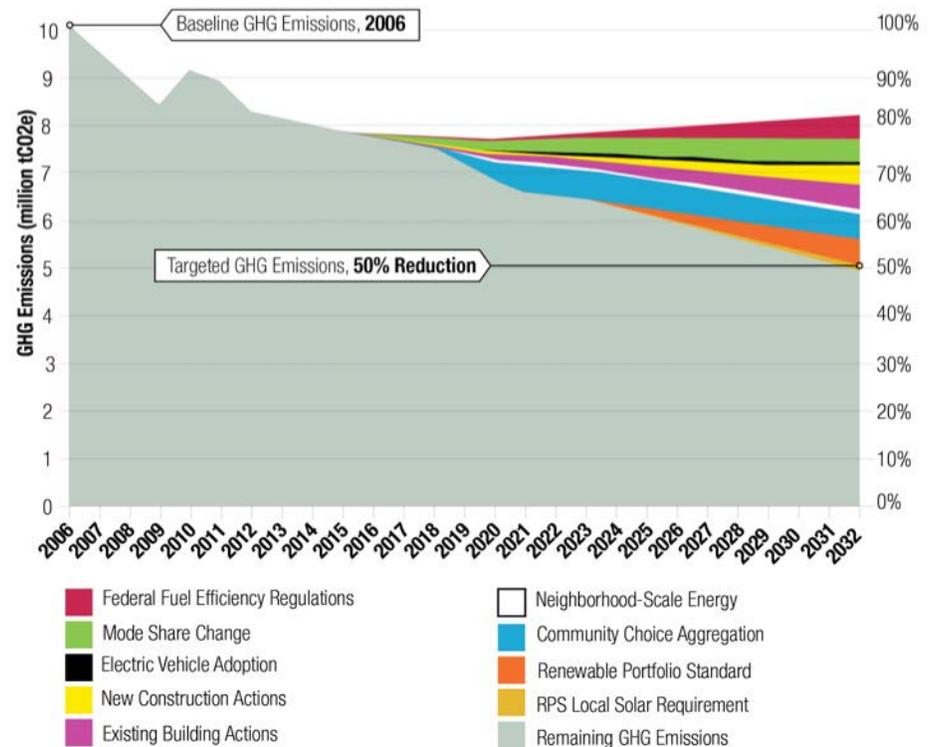
Land use and transportation scenarios that reduce trips or shift single occupancy automotive trips to more efficient modes would also be considered. The development of

RECENT DEVELOPMENTS TO NOTE!

A recent important development for transportation in Portland is its inclusion in the pilot program for “Highly Autonomous Vehicles” through the “Road Rules” program. Road Rules provides the foundation for cities and road authorities to communicate with drivers for safe and effective deployment of HAVs on public roads. INRIX AV Road Rules is the first platform that enables cities and road authorities to assign, validate, and manage traffic rules and restrictions for autonomous vehicles operating on public roads. Hosting this pilot program may support earlier adoption of HAV transportation systems in Portland, which can lead to a more efficient system with lower emissions.

actions will reflect and build upon the research, planning, and the five goal areas included in the Portland Area Comprehensive Transportation System’s (PACTS) long-range transportation plan (developed 2013-2015) in order to synchronize Portland and South Portland’s efforts with regional planning strategies that focus on Transportation Demand Management (TDM), electric vehicle charging networks, and enhancing infrastructure for non-motorized transit, among others.

The results of the model will be visualized for the cities in a wedge analysis to allow stakeholders to understand the contribution of all quantifiable strategies to the overall mitigation targets (see figure below for example). We will hold a workshop with City staff, Steering Committee members, and other individuals as selected by City staff, to test and refine the model using on-the-ground knowledge. The workshop will be a half-day, and we would propose that City staff be responsible for coordinating invitations and attendance and acquiring a location. Following the workshop, the model and mitigation strategies will be refined, and a gap analysis will be conducted to ensure that the strategies are meeting the Cities’ goals.

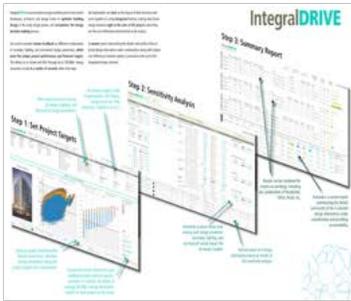


Through the findings from this analysis, we will provide infographics and waterfall and wedge diagrams, which will be included in the final report. Integral will also provide a copy of the Community Energy and Emissions Model to the Cities for their use after the completion of the project. This turns what has historically been a static process that quickly becomes outdated into an active opportunity to consistently improve goals and outcomes and adapt to changing conditions locally and nationally. We offer one training session to key staff on how to use the model, which will be recorded.

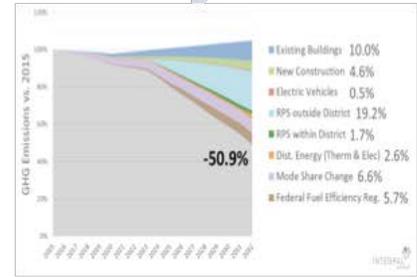
Climate Inventory

City Energy Model

Visualization



Building Inputs												
Existing Buildings Baseline												
	Building	SI										
Building 1
Building 2
Building 3
Building 4
Building 5
Building 6
Building 7
Building 8
Building 9
Building 10
Building 11
Building 12
Building 13
Building 14
Building 15
Building 16
Building 17
Building 18
Building 19
Building 20
Building 21
Building 22
Building 23
Building 24
Building 25
Building 26
Building 27
Building 28
Building 29
Building 30
Building 31
Building 32
Building 33
Building 34
Building 35
Building 36
Building 37
Building 38
Building 39
Building 40
Building 41
Building 42
Building 43
Building 44
Building 45
Building 46
Building 47
Building 48
Building 49
Building 50



Process model for development of the carbon mitigation strategies.

Adaptation Strategy Matrix: Pratt Building (Tasker I)

Adaptation Strategy	Engaged Time Frame	Recommended	High Priority	Comments
PROTECTION				
3.1 Water Infiltration Prevention	N/A	No		Water infiltration risk is minimal
3.2 Backflow Preventers	Short Term	Yes		Install Flood of sensors
3.3 Backwater Valves	Short Term	Yes		Prevent backflow flooding in basement
3.4 Sump Pumps	Short Term	Yes		Install sump pumps in basement
ADAPTATION				
3.8 Envelope Efficiency	Long Term	Yes		Increase envelope performance
3.6 Elevated Equipment	N/A	No		Tasker is not in a floodplain
3.7 Elevated Living Space	N/A	No		Tasker is not in a floodplain
3.8 Surface Stormwater Management	Long Term	Yes		Reduce risk of flood damage from intense precipitation
3.9 Window Shading	Short Term	Yes		Install window awnings
3.10 Distributed Heating & Cooling	N/A	No		Tasker is not in a floodplain
BACKUP				
3.11 Personal Electrical Connections	N/A	No		Site is not susceptible to power outages
3.12 Maintaining Backup Power to Critical Systems	Long Term	Yes		Install additional backup power

Adaptation Strategy Matrix developed as part of resilience planning for the Philadelphia Housing Authority.

Climate Adaptation Strategy Development

Development of climate adaptation strategies will directly respond to the outcomes of the climate risk vulnerability assessments, as well as the risk and vulnerability concerns elucidated in the public engagement and Steering Committee meetings. The assessments will naturally facilitate prioritization of strategies through identifying areas with high risk exposure, compounding vulnerabilities (e.g., communities that face disproportionate burden), or high impact from failure (e.g., failure of critical infrastructure). The team will focus on strategies to address these areas of highest vulnerability, in addition to strategies that are “low-hanging fruit”—that is, low-cost, feasible, and widely supported by the Cities and residents, which create opportunities for building awareness and momentum around climate adaptation. The extent to which risk and vulnerability will likely continue to change over time is a critical factor and will be highlighted in this analysis.

The development of adaptation strategies for Portland and South Portland will include a focus on public infrastructure, including the city’s stormwater system, energy systems, waterfront infrastructure, transportation infrastructure (i.e., culverts and bridges), water/wastewater infrastructure, and public buildings and facilities—all of which will likely experience impacted reliability and/or capacity with climate change. Strategies will focus on mitigating cascading failure of critical infrastructure in order to prevent interruptions in distribution networks, public services, and business operations. Woodard & Curran’s understanding of the infrastructure in Portland and South Portland will provide an important foundation for strategy development. Based on our previous engineering projects in the communities, we have a strong sense of the critical assets, capacity, treatment systems, and flood prone areas. To address flooding and drainage challenges specially, we will look to prioritize actions associated with the most critical and vulnerable assets in the communities.

Both communities have a robust asset management system that can be utilized for this project. The City of Portland has completed and maintains a criticality analysis of its sanitary sewer system and pump stations. They are also currently embarking on an Integrated Water Plan which will yield helpful data. The City of South Portland is in the process of implementing such a system and has criticality data on its treatment plant assets. The criticality analysis will be a starting point to planning adaptation strategies that address the most critical assets. Design standards and the engineering of flood mitigation, stormwater management, and specifically green infrastructure projects will be key components to the adaptation projects we expect to address critical assets. Woodard & Curran worked with the City of Portland to lead its first green infrastructure projects to reduce combined sewer overflows and drove revisions to the City Code of Ordinances and Technical Design standards. We will continue this strategy to address the right construction projects to inform City planning and zoning ordinances, revise development design standards, and help improve control of sewer overflows.

Green infrastructure strategies will also fit within a broader set of strategies designed to enhance the resilience of Portland and South Portland's natural systems. Strategies will include a focus on using nature-based solutions for adapting to climate change (e.g., green infrastructure for flood management, a healthy tree canopy for mitigating the heat island effect, among others); they will also focus on maintaining the resilience of the natural systems themselves (e.g., planting species that can withstand high winds or warmer temperatures, enhancing adaptive management for addressing non-native invasive species or pests, among others). Resilient zoning and land use policies can be developed to not only address flood risk, but also to ensure the health and resilience of natural systems which will play a significant role in the resilience of the cities as a whole.

In addition to public infrastructure and natural systems resilience, our team will incorporate a strong focus on social resilience, including how climate change may affect health and livelihoods, as well as place added stress and need for formal and informal social networks, city policies, and programs. With the understanding that social relationships are a crucial pillar to community resilience, innovative cities across North America have been developing municipally-funded resilience hubs, community centers, and events-based programming such as block parties or barbecues designed to encourage the exchange of information and connections between neighbors. Our work in Northampton has included working with community social service partners, including libraries, homeless services, and affordable housing programs to build collaboration between the development of social resilience strategies and services designed to support particular vulnerable populations. Because social resilience is directly tied to health, community networks, and economic wellbeing, social resilience strategies will often overlap with other sectors, including housing, economic development, and transportation. Thus, our approach to developing social resilience strategies (as well as strategies for infrastructure and natural systems resilience) will look for ways in which these efforts dovetail, enhance, or align with the cities' comprehensive planning and economic development efforts.

Cost/Benefit Analysis, Feasibility, and Co-benefits

The team proposes to conduct a high-level cost benefit analysis on the proposed actions. Many of our clients find it essential to develop climate action plans that explore and quantify the economic costs and benefits resulting from policies and programs. Municipal leaders and residents need to know what key economic and jobs outcomes would occur

TABLE 1. Example output for Cost-Benefit Analysis for new building construction climate mitigation measures

ASSUMPTIONS (from CEP)	METRIC	ESTIMATED IMPACTS
<p>Building code adoption cycle</p> <ul style="list-style-type: none"> Current: Based on EUIs for 2012's International Energy Conservation Code 2017: Assumed to be 17% more efficient than on average current codes 2020: Net-Zero Code adopted for low-rise residential buildings; high performance code update adopted for all other buildings 2026: Net-Zero Code adopted for all buildings <p>Annual construction rates (new)</p> <ul style="list-style-type: none"> Low Rise residential = 0.20% Multifamily = 1.05% Office = 0.97% Hotel/ICI = 0.78% <p>Annual construction rates (replacement)</p> <ul style="list-style-type: none"> Low Rise residential = 0.09% Multifamily = 0.45% Office = 0.42% Hotel/ICI = 0.33% 	COMMUNITY ECONOMIC COSTS	
	<p>Change in construction costs to achieve Net Zero Ready Buildings (% of average)</p> <ul style="list-style-type: none"> Office = 1 - 6%¹ (USD 2013) Multifamily = 2 - 7%¹ (USD 2013) Single Family Detached = 12%² (USD 2015) 	<p>Change in construction costs to achieve Net Zero Ready Buildings (% of average)</p> <ul style="list-style-type: none"> Total additional construction costs from all code updates between now and 2032 estimated to be \$127M to \$608M (USD 2017) Approx. half of these costs are due to Net-Zero Codes that start in 2022 for low-rise and single family residential buildings and 2029 for all other building types Costs are nearly evenly split between residential and commercial
	COMMUNITY ECONOMIC BENEFITS	
	<p>Jobs created through investing in reducing energy consumption</p> <ul style="list-style-type: none"> Multifamily 9.88 per \$1M spent (USD2012) Commercial 9.70 per \$1M spent (USD2012) 	<p>Jobs created through investing in reducing energy consumption</p> <ul style="list-style-type: none"> Investments in codes that achieve this level of energy savings can support up to 250 new full-time jobs by 2020, increasing to 750 by 2025, and 1850 by 2032
	<p>Change in resale value of Net Zero Buildings (%)</p> <ul style="list-style-type: none"> 10.7% higher in NZR home compared to conventional home³ 	
<p>Energy cost savings</p> <ul style="list-style-type: none"> Energy cost savings based on modelled energy use reductions and average 2017 rates for electricity, natural gas, and fuel oil⁴ Reduction in energy use yields a reduction of up to \$1 billion (USD 2017) in energy savings relative to BAU Approx. 55% of savings are captured by residential buildings This level of savings yields an overall net financial benefit in the District's push toward a net-zero building code 		

¹ International Living Future Institute, New Buildings Institute, SKANSKA. "Financial Study: A Cost Comparison Report for Buildings in the District of Columbia." September 2013

² Efficiency Vermont. "Net Zero Energy Feasibility Study Full Report." January 2015

³ Farhar, B.C., Coburn, T.C. "A New Market Paradigm for Zero-Energy Homes: The Comparative San Diego Case Study."

⁴ Energy Information Administration District of Columbia State Profile and Energy Estimates, updated March 2017, <https://www.eia.gov/state/?sid=DC>

through climate action, and the ancillary benefits that climate action can provide.

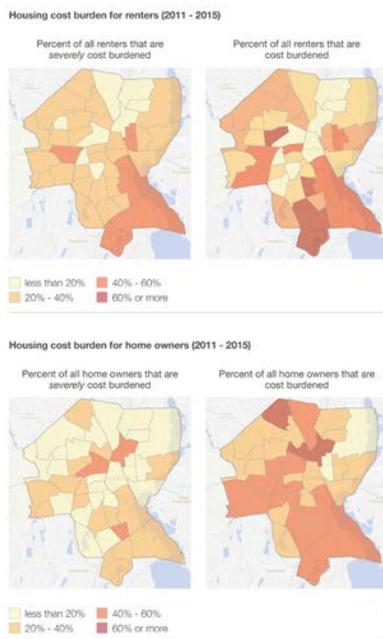
The team will provide a strategy-by-strategy breakdown of the costs and/or benefits of various actions in the proposed climate action and adaptation plan. Noting that not all costs or potential benefits have a direct or measurable monetary outcome, the analysis in some areas may be limited or reference qualitative rather than quantitative opportunities. Where data and sound research already exists, we will perform a 'desktop' analysis based on best practices to source potential economic outcomes. An excerpt of this work from another project is provided in **Table 1** for reference.

We will also create a matrix that evaluates the technical and practical feasibility and risks of each action and identify co-benefits, including jobs, human health, wellbeing, air quality, and resilience for each action. Some of these co-benefits may be able to be quantified for some actions.

Climate and Equity Assessment

Our team recognizes that if we solve the worst causes and impacts of climate change, but fail to find equitable ways to do so, then in the end we would have still failed as a society. The proposed public engagement process will aim to address procedural equity; our team will also provide an analysis of the distributional and structural equity implications of various climate action and adaptation strategies.

We have developed an equity framework to support scenario analysis related to the impacts and opportunities of climate planning on equity outcomes. The framework helps to answer questions about the consequences and benefits of various climate mitigation and adaptation choices in terms of whether the strategy increases financial burden, increases inaccessibility, or reinforces structural equity for specific populations, to guide decision-making to move cities towards greater social equity. Our analysis would use the cost/benefit analysis discussed above to define how the potential impacts and benefits of climate action could be structured to maximize outcomes for low- to moderate-income residents, communities of color, people who speak English as a second language, and people with disabilities, among other vulnerable populations. All proposals would be referenced back the proposed climate action plan with specific recommendations on how they could be integrated.



Understanding housing cost burdens for renters in the City of Providence as part of the City of Providence's equity-focused climate action planning process

TABLE 2. Example output for Equity Research for energy policy and initiatives in Washington DC

	POSSIBLE RISKS TO EQUITY	AMENDED ACTION
NEW CONSTRUCTION		
NC.1 Establish a pathway to net-zero building codes between 2020 and 2026	 	<p>Building codes should be amended to dictate post-occupancy requirements that reflect differing unit specifications, such as each unit’s utility costs, size of unit, and type of unit.</p> <p>New construction for low-income multifamily housing developments will be prioritized through financial incentives or subsidies.</p> <p>The District should consider funding new construction developments for net-zero energy affordable housing. This can be phased in, beginning with smaller projects before looking at the feasibility of funding larger projects.</p>
NC.2 Provide a net-zero energy incentive package	 	<p>These incentive packages will prioritize developers of LMI or social housing projects.</p>
EXISTING BUILDINGS		
EB. 2 Increase DCSEU flexibility		<p>Special attention to include LMI communities will be supported with outreach to relevant community organizations. Track performance and results of this targeted outreach to LMI communities.</p>
EB. 3 Provide the incentives necessary to operate a District-wide energy retrofit program	 	<p>Target LMI communities with the provision of sustainable and equitable loans, and provide energy literacy training and energy management coaching to LMI communities.</p> <p>A specialized outreach strategy to educate and inform LMI, social and affordable housing communities on building energy performance data will be developed and implemented.</p>

KEY



Increased financial burden is a potential barrier for equity resulting from a strategy that leads to increased costs that are disproportionately carried by residents in the LMI community.



Inaccessibility refers to barriers that arise from strategies that overlook accessibility for low-income households and marginalized groups.



Reinforcement of structural inequity refers to barriers from strategies that, if not executed carefully, could increase social equity gaps in the City.

BUILDING RESILIENCE IN BOSTON

"Best Practices" for Climate Change Adaptation and Resilience for Existing Buildings

5

COMPONENT 5: REPORT PRODUCTION

Production of the Climate Action and Adaptation Plans

The final Climate Action and Adaptation Plans will include a comprehensive matrix of all recommended strategies and actions that overlays for each strategy/action: GHG reduction potential, cost/benefit analysis, possible resilience co-benefits, equity research, proposed climate adaptation strategies and overlap with proposed mitigation actions. We will also detail appropriate next steps for each action, tested for accuracy and feasibility with City staff and the Steering Committee. In our experience, including explicit implementation timelines and concrete, stakeholder-tested next steps is critical to ensuring that a plan does not just sit on a shelf. A first draft of the CAAPs will be presented to the Cities' staff and the Steering Committee for review prior to being shared for broader public comment.

Production of the Summary Report, Infographics, and Social Media Content

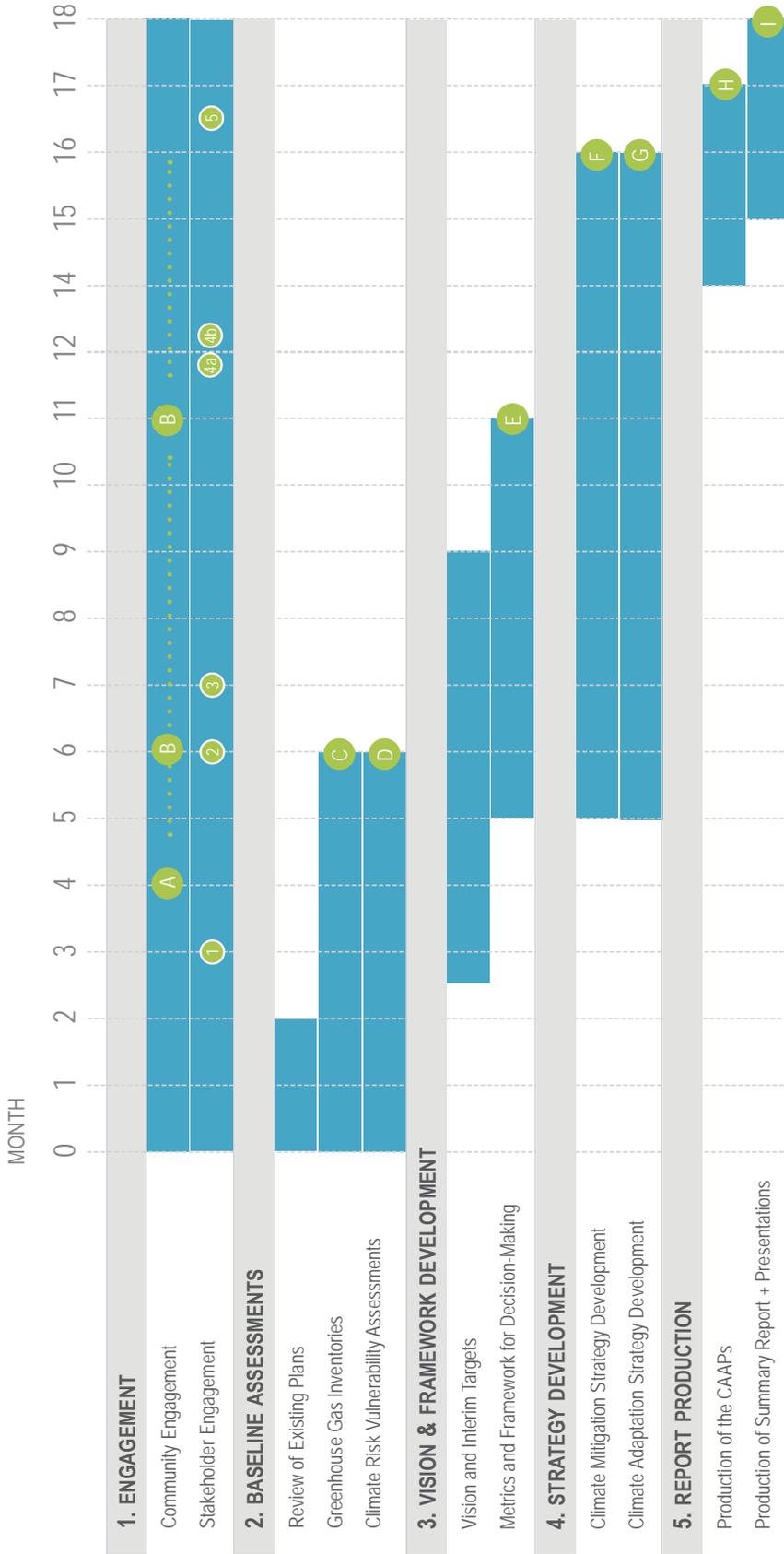
To further enhance the accessibility of the Climate Action and Adaptation Plans, the team will generate summary reports that share the vision and key strategies in non-technical language and in a highly visual way. KLA will generate a number of infographics that will be integrated into both reports, as well as used in the presentations. These graphics will be designed for use in social media and will dovetail with the messaging and community engagement strategy for the plans.

6

COMPONENT 6: OTHER TECHNICAL ASSISTANCE

This team's staff are available to aid the Cities with related work at their standard hourly rates. Ad-hoc additional technical assistance is sometimes requested by clients and provides good value and alignment of methodologies.

Timeline and Schedule of Deliverables



SCHEDULE OF DELIVERABLES

Engagement deliverables include:

- Engagement Strategy to ensure equitable outcomes (A)
- Project Branding Strategy (A)
- Deployment of MetroQuest surveys for community input (B)
- Five community engagement forums and/or in-person activities with accompanying printed or digital materials — ongoing with frequency determined by decided activities (•••)
- Six Stakeholder Committee meetings with accompanying materials to support discussion (1, 2, 3, 4b, 5)
- Social media content (up to 8 posts per week)
- Monthly Community Engagement Reports

Baseline Assessments deliverables include:

- Completed Greenhouse Gas Inventories (C)
- Completed Climate Risk Vulnerability Assessments (D)

Vision & Framework Development deliverables include:

- Language development around the vision and interim goals to be incorporated in the final CAAPs
- Framework and metrics for strategy evaluation and/or decision-making (E)

Strategy Development deliverables include:

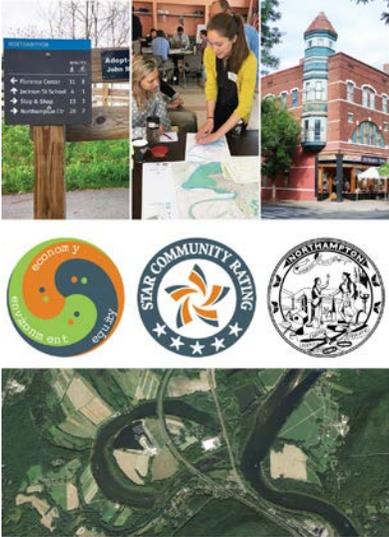
- Community Energy and Emissions Model with training session on how to continue to use the model (F)
- Wedge diagram showing impact of climate mitigation strategies (F)
- Write-up to be incorporated in the final CAAPs on climate scenarios to be used for climate adaptation planning (G)

Report Production deliverables include:

- Final Climate Action and Adaptation Plans (H)
- Summary Reports, Infographics, and Presentations (I)



PART E: PAST PERFORMANCE



Climate adaptation and mitigation planning for the City of Northampton, MA

Climate Resilience & Regeneration Plan

Northampton, MA

Linnean and KLA are currently working with the City of Northampton on a year-long effort to advance climate adaptation and mitigation planning within the city. The multifaceted project aims to create a cohesive framework for future planning, decision-making, and implementation that effectively considers and addresses the effects of climate change. In the spring of 2018, Linnean led the facilitation of the city’s Municipal Vulnerability Preparedness (MVP) process, a program funded and designed by the Commonwealth of Massachusetts that uses community workshops to identify vulnerabilities, strengths, and strategies for increasing the city’s resilience. Subsequently, Linnean and KLA have been improving and updating the city’s greenhouse gas inventory, developing a framework for strategy evaluation, aligning the City’s sustainability plan with the STAR Communities Framework, and developing a strategy for ongoing engagement and outreach around climate action and adaptation. Drawing from the insight gathered throughout this process, Linnean will then lead the development of the city’s Climate Resilience and Regeneration Plan, which will provide Northampton with a roadmap for climate mitigation and adaptation.

Client: City of Northampton, MA

Contact: Wayne Feiden, Director of Planning and Sustainability | (413) 587-1265 | wfeiden@northamptonma.gov



Infographic for the Cambridge “Getting to Net Zero” Roadmap

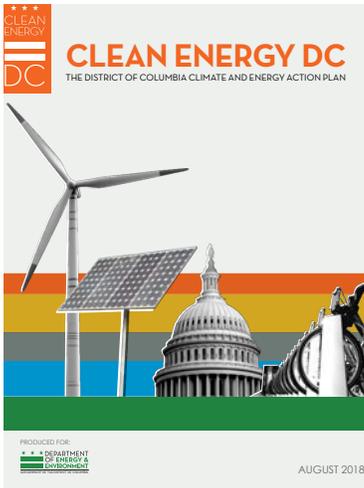
“Getting to Net Zero” Roadmap

Cambridge, MA

In response to a citizen petition, the City of Cambridge, MA is developing a roadmap to becoming a net zero energy community. The City retained Integral Group in 2014 to advise City staff and a task force of key stakeholders and professional experts to develop an action plan to meet the net zero target. Integral Group is advising the task force by providing project management, facilitation, research, modeling and analysis, and policy recommendations to the task force and city staff. A key focus is policy tools and standards that can be applied to achieve significant energy and GHG savings from new construction and existing buildings. To support this objective, Integral Group compiled research and data, ultimately developing three primers: (1) best practices in net zero energy and energy efficiency policy - municipal case studies; (2) Cambridge building energy primer, a snapshot of Cambridge’s building stock including available data on energy use by building type and sector; and (3) a low carbon energy supply primer describing renewable and low carbon energy generation options that are feasible in Cambridge. The project deliverable will be a high level action plan laying out a set of strategies—including regulation, education, and incentives—to move Cambridge toward the net zero objective. See: <https://goo.gl/pQNEuX>.

Client: City of Cambridge, MA

Contact: Susanne Rasmussen, City of Cambridge | (617) 349-4607



Clean Energy DC Summary Report

District of Columbia Comprehensive Energy Plan (Clean Energy DC)

Washington DC

In 2015-2018, Integral Group was retained to develop a Comprehensive Energy Plan for the District of Columbia Department of Energy and Environment (DOEE), which was branded as “Clean Energy DC” (CEDC). The plan accounts for all energy use within the city as well as the District’s energy supply, including buildings, transportation, renewable energy, and grid modernization. Working with D.C. staff, Integral developed a methodology to forecast energy and emissions use over time in a customized Excel-based model that DOEE will continue to use beyond the project. The model simulates energy and emissions from buildings and transportation out to 2032 based on various policy and energy infrastructure decisions. The Integral team has led the development of communication and engagement materials and sessions intended to effectively communicate the CEP objectives and strategies and offer stakeholders the opportunity to provide input. Integral’s role was also expanded to develop a net-zero energy compliance path for the District’s new building codes, conducting deeper analysis into high priority building, renewable energy, and transportation policies, and developing an interactive online dashboard that citizens can use to understand and interact with the plan. View the final report and the dashboard at <http://cleanenergydc.org>.

Client: The District of Columbia Department of Energy & Environment

Contact: Edward Yim, Department of Energy and Environment | edward.yim@dc.gov | 202-299-3339



“Thrive Indianapolis” events announced on social media to engage the residents across Indianapolis

Sustainability & Resilience Action Plan

Indianapolis, IN

In 2017, KLA was selected by the City of Indianapolis, IN to lead their Sustainability & Resilience Action Plan process. KLA oversees a 7-firm consultant team that is tasked with delivering a 12-month, equity-driven process that is deeply rooted in building local social capital and capacity.

Project Activities & Deliverables:

- Public and stakeholder engagement strategy and process
- LGOP & GPC compliant greenhouse gas emissions inventory
- Climate vulnerability assessment
- Multi-hazard mitigation plan
- Online community dashboard
- Marketing and communications strategy
- Sustainability and resilience action plan

Client: City of Indianapolis, IN

Contact: Katie Robinson, Director of Sustainability | katie.robinson@indy.gov



Climate Action & Sustainability Planning Services

New Bedford, MA

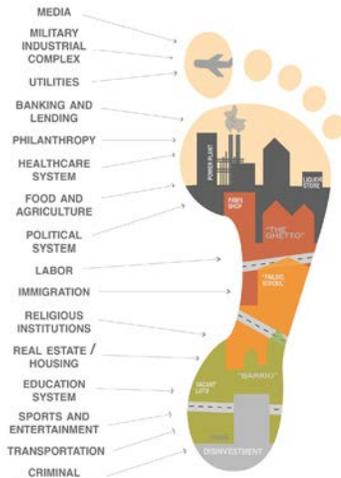
Project Description: KLA was recently awarded a contract for Climate Action & Sustainability Planning Services for the City of New Bedford, MA. For this multi-year contract, KLA is partnering with the City to design a comprehensive program and brand to house their current and future climate and sustainability initiatives, supporting the City through the Massachusetts Municipal Vulnerability Preparedness (MVP) program, and delivering an equity-driven Climate Action & Adaptation Planning process.

Project Activities & Deliverables:

- Delivery of the Massachusetts Vulnerability Preparedness (MVP) process
- Climate vulnerability assessment
- Completion of a GPC compliant GHG inventory
- GHG Reduction Plan;
- Community Climate Adaptation Plan
- Ongoing, inclusive, and equitable public engagement dialogue
- Online community dashboard
- Marketing and branding strategy

Client: City of New Bedford, MA

Contact: Michele Paul, Director of Resilience and Environmental Stewardship | michele.paul@newbedford-ma.org



Framework for advancing social equity in climate action planning

Equity in Citywide Sustainability Plan

Providence, RI

The City of Providence hopes to become a national model of equity and sustainability. In 2016, Linnean and a team of organizations partnered with City agencies and representatives of underserved communities in the City of Providence to build a framework for meaningful community participation in climate action policy. In order to build on the City of Providence’s goal of creating a visionary, measurable, achievable, and community-oriented climate action plan, the team designed a set of regenerative activities to support the City and communities in building their own capacity to hold constructive and inclusive conversations and to take collaborative action around equitable and sustainable development. The project has worked to address a number of sustainability and climate vulnerability issues, as well as align diverse community perspectives around a common goal—to create a thriving city for all the people of Providence.

Client: City of Providence, RI

Contact: Leah Bamberger, Director of Sustainability for City of Providence | Lbamberger@providenceri.com | (401) 421-2489



SA Tomorrow Sustainability Plan

San Antonio, TX

KLA worked closely with the San Antonio Office of Sustainability to lead the development of the SA Tomorrow Sustainability Plan Project. The KLA Team delivered a bevy of services and products to the City with the ultimate goal of creating a more sustainable community. Through strong facilitation, equitable engagement, and an effectively designed process, the City completed a comprehensive, robust, highly graphic Sustainability Plan, which was approved in August 2016. Project activities and deliverables included:

- Design of integrated sustainability planning process that was in line with the STAR Community Rating System;
- Facilitation of Leadership and Advisory Committee meetings;
- Development of Sustainability Plan, with current conditions, goals, actions, metrics, and targets for eight focus areas;
- LGOP and GPC Compliant GHG Inventories;
- Climate Risk & Vulnerability Assessment;
- Community Engagement Plan, including online and in-person engagement;
- Hosting of the City's first Sustainability Forum;
- Sustainability Dashboard to provide ongoing engagement and reporting related to the identified goals and targets;
- Sustainable Return on Investment Analyses.

Client: City of San Antonio, TX

Contact: Eloisa Portillo-Morales, Sustainability Planning Manager, Office of Sustainability | Eloisa.Portillo-Morales@sanantonio.gov | 210-207-6322



Richmond, VA

Richmond Climate Action Plan

Richmond, VA

Integral Group was retained by the City of Richmond, Virginia, under a grant from the Energy Foundation, to develop a Climate Action Plan (CAP) for the City. Integral Group is developing a dynamic energy and climate model that the city can use to actively and continuously monitor its efforts. The model simulates energy and emissions from buildings and transportation out to 2050 based on various policy and energy infrastructure decisions. Based on the results of the modeling, Integral Group is developing a Climate Action Plan of key actions, including a careful consideration of the City's spheres of influence and political landscape. Integral Group is also examining the equity impacts of the plan's actions and adjusting as needed, and quantifying, where possible, costs, benefits and co-benefits of plan actions. The work is well underway and will be completed by the end of 2018.

Client: City of Richmond (under grant from the Energy Foundation)

Contact: Alicia Zatcoff, Sustainability Manager, City of Richmond | Alicia.zatcoff@richmondgov.com | 804-646-3055



Lexington, MA

Lexington “Getting to Net Zero” Roadmap

Lexington, MA

Integral Group was retained to guide and support the Town of Lexington’s Getting to Net Zero Task Force as they develop a roadmap to net zero emissions for the Town of Lexington. This process included design, facilitation, research, analysis, and development of reference materials and delivery of the roadmap and plan. In addition, Integral Group assembled energy efficiency experts to join a working group with members of the Task Force to elicit input into actions and strategies for implementation. Following this phase, research, emissions inventorying and modeling helped the consultant team undertake a process of prioritization of actions and strategies. Integral Group’s final report included a concise but practical action plan and roadmap for Lexington to achieve its net zero objective, as well as detailed documentation of the Getting to Net Zero Process in its entirety, the approach to engagement, and the methodology for analysis and prioritization of actions.

Client: Town of Lexington

*Contact: Mark Sandeen, Chair, Sustainable Lexington |
mark.sandeen@sustainablelexington.org*



Vancouver, BC

GHG Emissions Reductions: Citywide Building Retrofit Strategy

Vancouver, BC

Integral Group supported the development and validation of the City of Vancouver’s Building Retrofit Strategy, which was developed to support the City of Vancouver’s Greenest City 2020 Action Plan. The strategy includes a set of recommended actions for the City to meet their target of reducing greenhouse gas emissions by 20% by 2020. The emission reductions target required the elimination of 160,000 tonnes of greenhouse gas emissions from buildings over a six year period. This work involved breaking down total emissions by building type, and identifying areas of greatest opportunity for reductions. The emission reduction approach focused on actions that would achieve the largest reductions for the least amount of financial and resource investment. An emissions reduction model was developed to calculate the reductions associated with each proposed action, and test the most effective suite of actions. Actions were categorized into three overarching areas: capacity building, regulation, and incentives.

Client: City of Vancouver

Contact: Sean Pander, City of Vancouver | sean.pander@vancouver.ca | 604-871-6542



Toronto Green Standard V. 2.0;
Toronto, ON

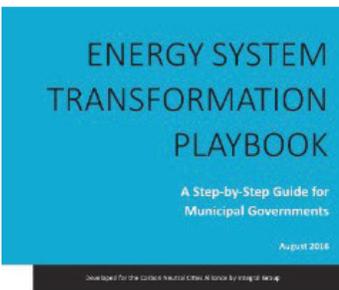
Global Best Practices in Energy Efficiency Study

Toronto, ON

The City of Toronto retained Integral Group to explore effective approaches to energy efficiency standards and metrics from different jurisdictions around the world. The purpose of the research is to inform the evolution of the current 'Toronto Green Standard' (TGS) for buildings, which addresses sustainable energy design and ultimately aims to keep the City on track to meet its climate change and greenhouse gas reduction targets. The research approach draws from best practices from North America and the EU, and identifies tools, metrics, regulations, and standards that would support Toronto in meeting its objectives. Integral Group is working closely with the City of Toronto staff team and steering committee to develop a set of selection criteria with regards to best practices, and to develop a prioritized set of key objectives, constraints, and success factors to to evaluate best practices. The result will be a recommended approach tailored to the City of Toronto that will best support the City in meeting its greenhouse gas reduction and climate resilience objectives, while being practical and viable to implement, and providing consistent, useful information on building performance and GHG emissions. For further information see: <https://goo.gl/3g93CC>.

Client: City of Toronto

Contact: Lisa King, City of Toronto | Lisa.M.King@toronto.ca | 416-392-9698



Carbon Neutral Cities Alliance
Energy System Transformation
Playbook

Carbon Neutral Cities Alliance Energy System Transformation Playbook

Boulder, CO, Minneapolis, MN, and Seattle, WA

Working with the cities of Boulder, Minneapolis and Seattle, Integral developed the Energy System Transformation Playbook. The project was supported by a grant from the Carbon Neutral Cities Alliance, a collaboration of cities committed to achieving aggressive long-term carbon reduction goals. The Playbook is a tool that can be used by any city striving to transform to a low-carbon future. The strategies in the Playbook were tested on a different type of neighborhood in each of the three cities (Boulder, Seattle, and Minneapolis). To test the strategies, Integral collected baseline energy use data for each neighbourhood and modeled the energy and GHG impacts of transitioning from fossil fuel based energy to clean energy, noting where cities have varying levels of influence of the key aspects of their energy system. The Playbook includes guidance on policy, planning, programs and infrastructure investment to support energy system transitions in cities.

Client: Carbon Neutral Cities Alliance

Contact: Brett KenCairn, Senior Environmental Planner, kencairnb@bouldercolorado.gov, 303-441-3272



North Vancouver, BC

District of North Vancouver Community Energy and Emissions Plan

North Vancouver, BC

The District of North Vancouver awarded their Community Energy and Emissions (CEEP) project to Integral Group's Research and Planning Team in the summer of 2017, and the project is well underway today. Integral Group is in the process of building a comprehensive and useful plan that is easily implementable by District staff, and structured to equip staff to manage the CEEP's ongoing evolution.

In addition to providing a basic tool and framework from which to evaluate the potential of different energy and emissions reduction actions, Integral Group created an extensive engagement strategy to build capacity and ensure understanding across a wide range of stakeholder groups and the public. The final CEEP will be an integrated, community-wide plan with analysis and actions addressing land use, buildings, transportation, energy management, waste management, and urban forestry.

Client: District of North Vancouver

Contact: Caroline Jackson, cjackson@cnv.org, 604.990.4224



Public-private partnership
stakeholder facilitation

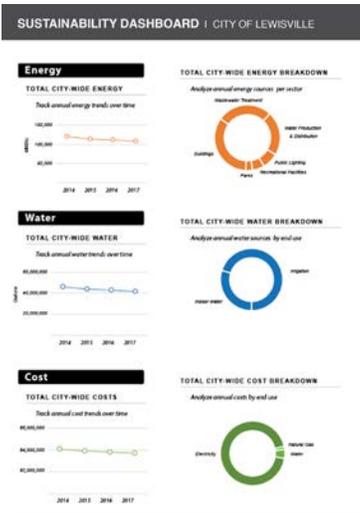
Kendall Square EcoDistrict

Cambridge, MA

Linnean Solutions led the facilitation and planning of district-scale climate mitigation and adaptation strategies for the Kendall Square EcoDistrict, a public-private collaboration in Cambridge, MA. The EcoDistrict's members include property owners, local businesses and corporate tenants, institutions, non-profits, community leaders, and the City of Cambridge. As the primary facilitator, Linnean guided the EcoDistrict stakeholders toward developing shared values-based goals, metrics and tools for evaluating progress towards those goals, and projects for the EcoDistrict to pursue. Leveraging collaborative action and district-scale efficiencies, these interrelated goals included strengthening district resilience; managing stormwater; reducing energy consumption; increasing connectivity, amenities, and mobility within the community; fostering ecological vitality; and engaging businesses, land-owners, and residents within the community.

Client: Multiple public and private EcoDistrict stakeholders

Contact: Susanne Rasmussen, City of Cambridge | (617) 349-4607



Sustainability dashboard, tracking energy consumption, water use, and cost savings, among other metrics

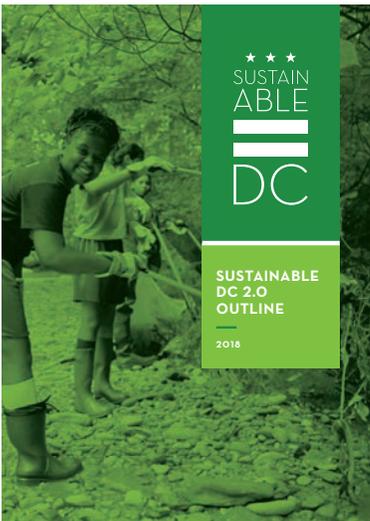
Sustainability Assessment and Carbon Mitigation Plan

Lewisville, TX

Linnean conducted the first sustainability and carbon assessment of municipally-owned properties in Lewisville, Texas. By tracking and compiling historical electrical, natural gas, and potable and irrigation water use data, waste collection data, and water and wastewater treatment data, Linnean developed a holistic evaluation of the municipality's sustainability performance and carbon emissions from city activities. Using the resource use data, Linnean provided the City with tailored climate adaptation mitigation strategies, with an emphasis on projects with low upfront costs and high potential return on investment. To ensure that the system for collecting carbon data and the report that Linnean developed would continue to provide value, Linnean developed an interactive resource tracking tool for the city. The tool creates an opportunity for the City to understand the resource and carbon reductions from their initiatives over time, and will allow a transparent way for engaging the public on these issues.

Client: City of Lewisville, TX

Contact: Lisa Weaver, City of Lewisville | (927) 219-3503



Washington D.C.

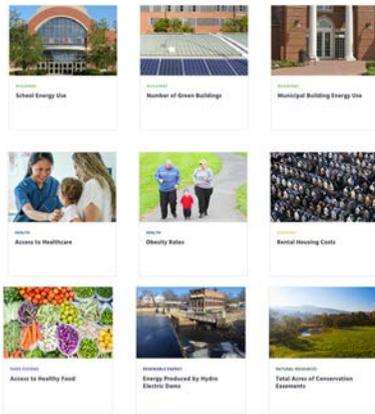
Sustainable DC Plan Review and Analysis

Washington, DC

Integral Group is supporting the DC Department of Energy and Environment in conducting a thorough review of the District's Sustainable DC Plan, created in 2012. Integral is leading a team of sub-consultant subject-matter-experts (Nelson Nygaard and HDR) in conducting rigorous quantitative analysis to determine whether the District is on track to meet the objectives laid out in the original plan. The nature of the work is to review and revise the sustainability targets as needed, and to analyse the aggregate impact of each of the actions included in the plan to determine whether the actions are sufficient to meet the sustainability goals and targets. The team will make recommendations to the DOEE to shape a revised framework for an updated Sustainable DC 2.0 plan.

Client: The District of Columbia Department of Energy & Environment

Contact: Edward Yim, Department of Energy and Environment | edward.yim@dc.gov | 202-299-3339



See: www.livablenashua.org

Livable Nashua Climate Action Engagement

Nashua, NH

The City of Nashua, NH was seeking a way to promote its actions to the community. Without a sustainability office or plan, the City had focused primarily on simply taking action, but struggled to share those actions with the community. KLA worked with Nashua to assess the various actions they have been taking, collect the data showing the value of those actions, and utilized the KLA storytelling framework to highlight those actions in a way that would engage the community. Once the dashboard was completed, the City asked KLA to develop a GPC compliant community wide greenhouse gas emissions inventory. Project activities and deliverables included:

- Global Protocol for Community Wide Greenhouse Gas Emissions Inventories (GPC) compliant greenhouse gas emissions inventory;
- Facilitated in-person stakeholder meeting to identify and prioritize indicators;
- Designed online site that mimics City’s existing site and highlights key data sets with easily understood explanations that turn data into a story and motivate behavior change;
- Developed brand and logo for Livable Nashua Program, as well as Public Engagement Strategy centered around the dashboard;
- Weekly news feed updates and social media content to promote site;
- Monthly tracking of site analytics and general performance.

Client: City of Nashua, NH

Contact: Sarah Marchant | marchants@nashuanh.gov | (603) 589-3095

Medford Climate Change Messaging and Engagement

Medford, MA



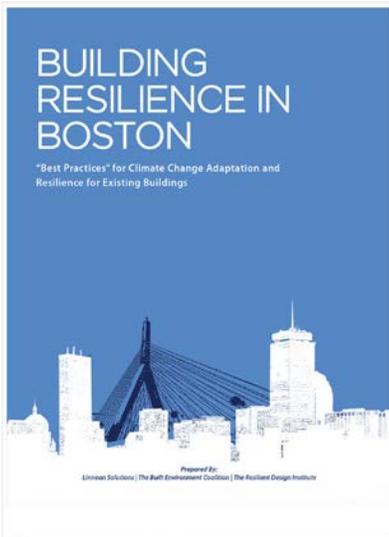
GO GREEN | Medford

The “Go Green Medford” website will soon house new content, data, and metrics about climate action in Medford

The City of Medford is currently in the final stages of developing a Climate Change Vulnerability Assessment (CCVA), and has begun the initial stages of climate change adaptation planning. Linnean is working with the City of Medford Office of Energy and Environment throughout this process, helping with a variety of services that will help make information around climate change, vulnerability and risks, and adaptation strategies more accessible to Medford’s diverse communities. Currently, Linnean is providing content development support and recommendations on language, data, and graphics in the city’s CCVA, as well as working with the Office of Energy and Environment to update the city’s website to include new language, data, and metrics about climate adaptation and mitigation. These recommendations and updates will fit into a broader engagement and messaging strategy, which will help the City of Medford effectively share information, resources, and news about the city’s climate adaptation and mitigation efforts, as well as work collaboratively with Medford residents and organizations in an ongoing way. Linnean led the design of this community engagement strategy, and will help launch the strategy through in-person activities and workshops.

Client: City of Medford, MA

Contact: Alicia Hunt, Director of Energy and Environment | (781) 393-2137 | ahunt@medford-ma.gov



Resilience planning report for the City of Boston and Green Ribbon Commission

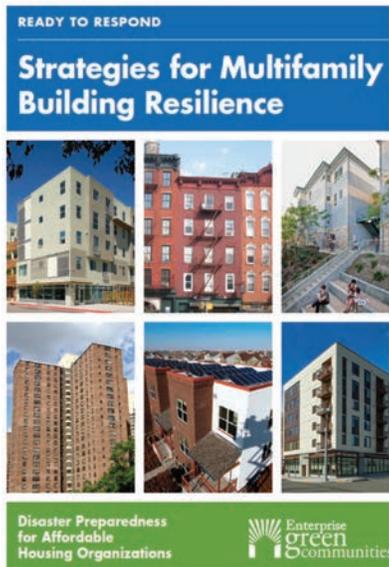
Climate Adaptation: Building Resilience in Boston

Boston, MA

Linnean co-developed the well-regarded report “Building Resilience in Boston” to advise the City of Boston on climate adaptation strategies for improving resilience of existing physical assets in Boston. To establish best practices related to city resilience, Linnean drew from national and international research, publications, and planning documents, as well as conducted extensive interviews with local experts. A comprehensive list of resilience solutions was compiled and formatted in the form of “tear-sheets” to provide policy-makers, architects, engineers, and the community at large with a single source of practical resilience solutions. The report also highlighted programs and policies that local organizations and governments can employ to mitigate vulnerability, including assessing neighborhood-level vulnerability, as measured by geologic, socio-economic, cultural, natural, and demographic indicators. See: goo.gl/tal3QC.

Client: City of Boston, MA and Boston Green Ribbon Commission

Contact: Carl Spector, Commissioner of the Environment for City of Boston | Carl.Spector@cityofboston.gov | 617-635-3850



Strategies for improving resilience for the multifamily housing sector

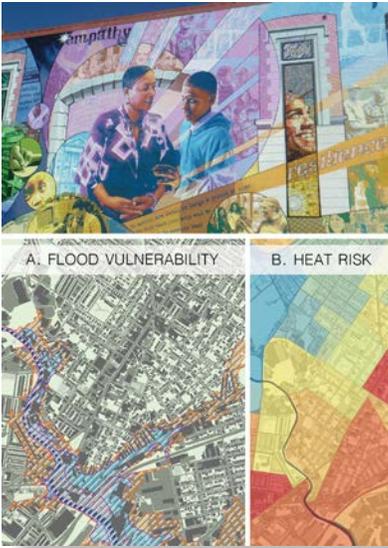
Climate Adaptation: Strategies for Multifamily Building Resilience

National scale tool

Linnean worked with Enterprise Community Partners on the development of a resilience manual for multifamily affordable housing that offers a comprehensive set of strategies to make affordable housing properties less vulnerable to climate change. Enterprise compiled 56 property damage assessments from sites affected by Superstorm Sandy in New York. From these reports, Linnean compiled actual costs associated with building damage and retrofit upgrades, and evaluated a set of strategies based on their applicability to multifamily affordable housing, effectiveness against a range of disasters, cost of installation, and feasibility of implementation. To support this analytical process, Linnean engaged a large number of NYC’s affordable housing and resilient design practitioners, including building managers, architects, engineers, planners, and policymakers. FEMA participated in the editorial review process, and acknowledged the importance and groundbreaking nature of this resilience manual. See the report at: <https://goo.gl/DdNkKb>.

Client: Enterprise Community Partners

Contact: Laurie Schoeman, Enterprise Community Partners | (212) 284-7156 | lschoeman@enterprisecommunity.org



Vulnerability assessments and resilience planning for the Philadelphia Housing Authority

Resilience Planning: Philadelphia Housing Authority

Philadelphia, PA

Linnean conducted vulnerability assessments and developed resilience reports for forty-seven properties (hundreds of facilities) for the Philadelphia Housing Authority. The process included conducting on-site facility audits; mapping and analyzing climate vulnerabilities and other physical, environmental, and human-induced hazards; interviewing facility managers and residents; and recommending critical resilience upgrades to building designs, infrastructure, and mechanical systems. Accompanying the facility reports, Linnean developed an organizational report for the agency that provides comprehensive solutions for new policies, programs, and partnerships to increase the resilience of the agency to climate change and other citywide acute and chronic hazards. Recommendations covered design, operation, maintenance, and financial planning for investments, as well as frameworks for external partnerships and improved resident engagement, health, and wellbeing.

Client: Philadelphia Housing Authority

Contact: Barbara Moore, Sustainability Coordinator, PHA | (215) 684-5798 | barbara.moore@pha.phila.gov



Snow storm on Trincroft Street, Medford (2016)

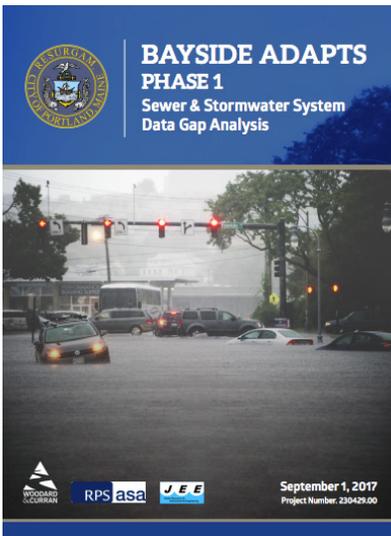
Resilience-based Hazard Mitigation and Emergency Management

Medford, MA

Linnean is working with the City of Medford Board of Health to help align Medford's emergency management and hazard mitigation efforts with the city's climate resilience planning. These services build on findings emphasized during the City's Municipal Vulnerability (MVP) Workshop (March 7, 2018), as well as expand upon and strengthen the city's current efforts to identify and reach vulnerable populations, particularly with respect to reducing the impact of hazards from climate change. This work supports future updates to the Emergency Management Plan (2004) and Hazard Mitigation Plan (2017), enhances alignment between the Office of Energy and Environment and the Board of Health, and begins to help the City integrate resilience thinking into its emergency management and hazard mitigation planning.

Client: City of Medford, MA

Contact: Mary Ann O'Connor, Director of Medford Board of Health | (781) 393-2565 | moconnor@medford-ma.gov



Bayside Adapts Phase 1: Stormwater System Data Gap Analysis

Portland, ME

Flooding has been a problem in Portland's Bayside area for decades. The low-lying neighborhood is susceptible to flooding during high tides, and when coupled with heavy rain, these conditions worsen. The City and its partners are identifying the key information and tools necessary to assist in addressing today's issues and to adapt to tomorrow's changing climate. To date, numerous initiatives, studies and processes have analyzed and projected the coastal impact of storm surge and sea level rise in the northeast region. The information available is from many different sources and not necessarily analyzed specifically for the City of Portland. To improve the City's understanding of this information and be able to utilize it effectively, Woodard & Curran collaborated with the City to use a multi-disciplinary approach to bring together the big picture potential changes to our City's climate with an in depth look at what information the City needs to improve their knowledge of the sewer and stormwater infrastructure assets. In addition to identifying the planning scenarios for sea level rise, numerous Portland-specific storm surge and precipitation tables were developed to aid in future modeling and planning. These climate change tables, combined with sewer and drain system information, ground surface information, and other model inputs, will help plan the adaptation strategies for Bayside. The final product details what is known about the drainage system in Bayside and details recommended next steps for closing the data gaps.

Client: City of Portland, ME



Increasing Coastal Resiliency by Mapping Inundation Pathways

Provincetown, MA

Woodard & Curran worked closely with Provincetown to identify critical facilities and infrastructure, conduct a detailed risk assessment, identify vulnerabilities, and help prioritize mitigation projects and adaptation strategies for the community. Provincetown is a coastal community located on a narrow peninsula at the tip of Cape Cod surrounded by Cape Cod Bay and the Atlantic Ocean. With the amount of ocean exposure, the community has significant vulnerabilities due to natural hazards, major storm events and sea level rise (SLR). Provincetown was awarded a grant for this project from the Massachusetts Coastal Zone Management program. One unique aspect of the project focused on preparing site-specific GPS surveys and exploring the horizontal extents of documented flood elevations associated with coastal inundation (referred to as Storm Tide Pathways in the final report) to help minimize uncertainties associated with SLR projections. The project included the installation of an interactive tide gauge as well. Each component of the project was designed with the overall intent of better informing public education and outreach efforts associated with the vulnerabilities of the community. During the course of this project, Provincetown was also working with the Cape Cod Commission to update its local Hazard Mitigation Plan. Woodard & Curran provided input during this process and contributed to the risk analysis used for the final report.

Client: Town of Provincetown, MA



FEMA Grant-Funded Flood Prevention Infrastructure

Quincy, MA

The City of Quincy experienced devastating floods during several rainfall events in March 2010, resulting in over a million dollars in public damages and untallied private damages. Woodard & Curran is leading the effort to implement the necessary infrastructure to eliminate flooding within these West Quincy neighborhoods up to the 25-year 24-hour storm event. These improvements include:

- A new pumping system to convey stormwater that cannot drain freely to Furnace Brook, due to Furnace Brook surcharging during storm events and flowing back into the project area. The pumped stormwater will be conveyed to a point downstream in Furnace Brook via a force main;
- A new diversion pipe to convey stormwater directly to Furnace Brook;
- The construction of new surface collection structures and closed conduit gravity drain pipes to convey stormwater to Furnace Brook and the pumping system; and
- The installation of backflow check valves to prevent stormwater from flowing back from Furnace Brook into the gravity drain pipes and surcharging the drainage areas.

The finish floor of the pump stations and top of the wet well are designed to be at an elevation of one foot above the 100-year flood elevation. This infrastructure, along with the cleaning of the Brook, will alleviate the frequency, duration, and extent of flooding in the project area.

Client: City of Quincy, MA



Wastewater System Improvements & Flood Resiliency Evaluation

Warren, RI

Woodard & Curran has provided several wastewater system improvement and flood resiliency services to the Town of Warren. Our work includes completion of a multi-phase sewer system evaluation survey (SSES) and phased reconstruction program to remove infiltration and inflow (I&I), replacement of the Town's main interceptor, Town-wide facility planning, and design of a \$20M WWTF upgrade. The WWTF upgrade design involved conducting an evaluation of resiliency to SLR and future climate change using the model projections from the U.S. Army Corp North Atlantic Coast Comprehensive Study, 2016 Revised NEIWPC TR-16 manual, STORMTOOLS, a site specific model refinement by RPS of the STWAVE analysis by URI, NOAA SLR projections, and guidance from RIDEM. The flood resiliency evaluation included an STWAVE analysis and a structural analysis to compare the cost/benefits of repair and replacement versus structural improvements to the primary sludge pump station and the intermediate pump station and secondary gallery. Our recommendations included moving critical electrical and controls equipment above future flood elevations and replacing the plant's main pump station with dry-pit submersible pumps. Our evaluation considered cost-benefit evaluation, as well as implementation measures, incorporated into the upgrades to provide operational flexibility for better response and recovery after flooding conditions occur.

Client: Town of Warren, RI



Water Pollution Control Facility (WPCF) Resiliency

Hull, MA

Over 22 coastal storms have resulted in floods that have damaged property in Hull over the last 30 years. The Town's water pollution control facility (WPCF) is surrounded by the Atlantic Ocean and with a front door elevation of 12 feet, it has been severely impacted by storm events. Having a resilient and clear plan in place to manage future flood events is part of our work for this client. Woodard & Curran updated the Town's high flow management plan, and implemented a mock storm drill to evaluate the plan's effectiveness. Since the initial storm drill, the facility in Hull has adopted a culture of continuous improvement by empowering operators to identify and implement constructive changes after every storm event. Woodard & Curran is working closely with Hull to evaluate resiliency upgrades at the WPCF (includes use of EPA's CREAT tool), implement repair and replacement of critical assets, evaluate process modifications for efficiency improvements and provide stormwater system support. These planning projects, in combination with collection system resiliency improvements for infiltration/inflow/exfiltration prevention, demonstrate the Town's focus on building more resilient facilities and improving return-to-operation time after major storm events occur.

Client: Town of Hull, MA



Climate Change Implications for Wastewater Infrastructure

Rhode Island

The Rhode Island Department of Environmental Management (RIDEM) is working in collaboration with the Rhode Island Bays, Rivers, and Watersheds Coordination Team (RI BRWCT) to integrate climate change considerations into future wastewater facility systems planning. RIDEM hired Woodard & Curran to evaluate the implications of climate change on all wastewater treatment and infrastructure systems in the state. Woodard & Curran is working directly with the wastewater facility operators to understand and assess the climate change-related risks to their treatment facilities, pump stations, and combined sewer overflows. Coastal and riverine models will be used to predict hazards from sea level rise, coastal erosion, waves, and coastal and riverine flooding. Woodard & Curran's scope of work includes developing a risk analysis matrix for each WWTF to prioritize those components subject to the greatest overall risk, including regulatory, age-related, and growth/expansion risks as well as those associated with sea level rise and storms. Woodard & Curran will then recommend climate change-adaptive strategies that the communities can incorporate into their Wastewater Facilities Plans. Individual facility profiles with educational outreach materials and fact sheets will be developed to promote awareness among community residents and public officials and to facilitate future discussions.

Client: Rhode Island Department of Environmental Management (RIDEM)

Additional Projects in Portland and South Portland

City of Portland, ME – Engineering Services. Woodard & Curran has served the City's multi-year engineering services contract since 2005, working with City's Department of Public Works, Parks & Recreation, Public Buildings Department, Economic Development Office, and Planning Department. Work includes sanitary and storm sewer planning and design; SSES and CMOM program development; streetscape and roadway infrastructure design; athletic facilities; parks and recreation facilities; bicycle/pedestrian facility planning, permitting and design; SCADA services; development peer review; water resources planning including watershed management planning and stormwater utility development work; land-use/environmental permitting; funding assistance; and consulting on a broad range of municipal issues.

City of South Portland, ME – Engineering Services. Woodard & Curran has served the City's multi-year engineering services contract since 2014, working with the City Manager's Office, Water Resources Protection, and Planning and Development departments. Work includes utility asset management program development; SCADA services; structural and electrical engineering at the City's wastewater treatment facility; development peer review; and consulting on a broad range of municipal issues.

City of Portland, ME – Stormwater Technical Standards. Utilizing the City's existing Section V, Stormwater Management Standards as a baseline document, Woodard & Curran rewrote the existing Stormwater Management Standards to include references and standards consistent with State of Maine Chapter 500 Stormwater Rules. We also incorporated Urban Best Management Practices and Green Infrastructure - Low Impact Development considerations into the Standards.

City of Portland, ME – Green Infrastructure Technical Standards. Woodard & Curran developed specific green infrastructure design standards for the City of Portland's Technical Design Standards and Guidelines. We developed standard details and specifications for City staff, City consultant teams, and the private development community to incorporate standardized green infrastructure design practices into projects with improvements proposed within the Municipal Right-of-Way.

City of Portland, ME – Stormwater Utility Development. Woodard & Curran worked to develop a City-wide stormwater utility, applying stormwater user fees as a mechanism to fund Portland's stormwater and combined sewer overflow abatement programs. The work included leading a consultant team to complete current and future/forecast program cost analyses, financial modeling, rate study evaluations, billing and data analysis, and public outreach.

City of Portland, ME – Stormwater Finance Outreach Plan and Implementation. The City is engaged in a process to evaluate stormwater user fees as a mechanism to fund its stormwater and combined sewer overflow abatement programs. This project will enable the City to maximize the effectiveness of stormwater funding outreach based on public perception surveys, business focus groups, and a review of regional and national outreach literature on the subject of stormwater utilities. This project is a result of W&C identifying grant funding opportunities and securing the federal grant funds.

City of Portland, ME – Stormwater Program Cost Evaluation. Woodard & Curran evaluated the condition of City stormwater infrastructure, as a basis for development of infrastructure remedial maintenance and replacement costs. The project included the acquisition of field data, cost estimating and database development and also included an evaluation of the City's stormwater compliance program. The cost evaluation project supports the City's efforts as they consider various options for sustainable stormwater financing.

City of Portland, ME – Integrated Stormwater/Wastewater Rate Structure Evaluation. Woodard & Curran evaluated the condition of city stormwater infrastructure as a basis for development of infrastructure remedial maintenance and replacement costs to be included in rate structure evaluation. The project included the acquisition of field data, cost estimating, database development, and included an evaluation of the city's stormwater compliance program. The rate structure project will support the City as they consider various options for sustainable stormwater financing and included public outreach planning and implementation, rate studies for new sanitary and stormwater fee structure, credit policy and manual and stormwater program development.

City of Portland, ME – Wastewater System CMOM. Woodard & Curran helped Portland increase efficiency and minimize the lifecycle cost of sanitary and combined sewer systems through a comprehensive assessment and development of a Capital Improvement Plan (CIP). The effort applied performance improvement, Capacity, Management, Operations and Maintenance (CMOM) principals as well as advanced Asset Management and Effective Utility Management (EUM) techniques developed to minimize operations, maintenance and capital renewal costs. The effort generated both short (1-5-year horizon) and long term (20 years) CIP, operations and organizational plans, as well as recommendations to improve the value of their GIS and computerized maintenance management system (CMMS) - CityWorks systems. In part because of this work, the City has addressed I/I sources, reduced maintenance costs for the collection system, reduced emergency maintenance costs, improved its ongoing maintenance and inspection program, and reduced Sanitary Sewer Overflows (SSO).

City of Portland, ME – Business Case Study Evaluation. Woodard & Curran developed the City's first Business Case Study (BCS) framework and subsequently applied the BCS framework to evaluate the Curtis Road wastewater pump station upgrade project. The BCS involved identification of project drivers, objectives, and an alternative analysis based on evaluation methodology that included direct costs as well as non-cost factors; non-cost factors related to consideration for the environmental and social impacts of each alternative. The BCS provided a 30-year Net Present Value for each of the alternatives and matrix of non-cost factors, providing an objective Business Case alternatives selection tool.

City of Portland, ME – Design-Build Curtis Road and Franklin Street Pump Station Upgrade. Woodard & Curran is leading the Progressive Design-Build of pump station upgrades for the replacement of the Curtis Road Pump Station and renovation of the Franklin Street Pump Station. This is the City of Portland's first infrastructure project delivered through Progressive Design-Build delivery method and is being evaluated as a model for future infrastructure project delivery.

City of Portland, ME – Western Promenade Sewer Evaluation. Woodard & Curran evaluated combined sewer back-up issues in the Western Promenade Neighborhood of Portland. Project included data collection, data evaluation, and developing recommendations to reduce sewer backup issues in the neighborhood. Data and recommendations were summarized within a report and presented to the Western Promenade Neighborhood Association.

City of Portland, ME – Drainage System Master Plan. Woodard & Curran developed a comprehensive plan to address stormwater system (drainage collection system and major cross culverts) capital, operations and maintenance, program management, and regulatory compliance needs. This project identified capital investment and infrastructure renewal plans and appropriate long-term management strategies to address ongoing operations and maintenance, stormwater compliance requirements, and rehabilitation and replacement needs for defensible and prioritized cost estimates for annual budgeting, staffing, and operational expenditures.

City of Portland, ME – Capisic Brook Watershed Management Plan. Woodard & Curran developed an integrated, watershed-based strategy for the restoration of the urban impaired Capisic Brook. The project included the acquisition of a \$100,000 grant through the EPA 604(b) planning grant program. The planning project included a targeted structural stormwater retrofit inventory, a social marketing strategy for outreach to residential landowners, a municipal financing plan, and a stormwater ordinance review.

City of Portland, ME – Capisic Pond Restoration. Woodard & Curran led the study, pre-permitting, and investigation of restoration alternatives for the urban pond. The project included pond sediment analysis for beneficial reuse, public meetings and facilitation, wetland enhancement plan, and critical outfall runoff control and abatement. The award-winning project has been met with broad praise from the neighborhood surrounding the pond.

City of Portland, ME – Clean Water Act Needs Assessment. Woodard & Curran supported the development of a shared vision for the new Water Resources Division within the City, and developed a summary document and schedule of the City's Clean Water Act (sanitary sewer, combined sewer and stormwater) obligations. W&C team members facilitated a series of workshops with Public Works Engineering and Water Resources Division staff, wastewater operations staff, City Purchasing Office, and Public Works Finance Team to develop a shared vision and focus around the City's Clean Water Act obligations. In addition to helping the Division build camaraderie and a shared understanding across the City around its obligations, the result of the effort was a comprehensive calendar (in MS Project) inclusive of administration, funding and finance, clean water programs and capital projects obligations.

City of Portland, ME – Sewer Separation Projects. Woodard & Curran led the development of more than 10 miles of new storm drain and sanitary sewer systems on numerous residential, commercial and industrial streets in Portland, ME. Projects included stormwater modeling and the development of design plans and specifications for separated storm drain, sanitary sewer, roadway repairs and reconstruction, and green infrastructure stormwater treatment systems.

References for Portland and South Portland Climate Action and Adaptation Planning Services

Project: Northampton Resilience and Regeneration Plan

Service Provider: Linnean Solutions and Kim Lundgren Associates

Client: City of Northampton, MA

Contact: Wayne Feiden, Director of Planning and Sustainability

Phone: (413) 587-1265

Email: wfeiden@northamptonma.gov

Project: Medford Climate Vulnerability Assessment & Climate Engagement Strategy

Service Provider: Linnean Solutions

Client: City of Medford, MA

Contact: Alicia Hunt, Director of Energy and Environment

Phone: (781) 393-2137

Email: ahunt@medford-ma.gov

Project: Building Resilience in Boston Report

Service Provider: Linnean Solutions

Client: City of Boston, MA and Green Ribbon Commission

Contact: Carl Spector, Commissioner of the Environment

Phone: (617) 635-3850

Email: Carl.Spector@cityofboston.gov

Project: "Getting to Net Zero" Roadmap

Service Provider: Integral Group

Client: City of Cambridge, MA

Contact: Susanne Rasmussen, Director of Environmental and Transportation Planning

Phone: (617) 349-4607

Email: srasmussen@cambridgema.gov

Project: District of Columbia Comprehensive Energy Plan

Service Provider: Integral Group

Client: The District of Columbia Department of Energy and Environment

Contact: Edward Yim, Department of Energy and Environment

Phone: (202) 299-3339

Email: edward.yim@dc.gov

Project: SA Tomorrow Sustainability Plan

Service Provider: Kim Lundgren Associates

Client: City of San Antonio, TX

Contact: Eloisa Portillo-Morales, Sustainability Planning Manager

Phone: (210) 207-6322

Email: Eloisa.Portillo-Morales@sanantonio.gov

PART F: PROJECT PERSONNEL

PROJECT LEAD

LINNEAN SOLUTIONS	
Jim Newman <i>Project Director</i>	(30%, 56 hours)
Ian Johnson Holly Jacobson	(30%, 94 hours) (50%, 395 hours)

SUBCONSULTANTS (Managed by Linnean Solutions)

Integral Group	Kim Lundgren Associates	Woodard & Curran	Milone & MacBroom
Bill Updike (20%, 62 hours) <i>Integral Director</i>	Kim Lundgren (30%, 82 hours) <i>KLA Director</i>	Mary House (20%, 11 hours) <i>W&C Director</i>	Carl Eppich (20%, 78 hours) <i>MMI Director</i>
Rachel Moscovich (30%, 24 hours) Marshall Duer-Balkind (40%, 271 hours)	Annie Strickler Suttle (30%, 33 hours) Jennifer Dudgeon (10%, 74 hours) Kara Runsten (50%, 223 hours) Amanda Kohn (10%, 58 hours)	Mary McCrann (20%, 96 hours) David White, Jr. (20%, 31 hours)	

ADVISORS (Managed by Linnean Solutions)

Chanel Lewis	Dylan Voorhees	James Kostaras	Jay Waterman	Julie Wormser	Lisa Fernandes	Lorenzo Macaluso
--------------	----------------	----------------	--------------	---------------	----------------	------------------

Organizational Chart of project personnel

Percentages indicate the proportion of staff time each team member has available for the project. All team members' workloads allow the project team to meet designated deadlines.

Hours indicate the number of hours each team member has allotted for the project. For resumes of project personnel, please see the Appendix.



JIM NEWMAN,
LEED AP (O&M), EcoDistrict AP;
LENSES Facilitation Certified &
Trainer

Mr. Jim Newman, Principal, Linnean Solutions

Jim will serve as the Project Director and point person for all communications with the Cities of Portland and South Portland. He will oversee the development and production of the Climate Action and Adaptation Plans, including all preceding and subcomponent deliverables.

Jim Newman is the founder and Principal at Linnean Solutions, based in Cambridge, MA and Portland, ME. As a leading professional in climate mitigation and adaptation strategies, Jim's work includes resilience analysis, policy, and design standard development; municipal planning; carbon mitigation planning and life cycle assessment; sustainability and resilience building certification; EcoDistrict planning and management; and stakeholder engagement processes to strengthen communities. As a Living Environments in Natural, Social, and Economic Systems (LENSES) Facilitator and Trainer, Jim regularly leads community planning workshops, and trains others in becoming effective facilitators. Jim is a founding board member of the Resilient Design Institute, and a key author of several influential resilience reports and tools—including the *Building Resilience in Boston* report and the Enterprise Community Partners' *Ready to Respond: Strategies for Multifamily Building Resilience* manual. Jim helped found the Massachusetts Chapter of the US Green Building Council and held the position of Chair of the Board of the Chapter for two years. Previously, Jim worked as the Director of Strategy at BuildingGreen. With this expertise, he has supported municipalities, districts, organizations, and agencies develop climate strategies across the US.



IAN JOHNSON,
Living Future Accredited,
LEED AP (Homes/BD+C)

Mr. Ian Johnson, Senior Director, Linnean Solutions

Ian will play a lead role in the development of climate mitigation and adaptation strategies, as well as in the facilitation of the Steering Committee.

Ian Johnson has 15 years of experience in industries ranging from construction project management to environmental analysis and sustainable design. He has led numerous projects through building certification, including LEED v4 for Homes, Building Design and Construction, Core and Shell, Neighborhood Development, as well as Passive House, and WELL, and with this experience brings expertise in high performance building strategies, energy policy, and approaches to advancing sustainability outcomes through zoning and building codes. Ian is a member of the Portland Climate Action Team (PCAT) and the Portland Resilience Hub. Prior to joining Linnean Solutions, Ian was the Founder and Principal of Signature Sustainability, based in Portland, Maine. He is a Certified Passive House Consultant, as well as being Living Future Accredited. Ian holds a Master of Arts in Energy and Environmental Analysis from Boston University.



HOLLY JACOBSON,
LEED Green Associate;
LENSES Facilitation Certified

Ms. Holly Jacobson, Resilience Consultant, Linnean Solutions

Holly will support the development of climate mitigation and adaptation strategies, and support facilitation of the Steering Committee. She will also manage the production of the Climate Action and Adaptation Plans.

Holly Jacobson guides local governments, institutions, developers, and organizations in developing climate action, adaptation, and resilience plans and strategies. Most recently, Holly is leading the development of the Resilience and Regeneration Plan and stakeholder workshops for Northampton, MA; design and development of the City of Medford's Climate Change Vulnerability Assessment and coordinated community engagement; process facilitation for an EcoDistrict pursuing district-scale sustainability investments; and organizational resilience planning and assessment for the 80,000-resident Philadelphia Housing Authority. Holly further brings experience in metrics, indicators, and co-benefits frameworks specifically applied to climate action planning. Prior to Linnean, Holly supported environmental planning research and community planning processes in Utah, including drafting and ushering in Salt Lake City's first executive order for integrating green infrastructure into capital projects. Holly has a master's degree in City Planning with certification in Environmental Policy and Planning from Massachusetts Institute of Technology, and a Bachelor of Arts degree from Bowdoin College.

Integral Group



BILL UPDIKE,
North American Board of Certified
Energy Practitioners (NABCEP)
Certified

Mr. Bill Updike, Principal, Integral Group

Bill will lead the baseline greenhouse gas inventories, the community energy and emissions modeling, and the development of climate action strategies. He will play a lead role in developing the Climate Action and Adaptation Plans and will oversee all materials developed by the Integral Group team.

Bill Updike has been a passionate advocate for climate, green building and environmental policy for decades, and is recognized as a national leader in green building, urban sustainable development and climate planning and programs. Bill has a diverse career background—including serving as Chief of the D.C. Department of Energy and Environment for six years, where he spearheaded green building and climate policy. Additionally, Bill has led project management for a renewable energy company, construction management for a deep green design/build firm, sales for a green building supply company, and, in the early part of his career, environmental journalism for two national magazines. This uniquely varied background has allowed Bill to gain expertise in sustainability and climate planning, programs, and policy development, green building strategies and solutions, and renewable energy deployment. Having worked in all sectors—private, government, and non-profit—he understands the challenges of budgets, time limitations, and the need for effective and efficient project delivery. Bill's extensive work on green building, energy, and climate mitigation and adaptation has earned him multiple awards including a Living Building Challenge Hero Award (from the International Living Future Institute) and a BOLD Award at Greenbuild in 2015.



RACHEL MOSCOVICH,
LEED AP

Ms. Rachel Moscovich, Associate, Integral Group

Rachel will support development of the greenhouse gas inventories and the development of climate action strategies. She will support the analysis of costs and benefits and study of co-benefits, with a focus on the waste sector.

Rachel Moscovich is a planner, strategist, and project manager who has worked for over ten years in sustainability and resiliency planning, green building, and corporate sustainability. Her experience ranges from research and analysis to policy development to program design and implementation. A skilled writer, Rachel has authored a variety of policy reports, white papers and articles on sustainability and urban design. She has also worked for city government, and managed waste reduction policies for the City of Vancouver. Rachel's ability to collaborate and coalesce a range of ideas and competing priorities makes her an effective project manager. She has the proven ability to see projects through from conceptualization to implementation and refinement. With extensive training and practical experience in urban planning, green building and sustainable business, Rachel brings a broad understanding of current sustainability issues and solutions in the public and private sectors.



MARSHALL DUER-BALKAND

Mr. Marshall Duer-Balkind, Sustainability Analyst, Integral Group

Marshall will be the energy modeler and a researcher for this project. He will conduct the greenhouse gas inventories, lead the community-scale energy and greenhouse gas emissions modeling, conduct research and analysis, and assist with project management and report writing.

Marshall Duer-Balkind has seven years' experience managing data-driven energy and climate plans and programs for the District of Columbia Government and the Institute for Market Transformation. His work includes comprehensive climate and energy action planning; oversight of Evaluation, Measurement, & Verification (EM&V) of energy efficiency and renewable energy programs; and implementing one of the nation's first Energy Benchmarking and Transparency programs. Marshall has broad experience in climate mitigation, climate resilience, energy efficiency, green building, urban planning, and environmental justice. He is experienced at applying a wide range of quantitative techniques to energy and climate data analysis, coupled with a critical eye for quality and reliability. He has applied his background in computer science to provide effective management of multiple software and data science projects, and has served as a technical advisor to the U.S. Department of Energy and the U.S. Environmental Protection Agency.



KIM LUNDGREN

Ms. Kim Lundgren, Chief Executive Officer, Kim Lundgren Associates

Kim will lead the public engagement process, as well as support the Steering Committee engagement process and visioning, goals, and framework development. She will also oversee all deliverables produced by the KLA team.

Kim Lundgren is the Chief Executive Officer of Kim Lundgren Associates, Inc., a woman-owned, benefits corporation that delivers solutions to create sustainable communities. Kim has nearly 20 years of professional experience, the last 16 of which have been spent working with local governments to design, secure funding for, implement, and evaluate sustainability programs focused on climate change adaptation and mitigation. As an early municipal sustainability pioneer, Kim developed the first climate action plan in Massachusetts and one of the first municipal climate adaptation plans in the country. As an experienced facilitator and strategist, Kim promotes a comprehensive approach to sustainability planning that encourages deep stakeholder engagement and the tracking of key sustainability indicators. Previously, Kim was the Director of Sustainability at Vanasse Hangen Brustlin, Inc. and the U.S. Services Director at ICLEI-Local Governments for Sustainability. In both positions, Kim secured millions of dollars to build new teams and offices focused on delivering climate and sustainability programs to hundreds of local governments throughout the country.



ANNIE STRICKLER SUTTLE

Ms. Annie Strickler Suttle, Communications Manager, Kim Lundgren Associates

Annie will play a lead role in the public engagement processes, and in the development of public messaging and infographics.

Annie Suttle has more than 10 years' experience in media and communications for nonprofits, most recently as Communications Director for the Local Energy Alliance Program in Charlottesville where she facilitated their marketing initiatives around residential and commercial energy efficiency. Previously, as Communications Director at ICLEI-Local Governments for Sustainability USA, she oversaw their initiatives to promote the climate, energy, and sustainability actions of cities and counties and to brand ICLEI USA as the premier organization supporting those leaders. Prior to ICLEI, Annie worked for six years at the Sierra Club where she held various positions, including Deputy Press Secretary. There she led media efforts on issues such as clean energy, coastal protection, wild forests, endangered species and the Arctic National Wildlife Refuge. She also worked on political campaigns in Arizona, Florida, Pennsylvania and Oregon. She earned her M.A. in Mass Communication at the University of Florida and her undergraduate degree at the University of the South (Sewanee).



JENNIFER DUDGEON

Ms. Jennifer Dudgeon, Client Service Manager, Kim Lundgren Associates
Jennifer will play a lead role in the public engagement processes, as well as support the Steering Committee engagement and visioning, goals, and framework development.

Jennifer Dudgeon has spent nearly 20 years working with governments and industries to identify opportunities to both reduce conventional energy generation and associated greenhouse gases (GHG). She was one of the first analysts to develop automated tools to calculate GHG emissions. All of her GHG inventories have been in compliance with relevant protocols and many have been successfully verified by third parties. In addition to her GHG footprint efforts, she has been a key partner in integrating sustainability principles throughout several multi-national Fortune 500 companies. She has also helped local, federal and international governments make more informed policy decisions around energy generation and related environmental policies. In 2013, she was recognized as one of the top female leaders in corporate social responsibility. Jennifer holds a Global Reporting Initiative (GRI) G4 certification, and is a regular guest lecturer at Harvard University where she shares her experience implementing sustainability programs in large organizations.



KARA RUNSTEN

Ms. Kara Runsten, Sustainability Specialist, Kim Lundgren Associates
Kara will play a lead role in the public engagement processes, as well as support the Steering Committee engagement and visioning, goals, and framework development.

Kara Runsten is a Sustainability Specialist at Kim Lundgren Associates, Inc. In this role, she works with KLA's local government clients on public engagement programs and training for climate action and sustainability planning projects, most recently for the cities of Indianapolis, IN and Northampton, MA. Prior to joining KLA, Kara worked for the City of Boston as the manager of a pilot round of the Climate Ready Boston Leaders program, an outreach program that trained 70 community leaders to spread awareness about climate preparedness to their coworkers, friends, and neighbors. Prior to this, she spent two years at Meridian Institute where she worked on domestic ocean policy projects, including Mid-Atlantic Regional Ocean Planning and the Joint Ocean Commission Initiative. Kara has a Masters in City Planning from the Massachusetts Institute of Technology and a B.A. in Public Policy from Stanford University.



AMANDA KOHN

Ms. Amanda Kohn, Sustainability Specialist, Kim Lundgren Associates
Amanda will play a lead role in the public engagement processes, as well as support the Steering Committee engagement and visioning, goals, and framework development.

Amanda Kohn joined Kim Lundgren Associates, Inc. as a Sustainability Specialist in 2018. She brings a strong background in data visualization and research to support KLA, local government clients, including Concord, MA and San Antonio, TX. Prior to joining KLA, Amanda worked as a GIS Research Analyst at the Public Health and Community Medicine Department at Tufts University. She developed online interactive maps of family resources across Massachusetts for the Children's Trust along with several internal maps to support decision-making. Prior, Amanda worked for the Stockholm Environment Institute on a

visualization tool for the United National Environment Management Group (UN EMG). She has been invited to Geneva, Switzerland twice to present at the 2017 UN EMG Nexus Dialogues. Amanda has a MS in Urban and Environmental Policy and Planning from Tufts University, Medford, Massachusetts and a BA in Biology, Environmental Science and Sociology from Coe College, Cedar Rapids, Iowa.

Woodard & Curran



MARY HOUSE

Ms. Mary House, Senior Principal, Woodard & Curran

Mary will play a lead role in the climate risk vulnerability assessment, as well as the development of infrastructural and environmental resilience and adaptation strategies. She will also oversee all deliverables produced by the Woodard & Curran team.

Mary House is a Senior Principal at Woodard & Curran and has been managing complex programs and projects for municipal and private clients for over 20 years. Mary co-leads Woodard & Curran's resiliency practice and has been extensively involved in climate change and hazard mitigation projects completed under FEMA and comparable state programs. As a result, she has an in depth understanding of federal regulations and guidance related to hazard mitigation planning. Mary has been involved in grant application development and administration, emergency management and hazard mitigation planning, and the identification of cost-effective and beneficial mitigation actions. She routinely works closely with diverse stakeholder groups to facilitate workshops, develop plans, engage resources, develop innovative solutions to complex issues, and deliver projects on time and within budget. Mary formerly led Woodard & Curran's Geographic Information Systems and Environmental Information Systems and Energy Efficiency and Sustainability groups. Mary is a technical advisor in the Climate Category for the Association for the Advancement of Sustainability in Higher Education's Sustainability, Tracking and Assessment Rating System.



MARY MCCRANN
American Institute of Certified
Planners (AICP)

Ms. Mary McCrann, Senior Planner, Woodard & Curran

Mary will support the climate risk vulnerability assessment, as well as the development of infrastructural and environmental resilience and adaptation strategies.

Mary McCrann has over 15 years of experience in Community Planning and Development and is the lead Planner for Woodard & Curran's resiliency practice. She has been extensively involved in sea level rise, climate change and hazard mitigation projects completed under FEMA guidance and other comparable state programs throughout New England. As a result, she has an in depth understanding of federal regulations and guidance related to hazard mitigation planning. In addition, Mary's work has focused on conducting due diligence/feasibility studies, obtaining local/state and federal permitting approvals and evaluating projects for consistency with regulatory and permitting requirements. She frequently conducts zoning and permitting regulatory reviews for

projects and works with clients on various projects such as Hazard Mitigation Planning, Redevelopment initiatives, potential Renewable Energy opportunities, Master Plans, Affordable Housing Studies and Open Space and Recreation Plans. Mary uses her skillset and knowledge to help clients identify market trends and funding sources (grant/loan) and prepare strategic analyses on potential opportunities, as well as submitting grant/loan applications.



DAVID WHITE, JR.
Professional Engineer - MA, RI

Mr. David White, Jr., Senior Vice President, Woodard & Curran

David will support the climate risk vulnerability assessment, as well as the development of infrastructural and environmental resilience and adaptation strategies.

David White has over 23 years of experience providing civil/site engineering and environmental consulting services to private sector and municipal clients in New England. He specializes in directing and managing multidisciplinary project teams of engineers, scientists, and regulatory specialists to obtain entitlements for commercial, residential, industrial, infrastructure, and public works projects from local, state, and federal regulatory agencies. His project experience includes seeing development projects from the conceptual planning phase through permitting, design, and construction; including site layout, roadway and access design, grading, stormwater management, and utility infrastructure assessment and design.

Milone & MacBroom



CARL EPPICH
American Institute of Certified
Planners (AICP)

Mr. Carl Eppich, Lead Transportation Planner, Milone & MacBroom

Carl will support the greenhouse gas emission inventories and the development of carbon mitigation strategies, with a particular focus on transportation emissions and low-carbon transit and land use strategies.

Carl Eppich is a Lead Transportation Planner with over 25 years of experience in the public, private, and nonprofit sectors. He previously worked as a Senior Transportation Planner for the Portland Area Comprehensive Transportation System (PACTS). Carl has expertise in multimodal transportation planning and budgeting, incorporating Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and Maine Department of Transportation (MaineDOT) processes and regulations. He is familiar in all aspects of integrated transportation and land use corridor planning; transit, bicycle, and pedestrian planning; sustainable development and implementation; and public outreach including the facilitation of Community Design Workshops. Mr. Eppich's other technical expertise includes transportation demand management, transportation energy and air quality, project budgeting and finance, travel demand management (TDM) and modeling, demographic/database/statistical modeling, cost-benefit analysis, GIS, and CAD.



CHANEL LEWIS

Ms. Chanel Lewis, A Seat at the Table

Equity and inclusion, Radical listening, Climate change action

As a community member, Chanel Lewis provides opportunities for people to gather, discuss, and learn about topics such as equity, inclusion, race, sex and gender, and climate change, among other topics. Her initiative, A Seat at the Table, is a partnership with the Treehouse Institute that seeks to bridge the gaps in our community by promoting “radical listening” as a way to build and strengthen empathy, compassion, understanding and action to make our communities more equitable and inclusive.

Chanel is also currently the Employer Relationship Manager for University of Southern Maine, and formerly the Program Coordinator for Educate Maine, where she engaged computing/IT industry partners to create a Maine-based talent pipeline through programming, internship creation, and K-12 volunteer opportunities. Chanel has served as a Hub Member and Vice Curator to the Global Shapers Community, as well as a current Board Member to the Portland Parks Conservancy and to the City of Portland Office of Economic Opportunity. Chanel has a Master of Arts in African-American Studies from Boston University and a Bachelor of Arts in Sociology from Howard University.



DYLAN VOORHEES

Mr. Dylan Voorhees, Natural Resources Council of Maine

Clean energy policy and law; Energy efficiency programs

Dylan Voorhees is the Clean Energy Director at the Natural Resources Council of Maine. Since 2006, Voorhees has led NRCM’s involvement in a variety of energy and climate issues, including adoption of the Regional Greenhouse Gas Initiative; wind power and solar energy policy; energy efficiency programs, laws and funding; promotion of electric vehicles; efforts to combat dirty fuels such as tar sands; and general education for the public and policymakers about the risks of climate change in Maine.

Voorhees played a leading role in legislation that led to the creation of the Efficiency Maine Trust. Prior to joining NRCM, he worked on wind power issues for the Executive Office of Environmental Affairs in Massachusetts, and on sustainable land use development for the Vermont Forum on Sprawl. Voorhees holds a B.A. from Columbia University and a Master of Public Policy from Harvard University’s Kennedy School of Government, where he concentrated in environmental and energy policy.



JAMES KOSTARAS

Mr. James (Jim) Kostaras, Institute for International Urban Development
[Economic and urban development; Financing urban resiliency](#)

During his 25-year career in the public and private sector, James Kostaras has created and implemented successful urban design and development strategies that have led to the revitalization of urban districts challenged by economic disinvestment. Urban climate adaptation and resiliency through urban planning and sustainable community development is a major focus of his work, including financing urban resiliency and green infrastructure through land value capture.

Jim brings significant experience working in local government in the United States, serving as an assistant director at the Boston Planning and Development Agency (former Boston Redevelopment Authority) from 1985 to 2002 and as the Executive Director of the City of Somerville's Office of Strategic Planning and Community Development from 2004 to 2007. In that position, he launched a major economic development strategy that has attracted over \$1.5 billion in anticipated public and private investment in Somerville, and secured over \$40 million in state and federal funding for affordable housing, parks, transportation and new infrastructure. In 2010, Jim founded Acadia Strategic Planning LLC, a firm that provides strategic project and program consulting services to public sector clients. His projects have garnered the 2001 American Institute of Architects Honor Award for Urban Design; the American Planning Association Massachusetts Chapter Award for Comprehensive Planning and the Congress for the New Urbanism Charter Award of Excellence. He is a registered architect in Massachusetts and a former member of the American Institute of Architects and the American Institute of Certified Planners.



JAY WATERMAN

Mr. Jay Waterman, Portland Housing Authority
[Affordable housing development; Green building strategies](#)

Jay Waterman brings over 20 years of experience in developing affordable housing and incorporating green building strategies into affordable residential projects. Jay joined the staff of the Portland Housing Authority in January 2015 as the Director of Real Estate Development and is responsible for all aspects of real estate development for the Housing Authority and its affiliate, Portland Housing Development Corporation.

Jay has helped provide over 1,550 units of housing to low-income households. He has secured over \$100 million of financing for numerous housing developments including LIHTC equity, State and Federal HOME funds, CDGB funds, private grant funds, energy efficiency grants, Federal Home Loan Bank AHP funds as well as tax-exempt bond and other amortizing and non-amortizing debt. Jay is formerly the Development Director for Avesta Housing, Maine's largest not-for-profit affordable housing developer. While at Avesta, Jay developed seven LIHTC projects and other affordable housing. Jay was also a Senior Associate at Thornton Tomasetti, a green building consulting and engineering firm based in New York, from 2008-2014. Jay recently completed the development of Bayside Anchor, a mixed-income, mixed-use, 45-unit LIHTC affordable apartment community in Portland, Maine that is poised to receive Passive House certification as an extremely energy efficient building.



JULIE WORMSER

Ms. Julie Wormser, Mystic River Watershed Association
Urban coastal flood resilience; Adaptation public policy

Julie Wormser brings expertise specifically in urban coastal flood resilience, and more broadly in executive management, natural resource policy, strategic communications, organizational development, and fundraising. Over the last 22 years, Julie has secured lasting, multi-stakeholder support for innovative solutions to public policy and business challenges.

Julie is the Deputy Director of the Mystic River Watershed Association (MyWRA), where she leads the climate resilience program, working with municipalities to plan for and implement regionally important projects to decrease the risk of harm from extreme weather while providing other benefits. Prior to MyWRA, Julie was the Vice President for Policy of Boston Harbor Now (2016-2017), and the Executive Director of The Boston Harbor Association (TBHA) (2011-2016), a non-profit organization focused on economic development, public access and sea level rise adaptation along Boston's waterfront. Julie is credited with bringing widespread awareness of Boston's need for urban coastal flood resilience to the city. She has co-led multiple successful multi-state efforts to increase federal funding for forestland conservation and sound marine fisheries management. In addition, Julie co-authored two foundational climate preparedness publications, including *Preparing for the Rising Tide*, a well-received primer on climate change adaptation released by TBHA.



LISA FERNANDES

Ms. Lisa Fernandes, Resilience Hub
Sustainable food systems; Permaculture; Community resilience

Lisa Fernandes is the Founder and Board President of The Resilience Hub, based in Portland, Maine. She also currently serves as the Communication Director for the Food Solutions New England (FSNE) project based at the UNH Sustainability Institute in Durham, New Hampshire, which is a regional collaborative network organized to support the emergence and continued viability of a New England food system that advances healthy food for all, racial equity, sustainable farming and fishing, and thriving communities.

Lisa is an experienced facilitator, communicator and permaculture designer/educator who appears in the film "Inhabit: A Permaculture Perspective, and believes that the strategies of resilience-building, re-skilling and re-localization are among the best we have for creating vibrant communities and for navigating future challenges. Lisa has sat on the boards of the Eat Local Foods Coalition (ELFC), the Permaculture Association of the Northeast (PAN), and the Grantmaking Committee of the New England Grassroots Environment Fund. She has been active in the Portland Mayor's Initiative for Healthy Sustainable Food Systems, MOFGA's Ag Services Committee, the Portland Food Coop, Hour Exchange Portland and is a Master Food Preserver and Master Composter. Lisa attended Boston College and The Evergreen State College and has worked in the public, private and non-profit sectors. Lisa and her family are actively converting their 1/3-acre property into a demonstration site for resilient and abundant "post fossil fuel" living.



LORENZO MACALUSO

Mr. Lorenzo Macaluso, Center for EcoTechnology
Waste reduction systems, programs, and policy

Lorenzo Macaluso is the Director of Client Services at the Center for EcoTechnology and is a national expert on waste reduction systems. He works with government, foundation, and industry partners to develop award-winning waste diversion solutions for businesses and homeowners to help them reduce waste, save energy, and improve environmental performance.

Lorenzo serves on the MassDEP Organics Subcommittee and has presented at numerous state and national conferences as a waste reduction infrastructure development expert. He designed and implemented a variety of environmental programs throughout the Northeast, and consulted with many others nationally. Lorenzo has a Master of Public Health with an Environmental Health focus, and a Bachelor of Science in Natural Resource Management; both degrees are from the University of Massachusetts, Amherst.



PART G: COST PROPOSAL

Staff Rates

The following represents the staff rates for the consultant team.

Linnean Solutions

Principal	\$150
Senior Director	\$125
Resilience & Sustainability Consultant	\$100

Integral Group

Principal	\$275
Associate	\$175
Sustainability Analyst	\$145

Kim Lundgren Associates, Inc.

CEO	\$150
Communications Manager	\$105
Client Services Manager	\$100
Sustainability Specialist	\$95

Woodard & Curran

Senior Principal	\$225
Senior Vice President	\$225
Senior Planner	\$163

Milone & MacBroom

Lead Transportation Planner	\$130
-----------------------------	-------



Project Budget

	TOTAL	Linnean Solutions	Integral Group	Kim Lundgren Associates	Woodard & Curran	Milone & MacBroom
1. Engagement	\$65,092	\$13,400	\$6,720	\$42,900	\$1,552	\$520
1.a. Community Engagement	\$42,700	\$1,000		\$41,700		
<i>Design of process for equitable outcomes</i>	\$600			\$600		
<i>Public engagement and branding strategy</i>	\$4,000			\$4,000		
<i>Content development (design and printing)</i>	\$9,500			\$9,500		
<i>Facilitation of 5 public forums</i>	\$13,500	\$1,000		\$12,500		
<i>Deployment of MetroQuest survey</i>	\$5,000			\$5,000		
<i>Social media content (up to 8 posts / week)</i>	\$5,000			\$5,000		
<i>Monthly engagement evaluation reports</i>	\$3,600			\$3,600		
<i>Prioritized list of actions for tech. consultants</i>	\$1,500			\$1,500		
1.b. Steering Committee Engagement	\$22,392	\$12,400	\$6,720	\$1,200	\$1,552	\$520
<i>Meeting materials, agendas, objectives</i>	\$5,600	\$5,600				
<i>Facilitation of 6 meetings</i>	\$14,492	\$4,500	\$6,720	\$1,200	\$1,552	\$520
<i>Integration of input received into action items</i>	\$800	\$800				
<i>Interviews with members as needed</i>	\$1,500	\$1,500				
2. Baseline Assessments	\$47,708	\$12,650	\$20,420		\$9,698	\$4,940
2.a. Review of Existing Plans	\$6,450	\$2,100	\$3,570			\$780
2.b. Greenhouse Gas Inventories (x2)	\$21,010		\$16,850			\$4,160
2.c. Climate Risk Vulnerability Assess. (x2)	\$20,248	\$10,550			\$9,698	
3. Vision & Framework Development	\$16,530	\$4,900	\$6,640	\$4,990		
3.a. Vision and Interim Targets	\$7,620	\$1,900	\$3,680	\$2,040		
3.b. Metrics & Framework for Decision-Making	\$8,910	\$3,000	\$2,960	\$2,950		
4. Strategy Development	\$53,003	\$12,700	\$21,750		\$13,873	\$4,680
4.a. Climate Mitigation Strategies	\$28,930	\$2,500	\$21,750			\$4,680
<i>Community Energy and Emissions Model</i>						
<i>Wedge diagram development</i>						
<i>Quantification of costs and benefits</i>						
<i>Assessment of technical/financial feasibility</i>						
<i>Estimation of implementation timeline</i>						
<i>Identification of co-benefits / impacts</i>						
<i>Identification of policy opportunities</i>						
<i>Identification of regional partnerships</i>						

Costs of subcomponents are embedded in the development of climate mitigation strategies (Component 4.a.)

Budget continued on following page.

	TOTAL	Linnean Solutions	Integral Group	Kim Lundgren Associates	Woodard & Curran	Milone & MacBroom
4.b. Climate Adaptation Strategies	\$24,073	\$10,200			\$13,873	
<i>Identification of climate scenarios</i>						
<i>Quantification of costs and benefits</i>						
<i>Assessment of technical/financial feasibility</i>						
<i>Estimation of implementation timeline</i>						
<i>Identification of co-benefits / impacts</i>						
<i>Identification of policy opportunities</i>						
<i>Identification of regional partnerships</i>						
5. Report Production	\$16,685	\$9,700	\$5,015	\$1,970		
5.a. Production of CAAPs	\$12,585	\$5,600	\$5,015	\$1,970		
5.b. Production of Summary Reports	\$3,100	\$3,100				
5.c. Production of Presentations	\$1,000	\$1,000				
6. Project Management	\$6,300	\$6,300				
6.a. Coordination w/ Cities & Project Team	\$6,300	\$6,300				
SUBTOTAL	\$205,318	\$59,650	\$60,545	\$49,860	\$25,123	\$10,140
Advisors						
Budget earmarked to compensate advisors	\$8,700					
Expenses						
Travel	\$3,422	\$480	\$2,000	\$942		
Translation / Interpretation	\$2,500			\$2,500		
PROJECT TOTAL	\$219,940	\$60,130	\$62,545	\$53,302	\$25,123	\$10,140

Costs of subcomponents are embedded in the development of climate adaptation strategies (Component 4.b.)



APPENDIX 1: REQUIRED DOCUMENTATION

Please see the subsequent pages for the following documentation:

- Completed Proposal Form
- Acknowledgement of Addendum #1
- Acknowledgement of Addendum #2
- Acknowledgement of Addendum #3

PROPOSAL**Development of Climate Action & Adaptation Plans for the Cities of Portland and South
Portland, Maine
RFP #19006**

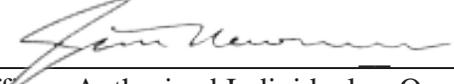
The UNDERSIGNED hereby declares that he/she or they are the only person(s), firm or corporation interested in this application as principal, that it is made without any connection with any other person(s), firm or corporation submitting an application for the same.

The UNDERSIGNED hereby declares that they have read and understand all conditions as outlined in the invitation, and that the application is made in accordance with same.

The UNDERSIGNED hereby declares that any person(s) employed by the City of Portland, Maine, who has direct or indirect personal or financial interest in this application or in any portion of the profits which may be derived therefrom has been identified and the interest disclosed by separate attachment. (Please include in your disclosure any interest which you know of. An example of a direct interest would be a City employee who would be paid to perform services under this application. An example of an indirect interest would be a City employee who is related to any officers, employees, principal or shareholders of your firm or to you. If in doubt as to status or interest, please disclose to the extent known).

The proposer acknowledges the receipt of Addenda numbered 3 (if applicable)

COMPANY NAME: Linnean Solutions, LLC
(Individual, Partnership, Corporation, Joint Venture)

AUTHORIZED SIGNATURE:  DATE: 09/01/2018
(Officer, Authorized Individual or Owner)

PRINT NAME & TITLE: Jim Newman, Principal

ADDRESS: 5 Upland Road, Suite 3

Cambridge, MA

02140

Zip Code

TELEPHONE: (617) - 699 - 7323 FAX: _____

E-MAIL ADDRESS: jim@linneansolutions.com

FEDERAL TAX I.D. NUMBER: 27-3173199

**** THIS SHEET MUST BE RETURNED WITH YOUR PROPOSAL ****

NOTE: All applications must bear the handwritten signature of a duly authorized member or employee of the organization making the application. This sheet must be signed and returned with proposal page.



CITY OF PORTLAND, MAINE
Development of Climate Action & Adaptation Plans for Portland & South Portland
RFP #19006

Current Date: August 16, 2018

The attention of firms submitting proposals for the work named in the above Invitation is called to the following modifications to the documents as were issued.

The items set forth herein, whether of clarification, omission, addition and/or substitution, shall be included and form a part of the Contractor's submitted material and the corresponding Contract when executed. No claim for additional compensation, due to lack of knowledge of the contents of this Addendum will be considered.

ALL BIDDERS ARE ADVISED THAT RECEIPT OF THIS NOTICE MUST BE DULY ACKNOWLEDGED ON THE BID PROPOSAL FORM OR BY THE INSERTION OF THIS SHEET, SIGNED, AND SUBMITTED WITH YOUR PROPOSAL.

**MATTHEW F. FITZGERALD
PURCHASING MANAGER**

Please see attached our response to questions received related to this RFP.

Receipt of **Addendum No. 1** to the City of Portland's RFP #19006, Development of Climate Action & Adaptation Plans for Portland & South Portland is hereby acknowledged.

COMPANY NAME: Linnean Solutions, LLC

SIGNED BY:  DATE: 09/01/2018

PRINT NAME & TITLE: Jim Newman, Principal

ADDRESS: 5 Upland Road, Suite #3

Cambridge, MA

02140

ZIP CODE

CITY OF PORTLAND, MAINE
Development of Climate Action & Adaptation Plans for Portland & South Portland
RFP #19006

Current Date: August 22, 2018

The attention of firms submitting proposals for the work named in the above Invitation is called to the following modifications to the documents as were issued.

The items set forth herein, whether of clarification, omission, addition and/or substitution, shall be included and form a part of the Contractor's submitted material and the corresponding Contract when executed. No claim for additional compensation, due to lack of knowledge of the contents of this Addendum will be considered.

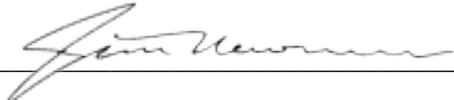
ALL BIDDERS ARE ADVISED THAT RECEIPT OF THIS NOTICE MUST BE DULY ACKNOWLEDGED ON THE BID PROPOSAL FORM OR BY THE INSERTION OF THIS SHEET, SIGNED, AND SUBMITTED WITH YOUR PROPOSAL.

**MATTHEW F. FITZGERALD
PURCHASING MANAGER**

As we have received some questions related to this RFP that we won't be able to respond to until next week, we are pushing the proposal opening date out. The new submission date for proposals is **Wednesday, September 5, 2018 at 3:00 p.m.**

Receipt of **Addendum No. 2** to the City of Portland's RFP #19006, Development of Climate Action & Adaptation Plans for Portland & South Portland is hereby acknowledged.

COMPANY NAME: Linnean Solutions, LLC

SIGNED BY:  DATE: 09/01/2018

PRINT NAME & TITLE: Jim Newman, Principal

ADDRESS: 5 Upland Road, Suite #3

Cambridge, MA 02140
ZIP CODE

CITY OF PORTLAND, MAINE
Development of Climate Action & Adaptation Plans for Portland & South Portland
RFP #19006

Current Date: August 28, 2018

The attention of firms submitting proposals for the work named in the above Invitation is called to the following modifications to the documents as were issued.

The items set forth herein, whether of clarification, omission, addition and/or substitution, shall be included and form a part of the Contractor's submitted material and the corresponding Contract when executed. No claim for additional compensation, due to lack of knowledge of the contents of this Addendum will be considered.

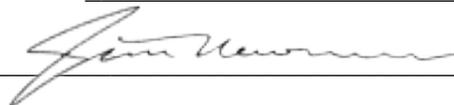
ALL BIDDERS ARE ADVISED THAT RECEIPT OF THIS NOTICE MUST BE DULY ACKNOWLEDGED ON THE BID PROPOSAL FORM OR BY THE INSERTION OF THIS SHEET, SIGNED, AND SUBMITTED WITH YOUR PROPOSAL.

MATTHEW F. FITZGERALD
PURCHASING MANAGER

Attached please find questions received related to this RFP. This will be the final addendum issued; we will be unable to respond to any further questions.

Receipt of **Addendum No. 3** to the City of Portland's RFP #19006, Development of Climate Action & Adaptation Plans for Portland & South Portland is hereby acknowledged.

COMPANY NAME: Linnean Solutions, LLC

SIGNED BY:  DATE: 09/01/2018

PRINT NAME & TITLE: Jim Newman, Principal

ADDRESS: 5 Upland Road, Suite #3

Cambridge, MA

02140

ZIP CODE



Jim Newman, LEED AP, O+M; EcoDistrict AP
Founder and Principal

DISCIPLINES

Climate mitigation and adaptation planning; Resilience and vulnerability analysis; Sustainability consulting; Building performance monitoring; LEED certification project management; Process facilitation and community engagement

ACCREDITATIONS

Certified Municipal Vulnerability Preparedness (MVP) Technical Service Provider; LEED Accredited Professional with specialty (O+M); EcoDistrict Accredited Professional; LENSES Practitioner, CLEAR; Regenerative Practitioner, Regensis Group

EDUCATION

MS in Management Science, Lehigh University; BS in Architectural Design, Massachusetts Institute of Technology

ADDRESS

Linnean Solutions, LLC
5 Upland Road
Cambridge, MA 02138
(617) 699 - 7323
jim@linneansolutions.com

Jim is the founder and Principal at Linnean Solutions, a mission-driven firm that helps local governments and communities reach resilience and sustainability goals. Jim's twenty years of experience includes climate mitigation and adaptation planning; resilience assessments for local governments and organizations; the development of sustainability and resilience frameworks, manuals, and certification programs; carbon and life cycle analyses for rethinking building construction and waste; and stakeholder engagement processes to strengthen communities. As a Living Environments in Natural, Social, and Economic Systems (LENSES) Facilitator and Trainer, Jim regularly leads community planning workshops, and trains others in becoming effective facilitators. He is a member of the RELi/USGBC Steering Committee, where he has worked to bring a social equity lens to the development of the new certification standard for resilient buildings. Jim is a key author of several influential resilience reports and tools—including the Enterprise Community Partners' Ready to Respond: Strategies for Multifamily Building Resilience manual—and has worked with cities including Medford, Northampton, Boston, and Providence on reaching resilience goals.

Previous to Linnean, Jim worked with BuildingGreen, as the Director of Strategy, where he led the development and introduction of most of BuildingGreen's online products including LEEDuser.com, BuildingGreen Suite, and the High Performance Buildings Database.

ACTIVITIES

Member, Board of Directors USGBC MA Chapter
Member, Board of Directors, Resilient Design Institute
Member, Board of Directors, CLEAR
Member, USGBC Resilience Working Group

RECENT PRESENTATIONS

Urban Regeneration Forum 2018: Keynote: *Exploring Resilience through the Lens of Regeneration*
NESSBE Health of Place 2017: Presentation: *Resilience and Social Justice*
Greenbuild 2016: *Future Proofing Climate Smart Multifamily Housing*
ABX 2016: *Thriving in an Age of Rising Seas*
ABX 2016: *Mainstreaming Resilience as Part of Standard Practice*
NESEA BuildingEnergy16: *Community Resilience Planning*
Dynamic Cities Conference 2016: *Conceptualizing Sustainable Futures*
Living Futures 2016: *Thriving with Water in Boston*

SELECTED PUBLICATIONS

Co-authored Technical Reports

Enterprise Community Partners. *Ready to Respond: Strategies for Multifamily Building Resilience*. (2015).

Linnean Solutions, The Built Environment Coalition, & The Resilient Design Institute. *Building Resilience in Boston: "Best Practices" for Climate Change Adaptation and Resilience for Existing Buildings*. Report for the Boston Green Ribbon Commission. (2013).

Community Assessment of Freeway Exposure and Health (CAFEH). *Improving Health in Communities Near Highways*. (2015).

Co-authored Peer-reviewed Articles

Brugge, Doug, et al. Developing Community-Level Policy and Practice to Reduce Traffic-Related Air Pollution Exposure. *Environmental Justice*. (2015), 8(3): 95-104.

SELECTED PROJECT EXPERIENCE

Linnean Solutions, Cambridge, MA and Portland, ME

Founder and Principal | 2010 - Present

- Project Lead, Climate Resilience and Regeneration Plan and Municipal Vulnerability Preparedness Process, Northampton, MA (2018)
- Sustainable and Efficient Waste Management Plans consulting for the construction sector, Center for EcoTechnology, Northampton, MA (2018)
- Project Lead, Climate Change Vulnerability Assessment Development Services and Public Engagement Strategy, Medford, MA (2018)
- Resilience-based Hazard Mitigation Planning and Vulnerable Populations Assessment, Medford, MA (2018)
- LEED for Neighborhood Development (LEED ND) Consultant, Union Point Development (2018)
- Resilience Consultant, Facility Resilience Assessments and Organizational Report for the Philadelphia Housing Authority (2017)
- Sustainability and Resilience Consultant, Strategies to embed equity in City of Providence Climate Action Plan (2017)
- Integrative Design Process Facilitator and Sustainability Consultant, San Luis Potosi, Mexico mixed-use development (2017)
- Sustainability Consultant, Vitality Estates Assisted Living Facility (2017)
- Sustainability Consultant, Union Point Development (2017)
- Process Facilitator and Resilience/Sustainability Consultant, Kendall Square EcoDistrict, Cambridge, MA (2016)
- Project Lead, Sustainability and Carbon Assessment for the City of Lewisville, Texas (2016)
- Co-author and Resilience Consultant, Enterprise Community Partners' *Ready to Respond: Strategies for Multifamily Building Resilience* manual (2015)
- Author, *Improving Health in Communities Near Highways*, public health design interventions through community process (2015)
- Author and Project Lead, *Building Resilience in Boston* report for the Boston Green Ribbon Commission (2013)
- Sustainability and Living Building Challenge Consultant, Hitchcock Center for the Environment, Amherst, MA (2013)



Ian Johnson, LEED AP BD+C/Homes, LEED Green Rater, WELL AP
Senior Director

Ian Johnson has 15 years of experience in industries ranging from construction project management to environmental analysis and sustainable design. He has led numerous projects through building certification, including LEED v4 for Homes, Building Design and Construction, Core and Shell, Neighborhood Development, as well as Passive House, and WELL, and with this experience brings expertise in high performance building strategies, energy policy, and approaches to advancing sustainability outcomes through zoning and building codes. Ian is a member of the Portland Climate Action Team (PCAT) and the Portland Resilience Hub. Prior to joining Linnean Solutions, Ian was the Founder and Principal of Signature Sustainability, based in Portland, Maine. He is a Certified Passive House Consultant, as well as being Living Future Accredited. Ian holds a Master of Arts in Energy and Environmental Analysis from Boston University.

DISCIPLINES

Resilience and sustainability planning; building science and certification; project management; vulnerability assessment; process facilitation and community engagement; regenerative development

ACCREDITATIONS

LEED AP Homes, BD+C; LEED Green Rater; WELL AP; CPHC; Living Future Accredited; LENSES Facilitator, CLEAR; Permaculture Design Certified

EDUCATION

MA in Energy and Environmental Analysis, Boston University;
BS in Information Systems, Saint Michael's College

EXPERIENCE

15 Years

ACTIVITIES

Member, North East Sustainable Energy Association
Member, US Green Building Council - National and Massachusetts Chapter
Member, Passive House Alliance - National and Maine Chapter
Member, Living Future Collaborative, Boston Chapter
Member, Portland Climate Action Team (PCAT)
Member, Resilience Hub - Portland, ME

RECENT PROJECT EXPERIENCE

Linnean Solutions, Cambridge, MA and Portland, ME

Senior Director, 2018 - Present

- Climate Resilience and Regeneration Plan and Municipal Vulnerability Preparedness Process, Northampton, MA (2018)
- Sustainable and Efficient Waste Management Plans consulting for the construction sector, Center for EcoTechnology, Northampton, MA (2018)
- Sustainability and resilience consulting, San Luis Potosi mixed-use development, San Luis Potosi, Mexico (2017 - 2018)
- LEED BD+C: New Construction v4 consultant for Lynnfield Medical Village, Lynn, MA (2018)
- LEED consultant and LEED provider for Spofford Buildings, mixed-use project, Bronx, NY (2018)
- LEED for Homes Mid-Rise 2010 and LEED ND v4 consultant for Clippership Wharf, mixed-use project, Boston, MA (2016 - Present)

RECENT PRIOR EXPERIENCE

Signature Sustainability, Portland, ME

Founder and Principal, 2015 - 2018



Holly Jacobson, LEED Green Associate
Resilience and Sustainability Consultant

Holly guides local governments, institutions, developers, and organizations in developing climate action, adaptation, and resilience plans and strategies. Most recently, Holly is leading the development of the Resilience and Regeneration Plan and stakeholder workshops for Northampton, MA; design and development of the City of Medford's Climate Change Vulnerability Assessment and coordinated community engagement; process facilitation for an EcoDistrict pursuing district-scale sustainability investments; and organizational resilience planning and assessment for the 80,000-resident Philadelphia Housing Authority. Holly further brings experience in metrics, indicators, and co-benefits frameworks specifically applied to climate action planning. Prior to Linnean, Holly supported environmental planning research and community planning processes in Utah, including drafting and ushering in Salt Lake City's first executive order for integrating green infrastructure into capital projects. Holly has a master's degree in City Planning with certification in Environmental Policy and Planning from Massachusetts Institute of Technology, and a Bachelor of Arts degree from Bowdoin College.

DISCIPLINES

Resilience and sustainability planning; vulnerability assessment; process facilitation and community engagement; regenerative development

ACCREDITATIONS

Certified Municipal Vulnerability Preparedness (MVP) Technical Service Provider;
LEED Green Associate;
LENSES Facilitator, CLEAR;
Certificate in Environmental Policy and Planning, Massachusetts Institute of Technology

EDUCATION

MA in City Planning, Massachusetts Institute of Technology;
BA in Biology and Environmental Science, Bowdoin College

EXPERIENCE

6 Years

MEMBERSHIP

Member, Climate Forward Working Group, Somerville, MA (2017-2018)
Member, Sustainable Infrastructure Executive Order Working Group, Salt Lake City, UT (2016)

SELECTED PROJECT EXPERIENCE

Linnean Solutions, Cambridge, MA and Portland, ME

Resilience and Sustainability Consultant | Nov. 2015 - Present

- Climate Resilience and Regeneration Plan and Municipal Vulnerability Preparedness Process, Northampton, MA (2018)
- Climate Change Vulnerability Assessment development services and Messaging and Public Engagement Strategy, Medford, MA (2018)
- Resilience-based Hazard Mitigation Planning and Vulnerable Populations Assessment, Medford, MA (2018)
- Organizational Resilience Report and Training Workshops, Philadelphia Housing Authority (2016-2017)
- Strategies to integrate equity into municipal Climate Action Plan, City of Providence (2016-2017)
- Integrative Design Process Facilitation and Sustainability Consulting, San Luis Potosi, Mexico mixed-use development (2017)
- Sustainable infrastructure consulting, Union Point development (2016)
- Sustainability and district-scale resilience strategy research and stakeholder facilitation, Kendall Square EcoDistrict (2013-2015)

BILL UPDIKE

Principal | Sustainability Consultant

Bill has been a passionate advocate for climate, green building and environmental policy for decades, and is recognized as a national leader in green building, urban sustainable development and climate planning and programs. Bill has a diverse career background—including spearheading green building and climate policy for the District of Columbia government, project management for a renewable energy company, construction management for a deep green design/build firm, sales for a green building supply company, and, in the early part of his career, environmental journalism for two national magazines. This uniquely varied background has allowed Bill to gain expertise in sustainability and climate planning, programs, and policy development, green building strategies and solutions, and renewable energy deployment. Having worked in all sectors—private, government and non-profit—he understands the challenges of budgets, time limitations, and the need for effective and efficient project delivery.

Bill's extensive work on green building, energy, and climate mitigation and adaptation has earned him multiple awards including a Living Building Challenge Hero Award (from the International Living Future Institute) and a BOLD Award at Greenbuild in 2015. Some key accomplishments include the first U.S. city adoption of all of the major chapters of the International Green Construction Code as a mandatory code, the first legislation to create a city-based Green Bank in the U.S., the first model net zero energy construction code in the U.S., the creation of an innovative grant program to fund green building and climate research, the adoption of DC's first climate adaptation plan, and the development of DC's Property Assessed Clean Energy (PACE) financing program. Bill has substantial technical knowledge in green building, climate change, and neighborhood-scale sustainable development, but also thrives on the softer skills of project management, visionary big picture thinking, writing, and public outreach and communication.

Green Construction & Energy Conservation Code Development
Washington, DC
Role: Chair, Technical Advisory Group

Creation of Sustainable DC Plan
Washington, DC
Role: Co-Chair, Energy Working Group

Net Zero Energy Code Development
Washington, DC
Role: Chair, Technical Advisory Group

Creation of Climate Ready DC Plan
Washington, DC
Role: Chief, Green Building & Climate Branch

Development of DC Green Bank
Role: Chief, Green Building & Climate Branch

EcoDistricts Target Cities Program
Washington, DC
Role: Chief, Green Building & Climate Branch

Clean Energy DC Plan
Washington, DC
Role: Chief, Green Building & Climate Branch

City-Wide Microgrid & District Energy Potential Study
Washington, DC
Role: Chief, Green Building & Climate Branch



SPECIALTIES

- Green Building and Sustainability
- Climate Mitigation and Adaptation
- Energy Efficiency & Renewable Energy Solutions
- Green Infrastructure Strategies
- Community Engagement & Public Process
- Vision & Strategic Planning
- Microgrids & District Energy Solutions
- Energy & Climate Finance
- Media & Messaging

EDUCATION

- University of Notre Dame, Bachelor of Arts (B.A.)
- University of Arizona, Master of Arts (M.A.)

PROFESSIONAL DESIGNATIONS/ MEMBERSHIPS:

- North American Board of Certified Energy Practitioners (NABCEP) Certified
- Member, Living Future Congress
- Former Voting Member, DC Construction Codes Coordinating Board
- Former Chair, DC Green Building Advisory Council
- Member, DC Living Building Challenge Collaborative
- Member, U.S. Green Building Council—National Capital Region
- Interim Chief Sustainability Officer, Washington, DC
- Former City Councilman, Mount Rainier, Maryland
- Former Board President, Gateway Community Development Corporation
- Treasurer, Daniel DiTondo Foundation

AWARDS

- 2015 BOLD Award (Building Optimizers, Leaders & Disruptors) at Greenbuild for "Unsung Hero" Category
- 2015 Living Building Challenge Hero Award from the International Living Future Institute

RACHEL MOSCOVICH, MES, LEED AP
Associate, Sustainability and Energy Planning

Rachel is a planner, strategist and project manager who has worked for over ten years in sustainability and resiliency planning, green building and corporate sustainability. Rachel's experience ranges from research and analysis to policy development to program design and implementation. A skilled writer, Rachel has authored a variety of policy reports, white papers and articles on sustainability and urban design.

Rachel's ability to collaborate and coalesce a range of ideas and competing priorities makes her an effective project manager. She has the proven ability to see projects through from conceptualization to implementation and refinement. With extensive training and practical experience in urban planning, green building and sustainable business, Rachel brings a broad understanding of current sustainability issues and solutions in the public and private sectors.

DC Department of Energy and Environment, Sustainable DC Review and Analysis
 Role: Project Manager

City of Toronto Global Best Practices in Energy Efficiency Standards Study
 Toronto, ON
 Role: Lead Researcher

Toronto + Ontario Reporting Requirement for Large Buildings: Policy Development Consultations
 Toronto, ON
 Role: Lead Researcher

Sapperton District Energy System Bylaw
 New Westminster, BC
 Role: Research + Analysis

Green Buildings and Workplace Productivity Swiss Real
 Vancouver BC
 Role: Project Design & Research Lead

City of Vancouver Building Retrofit Strategy, Vancouver, BC
 Role: Green Building Planner*

Comprehensive Energy Plan for Washington D.C.
 District of Columbia
 Role: Project Management, Process Design and Research

Vancouver Demolition, Construction and Land-Clearing Waste Diversion Strategy,
 Vancouver, BC
 Role: Green Building Planner*

City of Cambridge Getting to Net Zero Task Force
 Cambridge, MA
 Role: Lead Researcher and Project Manager

City of Vancouver Carbon Neutral Buildings Strategy
 Vancouver, BC
 Role: Green Building Planner*

Vancouver Building Bylaw Energy Upgrade Requirements
 Vancouver, BC
 Role: Green Building Planner*



SPECIALTIES

- Green building and sustainability
- Resilience planning
- Corporate sustainability strategy development
- Renewable energy solutions
- Energy conservation and efficiency

EDUCATION

- Master in Environmental Studies, Graduate Diploma, Business and Environment, York University, Toronto, ON, 2007
- Diploma in Environment, McGill University, Montreal, PQ, 2004
- Bachelor of Arts, History, Barnard College, Columbia University, New York, NY, 2002

PROFESSIONAL DESIGNATIONS/ MEMBERSHIPS:

- Urban Land Institute
- CaGBC
- USGBC
- Cascadia Green Building Council
- Board Member, Icarus Foundation, June 2011 - 2013

PUBLICATIONS

- "Vancouver's Greenest City Action Plan Enabling Deep Efficiency Improvements," ACEEE Summer Study on Energy Efficiency In Buildings, 2014
- "Green Walls for Greener Cities: Policies", Living Architecture Monitor, Vol. 15, Issue 3, Fall 2013
- "Deconstruction Strategy: Reduce Waste, Create Green Jobs", Construction Business Magazine, Vol. 10, No. 3, March/April 2013
- The Challenge Series. Millennium Water: The Southeast False Creek Olympic Village. Available in print and web: www.thechallengeseries.ca 2009
- "Millennium Water: Vancouver's Olympic Village." In: A. Ritchie and R. Thomas (Eds.) Sustainable Urban Design: An Environmental Approach. UK: Taylor and Francis, 2008

MARSHALL DUER-BALKIND, B.A, M.E.M Sustainability Analyst

Marshall brings to Integral Group over seven years' experience managing data-driven energy and climate plans and programs for local governments and non-profit organizations. He served as lead staff analyst and project manager for the Government of the District of Columbia on their comprehensive climate and energy action plan, and oversaw evaluation, measurement, & verification of energy efficiency and renewable energy programs. He also managed all aspects of implementation of one of the first Energy Benchmarking and Transparency programs in the US, building it from a concept into a national model. He has applied his background in computer science to provide effective management of multiple software and data science projects, and as served as a technical advisor to the U.S. Department of Energy and the U.S. Environmental Protection Agency.

Marshall has broad experience in climate mitigation, climate resilience, energy efficiency, green building, urban planning, and environmental justice. He is experienced at applying a wide range of quantitative techniques to energy and climate data analysis, coupled with a critical eye for quality and reliability. He has managed multiple complex and high-visibility public engagement processes and rulemakings, and his experience making complex topics more accessible makes him a frequently requested speaker.

Clean Energy DC: The District of Columbia Climate and Energy Plan
Role: Staff lead*

District of Columbia Building Energy Benchmarking Program:
Role: Program Manager*

District of Columbia Sustainable Energy Utility
Role: Evaluation, Measurement, & Verification Lead*

Sustainable DC Building Energy Performance Standards Task Force
Role: Chair*

Sustainable DC 2.0 Energy, Climate, and Built Environment Working Group
Role: Co-Chair*

U.S. Department of Energy Building Energy Data Exchange Specification Working Group
Role: Member*

U.S. Department of Energy Unique Building Identification Working Group
Role: Member*



SPECIALTIES

- Energy modeling and analysis
- Climate Mitigation and Adaptation Planning
- Energy Efficiency & Renewable Energy Solutions
- Energy Benchmarking

EDUCATION

- Master of Environmental Management, Global Change Science and Policy, Yale University School of Forestry & Environmental Studies, New Haven CT, 2011
- B.A., Political Science and Computer Science, Oberlin College, Oberlin OH, 2006

PROFESSIONAL MEMBERSHIPS:

- Senior Fellow, Environmental Leadership Program
- Member, U.S. Green Building Council—National Capital Region

PUBLICATIONS:

- Co-author, "A Framework for Equitable City Energy Planning." 2018. Proceedings of the ACEEE Summer Study on Energy Efficiency in Buildings.
- Co-author, "Fast Feedback Evaluation." 2017. Proceedings of the International Energy Program Evaluation Conference.
- Co-author, "Putting Data to Work: Using Building Energy Performance Data to Expand the Market for Energy Efficiency in Buildings." 2016, ACEEE Summer Study.
- Co-author, "DataIQ – A Machine Learning Approach to Anomaly Detection for Energy Performance Data Quality and Reliability." 2016 ACEEE Summer Study.
- Lead author, "Resilience, Social-Ecological Rules, and Environmental Variability." 2013. Ecology and Society 18(4): 50.

Kim Lundgren, ENV SP



Career Highlights

- Developed first municipal climate action plan in the Commonwealth of Massachusetts in 2001
- Hired as one of the first municipal sustainability directors in the country in 2001
- Wrote one of the first municipal climate adaptation plans in the US from 2006-2007
- Experience working directly with hundreds of local governments across the country on climate change mitigation and adaptation planning, communication, implementation, and evaluation
- Hosted dozens of successful public engagement forums, meetings, events, and activities focused on truly giving the community a voice in the planning process
- Delivers high quality, easy to read, implementable climate action, energy, and sustainability plans directly to more than a dozen local governments over the last 6 years
- Served as Chair for the American Public Works Association's Center for Sustainability 2015-2017
- Member of the STAR Communities Technical Advisory Group 2014-2017

Relevant Project Experience

City of New Bedford, MA: Climate Action & Sustainability Planning Services

KLA was recently awarded a contract for Climate Action & Sustainability Planning Services for the City of New Bedford, MA. For this multi-year contract, KLA is partnering with the City to design a comprehensive program and brand to house their current and future climate and sustainability initiatives. Anticipated year one tasks include, delivery of the Massachusetts Vulnerability Preparedness (MVP) process, including a climate vulnerability assessment; completion of a Global Protocol for Community Scale Greenhouse Gas (GHG) Emissions Inventories; a GHG Reduction Plan; a Community Climate Adaptation Plan; an ongoing, inclusive, and equitable public engagement dialogue; an online community dashboard; and a marketing and branding strategy. Kim is the Project Director for New Bedford.

City of Indianapolis, IN: Sustainability & Resilience Action Plan

In 2017, KLA was selected by the City of Indianapolis, IN to lead their Sustainability & Resilience Action Plan process. As Project Director, Kim oversees a consultant team to deliver an equity-driven process that is deeply rooted in building local social capital and capacity. Tasks associated with this 12-month project include, development of a public and stakeholder engagement strategy and process; greenhouse gas emissions inventory; climate vulnerability assessment; a multi-hazard mitigation plan; an online community dashboard; a marketing and communications strategy; and a sustainability and resilience action plan.

City of Cambridge, MA: Online Sustainability Dashboard

Kim is working with the City of Cambridge, MA, the highest rated STAR Community in the country, to develop an online dashboard tool to track their progress toward achieving the goals identified through the Strategic Plan of the Environment & Transportation Division of the Community Development Department.

City of San Antonio, TX: Sustainability Plan Project

From 2015-2016, Kim Lundgren was the project manager and lead consultant for the development of the City of San Antonio's sustainability planning effort, which was occurring in tandem with a comprehensive

plan and a strategic multi-modal transportation plan. Kim led a team of small, woman-owned businesses that worked closely with the City's Sustainability Office to design and execute a sustainability planning process that leveraged the STAR Framework and would result in an actionable sustainability plan. This 18-month process resulted in the development of a Sustainability Plan highlighting the identified goals, actions, and metrics for eight Focus Areas (Energy, Food Systems, Green Buildings, Land Use & Transportation, Natural Resources, Public Health, and Solid Waste) in English and Spanish; ongoing online and in-person community engagement; the City's first Sustainability Forum; LGOP and GPC compliant greenhouse gas emissions inventories; climate vulnerability assessment; GIS mapping; sustainability dashboard; sustainability framework for other plans to follow; and facilitation of the Sustainability Advisory Committee and Leadership Team meetings. The Final Plan was approved in August 2016.

Education

Tufts University, Medford, MA 2002
Master of Arts in Urban and Environmental Policy and Planning

University of Massachusetts, Amherst, MA 1997
Bachelor of Science in Environmental Science

Professional Affiliations and Accreditations

Institute for Sustainable Infrastructure Accredited Envision™ Sustainability Professional
2012- present

American Public Works Association (APWA) Member
2012-present

APWA Center for Sustainability
Leader: 2012-2018
Chair: 2015-2017

American Planning Association (APA) Member
2009-present

APA Sustainable Communities Division
2013-present

American Society of Adaptation Professionals Member
2014-present

=====

Annie Strickler Suttle



Career Highlights

- More than 15 years' experience in media and communications related to climate, energy and sustainability
- Leading KLA's communications and marketing support to local government clients
- As Communications Director for the Local Energy Alliance Program in Charlottesville she facilitated marketing initiatives around residential and commercial energy efficiency.
- Led media efforts on issues such as clean energy, coastal protection, wild forests, endangered species and the Arctic National Wildlife Refuge, as Deputy Press Secretary of Sierra Club

Relevant Project Experience

City of New Bedford, MA: Climate Action & Sustainability Planning Services

KLA is delivering Climate Action & Sustainability Planning Services for the City of New Bedford, MA. For this multi-year contract, KLA is partnering with the City to design a comprehensive program and brand to house their current and future climate and sustainability initiatives. Anticipated year one tasks include, delivery of the Massachusetts Vulnerability Preparedness (MVP) process, including a climate vulnerability assessment; completion of a Global Protocol for Community Scale Greenhouse Gas (GHG) Emissions Inventories; a GHG Reduction Plan; a Community Climate Adaptation Plan; an ongoing, inclusive, and equitable public engagement dialogue; an online community dashboard; and a marketing and branding strategy. Annie is assisting with the development and implementation of the marketing and branding strategy for New Bedford and is the strategic lead for communications and social media campaigns.

City of Indianapolis, IN: Sustainability & Resilience Action Plan

In 2017, KLA was selected by the City of Indianapolis, IN to lead their Sustainability & Resilience Action Plan process. Tasks associated with this 12-month project include, development of a public and stakeholder engagement strategy and process; greenhouse gas emissions inventory; climate vulnerability assessment; a multi-hazard mitigation plan; an online community dashboard; a marketing and communications strategy; and a sustainability and resilience action plan. Annie is assisting with the development and implementation of the marketing and communications strategy for Indianapolis.

City of San Antonio, TX: Sustainability Dashboard and Communications Support

The City of San Antonio has re-engaged KLA to develop the next iteration of the SA Tomorrow Sustainability Dashboard and provide associated public engagement and communications and marketing support to promote the use of the dashboard. Annie provides the strategic direction for the social media and communications campaigns.

Education:

University of Florida, Gainesville, FL, 2001
Master of Arts in Mass Communication, with Distinction

University of the South (Sewanee), Sewanee, TN, 1998
Bachelor of Arts, Cum Laude

Jennifer Dudgeon, Client Service Manager



Career Highlights

- 20 years working with local, state, and federal government agencies, institutions, and businesses to identify opportunities to reduce energy generation and associated greenhouse gases (GHG).
- One of the first analysts to develop automated tools to calculate GHG emissions.
- In 2013, she was recognized as one of the top female leaders in corporate social responsibility.
- Frequent guest lecturer at Harvard University on implementing sustainability programs in large organizations
- Knowledge of the Local Government Operations Protocol (LGOP) and the Global Protocol for Community Scale Greenhouse Gas Emission Inventories (GPC)
- CA Technologies, Corporate Greenhouse Gas Footprint, 2010, 2011, 2012, 2013, 2014
- Worcester Polytechnic Institute, Greenhouse Gas Footprint, 2013

Relevant Project Experience

City of New Bedford, MA: Climate Action & Sustainability Planning Services

KLA was recently awarded a contract for Climate Action & Sustainability Planning Services for the City of New Bedford, MA. For this multi-year contract, KLA is partnering with the City to design a comprehensive program and brand to house their current and future climate and sustainability initiatives. Anticipated year one tasks include, delivery of the Massachusetts Vulnerability Preparedness (MVP) process, including a climate vulnerability assessment; completion of a Global Protocol for Community Scale Greenhouse Gas Emission Inventories (GPC); a GHG Reduction Plan; a Community Climate Adaptation Plan; an ongoing, inclusive, and equitable public engagement dialogue; an online community dashboard; and a marketing and branding strategy. Jen is leading the GHG Inventory and Reduction Plan for New Bedford.

City of Indianapolis, IN: Sustainability & Resilience Action Plan

In 2017, KLA was selected by the City of Indianapolis, IN to lead their Sustainability & Resilience Action Plan process. Tasks associated with this 12-month project include, development of a public and stakeholder engagement strategy and process; greenhouse gas emissions inventory; climate vulnerability assessment; a multi-hazard mitigation plan; an online community dashboard; a marketing and communications strategy; and a sustainability and resilience action plan. Jen is leading the GHG Inventory for Indianapolis.

City of Nashua, NH: Livable Nashua Dashboard & GHG Inventory

KLA is developing and providing maintenance for the City of Nashua's online Livable Nashua Dashboard. To address the need of the city to engage the community in sustainability initiatives, Jen is working with Nashua to assess the various actions taken, collect data showing the value of those actions, and integrate the KLA storytelling framework to highlight those actions in a way that builds community participation.

City of Encinitas, CA: Climate Action Dashboard

The City of Encinitas engaged KLA to develop an online dashboard in conjunction with an updated Climate Action Plan. The City was seeking to highlight the actions that have been identified through the climate action planning process to provide an easy way for community members to both track progress on those actions and their associated goals as well as learn about simple steps they can take to help the City implement the actions and achieve the goals. Jen leads the support for Encinitas' Climate Action Dashboard.

Education

Master of Science in International Climate Change Policy, John Hopkins University
Bachelor of Science in Environmental Science, Virginia Commonwealth University

Professional Affiliations and Accreditations

- United Nations Transformative Leadership Program
- Lean Six Sigma Green Belt
- Global Reporting Initiative (GRI) G4 certification



Career Highlights

- Conducted Master's Thesis with the City of Boston to identify indicators to evaluate the success of its climate change adaptation initiatives.
- Managed day-to-day operations of the Mid-Atlantic Regional Planning Body and helped author the Mid-Atlantic Regional Ocean Action Plan, certified by the White House in 2016.
- Led community outreach and stakeholder engagement initiatives in multiple U.S. cities related to climate and sustainability planning processes.

Relevant Project Experience

City of Indianapolis, IN: Sustainability & Resilience Action Plan

In 2017, KLA was selected by the City of Indianapolis, IN to lead their Sustainability & Resilience Action Plan process called Thrive Indianapolis. In her role as a Sustainability Specialist, Kara coordinates community engagement for the project. She oversees a group of subcontractors and community partners that are striving to engage populations that have traditionally been left out of planning processes. She also develops training and workshop content, drafts Thrive communication materials, and evaluates community input ensuring that the voice of the public is reflected in the final plan.

City of Northampton, MA: Climate Resiliency & Regeneration Plan

Kara oversees community engagement for the Climate Resiliency & Regeneration Plan process by managing a group of community partners in Northampton. These partners represent populations that often do not have a voice in planning processes. She also creates and conducts workshops and develops communication and evaluation materials for the project.

City of Cambridge, MA: Sustainability Dashboard

KLA is leading the development and maintenance of Cambridge's online Sustainability Dashboard. Kara is managing the communications materials for the Dashboard platform. The Dashboard assesses and communicates Cambridge's many sustainability efforts and aims to increase public engagement in these initiatives.

City of Boston MA: Climate Ready Boston

Prior to working with KLA, Kara worked with the City of Boston and managed the pilot round of the Climate Ready Boston Leaders program, an outreach program that trained 70 community leaders to spread awareness about climate preparedness to their coworkers, friends, and neighbors. These community leaders hailed from every neighborhood in Boston and held presentations around the city, engaging more than 300 people in learning about Boston's initiatives in these areas. She also developed recommendations for how to sustain and improve the program moving forward, and it is now in its third round. Additionally, Kara created an online tool to track the City's progress in implementing the 39 initiatives identified in the Climate Ready Boston report.

Education

MCP, Environmental Policy and Planning, Massachusetts Institute of Technology
BA, Public Policy (Environmental Policy), Stanford University

Professional Affiliations and Accreditations

- American Planning Association
- American Society of Adaptation Professionals



Career Highlights

- Experience developing various online engagement tools including gamification surveys, nexus mapping, and interactive geospatial maps.
- Research and data visualization focused on sustainability impacts through both a scientific and social justice lens.
- Practiced facilitator and public speaker from workshops, to the classroom and to United Nations'

Relevant Project Experience

City of Indianapolis, IN: Sustainability & Resilience Action Plan

In 2017, KLA was selected by the City of Indianapolis, IN to lead their Sustainability & Resilience Action Plan process. As Sustainability Specialist, Amanda collaborated through research and design suggestions on eight element fact sheets. Additionally, she published the MetroQuest Public Involvement Software online engagement tool and is contributing to the action implementation and prioritization framework.

City of Concord, MA: Municipal Vulnerability Preparedness (MVP) Process

Concord received extra grant funding to extend the scope of a MVP Process to conduct inclusive and expanded engagement. Amanda is leading this effort in setting up the MetroQuest Public Involvement Software, writing the Public Engagement Strategy. Additionally, Amanda is responsible for researching and designing a climate change summary to capture data and metrics from the MVP process. Through coordination with the City, she has managed the pulling together of a network of climate action partners and is developing opportunities for youth engagement in various activities.

City of Sunrise, FL: Sustainability Action Plan

As part of her role as sustainability specialist, Amanda researched and crafted five toolkits on sustainable recommendations. Topics included in the toolkits included: Environmental Preferred Purchasing Policies, Green the Fleet, Sustainable Commuting Programs, Public Engagement, Land Development Code Amendments

National Park Service, Brookline, MA

Prior to joining KLA, in 2014 and 2016, Amanda applied project management and team leadership skills including collaborative decision making, communication, documentation, and logistical planning. She also designed and implemented 8-week work program meeting 10 management objectives, while also achieving youth development goals for 6 teens. Additionally, Amanda developed original outreach initiatives geared towards teens, who were underrepresented in the established programming.

Education

Master of Science in Urban and Environmental Planning and Policy, Tufts University, MA
Bachelor of Arts in Sociology, Biology, and Environmental Science, *cum laude*, Coe College, IA

Professional Affiliations and Accreditations

- Municipal Vulnerability Preparedness Certified
- New England Water Works Association
- American Planning Association



MARY HOUSE

SENIOR PRINCIPAL

Professional Profile

Mary is a Senior Principal at Woodard & Curran and has been managing complex programs and projects for municipal and private clients for over 20 years. Mary co-leads Woodard & Curran's resiliency practice and has been extensively involved in climate change and hazard mitigation projects completed under FEMA and comparable state programs. As a result, she has an in depth understanding of federal regulations and guidance related to hazard mitigation planning. Mary has been involved in grant application development and administration, emergency management and hazard mitigation planning, and the identification of cost-effective and beneficial mitigation actions. She routinely works closely with diverse stakeholder groups to facilitate workshops, develop plans, engage resources, develop innovative solutions to complex issues, and deliver projects on time and within budget. Mary formerly led Woodard & Curran's Geographic Information Systems and Environmental Information Systems and Energy Efficiency and Sustainability groups. Mary is a technical advisor in the Climate Category for the Association for the Advancement of Sustainability in Higher Education's Sustainability, Tracking and Assessment Rating System.

Related Experience

City of Fall River, MA – Grant Support and Hazard Mitigation Plan Development.

Woodard & Curran assisted the City with the successful development of a FEMA Pre-Disaster Mitigation grant application to fund the development of a hazard mitigation plan. Mary was the project manager working with the City to develop the hazard mitigation plan. Work completed included engagement with City stakeholders including departmental staff representing public works, emergency management, administration, and planning. Other community engagement activities included public meetings, interviews and the development of an on-line survey to seek further input. The planning process followed an all hazards approach and identified mitigation actions to reduce impacts to the City experienced from weather related events and climate change. The plan recently received approval from MEMA and FEMA.

Town of Provincetown, MA – Vulnerability Assessment and Hazard Mitigation

Update. Served as Project Manager to support the project team and worked closely with the client to understand the role of Provincetown's critical infrastructure, how natural hazards have and may impact them and help the Town prioritize adaptive strategies to increase their resiliency where possible. The assessment included a partnership with Coastal Studies to conduct a street by street analysis of inundation pathways along with the more detailed public infrastructure assessment.

Town Barnstable, MA - Hazard Mitigation Plan Update (Selected Sections). Served as Principal in Charge for the development of selected sections of the Town's Hazard Mitigation Plan that is consistent with MEMA and FEMA guidance. Tasks included researching and analyzing natural hazards, developing mitigation actions, engaging community and City stakeholders, outlining potential funding sources and developing an

Education

- Masters, Environmental Science and Engineering, Colorado School of Mines
- Bachelors, Chemistry and Environmental Studies, Bowdoin College

Professional Associations

- Association for the Advancement of Sustainability in Higher Education, STARS Technical Advisor
- Woodard & Curran Board of Directors (2014 - present)

Publications and Presentations

- 2016 Climate Change Journal
- House, M.E., and Ivanovich, M.K. Resiliency Resources: Accessing FEMA Funding to Protect and Retrofit Utility Infrastructure, WE&T November 2015.
- "Lessons Learned From the Aftermath of the Boston Marathon Tragedy," EACUBO Annual Meeting, October 2013.
- "Funding a FEMA Hazard Mitigation Plan and Project," CSHEMA Annual Conference, July 2013.
- House, M.E., and Daniel Fogel. "How to Plan, Change, and Improve Environmental Sustainability Outcomes." Sustainability: The Journal of Record. December 2010, Vol. 3, No. 6: 342-347.

overall plan that fulfills local, state and federal requirements.

University of Massachusetts – Multi-Campus Hazard Mitigation Plan. Mary served as the Project Manager working with UMass Lowell, UMass Boston, UMass Dartmouth and the UMass System and President's Office to develop a FEMA approved multi-campus hazard mitigation plan. The plan incorporates natural, human and technological hazards and develops mitigation actions to minimize potential damages to campus stakeholders, assets and operations from these events. The project was executed through a collaborative process working very closely with internal stakeholders at all campuses included, representatives from FEMA and MEMA, as well as other external community stakeholders. Over 100 stakeholders were involved in the development of the plan and over 200 mitigation actions were developed across the four campuses. A project specific website was developed to facilitate communications across the campuses. Specifically for the UMass Boston campus, extensive review of applicable Boston area climate change research was completed and incorporated into the plan as applicable. The plan was approved by MEMA and FEMA in 2015.

University of Massachusetts Medical School – Multi-Hazard Mitigation Plan. Mary served as the Project Manager to develop a FEMA approved multi-hazard mitigation plan for UMass Medical School. The plan development was funded by a grant from the Hazard Mitigation Grant Program. The plan incorporates human, natural and technological hazards and has identified mitigation actions to reduce the risks experienced from hazard events. Unique to this plan is the Medical School's relationship with Massachusetts Memorial Hospital that includes shared personnel services. The plan was approved by MEMA and FEMA in 2015.

Connecticut State Colleges & Universities, 17 Connecticut Campuses – Multi-Campus Hazard Mitigation Plan.

Mary led the successful development of a hazard mitigation grant application to develop a multi-campus hazard mitigation plan for Connecticut State Colleges & Universities' 17 campus system. Connecticut State Colleges & Universities received a hazard mitigation grant of \$950,000 from FEMA administered by the Connecticut Department of Emergency Management and Homeland Security to develop the plan. Woodard & Curran is supporting the administration of the grant by developing quarterly progress reports and supporting the tracking of in-kind labor contributed by the System. Woodard & Curran engaged over 200 campus stakeholders in the planning process and identified over 300 mitigation action items. The plan has been approved with no comments received and is pending adoption.

University of Massachusetts-Lowell – Campus-Wide Climate Action Plan Development and Implementation.

Project Manager responsible for the development of a campus-wide climate action plan to meet the University's obligations as a signatory of the American College & University Presidents' Climate Commitment signed by the UMass President. Mary facilitated a series of meetings with senior stakeholders at the campus including the Vice Chancellor For Finance and Operations, the Associate Vice Chancellor of Facilities Management, the Associate Vice Chancellor of Financial Services, the Dean of Engineering, the Director of Environmental and Emergency Management and other representatives from Facilities, Residential Life, Academia, Transportation, Media Relations, and the student body. In a period of three months, goals and implementation plans to achieve climate neutrality were developed and approved by the stakeholder group and endorsed by the University Chancellor. Mary continues to support UMass Lowell in

the implementation of the plan and served for a year and a half as the campuses' first Director of the Office of Sustainability.

Central Connecticut State University (CCSU) – Climate Action Plan Report and Progress Report. Project Manager for CCSU's Climate Action Plan and Sustainability Initiatives. CCSU was a charter signatory of the American College and University President's Climate Commitment (ACUPCC), which commits the school to achieving climate neutrality. The CAP lays out the path CCSU will follow to become climate neutral, including setting reduction goals, the identification of 'mitigation strategies' to achieve these goals, and defined metrics and methodologies to measure progress toward meeting goals. It also describes how CCSU will incorporate climate neutrality into its curriculum, which is required under the Commitment. Mary also helped CCSU complete its first Progress Report showing how CCSU has worked toward its goal.





MARY MCCRANN, AICP

SENIOR PLANNER

Professional Profile

Mary has over 15 years experience in Community Planning and Development and is the lead Planner for Woodard & Curran's resiliency practice. She has been extensively involved in sea level rise, climate change and hazard mitigation projects completed under FEMA guidance and other comparable state programs throughout New England. As a result, she has an in-depth understanding of federal regulations and guidance related to hazard mitigation planning. In addition, Mary's work has focused on conducting due diligence/feasibility studies, obtaining local/state and federal permitting approvals and evaluating projects for consistency with regulatory and permitting requirements. She frequently conducts zoning and permitting regulatory reviews for projects and works with clients on various projects such as Hazard Mitigation Planning, Redevelopment initiatives, potential Renewable Energy opportunities, Master Plans, Affordable Housing Studies and Open Space and Recreation Plans. Mary uses her skill set and knowledge to help clients identify market trends and funding sources (grant/loan) and prepare strategic analyses on potential opportunities as well as submitting actual grant/loan applications.

Related Experience

City of Portland, ME – Bayside Adapts, Phase I. Serving as Project Planner to support the project team providing planning and engineering services to facilitate climate change adaptation planning in the City's Bayside neighborhood. The focus of the project is to conduct a Sewer and Stormwater Data Gap Analysis and public engagement process to help the community identify a socially responsible, technically sound and financially feasible adaptive strategy to protect the Bayside Neighborhood from the effect of rising tides, extreme rain events and storm surge. The key outcomes are to position the City for a Phase II project and to identify any immediate priority actions to lessen flooding risks and impacts discovered during the project.

Town of Provincetown, MA – Adaptive Strategies to Increase Coastal Resiliency. Serving as Project Planner to support the project team and work closely with the client to understand the role of Provincetown's critical infrastructure, how natural hazards have and may impact them and help the Town prioritize adaptive strategies to increase their resiliency where possible. The assessment includes a partnership with Coastal Studies to conduct a street by street analysis of inundation pathways along with the more detailed public infrastructure assessment.

Hull, MA – Evaluation of Wastewater Treatment Facility and Collection System Resiliency Upgrades Using EPA's CREAT Tool. Serving as Project Planner to work with Hull WWTF staff and EPA to complete the final day of technical assistance and complete/update the initial evaluation of the four adaptation options outlined in the existing draft CREAT report. Project includes using the CREAT tool to evaluate other adaptation options for the wastewater treatment facility, pump stations, and the collection system to improve the resiliency of the ongoing plant O&M. The resiliency upgrades and adaptation plans that result will be incorporated into the Fiscal Sustainability Plan.

Education

- Masters, Community Planning and Development, University of Southern Maine
- Bachelors, Business Management, Roger Williams University

Registrations

- American Institute of Certified Planners
- American Planning Association, 023130

Professional Associations

- American Planning Association
- Portland Society of Architects, Board of Directors
- PROPEL

Publications and Presentations

M. McCrann. "Resilient Communities: Closing Data Gaps for Better Adaptation Planning." Presented at the Environmental Business Council New England's Climate Change Program Series in Boston, MA – March 2017.

M. McCrann (as a Contributor), "TR-16 Guides for the Design of Wastewater Treatment Works, 2011 Edition. As Revised in 2016." Participated in the review and revision of the document to reflect experience and thinking in preparing for storm surge and extreme weather events.

M. Ivanovich, M. McCrann. "An Ounce of Prevention: Accessing Funding for Hazard Mitigation Work - Water Utilities." Presented at the NEWWA Spring Conference in Worcester, MA - April 2014.

City of Fall River, MA – Hazard Mitigation Plan. Served as Project Planner to assist the City with the successful development of a FEMA Pre-Disaster Mitigation grant application to fund the development of a hazard mitigation plan. Work completed included engagement with City stakeholders including departmental staff representing public works, emergency management, administration, and planning. Other community engagement activities included public meetings, interviews and the development of an on-line survey to seek further input. The planning process followed an all hazards approach and identified mitigation actions to reduce impacts to the City experienced from weather-related events and climate change. The plan received approval from MEMA and FEMA.

Rhode Island Department of Environmental Management (RIDEM) – Implications of Climate Change for Rhode Island Wastewater Collection and Treatment Infrastructure. Served as Project Planner to support the project team on the evaluation of implications of climate change on all 19 wastewater treatment and collection systems as well as associated infrastructure throughout the state. The project includes working closely with the wastewater facility operators to understand and assess climate change related risks to treatment facilities, pump stations and combined sewer overflows. A risk analysis matrix for each WWTF will accompany the assessment and help prioritize those components subject to the greatest overall risk, including regulatory, age-related and growth/expansion risks. Individual facility profiles with educational outreach materials and fact sheets will be developed to promote awareness among community residents and public officials and to facilitate future discussions.

Winthrop, MA – Municipal Vulnerability Preparedness (MVP) Technical Services. Planner responsible for supporting Winthrop's Community Resiliency Building Workshop and development of the Summary of Findings. Mary was the lead facilitator during the CRB process and Listening Session. She worked closely with Winthrop's Core Team to prepare for and guide the community through a successful project focused on resiliency, climate change and sea level rise.

Town of Ogunquit, ME – Study of Adaptation Options to Protect the Ogunquit Sewage Treatment Plant Against Floods, Storm Surges, and Sea Level Rise. Project Planner on a team responsible for coordination of a flood risk assessment study for the Ogunquit Sewage Treatment Plant. Woodard & Curran worked with the Southern Maine Regional Planning Commission, Applied Coastal Research Engineering, and Ogunquit Sewage Treatment Plant personnel to categorize and assess the risks associated with sea level rise, flooding, and storm events. The project included the development of expected timelines for sea rise/flood levels, identification of potential vulnerabilities of the equipment and buildings, review of relevant regulatory restrictions, and development of adaptation recommendations and planning documents.

Town of Barnstable, MA – Hazard Mitigation Plan Update (Selected Sections). Served as Project Planner for the development of selected sections of the Town's Hazard Mitigation Plan that is consistent with MEMA and FEMA guidance. Tasks included researching and analyzing natural hazards, developing mitigation actions, engaging community and City stakeholders, outlining potential funding sources and developing an overall plan that fulfills local, state and federal requirements.

City of Quincy, MA – Preliminary FIRM Review and Analysis. Project Planner responsible for participating in public outreach efforts for the City of Quincy's Preliminary 2014 FIRMs. A Letter of Map Revision was submitted to the FEMA Region 1 office in June 2014, which provided updated flood zone boundaries and elevations resulting from the analysis.

Connecticut State Colleges & Universities – Multi-Campus All Hazard Mitigation Plan. Served as Project Planner for the development of a hazard mitigation grant application to develop a multi-campus hazard mitigation plan for Connecticut State Colleges & Universities' 17 campus system. Connecticut State Colleges & Universities received a hazard mitigation grant of \$950,000 from FEMA administered by the Connecticut Department of Emergency Management and Homeland Security to develop the plan. Woodard & Curran is supporting the administration of the grant by developing quarterly progress reports and supporting the tracking of in-kind labor contributed by the System. Woodard & Curran engaged over 200 campus stakeholders in the planning process and identified over 300 mitigation action items. The plan has been submitted for review.





DAVID WHITE, JR., PE

SENIOR VICE PRESIDENT

Professional Profile

Dave has over 23 years of experience providing civil/site engineering and environmental consulting services to private sector and municipal clients in New England. He specializes in directing and managing multidisciplinary project teams of engineers, scientists, and regulatory specialists to obtain entitlements for commercial, residential, industrial, infrastructure, and public works projects from local, state, and federal regulatory agencies. His project experience includes seeing development projects from the conceptual planning phase through permitting, design, and construction; including site layout, roadway and access design, grading, stormwater management, and utility infrastructure assessment and design.

Related Experience

City of Salem, MA – Canal Flood Mitigation. Project Manager for the design and permitting of the \$20M flood mitigation project. The project includes installation of large diameter storm drainage collection and conveyance systems, 11,000 GPM pump station with associated force main and 4 MG storage facility. The project included upgrades to the ballfield, seawall, incorporate walking paths at the Forest River Park. In addition, obtaining permits from numerous federal, state and local regulatory agencies. Responsible for preparation and submittal of Hazard Mitigation Grant from the Federal Emergency Management Agency, resulting in an award of \$3.8M.

Town of Nantucket, MA – Miacomet Pond Watershed Study. Project Manager for conducting a thorough assessment of stormwater and groundwater contributions to Miacomet Pond. The purpose of the study was to identify the source(s) of flooding on several properties adjacent to and up gradient of the pond. The work included performing an evaluation of historic and current land use patterns to determine impacts of recent developments in the watershed on the frequency, magnitude and extents of flooding. The study concluded with the identification and evaluation of both short- and long-term recommendations to alleviate flooding and framework for the development of a Watershed Management Plan. The Study also provide support to the Town for future wastewater planning based upon findings of groundwater contributions to the pond.

City of Salem, MA – Canal Street Drainage, Sewer and Water Improvements. Project Manager for the design and construction of utility improvements along an 8,000-foot length of Canal Street. The work includes, repairs to existing sanitary sewers, replacement of water interconnects, repairs to the roof and walls of a portion of 8-foot high by 10-foot wide, Circa 1900, masonry box, South River Conduit and replacement of the storm drainage collection system. The upgrade to the storm drainage is the first phase of a multi-phase project to mitigate chronic flooding of Canal Street and area businesses and residences.

City of Salem, MA – Jefferson Avenue Flood Mitigation. Project Manager for the preliminary design of flood control measures along the South River to reduce flooding

Education

- Masters, Civil Engineering, Northeastern University
- Bachelors, Civil Engineering, University of Massachusetts

Registrations

- Registered Professional Engineer - MA, 39880
- Registered Professional Engineer - RI, 7381
- Licensed Soil Evaluator, MA, SE2582
- Licensed Septic System Inspector, MA, SI4661

Professional Associations

- American Society of Civil Engineers
 - Boston Society of Civil Engineers, Governmental Affairs and Professional Practices Committee
-

impacts to resident and City infrastructure from historic flooding and considers additional measures to address sea-level rise. The work, consisting of installation of flood control berms and walls, is being performed under a Coastal Community Resilience Grant Program administered by the Massachusetts Office of Coastal Zone Management (CZM).

City of Quincy, MA – Miller/Cross/Furnace Avenue Neighborhood Flood Control Facility. Project Manager for the conceptual design and planning for a 30 mgd stormwater pump station to alleviate chronic flooding in the urban city neighborhood. The project included restoration of the floodplain along the historic area Furnace Brook which will improve public access to the greenway adjacent to the Furnace Brook parkway. In addition, preparation and submittal of a Hazard Mitigation Grant from the Federal Emergency Management Agency (FEMA), resulting in a \$5.8M award.

City of Quincy, MA – Broad Street Drainage Repairs and Tide Gate Replacement. Project Manager for the design, permitting and construction for replacement of approximately 2,000 feet of structural deficient storm drain piping. The work included obtaining permits from the U.S. Army Corp of Engineers (USACE) and Quincy Conservation Commission for structural repairs to the existing tide gate outfall structure, and replacement of the existing tide gates, and repair to an existing pile-support storm drain pipe located in a marsh area.

City of Leominster, MA – Burrage Avenue Drainage Improvement. Project Manager for a hydrologic/hydraulic analysis to identify measures directed at reducing flooding within the low lying area of the 233-acre Burrage Avenue/Mascoma Avenue watershed. A hydrologic/hydraulic computer model was developed to perform the analysis. Using the model, flooding

within the area was found to be the result of undersized infrastructure. Four alternatives for mitigating flooding were identified and evaluated. Recommendations to the City included enlarging the size of the existing closed conduit drainage system servicing the flood prone area.

City of Leominster, MA – West Street Drainage Improvement. Project Manager for a hydrologic/hydraulic analysis to identify measures directed at reducing the magnitude and frequency of flooding along West Street in Leominster. Flooding within the area was found to be the result of undersized infrastructure. Recommendations made to the City for mitigating flooding were directed at enlarging the size of an existing drainage system and constructing additional stormwater infrastructure.

City of Salem, MA – South River Flooding Study. Project Manager for the evaluation of flooding in the South River drainage basin of Salem. Historic flooding conditions in this watershed have resulted in chronic home and business evacuations throughout the Canal Street area of the City. The first phase of this investigation was to establish a comprehensive drainage system map, conduct preliminary evaluations of the system's capacity to handle flooding events, identify conditions under which flooding is most prevalent, and to develop a short-term and long-term strategy to mitigate the flooding conditions. The second phase of the investigation involved developing a comprehensive hydrologic/hydraulic (H/H) model with which establish existing and proposed flood profiles for the 10-100-year storm events. This included extensive infrastructure (including up to 8x10 box culverts) cleaning to maximize system capacity, flow metering, City-wide aerial survey and detailed (1' contour) survey within study area), assessment of 3,200 drainage structures using hand-held GPS tools to establish physical and conditional system profile, and flow metering

for model calibration, evaluated various H/H models and selected SewerGEMS® to evaluate a 1,430-acre watershed subject to substantial tidal influences. Evaluated 13 alternatives to alleviate flooding and selected comprehensive flood mitigation program.

City of Quincy, MA – City-Wide Flood Mitigation/Drainage Capital Improvement Program. Project Manager for the development and implementation of a City-wide capital improvement program to assist the City with remedying flooding within 24 flood-prone areas. The work included, coordination of multiple City department flood damage mitigation claims through FEMA's Post-Disaster Assistance Programs, identification of root cause of repetitive flooding, identification of measures to reduce the frequency, duration and extent of flooding, development of budgetary costs for mitigation measures, screening mitigation measures using FEMA's Benefit Cost Analysis to establish funding grant eligibility, and preparation of Pre-Disaster FEMA Flood Hazard Mitigation Grant applications. The project required coordination and outreach with numerous stakeholders including federal, state, and local agencies as well as many private residents and business owners. The project culminated in the preparation of a 3-year, \$10M Capital Improvement Plan.

City of Newton, MA – Ashmont Avenue Drainage Evaluation. Project Manager responsible for developing and evaluating options to replace damaged twin 24-inch culverts parallel to Ashmont Avenue. The scope involved determining whether upgrades were warranted based on a hydraulic capacity analysis and soils settlement evaluation through test pits. Responsibilities included client and sub-consultant coordination, reviewing detailed drainage calculations, evaluating recommendations and preparing a letter report presenting recommended alternatives with cost estimates.

Carl Eppich, AICP

Lead Transportation Planner

Years of Experience:

With This Firm: < 1

With Other Firms: 25

Education:

Master of Community Planning
and Development (MCPD)
Edmund S. Muskie School of
Public Service
University of Southern Maine
Portland, Maine

BS, Environmental and Resource
Economics
University of New Hampshire
Durham, New Hampshire

License/Certification:

Certified Planner

Professional Affiliations:

American Institute of Certified
Planners
Association of Pedestrian Bicycle
Professionals
Member, League of American
Bicyclists
Member, Congress for the New
Urbanism
American Planning Association,
Northern New England
Chapter,
Board Member,
Executive Committee – Past
President
Board Member, Grow Smart
Maine



Mr. Eppich is a Lead Transportation Planner with over 25 years of experience in the public, private, and nonprofit sectors. He previously worked as a Senior Transportation Planner for the Portland Area Comprehensive Transportation System (PACTS). Mr. Eppich has expertise in multimodal transportation planning and budgeting, incorporating Federal Highway Administration (FHWA), Federal Transit Administration (FTA), and Maine Department of Transportation (MaineDOT) processes and regulations. He is familiar in all aspects of integrated transportation and land use corridor planning; transit, bicycle, and pedestrian planning; sustainable development and implementation; and public outreach including the facilitation of Community Design Workshops. Mr. Eppich's other technical expertise includes transportation demand management, transportation energy and air quality, project budgeting and finance, travel demand management (TDM) and modeling, demographic/database/statistical modeling, cost-benefit analysis, GIS, and CAD.

Highlights of Mr. Eppich's previous experience include:

Destination 2040 – Long-range Transportation Plans Portland, Maine

Mr. Eppich was the project manager for the development of the major regional plan update for a 17-municipality region. These comprehensive transportation plans are federally required and involve a process of vision and goals development for the transportation system for the region. The plan further identifies strategies and recommendations for implementation over a 20-year timeframe. Managing a plan development committee and two consultant contracts over a 2-year-plus period, Mr. Eppich lead the plan development process which included coordinated land use and transportation principles. The development of a new framework focused on development centers and priority corridors that would enable a transit-oriented development pattern an innovative new approach for the region. The plan also focuses on the safety of people using all modes and mode shift as the major congestion management strategy. Destination 2040 won a Congress for the New Urbanism (CNU) Regional Engagement Award.

Portland-West Land Use and Transit Technical Assistance Plan Portland West Region, Maine

With Mr. Eppich's leadership and project management, six municipalities with limited access to the highway network west of Portland coordinated on the development of compact centers-oriented plan. With the anticipation of major roadway and transit investments in the corridor, each of the municipalities worked with their neighborhood residents to identify acceptable increases in mixed-use, transit-supportive densities and opportunities for increasing bicycle and pedestrian trips. The plan includes illustrated simulation graphics that aided residents with an understanding of the increased development densities.

Regional Traffic Management System Portland Region, Maine

Modernizing the signal systems along the major arterial roadways connecting downtown Portland with the suburbs was a multi-phased planning project lead by Mr. Eppich over 10 years. The goals of the RTMS include traffic signal coordination to maximize motor vehicle capacity during the morning and evening peak commutes, reduce emissions, congestion and aggregate energy use. The plan and resulting projects also feature pedestrian improvements at signal and bicycle detection. Over his tenure over \$7 million in signal modernization was completed on 8 corridors.

Most of these corridors are also served by bus transit and designed for bus-prioritization at signals. Mr. Eppich was lead staff to a six-municipality working group and coordinated the work plan with Milone & MacBroom staff prior to his employment at the firm.

**North of Portland Route 1 Complete Street Plan
Falmouth, Cumberland, Yarmouth, Freeport, Maine**

This major corridor plan led by Mr. Eppich focused on safety and accessibility for all modes on a 12-mile corridor connecting Portland with the northern suburban communities. The major goal of the study was to develop a plan that would lead to consistency of infrastructure. The plan included sidewalks, a sea-level and storm surge bridge adaptation concept, the extension of an adjacent off-road path, bike lanes, transit stop upgrades, and place-making opportunities.

**Gorham Village Bicycle & Pedestrian Plan (by Milone & MacBroom, hired by Mr. Eppich)
Gorham, Maine**

The Town of Gorham, Maine contracted through Mr. Eppich and PACTS a study to develop a plan bicycle, pedestrian, and transit access infrastructure for the Gorham downtown area which includes the University of Southern Maine. The plan identified hazardous areas, bicycle and pedestrian connections, and developed a list of projects with preliminary cost estimates. They Town and the Plan also anticipated improvements for new regional METRO bus service in 2018.

Sustain Southern Maine partnership and plan, HUD-EPA-USDOT 2011-2014

While at the Greater Portland Council of Governments and PACTS, Mr. Eppich provided expertise in transportation and land use strategies aimed at reducing land consumption, minimizing vehicular trips, reducing emissions and improving transit and non-motorized transportation modes. The effort included an update to the 2010 Energy Use and Emissions Inventory to now include both Cumberland & York Counties, Maine.

**Veterans Bridge Replacement Project
Portland, Maine**

This project was for the replacement of a critical failing bridge that connected the cities of Portland and South Portland. The Maine DOT coordinated through Mr. Eppich and PACTS an extensive stakeholder engagement process to understand the multi-modal needs for the connection, the sea-level and adaptation concerns and to develop an innovative and competitive process to deliver a signature bridge for the region. The project included a separated multi-purpose bicycle and pedestrian lanes with three bump-out overlooks, vertical artistic elements, under bridge lighting, and military service memorial park features at both ends.

**Moving Greater Portland Toward a Transit Focused Region
Greater Portland metro area – 17 municipalities and 7 transit providers**

Mr. Eppich was the Project manager for this initiative that engaged the broader Greater Portland Community for multiple discussions on growing the region through a transit-oriented development approach that could reduce projected traffic and congestion, reduce land consumption, and attract employer and employees. A report with multiple strategies was published and distributed widely in the years after. Three major fixed route bus services into areas previously without transit service have resulted in the following years.

**Kennebunk Open Space Plan
Kennebunk, Maine**

While working for the town Mr. Eppich was project manager for this plan that focused on natural resources for the town in the areas of environmental, recreational, and historical/cultural importance including viewsheds. Leading an ad hoc committee, this plan was ultimately amended to the town's comprehensive plan.

THIS PAGE IS INTENTIONALLY LEFT BLANK



LINNEAN SOLUTIONS

linneansolutions.com

Cambridge, MA

CONTACT

Jim Newman, Linnean Solutions

jim@linneansolutions.com

617-699-7323