Metropolitan Washington Council of Governments

Multi-Sector Approach to Reducing Greenhouse Gas Emissions in the Metropolitan Washington Region

RFP No. 15-010

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WSP

Table of Contents

Chapter 1. Qualifications of WSP and Personnel

WSP recently combined with Parsons Brinckerhoff (PB) to become one of the world's leading engineering and professional services consulting firms. Bringing together 31,500 staff, based in more than 500 offices, across 39 countries, we provide services to transform the built environment and restore and protect the natural environment. With the acquisition of Parsons Brinckerhoff in November 2014, WSP has annual revenues of $4.8 billion. We are able to bring best of world-class solutions from around the globe, with our Program Manager (PM), Matt Aberant, overseeing the project from within the Metropolitan Washington Council of Governments (COG) region out of our office in Arlington, Virginia.

WSP has been providing comprehensive climate change, transportation and energy services since 1998, gradually adding services over time, and formalizing into the integrated structure we now offer to meet the increasingly cross-disciplinary approach required by our clients and their stakeholders. Our offerings now closely mirror the Scope of Services outlined in the Request for Proposal (RFP). Our Sustainable Strategies Practice provides the expertise in economics, policy, and carbon delivered within a broader strategic planning capability. Our Greenhouse Gas Emissions and Resource Management Practice offers experience in greenhouse gas (GHG) emissions management and mitigation, and combines with our Clean Energy Practice to identify low-carbon, zero-carbon and net negative carbon strategies and technologies. This effort will also be supported by the Placemaking and Transportation divisions of newly acquired Parsons Brinckerhoff, bringing professionals with experience working with state departments of transportation (DOT) and staff with direct experience with the Washington DC DOT and Maryland DOT. Our Placemaking team works at the nexus of planning and design in land use, transportation and the built environment to enhance the public realm, capitalize on local assets and promote sustainability. This expertise, as related to GHG reduction strategies, encompasses regional planning, transit oriented development, complete streets, context sensitive solutions, progressive parking strategies, and complete trips for transit users. This range of expertise helps broaden our view so that we understand that transportation is more impactful than simply emissions from car tail pipes, but involving multimodal analysis, connecting land use and the built environment, as the public realm is part of a built environment (spaces between the buildings, including streets and open space) that informs modal choices, quality of life, and locational choices for employment and living. Experts from across the WSP and PB organizations described above, along with our selected Disadvantaged Business Enterprise (DBE) partners will work together to provide expertise across all four sectors that COG will be analyzing in their effort to reduce GHGs and achieve the aggressive targets set for the region. Our sustainability and energy practice (S&E) was created specifically to integrate the multi-disciplinary services required by clients such as COG, and our vast array of capabilities will be delivered through a single point of contact to COG.

WSP has selected two DBEs to join our Team in supporting COG. Gallop Corporation (Gallop) is a consulting firm with highly technical skills and specialized experience in transportation demand modeling and quantitative analysis. Gallop's professional staff have been involved in numerous projects and studies throughout the Baltimore-

Washington region. Gallop will develop data needed for input into our GHG and cost calculation methodologies. The second DBE is Straughan Environmental, a full service environmental firm whose experience covers development of planning studies, facility planning, land use planning, LEED, environmental assessments, and sustainability studies, with particularly strong expertise in the Built Environment Sector and in developing economic and air quality impact assessments. Straughan staff will support our co-benefits analysis and our work with the Built Environment Sector Subgroup. WSP has a plan in place with our DBE partners to provide them a total of 25% of the value of the contract, surpassing COG's 19% target for DBE participation (see Chapter 3).

WSP will apply the lessons learned and tools developed by our key personnel on similar and directly relevant projects for clients such as Prince Georges County, Boulder County, Colorado, Washington State, Sacramento Municipal Utility District and Arlington County, Virginia, and Washington DC's District Department of Transportation. Our PM has been active in providing similar and related support across the COG planning region since 2009. Mr. Aberant has done GHG emissions inventory development and mitigation support with Montgomery County, Arlington County, and Prince George's County, and provided review and guidance to Fairfax County on their GHG inventory and management efforts. He has worked with COG during the course of these projects to gather data and share results across the region. He has participated in several COG working group meetings over the years, and has an excellent understanding of the organization and their member governments.

WSP's GHG Emissions Mitigation Experience

WSP's key staff have significant experience evaluating GHG reduction strategies to help cities, counties, states, federal government agencies, utilities and private organizations across the United States plan and prioritize investment options to maximize

Examples of Relevant Projects Completed by Select Key Proposed Personnel

Matt Aberant (PM)

- Cost Effectiveness Evaluation Model for Electrification Technologies (SMUD)
- GHG Inventory development for Montgomery County, Arlington County, Prince George's County
- Updated GHG Inventory, Carbon Budget Goal Setting, and Carbon Neutrality Feasibility White Paper (SMUD)
- Electric Vehicle Investment Evaluation Tool for GHG and Cost optimization to reach a target of 175,000 EVs by 2030 (SMUD)
- Climate Action Plan for Prince George's County MD

Tim Kidman (Deputy PM)

- Evaluation of Approaches to Reduce State-Wide GHG Emissions (Washington State)
- Greenhouse Gas Marginal Abatement Cost Curve (MACC) Model (SMUD)
- Scoping and Strategy Development Document for a GHG Offsets Demonstration Project
- GHG Reduction Quantification for Water Conservation Measures in Southern CA

Michael Mondshine (Senior Technical Expert)

- GHG Regulation and Policy Analysis and Associated Impact Analysis for Western Electricity Markets (SMUD)
- Impact of Federal Regulations on Washington State Emissions
- Evaluation of climate protection actions – GHG emissions, other environmental impacts, and benefit cost evaluations for Montgomery County, MD

Evan Evans (Built Environment Lead)

- Boulder County Sustainability Planning, Implementation, and Impact Evaluation
- Preliminary Feasibility Assessment (GHG, Costs) of Stand-Alone Micro-grid and District Energy System

Marsha Kaiser (Transportation/Land Use)

- Tysons Corner Urban Plan – CarbonFIT model
- Westphalia Sector Plan, Prince George's County, MD

their energy savings, optimally reduce their emissions, and generate significant air quality and economic benefits. WSP's proposed project staff have recently completed a number of projects with similar scopes of work, where the evaluation of climate change, GHG emissions reduction, energy, land use, and transportation programs and policies were at the heart of the analysis. Across different levels of government and organizational types, WSP has excelled in analyzing and evaluating the costs and benefits of different types of GHG reduction measures and even the potential overlapping impacts with other measures and federal or state policy. For example, WSP key staff, including our proposed PM, Matt Aberant, deputy PM Tim Kidman, and the Senior Technical Expert, Michael Mondshine, along with proposed support staff Chris Bruno, recently exemplified our approach of integrating policy expertise and analytical skills through their support of the Climate Legislative and Executive Workgroup (CLEW) of Washington State in the evaluation of approaches to reduce state-wide GHG emissions. The project evaluated current State programs and the impacts from existing national, regional, and state regulations and policies, and recommended a set of additional actions needed to achieve the State's emission reduction targets set by the legislature. The team prepared a series of economic and policy analyses, cost estimates and GHG impact analyses, and presented results directly to Governor Inslee and the CLEW workgroup of four State legislators on topics such as a state level economy-wide cap and trade program, a carbon tax, and sector-specific approaches including a renewable portfolio standard, low carbon fuel standard, zero-emission vehicle mandate for the transportation sector and new building codes and energy efficiency funding mechanisms in the residential, commercial, and industrial sectors.

WSP's proposed Built Environment Sector Lead, Evan Evans, and proposed support staff Kealy Devoy, Mike Huisenga, Derek Fehrer, and Dan Sobrinski, have supported Boulder County, Colorado, through several phases of a GHG mitigation project over a six year period, including the following tasks:

- led a stakeholder engagement process, involving representatives of each municipal government in the county and the general public, that provided County government staff with input to the Sustainability Management Plan;
- developed an historical inventory of economy-wide energy usage, municipal solid waste (MSW) generation, and associated GHG emissions for the period of 1990 through the present;
- developed a projection of the business-as-usual emissions trend line out into the future, based on historical emissions data;
- disaggregated the overall inventory into sector-specific energy usage and associated GHG emissions;
- analyzed sector-specific energy efficiency, renewable energy, fuel-switching, and other emissions mitigation actions to identify cost-effective strategies for acquiring emissions reductions in each sector;
- aggregated sector-specific mitigation achievable with the identified strategies, thus establishing an overall achievable level of cost-effective sustainable energy actions and emissions reductions;

- based on these results, WSP recommended an economy-wide emissions reduction goal and target date (more realistic than the official Kyoto Protocol-based goal adopted by Commissioners);
- devised a Sustainability Action Plan for the Boulder County economy;
- designed specific program implementation and funding mechanisms; and
- developed budgets for successful program implementation, which would lead to achievement of the recommended sustainability goals.

The Placemaking team developed a CommunityViz-based scenario analysis tool (CarbonFIT) to evaluate land use related GHG emissions at a regional scale for the Greater Kansas City region (Kansas and Missouri) and at a precinct scale for the Tysons Corner Urban Master Plan (Virginia). Transportation Lead, Alice Lovegrove, and proposed support staff Edward Tadross conducted the purple line corridor transit study of air quality, energy, and greenhouse gases for the proposed 16 mile connection between the Metrorail Red Line, Green Line, and Orange Line for the Office of Planning of the Maryland Transit Administration. The project analyzed both Light Rail and Bus Rapid Transit alternatives within the corridor. The analysis took into account the varying energy usage factors for each mode considered and the change in VMT due to mode shifts and the resulting impact on fuel usage. Emission factors were derived from the Mobile 6.2 model using area specific fleet parameters, energy profile data as well as energy emission information from the U.S. Department of Energy. Compliance with the Transportation Conformity Rule was demonstrated. The analysis also included an evaluation of proposed stations and parking facilities associated with the project.

The WSP Team proposed staff have worked not just in the national capital region, but throughout the country on innovative projects that cross sector boundaries. For example, Alice Lovegrove and Edward Tadross were key staff on a project that conducted the air quality analysis of the proposed 700+ mile high-speed train system serving Sacramento, the San Francisco Bay Area, the Central Valley, Los Angeles, the Inland Empire, Orange County and San Diego. The air quality study projected the future pollutant emission burdens under future No-Build and four different Build Alternatives. The study also included the analysis of future traffic patterns, aircraft patterns, and energy usage of the rail system in order to determine the greenhouse gas impacts of each alternative. As the Program Manager, Ms. Lovegrove was responsible for project delivery, strategy development, implementation, and future monitoring.

WSP Team's Sector Experience

The WSP Team has worked extensively in the Energy, Transportation, Land use, and Built Environment sectors. The combination of WSP and Parsons Brinckerhoff has created one of the world's leading professional services consulting firms in the Built Environment Sector. WSP works to transform the built environment and restore the natural environment, with expertise in building engineering, design and performance to developing and improving

our nation's energy sources. The WSP Team provides comprehensive corporate energy management strategies, sustainable energy master planning, renewable energy resource assessments, feasibility studies, energy project investment due diligence, and energy audits. The Team's portfolio includes energy audits and analysis of many millions of square feet of commercial real estate, institutional buildings, and industrial facilities leading to energy efficiency retrofits that have saved clients many millions of dollars in energy costs. WSP was the consultant on Monsanto's Nidus Center, the first laboratory building to receive a LEED certification and on Alvento, a Madrid twin office tower project that received the first LEED certification in Europe. Recently, the WSP team conducted energy audits of every building on the campus of Georgetown University. Energy analysis results guided the development of a comprehensive campus energy master plan, including improvements to the campus district energy system.

The proposed WSP Team has extensive experience in providing GHG management services to Energy Sector clients as well, including significant engagement in the energy sector of the MWCOG jurisdiction. For example, we conducted a feasibility study of converting the MSW delivered to the District's Benning Waste Transfer Station into renewable electricity that would be put on the PJM grid. Waste heat from the power generation process would be captured and used to provide heating and cooling energy to Parkside, the mixed-use community immediately adjacent to Benning Station. WSP is also currently providing GHG management services to Washington Gas and Light (WGL) to enhance their GHG emissions inventory, improve their fugitive emission data collection from the gas delivery infrastructure, and evaluate progress in meeting their GHG reduction targets, targets that WSP PM, Matt Aberant, helped develop in previous work with WGL.

The WSP Team has also worked in the Energy Sector throughout the U.S. and internationally, and can bring this broad sector based experience to bear for COG. For example, we have devised an enterprise GHG mitigation strategy for Public Service of New Mexico. The resulting strategy emphasized aggressive demand-side management programs, biomass co-firing at coal-fired power plants, conversion of select coal-fired power plants to natural gas, utility-scale solar PV and wind, and upgrades to supercritical steam at select power stations. For the Ministry of Economy of Castilla y Leon, Spain's largest state, WSP developed a carbon mitigation plan for the state's electricity sector. The action plan called for upgrades to supercritical steam at select power stations, conversion of select coal-fired power plants to natural gas, utility-scale wind energy, and biomass co-firing at coal-fired power plants. The plan also quantified the economic impact of these actions, in particular the economic value of the avoided carbon taxes they would enable, and articulated a plan to develop in-state wind turbine manufacturing and biomass fuel production as economic development tools.

Additional Energy Sector experience includes our work for the past four years providing GHG inventory and reporting services to National Grid. This on-going engagement has provided us the opportunity to become intimately familiar with the National Grid enterprise and, in particular, their electricity and natural gas operations in New York, Massachusetts, and Rhode Island. Currently, WSP is providing GHG compliance services to CenterPoint Energy, a major energy supplier. CenterPoint's enterprise comprises an electric transmission and distribution utility serving the Houston metropolitan area, local natural gas distribution businesses in six states, a

competitive natural gas sales and service business serving customers in the eastern half of the U.S., interstate pipeline operations with two natural gas pipelines in the mid-continent region, and a field services business with natural gas gathering operations. For several years, WSP has been supporting CenterPoint in collecting the required field data, processing it, and reporting it in the framework of EPA's mandatory Greenhouse Gas Reporting Program.

The Transportation Division of WSP's newly acquired Parsons Brinckerhoff (PB) has extensive knowledge and experience across the Transportation Sector, such as mobile source air quality modeling, developing and running regional transportation models, conformity issues, and climate change and energy analysis. PB, as part of WSP, is a recognized leader in the transportation-related air quality field. As one of the nation's largest transportation-related engineering and environmental consultancies, staff have completed air quality and GHG emission impact assessments for the entire range of transportation projects including roadways, transit facilities, airports, toll plazas, depots, maintenance facilities, parking lots and garages. Our staff have worked in cooperation with the U.S. Environmental Protection Agency (EPA), to develop CAL3QHC, the air quality dispersion model required by the EPA for the completion of project-specific microscale State Implementation Plan conformity determinations. The team has also completed numerous conformity compliance determinations for roadway projects throughout the country, using state-of-the-art emissions estimations procedures to determine the effect of proposed projects on the regional burdens of carbon monoxide, nitrogen oxides, and volatile organic compounds. We have also completed both qualitative and quantitative PM10/PM2.5 analyses in accordance with FHWA guidance and also have extensive experience conducting quantitative construction-related air quality analysis. PB has been the on-call air quality and GHG consultant for New York State DOT (NYSDOT) for the past five years. Under this contract, PB has successfully completed a variety of tasks for NYSDOT including updating CMAQtraq, a database tool designed to organize and track information pertaining to Congestion Mitigation/Air Quality (CMAQ), to assist NYSDOT in evaluating the relative air quality benefits between projects of different scope and size and conducting a regional emissions analysis of the Orange County Transportation Council (OCTC) 2014-2018 Transportation Improvement Program (TIP) and 2040 Long Range Transportation Plan. That analysis was based on traffic data from the Orange County Transportation Council travel demand model which was supplied through NYSDOT for analysis years 2014, 2017, 2025, 2035 and 2040.

Gallop has collaborated with WSP in the past on transportation analyses in the region, working together to develop very similar analyses to those that will be required to support COG in this RFP. Recently, Gallop performed travel demand analysis and transit ridership forecasting for the Maryland Transit Authority (MTA) on several projects including the Baltimore Red Line Studies, Southern Maryland Transit Corridor Study, Baltimore Red Line AA/DEIS Study, and Purple Line AA/DEIS Study, SHA's MD 5/US 301 and Howard County US 1 Corridor Studies, DDOT's South Capitol Street Bridge and 11th Street Bridge EIS Studies, as well as FHWA's 14th Street Bridge Corridor EIS Study.

WSP's Placemaking practice has worked in the Land Use and Transportation Sectors and understands why climate change has resulted in a focus on com¬pact smart growth, travel demand management and other integrated land use and transportation strategies. The WSP team brings a broad suite of planning and policy decision-making tools and expertise that will help the study partners to easily identify both 'low-hanging fruit' solutions as well as to develop a strategic plan to implement the 'stretch solutions' in these sectors. The team offers a wide array of planning and design services from multi-jurisdictional policy planning to detailed station design. Our transit services also include corridor assessments, transit design, joint development planning, transit-oriented development (TOD) sketch and detailed planning, TOD policy and form-based code development, sustainability, and public education and involvement in a number of Metropolitan Washington locations. Combined with our sketch tool capabilities for scenario planning related to GHG reductions, the WSP Team is uniquely qualified to support MWCOG in this effort.

Beyond the proposed project team, WSP also has extensive resources that can be called upon in each sector for support in developing data sets and assumptions included in our evaluation methodologies. For example, WSP's Built Ecology Practice has spent the last 15 years designing high performance buildings, and the Power and Energy Division of newly acquired Parsons Brinckerhoff brings 1,100 professionals working on power engineering projects around the world including hydroelectric power plants, geothermal, solar, and other renewable technologies.

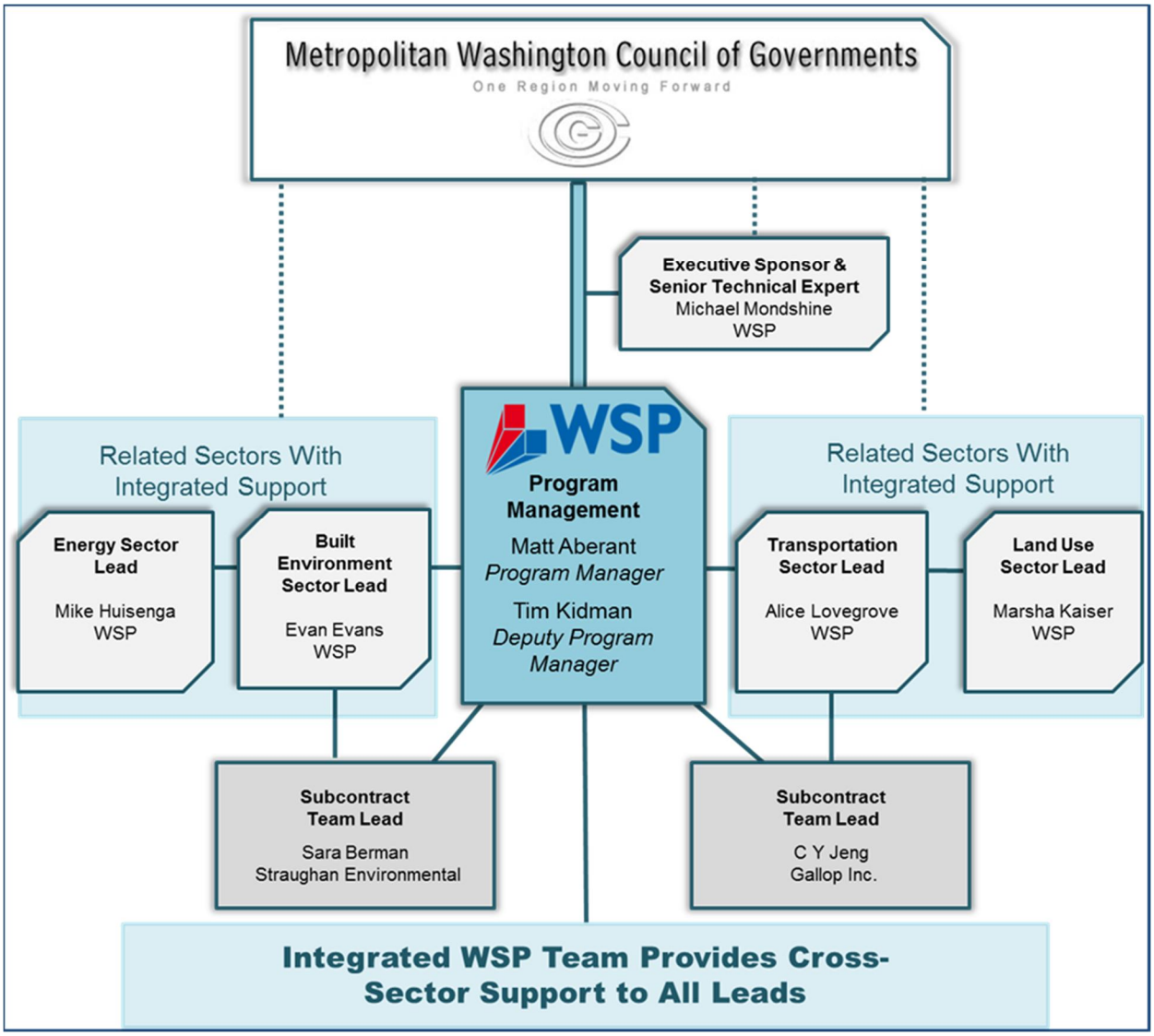
WSP Team Organization

WSP is proud to provide this highly skilled and qualified team of climate, utility, and energy experts, scientists, engineers, analysts, and planners to support COGs efforts in climate change mitigation, GHG emission reductions strategies, goal setting and regional planning. This pool of resources will be managed by a single frontline delivery organization, WSP Sustainability and Energy (S&E), which was created specifically to integrate the multi-disciplinary services required by clients such as COG. With our Vice President for Sustainability and Energy located in Arlington, Virginia, and serving as the Executive Sponsor of this project, our vast array of capabilities will be delivered through a single point of contact to COG. Over the last six years, S&E has assisted over 100 clients across all sectors, including local governments and transportation organizations, in developing GHG management strategies, managing scores of projects and personnel closely related to the Climate Change and GHG reduction evaluations, as demonstrated by the example projects and technical approach described in Chapter 2. As of 2011, the Climate Change Business Journal has recognized WSP's S&E delivery organization with a Gold Award for being one of the world's leading advisors on sustainability and climate change.

The WSP Team organizational structure, as illustrated in Figure 1, is designed to funnel the great breadth of experience and knowledge from all members of the WSP Team to COG to enhance and grow COG's leadership position on addressing climate change through enhanced scenario and strategic planning using advanced analysis.

The WSP PM, Mr. Matt Aberant, will be the primary point of contact between the project team and COG and bears ultimate responsibility for the development, staffing, budgeting, and execution of tasks under the contract. He will be directly supported on all aspects of managing the contract by the Deputy PM, Mr. Tim Kidman, who will also serve as a secondary contact for COG. The program management team will be supported by technical leads identified for each of the major sectors as described by COG, as well as by a team lead from each of our DBE's. For project execution it can often be more efficient to have technical staff directly communicating with one another, so individually tailored communication plans can be established for specific strategies to align WSP experts with the Multi-Sector Working Group (MSWG) members.

Figure 1. WSP Team Organization Chart



Key Staff

The combined GHG management experience of WSP's Key Staff stretches back more than 20 years and allows us to provide skills and experience in all of the potential strategic areas and sectors to analyze strategies that will enable COG to address the range of challenges presented by future GHG emission constraints and climate change stresses, as well as seize any opportunities presented in a future carbon constrained economy. Summary biographies for key staff appear directly below and resumes providing the specific role for each staff member and greater detail on their experience and education are provided for all proposed staff in **Appendix A** for COG's review. Table 1 below provides an overview of staff capabilities and availability as it relates to the scope of work as defined in the RFP.

The PM and Deputy PM will lead the project team, coordinate efforts with COG, attend meetings, provide technical support across all tasks, assign work to support staff and ensure on time and on budget delivery all deliverables. The Senior Technical Expert will attend meetings with COG to help facilitate consensus building and provide insight into strategy and methodology development. The Sector Technical leads will attend their respective Sector Subgroup meetings and lead the development of GHG reduction strategies and analysis methodologies related to their sectors. They will work with support staff to complete the analysis of each strategy and present results to the working groups.

The WSP PM, Mr. Matt Aberant, a Project Director with WSP, has 12 years of professional experience in the areas of climate change, environmental science, and modeling. Mr. Aberant has a history of leadership in the development, management, and evaluation of climate change issues and programs. He has significant experience managing projects for the U.S. Federal government, Local and State Government, commercial clients, and utilities. Mr. Aberant is well qualified as the proposed PM and to provide GHG quantification analysis through his experience in providing similar and related support across the COG planning region since 2009. He has managed GHG emissions inventory development and mitigation support projects with Montgomery County, Arlington County, and Prince George's County, and provided review and guidance to Fairfax County on their GHG inventory and management efforts. Mr. Aberant has worked with COG during the course of these projects to gather data and share results across the region. He has participated in several COG working group meetings over the years, and has an excellent understanding of the organization and their member governments. Mr. Aberant is well qualified to support all technical GHG quantification aspects of the scope of work across sectors as well as COG's goal setting efforts through his experience in similar roles with the Sacramento Municipal Utility District (SMUD), Washington State, and federal GHG program support. Mr. Aberant was the PM and technical lead supporting the U.S. Environmental Protection Agency's (EPA) Climate Leaders Program where he provided analysis and technical assistance to the Program and all new corporate partners for setting aggressive yet attainable GHG reduction goals from 2009 to 2012. He ran a model designed to set benchmarks for specific industry sectors in energy consumption, fuel prices, GHG intensity, and economic revenue. He also developed GHG emission and reduction

calculation methodologies and analytical tools for the U.S. Energy Information Administration, EPA's mandatory GHG Reporting Program, the U.S. Department of Defense in response to Executive Order 13514, NASA, USGS, the Defense Logistics Agency, and developed GHG reporting protocols for voluntary GHG reduction programs such as the 1605b Voluntary Reporting of Greenhouse Gases Program (the first Federal GHG registry), California Climate Action Registry (before it became the California Action Reserve) and The Climate Registry. Mr. Aberant is also well versed in co-benefits analysis and recently led the development of a co-benefits evaluation framework for the Water Environmental Research Foundation (WERF) as part of the development of Green Energy Life Cycle Assessment Tool (GELCAT) for screening selected renewable electric technologies for application at waste water treatment and water delivery facilities. Mr. Aberant is experienced supporting GHG emission reduction efforts in the energy sector on the supply side, performing GHG inventory and emission reduction analysis for utilities including, SMUD, Nebraska Public Power District, Oklahoma Gas and Electric, and Washington Gas and Light (WGL).

The WSP Deputy PM, Mr. Tim Kidman is a Senior Consultant at WSP who works on GHG mitigation, offsets, and adaptation, sustainable strategy, and related sectors including energy efficiency, renewable energy, and transportation. He has in-depth knowledge of state climate policy, carbon pricing mechanisms, the offset market, standards development process, verification, and project monitoring. Mr. Kidman is currently leading work on multiple sketch models, including one for an electricity community choice aggregator, assessing GHG mitigation initiatives, cost impacts, and benefits accruing across society. Mr. Kidman led the efforts for the Washington State Climate Legislative and Executive Workgroup (CLEW) to assess the emissions mitigation potential and cost impacts of various policy options under consideration for meeting state GHG mitigation targets by coordinating multiple parallel and overlapping modeling efforts. In addition to analyzing potential GHG policy options, he has also worked on the execution side, supporting both the U.S. EPA and California Air Resources Board in implementing their GHG reporting programs and platforms eGGRT and Cal-eGGRT, respectively. He is lead author of California's ozone depleting substances compliance offset protocol, and contributed to the development of multiple other compliance and voluntary offset protocols.

The WSP Executive Sponsor and Senior Technical Expert, Mr. Michael Mondshine, is an internationally recognized expert in the fields of energy, sustainability and climate change, with 22 years of experience in GHG accounting, policy development and mitigation. His prior experience includes development of climate action plan for the State of Maryland, under which he contributed to the review of more than 50 possible mitigation strategies, support for the Washington State CLEW for which he provided modeled analysis of the impact of Federal regulations on future emission levels within the state, and assistance to Arlington County in the preparation of community GHG inventories and development of their Community Energy Plan. He currently serves as senior client liaison on a contract to support development of district energy systems in Arlington. Mr. Mondshine has extensive experience with meeting facilitation and consensus building including developing and presenting workshops for stakeholder input into potential GHG emissions reduction strategies for the state of Maryland. More recently, he prepared and

led presentations for stakeholders for a proposed sustainable food processing district in Fresno, CA, including developers, the Mayor's office, potential district residents and the local utility. Mr. Mondshine is on the United Nations Framework Convention Roster of Experts for inventory preparation and has been recognized by the Intergovernmental Panel on Climate Change (IPCC) for his contributions to their receipt of the 2007 Nobel Peace Prize. He currently serves as Board Chair of the Association of Climate Change Officers (ACCO).

WSP's Built Environment Sector Lead, Evan A. Evans, is expert in energy efficiency, renewable energy, and greenhouse gas emissions management, working exclusively in these fields since 1979. Evan directs WSP USA's Sustainable Energy practice which provides comprehensive corporate energy management strategies, sustainable energy infrastructure master planning, renewable energy resource assessments, feasibility studies, investment due diligence, and monetization of carbon offsets from efficiency and renewable energy projects. A registered professional engineer, Mr. Evans has a 36-year track record of feasibility studies of the full gamut of renewable energy technologies and central energy plant performance improvements, energy performance improvements in buildings, and technical assessments of emerging sustainable energy technologies. He began his career in 1979 at the Solar Energy Research Institute (now the National Renewable Energy Laboratory). In recent years, his focus has been on next-generation technologies for producing renewable electricity, renewable thermal energy, renewable natural gas, and renewable liquid fuels from biomass MSW. He contributed to original Kyoto CDM methodologies for sugarcane bagasse-fired combined heat and power (CHP), industrial wastewater biogas-fired CHP, and small-scale run-of-river hydroelectric projects. Mr. Evans' project portfolio also includes energy audits and analysis of millions of square feet of commercial real estate, institutional buildings, and industrial facilities leading to energy efficiency retrofits that have saved his clients many millions of dollars in energy costs. Recently, Evan led the WSP team that conducted energy audits of every building on the campus of Georgetown University. Energy analysis results guided the development of a comprehensive campus energy master plan, including improvements to the campus district energy system.

WSP's Energy Sector Lead, Mike Huisenga, is a senior consultant in WSP's Sustainability and Energy practice with eight years of professional consulting experience in renewable energy project development. He has worked closely and extensively with our lead for the Built Environment Sector, Evan Evans, on GHG mitigation projects and corporate sustainability services. His areas of technical expertise include resource assessment, combined heat and power, solar power, financial analysis, industrial energy efficiency, and life cycle assessment. He is an expert user of various specialized software tools used in the energy and Life Cycle Assessment industries including SAM, HOMER Energy, Thermoflex, GREET, GaBi and SimaPro. Over the course of his career, Mr. Huisenga has focused on both domestic and international work with direct experience in Japan, China, Vietnam, Mexico, Guatemala, Honduras, Nicaragua, Belize, and South Africa supporting clean energy policy, program and project development. He has authored two original GHG Baseline and Quantification methodologies for the Verified Carbon Standard, and has provided input to the development of the mine methane protocol used in the California

compliance offset market. He has provided assistance to project operators with the verification and monetization of over 300,000 metric tons of carbon offsets.

WSP's Land Use lead, Marsha Kaiser, serves as the National Director of Placemaking Services within Parson Brinckerhoff. The Placemaking services are directed to projects which serve to build and revitalize communities through the integration of land use and transportation investment. Her extensive experience in planning is focused on land use, economic and development impacts of transportation projects. She specializes in context sensitive solutions that are geared to weaving transportation infrastructure into the fabric of communities. Ms. Kaiser served as deputy project manager in the development of comprehensive land use/transportation plan to convert this 1,700 acre suburban "edge city" into a walkable, vibrant urban center using four proposed new metro rail stations as the catalyst for the land development changes. The plan included design guidelines, context sensitive urban street cross sections, and alternative transit networks. Ms. Kaiser managed the application of proprietary software to determine reductions in carbon emissions at various stages of plan implementation.

Prior to joining Parsons Brinckerhoff, she served for eight years as the Planning Director for the Maryland Department of Transportation, involved in directing and guiding innovative multi-modal transportation solutions throughout the state.

WSP's Transportation Lead, Alice Lovegrove, has extensive experience in mobile source air quality modeling, environmental engineering emphasizing global climate change, and energy analysis for both operational and construction phases of a project. Ms. Lovegrove has detailed knowledge of the requirements set in the Environmental Protection Agency's (EPA) New Clean Air Act Amendments and Final Conformity Ruling. Her work for Parsons Brinckerhoff includes conducting environmental analyses and resolving conformity issues for bridges, rail (light, heavy and high speed) and highways across the United States. Ms. Lovegrove has prepared and managed major air quality and energy studies for the Federal Transit Administration (FTA), the Federal Highway Administration (FHWA), EPA and several state and local agencies. She has extensive experience with many emission and dispersion models including MOVES, MOBILE, EMFAC, EMIT, NONROAD, URBEMIS, CALEEMOD, CALINE4 and CAL3QHC. She received the 2008 PB Americas Award in the area of sustainability for her work in the field of climate change and was the 2009 PB Americas Professional Publications award winner for a paper she co-wrote regarding greenhouse gas analysis techniques in National Environmental Policy Act (NEPA) documentation. She is also the primary developer of the C-MISSION Construction Emission Tool, which integrates equations from the NONROAD model with actual construction scheduling, allowing the user to estimate daily, monthly and/or annual construction energy usage, criteria pollutants and greenhouse gas emissions.

Table 1. WSP Staff Capabilities Matrix

Staff	Key Staff?	Firm	Availability (% of Time)	Subject Matter Expertise and Planned Allocation						
				GHG Reduction	Cost Analysis	Co-Benefits and Air Quality	Energy	Built Environment	Transportation	Land Use
Key Staff										
Matt Aberant	Yes	WSP	50%	✓	✓	✓	✓	✓	✓	
Tim Kidman	Yes	WSP	50%	✓	✓		✓	✓	✓	✓
Michael Mondshine	Yes	WSP	20%	✓	✓		✓	✓		
Evan Evans	Yes	WSP	25%	✓	✓	✓	✓	✓		
Mike Huisenga	Yes	WSP	30%	✓	✓	✓	✓	✓		
Marsha Kaiser	Yes	WSP	40%		✓	✓			✓	✓
Alice Lovegrove	Yes	WSP	40%		✓	✓			✓	✓
Support Staff										
Eric Christensen	No	WSP	30%	✓	✓		✓	✓		
Derek Fehrer	No	WSP	30%	✓	✓		✓	✓		
Chris Bruno	No	WSP	30%	✓	✓		✓			✓
Kealy Devoy	No	WSP	30%	✓	✓			✓		
Brennen Walsh	No	WSP	30%	✓			✓			
Laura Aldrete	No	WSP	30%	✓					✓	✓
Edward Tadross	No	WSP	30%	✓		✓			✓	✓
Chris Dorney	No	WSP	30%	✓		✓			✓	✓
Sub-Contractor Staff										
CY Jeng	No	Gallop	30%						✓	
Eric Ho	No	Gallop	30%						✓	
Sara Berman	No	DBE	20%	✓	✓	✓			✓	
Diana Gutierrez	No	DBE	20%	✓	✓	✓	✓	✓	✓	
Alverna Durham	No	DBE	20%		✓	✓				

Chapter 2. Scope of Work

WSP's Sustainable Strategies Practice has been built around the concept of integrating economic and energy market impact analysis with a deep understanding of the federal, regional, state, and local public policy and regulatory environments around energy, sustainability and climate change. WSP applies this integrated knowledge base and analytical skill set to work with clients across a broad spectrum of sectors to develop comprehensive strategic plans. Given the time constraints, finite resources and importance of this project, WSP has designed a low-risk cost-minimizing approach that utilizes previous work done by COG and the methods, processes and tools developed and executed on similar projects by the WSP team for federal agencies, states, municipalities, utilities and commercial entities. WSPs approach to each task, as described in the COG RFP, is provided below.

As COG has only secured a guaranteed $200,000 of funding, WSP is recommending an approach utilizing sketch planning tools, established models and simplified cost and co-benefit analysis methodologies that will accomplish the goals of this effort and provide significant value for that level of funding. WSP has successfully taken this approach in the past for resource constrained projects with Prince George's County, Maryland, Washington State, Boulder County, Colorado, and the Sacramento County Municipal Utility District (SMUD). Further, at that level of funding, there will be an inevitable trade-off between the number of strategies examined and the depth of that examination. WSP's approach to managing that trade-off is described under Tasks 3 and 4 below. It is our expectation that we can limit if not eliminate some of these trade-offs should additional funding be available, and this topic would be a central point of discussion during the finalization of the contractor work plan. WSP has proposed this approach because additional funding often is uncertain and may take time to secure, and it allows us to begin work at full speed with clear objectives for highly valuable output while permitting COG and expand the scope and depth of the final product should additional funds become available.

Task 1. Finalize Contractor Work Plan

WSP proposes the following task and subtask breakdown as the initial basis for the contractor work plan to be developed under Task 1. The details of this proposed task list and schedule will be discussed and finalized with COG as part of the Kickoff meeting. The final agreed upon set of tasks and deliverables and the associated schedule of due dates will be submitted as the Task 1 deliverable, Contractor Work Plan. See Table 2 below for our detailed initial proposed work plan.

Table 2. Initial Proposed Work Plan

Task/Subtask	Deliverable	Start Date	Due Date	Personnel Supporting
Task 1	Final Work Plan	Day of Award	1 Week after Kickoff	Aberant, Kidman
Sub Task 1.1	Kick Off Meeting	With-In 1 Week of Award	Late March	Aberant, Kidman
Task 2	Meet With Sector Subgroups. Prepare Technical Memo	1 Week After Kickoff	May 8th	All Key Staff, Select Support Staff
Sub Task 2.1	Review of Subgroup Initial List of Strategies	1 Week prior to Subgroup Meetings	First Subgroup Meetings	All Key Staff, Select Support Staff
Sub Task 2.2	Energy/Environment Subgroup Meeting 1	Early April	Early April	Aberant, Kidman, Evans, Mondshine, Energy Technical Lead.
Sub Task 2.3	Transportation Subgroup Meeting 1	Early April	Early April	Aberant, Kaiser, Lovegrove, CY Jeng
Sub Task 2.4	Land Use Subgroup Meeting 1	Early April	Early April	Kaiser, Aldrete, Aberant,
Sub Task 2.5	Develop Draft Technical Memo For Each Subgroup	Mid April	Mid April	All Key Staff, Select Support Staff
Sub Task 2.6	Energy /Environment Subgroup Meeting 2	Mid April	Mid April	Aberant, Kidman, Evans, Mondshine, Energy Technical Lead.
Sub Task 2.7	Combined Land Use Transportation Subgroup Meeting 2	Mid April	Mid April	Aberant, Kaiser, Aldrete, Lovegrove, CY Jeng
Sub Task 2.8	Revised Technical Memos / Combined List of Recommended Strategies	Late April	May 8th	All Key Staff, Select Support Staff
Task 3	Present Combined List of Recommended Strategies to MSWG and Finalize Technical Memo	May 8th	End of May	All Key Staff, Select Support Staff
Sub Task 3.1	Present to MSWG on Subgroup Strategies	May 8th	May 8th	Aberant, Mondshine, Kaiser, Aldrete
Sub Task 3.2	Collect and Address feedback and comments from MSWG	May 8th	Mid-May	All Key Staff, Select Support Staff
Sub Task 3.3	Develop Final Technical Memo on Combined List of Strategies for Detailed Analysis	Mid-May	Late May	All Key Staff, Select Support Staff
Task 4	Analyze Selected Strategies and Draft Technical Memo Detailing Results	Early June	Mid-July	All Key Staff, All Support Staff
Task 5	Present Results and Interim Technical Report to Subgroups and full MSWG	Mid-July	Mid-August	All Key Staff, Select Support Staff
Sub Task 5.1	Present Results of Task 4 to Sub-Groups	Mid-July	Late-July	All Key Staff
Sub Task 5.2	Address Sub-Group Comments	Mid-July	Late-July	All Key Staff, Select Support Staff
Sub Task 5.3	Present Results to Full	July 31st	July 31st	Aberant, Mondshine, Kaiser, Aldrete

Task/Subtask	Deliverable	Start Date	Due Date	Personnel Supporting
	MSWG			
Sub Task 5.3	Assist MSWG to prepare presentations	August	September	All Key Staff, Select Support Staff
Task 6	Explore Sector GHG Goals and Targets	Early August	Late -September	Aberant, Kidman, Select Support Staff
Sub Task 6.1	Develop Technical Memo on sector goals and targets	Early August	Mid-September	Aberant, Kidman, Sobrinski, Bruno, Devoy
Sub Task 6.2	Present Technical Memo To MSWG	September 25th	September 25th	Aberant, Sobrinski
Task 7	Final Technical Report	Early October	January 2016	All Key Staff, Select Support Staff
Sub Task 7.1	Address All Remaining Comments on Tasks 4 and 6	Early October	Late October	All Key Staff, Select Support Staff
Sub Task 7.2	Incorporate Results from All Tasks in Final Report	November	Early December	All Key Staff, Select Support Staff
Sub Task 7.3	Assist COG Staff in Preparing Presentations to COG Groups and Board in Dec. and Jan., Participate if Needed	Mid-December	January 2016	All Key Staff, Select Support Staff

Task 2. Meet with Subgroups and Review Proposed Strategies

The primary purpose of Task 2 is to achieve consensus within each sector subgroup on which GHG reduction strategies to analyze further. WSP's PM will lead this task with direct support by the Sector Leads and the Senior Technical Expert. Through a contract vehicle provided by COG, The WSP PM, Mr. Aberant, worked through a similar process with Prince George's County. As part of a larger GHG inventory and climate action planning project, Mr. Aberant, as the PM, facilitated the development of a public and private community stakeholder working group, and worked with the group to identify new GHG reduction programs and measures across sectors. A similar process was used, where the main working group was divided into subgroups, each with a clearly defined purpose. Mr. Aberant worked directly with several of the subgroups, conducting trainings and collecting information and data to help facilitate the process. The subgroups were then brought back together and an agreement was made on the set of measures and strategies to be included in the planning effort. Learning to leverage the resources within the working group became critically important to the project, as the project budget couldn't support allocating 100% of the required work to the contractor. Mr. Aberant coordinated the distribution of tasks to the subgroups and requested a lead for each subgroup to volunteer to be accountable for the group, providing the information and support needed. A similar effort will be made as part of Task 2. WSP will work to identify the capacity and interests of municipal government staff who are members of the MSWG to support this effort beyond attending meetings, by providing additional time, data, and applying their knowledge and experience. This strategy will also help create a sense of ownership by the members of the working group and facilitate stakeholder buy-in later in the process and continued support through future implementation.

The PM and Senior Technical Expert will attend each meeting in person, and the Land Use Sector Lead wills attend meetings for her respective sector specific subgroup and the Transportation subgroup in person. The Deputy PM and Energy, Transportation, and Built Environment Sector Leads will attend the subgroup meetings remotely, via teleconferencing, with WSP support staff and subcontractor staff, along with the PM and Senior Technical Expert attending in person. WSP will meet twice with each of the three Sector Subgroups (Energy/Environmental, Transportation, and Land Use) to refine and finalize a list of GHG reduction strategies for each of the four sectors: Energy, Built Environment, Transportation, and Land Use. Each Sector's list of reduction strategies will be made up of two components, a Primary list of strategies, and a Stretch list of strategies. The Primary list will be strategies with strong potential to effectively reduce GHG emissions under current conditions. The Stretch list will be a smaller set of strategies that would likely require some major shift (e.g., public policy, energy prices, technology) before they would be feasible.

Prior to the first meeting with the Sector Subgroups, WSP will request the preliminary lists of reduction strategies developed by each group be provided at least one week before the first meeting. This will allow WSP time to prepare to discuss each list, develop suggestions for consolidation or expansion, and determine potential analysis methodologies for further evaluation. During the first meeting, WSP staff and the members of each Sector Subgroup will discuss the list of strategies, providing additional insight and detail based on our knowledge and experience working in these sectors on previous projects. Based on these discussions, WSP will develop a Technical Memorandum to provide to each subgroup prior to the second meeting, recommending a prioritized list of strategies, both Primary and Stretch, to be further analyzed and considered for inclusion in future action planning efforts.

Prioritizing strategies for the purpose of the Technical Memorandum will not be limited to the potential magnitude of GHG emission reductions, but on a multitude of criteria that will provide an overall ranking of effectiveness. The primary drivers of effectiveness such as GHG impacts, costs, and potential co-benefits will not be quantified in detail until Task 4. While qualitative assessments of these will drive the prioritization process, several other alternative criteria will also be applied based on WSP's and COG's past experience with these strategies. The criteria for the Primary list of sector strategies may differ slightly from those used to prioritize the Stretch list. WSP will evaluate potential strategies based on GHG reduction potential, cost, and alternative criteria such as:

- Has COG included this strategy in past work and has analysis on this strategy been completed or started during a previous COG project?
- Are there quantitative methods and data available for advanced analysis, or will additional analyses provide minimal value in evaluating the strategy? For example, evaluating the impacts of educational and public engagement programs on GHG emissions in some sectors can be very difficult. It is likely that estimates based on a literature review of studies in this area would provide as good or better results, at lower cost, than attempting to develop a complex quantitative methodology that attempt to forecast changes in behavior.

- Are there examples of this project, either successfully or not successfully, being implemented in other regions or municipalities? Real world examples can provide key insight into the potential for success that a model or calculation methodology cannot.
- Is there political will or public support for implementation? This is where input from the MSWG will be critical in helping WSP understand any potential road blocks to implementation that may exist currently in the member governments or overall region. Even a strategy with the potential to be very effective will not provide reductions if it cannot be implemented. Based on our assessment here, some strategies could be pushed from the Primary list and be considered for further analysis as part of the Stretch list of strategies being developed.
- Regional Implementation vs. Local Implementation. Can this strategy be scaled and implemented for the whole region?
- Are there relevant co-benefits applicable to this strategy? (See Table 3 for potential co-benefits)

WSP will present a Technical Memorandum to each Sector Subgroup during their second meeting describing our process for prioritizing and potentially condensing the list of strategies. This will include evaluation details and WSP's decision rationale. WSP will facilitate discussion on this revised list with all the members of each subgroup. This will be a formal process that allows each member to voice their opinion and be heard by the group. Adjustments, exclusions, or additions will be made based on this discussion, and WSP will build consensus around a concise final list of highly effective strategies. Our Senior Technical Advisor will run this meeting and utilize his previous experience in meeting, expert panel, and work group facilitation. WSP will also set expectations for the enhanced analysis to be completed on this finalized list by discussing potential methodologies, tools, processes, and data needs with the Subgroup. WSP will look to leverage resources by recruiting members of each subgroup at this meeting to provide data or suggestions for data sources needed to ensure the enhanced analysis completed in Task 4 is region-specific. While COG will be providing a significant amount of data, certain strategies may be suggested by members of the subgroup because of data they have available or have worked with previously.

WSP is proposing the second meeting of the Transportation and Land Use sector subgroups be combined into a joint meeting. The WSP team approach recognizes the inextricable link between land use and transportation decisions. While the demand for transportation infrastructure is derived from land use choices, we also understand how transportation choices can influence land use investments, especially in light of changing demographics and employment types (e.g., high percentage of independent contractors) in the Metropolitan Washington region. We also understand the COG's Region Forward vision and the role of the 141 Regional Activity Centers plan in achieving that vision and shaping integrated land use and transportation investments. Consequently, the team proposes to conduct a combined land use and transportation meeting to consider the benefits and constraints of the strategies identified by the Sector subgroups. The discussion will also address the link between land use and transportation strategies and whether an 'integrated' group should be developed to reflect the interrelationship.

Our Land Use Sector Lead Marsha Kaiser has learned that it is almost impossible to separate land use and transportation and has taken this combined approach on projects such as managing a multi-dimension conceptual plan to create an urban district through the interconnection of the Historic Baltimore Penn Station with the neighborhoods north and south of the station. The project included plans for redevelopment of the internal station to accommodate future passenger and revenue generating growth, with complete streets and land development concepts to connect the city better to the station. Extension of development over the Jonesfalls Expressway was even included to create more connectivity between the neighborhoods on either side, and to add to the vibrancy of the area. The project goals were to both increase the utilization of main transportation hub and better utilize the surrounding areas.

Critical to the effort in Task 2 will be communicating potential evaluation methodologies for the proposed strategies. This will build an understanding of data requirements, levels of uncertainty, level of regional specificity of the results, and other elements that will better enable the Sector Subgroups to select strategies to include. WSP has extensive experience with evaluating GHG reductions for a wide range of projects and programs in the Land Use, Transportation, Energy and Built Environment Sectors. We can use this experience to clarify how strategies need to be defined and structured to ensure the highest quality analysis. For example, the RFP gives several examples of strategies as part of the Task 2 description, such as increase proportion of electric vehicles in fleet to 15% by 2030 that would require a slightly different structure to do a full analysis. The methodology for estimating GHG reductions could be straightforward for this strategy and WSP could utilize the framework for existing tools we have developed for Prince George's County, SMUD, Washington State, Boulder County and others to facilitate the calculation. However, the cost methodology is where some changes to the structure of the strategy may be required based on the level of complexity COG is requesting. For GHGs, WSP would use the COG vehicle population data and VMT projections out to 2030, along with assumptions or modeled projections agreed upon with the MSWG about future vehicle efficiency, electricity emission factors, and the timing of the transition (going to 15% with a linear interpolation or through an alternative adoption pathway), to estimate the total VMT and fuel consumption for both a baseline or business as usual (BAU) scenario (e.g. 8% EVs in 2030) and the strategic scenario (15% EVs in 2030), with the difference being used to estimate the potential GHG reductions. WSP has developed scenario based emission calculation tools to use for just this purpose for multiple clients and can efficiently adapt our current suite of tools to cover the GHG calculations for the selected COG strategies. The methods proposed for use with the COG strategies would strive for consistency with the inventory methods and factors used by COG to develop the 2005 baseline and 2012 updated inventory. This will ensure reductions estimated will be comparable with previous emission estimates.

For developing cost estimates there are many factors that need to be considered that may alter the structure or require additional detail to be added to the strategy. In order to push EV adoption to 15% by 2030, some action will be required to incentivize more of the public to purchase EVs that would not have done so in the absence of this action. Examples of this include, but are not limited to:

- Having utilities provide a reduced rate for home charging;
- Provide a buy down incentive to reduce the cost of purchasing a vehicle;
- Install more regional public charging stations to reduce range anxiety; and
- Work with multi-family buildings to overcome the challenges and costs of installing charging stations for their residents.

Each of these incentivizing actions has a different cost associated with it. It is outside the scope of this task to estimate the scale at which each possible incentivizing action would enable COG to meet the strategy goal, in this case 15% EVs by 2030. WSP will work with MSWG to develop some conservative and realistic assumptions around these based on existing studies, our past experience, and similar efforts implemented in other regions. Without defining these incentivizing actions, any cost estimate will only capture a portion of the actual cost of the strategy. It is simple enough to calculate the number of EVs that would be required to meet the 15% by 2030 goal and their marginal costs (cost over traditional vehicles), and marginal energy cost or savings (cost of gas for those vehicles minus the cost of electricity). However, the marginal vehicle and energy costs are not the whole picture. Not only are there costs associated with the electric vehicle supply equipment (EVSE) including residential chargers, public charging stations and the associated infrastructure as well as any electric utility costs associated with meeting new demand that likely gets passed on to the rate payers, but in order to be comprehensive, COG should include as many of the following cost/benefits as possible in their evaluation.

a) **Capital/Technology Cost –** Represents the marginal up-front cost of the strategy.

b) **Maintenance Cost –** Represents the annual net change in maintenance costs related to the strategy.

c) **Incentive Costs/Benefits –** Represents the one-time costs to the program administrator (whoever is incentivizing the action) and benefits to participants for implementation of the measure.

d) **Overhead/Administrative Costs –** Represents the one-time costs to program administrator associated with instituting the incentive program.

e) **Electricity Avoided Cost –** Represents the increase (EVs) or decrease (EE) in bill payments from the participants as a result of strategy implementation

f) **Rate Payer Avoided Fuel Cost –** Represents the increase or decrease in bill payments from participants to a natural gas, gasoline or other fuel type supplier as a result of strategy implementation.

g) **Electricity Avoided Cost (to Utility) –** Represents the increase or decrease in electricity procurement, capacity, or infrastructure costs, as a result of strategy implementation.

h) **Utility Avoided Fuel Cost –** Represents the increase or decrease in procurement costs to the natural gas, gasoline, or other supplier as a result of measure implementation.

WSP would first work with the MSWG to come up with an agreed-upon definition or set of definitions of cost. Typically when evaluating the cost of GHG mitigation strategies for different types of organizations, WSP will utilize one or more of the following cost tests.

- Total Resource Cost Test
- Participant Cost Test
- Program Administrator Cost Test
- Rate Payer Impact

Each of these cost tests includes different elements of cost depending on the perspective taken. For example the Total Resource Cost Test would likely capture everything, whereas the Program Administrator cost test, which is just from the perspective of whoever is performing the incentivizing action (like paying for public charging stations for EVs), might just be the incentives and overhead costs (depending on who the program administrator is). WSP has worked with all of these cost tests for a diverse set of clients across sectors and will help COG define costs in the most appropriate way for this effort. Part of this would also be defining the financial metrics to allow all costs to be calculated in Net Present Value (NPV) so that strategies with different implementation time frames can all be compared. This is an example of how we will approach the strategies and breakdown them down to determine the appropriate methodologies to be considered for use in the analysis.

The following are a sample of projects completed by the proposed WSP Team that detail our experience in evaluating a wide range of GHG reduction measures.

1	Title: Comprehensive GHG Management Plan				
Relevance	Similar budget for a similar sector-based strategy GHG reduction analysis				
Client	City of Boulder				
Contract Value	$300,000	Period of Performance	2006 - 2013	Key Staff	Evan Evans (WSP) Dan Sobrinski (WSP) Derek Fehrer (WSP) Mike Huisenga (WSP) Kealy Devoy (WSP)

Summary

WSP played a central role over a period of seven years in the sustainability management activities of Boulder County, Colorado (population 320,000). WSP led a stakeholder engagement process, involving representatives of each municipal government in the county and the general public that provided County government staff with input to the Sustainability Management Plan. This sustained engagement is a good example of the creative thinking that WSP brings to complex program-planning assignments. WSP's work with Boulder County and, synergistically but separately, with the City of Boulder and University of Colorado recommended several innovative approaches to community sustainability relating to program funding resources, residential and commercial green buildings building code updates, energy project financing, biofuel life cycle assessments, recycling program development, and electric vehicle manufacturer partnerships.

During this process, WSP completed an economy-wide GHG inventory of the emissions for the industrial, transportation, commercial and residential buildings, agriculture and solid waste sectors in Boulder County. WSP then developed an Inventory Management System to track emissions on an annual basis and performed detailed technical and financial analyses from the results to assess a variety of GHG emissions reduction strategies within each economic sector. This informed our development of a comprehensive GHG goal setting and management plan, recommending specific strategies that the County could pursue to achieve its goals. Based on this work, WSP designed specific program implementation and funding mechanisms and developed budgets that were ample for successful program implementation, eventually leading to achievement of the recommended sustainability goals.

When Boulder County considered expanding the County's management plan, WSP focused on developing specific implementation mechanisms including:

- Expansion of existing programs that yield sustainable energy and GHG benefits;
- Creation of new programs that deliver emissions reductions along with various co-benefits including water efficiency, waste management, local job creation, and public health improvements;
- Development of policy initiatives designed to institutionalize energy, water, waste, and GHG management;
- Development of regulatory initiatives as drivers of sustainability policy;
- Creation of funding mechanisms to supply the necessary budgets; and
- Development of the management tools that enable County staff to effectively manage the various sustainability programs.

2	Title: Evaluation of Approaches to Reduce GHG Emissions in Washington State				
Relevance	Similar budget for a sector-based state and federal strategy GHG Reduction Analysis				
Client	Washington State Office of Financial Management				
Contract Value	$348,769	Period of Performance	6/21/2013 - 2/28/2014	Key Staff	Tim Kidman (WSP) Michael Mondshine(WSP) Matthew Aberant (WSP) Christopher Bruno (WSP)

Summary

WSP Team members, while employed at Leidos, supported the Climate Legislative and Executive Workgroup (CLEW), headed by Governor Inslee, in the Evaluation of Approaches to Reduce GHG Emissions in Washington State. The Workgroup hired these Leidos to evaluate current state programs and the impact from existing and planned state, regional and federal polices, and recommend a set of

2	Title: Evaluation of Approaches to Reduce GHG Emissions in Washington State
Relevance	Similar budget for a sector-based state and federal strategy GHG Reduction Analysis

actions and policies to reduce GHG emissions, that if implemented would ensure achievement of the State's emissions reductions targets set by the legislature. The WSP Team members prepared a series of technical analyses, and presented results directly to Governor Inslee and the CLEW workgroup of four State legislators. A sample of existing and potential state and Federal policy approaches that were evaluated include:

- An economy-wide cap and trade program and carbon tax;
- Sector-specific approaches including a renewable portfolio standard and emission performance standard for the power sector;
- Growth management/compact development planning and zero-emission vehicle mandate for the transportation and land use sectors; and
- Building codes for new buildings and energy efficiency programs to conserve fuel in existing buildings in the residential, commercial, and industrial sectors.

3	Title: Sustainability Action Plan				
Relevance	Sector-based strategy GHG reduction analysis and workgroup facilitation for MWCOG				
Client	Metropolitan Washington Council of Governments and Prince George's County, Maryland				
Contract Value	$145,495	Period of Performance	2010-2012	Key Staff	Matthew Aberant (WSP)

Summary

Mr. Matt Aberant, while employed at Leidos, worked with the Metropolitan Council of Governments and Prince George's County, MD to develop a comprehensive inventory of County government and community GHG emissions and a Climate Action Plan for how to reduce their GHG emissions and meet county adopted reduction targets. As part of this effort, Mr. Aberant conducted trainings for County staff, collected activity data on sources that contribute to emissions, developed a forecast of GHG emissions, facilitated the development of a public and private community stakeholder working group, and worked with the stakeholder working group to identify new GHG reduction programs and measures across sectors. Mr. Aberant then quantified GHG benefits and characterized costs from these agreed-on potential new reduction strategies, and prioritized the selected reduction measures and developed an implementation strategy based on criteria agreed upon by the County and the working group. The team worked with the County to develop an outreach strategy and captured the entire process and results of the project in a Climate Action Plan and Report.

4	Title: Facility Energy Assessments, GHG Reduction Strategy, and Goal Setting				
Relevance	Strategic planning, GHG reduction analysis, and enterprise-wide GHG goal setting				
Client	Global Insurance Company				
Contract Value	Confidential	Period of Performance	August 2014-present	Key Staff	Evan Evans (WSP) Eric Christensen (WSP) Josh Nothwang (WSP) Brennen Walsh (WSP) Kealy Devoy (WSP) John Reed (WSP)

Summary

WSP was engaged by a global insurance company for three related work scopes: conduct facility energy assessments, develop a greenhouse gas (GHG) reduction strategy focused on the company's employee travel and technology programs, and establish energy and GHG goals for external publication. Prior to being awarded the work, WSP team members assisted the client to develop project focus areas and objectives for eventual release of a request for proposals. After contracting, a global network of WSP team members evaluated energy efficiency measures at owned buildings in nine countries, identified opportunities for GHG reduction based on improvements to employee travel and technology policies and procedures, and recommended enterprise-wide energy and GHG goals that aligned leading industry practice and the results of WSP's previous work. Results included a summary of cost, energy, and GHG

4	Title: Facility Energy Assessments, GHG Reduction Strategy, and Goal Setting
Relevance	Strategic planning, GHG reduction analysis, and enterprise-wide GHG goal setting

reductions possible at various levels of investment, improvements to the company's scope 1, 2, and 3 GHG emissions inventory, enterprise-wide energy goals, and an implementation plan for strategies recommended across the three work scopes.

5	Title: Red Line and Purple Line Corridor Transit Studies, Washington DC Metro Area				
Relevance	Transportation/Land use air quality, energy and GHG analyses for the MWCOG region				
Client	Maryland Transit Administration, Office of Planning				
Contract Value	$100,000-200,000 each	Period of Performance	2007-Present	Key Staff	Alice Lovegrove (WSP) Edward Tadross (WSP)

Summary

Members of the WSP team conducted the air quality, energy and GHG analyses for the proposed 16 mile Purple Line connection between the Washington Metropolitan Area Transit Authority Metrorail Red Line, Green Line and Orange Line. The project analyzed both Light Rail and Bus Rapid Transit alternatives within the corridor. The analysis took into account the varying energy usage factors for each mode considered, the change in vehicle miles traveled due to mode shifts and the resulting impact on fuel usage. Emission factors were derived from Mobile 6.2 emissions modeling software using area specific fleet parameters, energy profile data as well as energy emission information from the Department of Energy. Compliance with the Transportation Conformity Rule was demonstrated. The analysis also included an evaluation of proposed stations and parking facilities associated with the project.

Our staff are also currently conducting the air quality, energy and greenhouse gas analyses for the FEIS on the proposed 12 mile Red Line Corridor Light Rail Transit system, connecting areas in Baltimore County to major activity centers in downtown Baltimore. The analysis includes evaluating the GHG and air quality impacts due to roadway changes needed to accommodate the project, as well as planned stations and associated parking facilities. Emission factors were derived from Mobile 6.2 using area specific fleet parameters, energy profile data as well as energy emission information from the Department of Energy. Compliance with the Transportation Conformity Rule was demonstrated. PB also conducted these analyses in the DEIS phase of the project.

6	Title: SMUD Climate Change Response Planning Report (2009) and Update (2013)				
Relevance	GHG reduction and cost analysis, strategic planning, and sector-specific goal setting				
Client	Sacramento Municipal Utility District (SMUD)				
Contract Value	$78,650	Period of Performance	2010 and 2013	Key Staff	Tim Kidman (WSP) Matthew Aberant (WSP)

Summary

WSP staff members, Matt Aberant and Tim Kidman, while employed with Leidos, supplied QA review and management of an analysis of a range of options for SMUD to respond to the physical, regulatory, and societal demands of climate change, and defined the bounds of likely impacts of proposed carbon dioxide (CO_2) cap-and-trade program design options. The report identified SMUD's best GHG emission reduction opportunities to address these demands while considering cost, technical feasibility, and the necessity to meet load. The analysis prioritized mitigation actions for SMUD to consider, such as, renewable energy, demand side management (DSM), carbon capture and storage (CCS), distributed generation, and cogeneration. The report provided critical guidance in setting strategic goals for reducing SMUD's GHG emissions and climate change liability and developed and refined scenarios that reflected SMUD's projected GHG emissions and compliance requirements under various proposed regulatory schemes. In addition, the project team analyzed regulatory and physical climate change risks facing SMUD and identified key efficiency improvement and technology development areas. WSP staff also provided suggestions to SMUD for improving public outreach and communications of its climate change activities to its stakeholders.

7	Title: New York State Department of Transportation, On-Call Consultants for Air Quality, Energy and Greenhouse Gases				
Relevance	Similar regional council transportation air quality emissions analysis and forecasting				
Client	New York State Department of Transportation (NYSDOT)				
Contract Value	$500,000	Period of Performance	2009-present	Key Staff	Alice Lovegrove Edward Tadross
Summary					
PB has been the on-call air quality consultant for NYSDOT for the past five years. Under this contract, PB has successfully completed a variety of tasks for NYSDOT. Of relation to the MWCOG scope of work, PB conducted a regional emissions analysis of the Orange County Transportation Council (OCTC) 2014-2018 Transportation Improvement Program (TIP) and 2040 Long Range Transportation Plan for particulate matter 2.5 microns in diameter or less ($PM_{2.5}$) and nitrogen oxides (NO_x). The analysis was based on traffic data from the OCTC travel demand model (OCTC TDM), which was supplied by OCTC through NYSDOT for analysis years 2014, 2017, 2025, 2035 and 2040. Estimates of annual direct $PM_{2.5}$ and annual NO_x resulting from the OCTC travel demand model were calculated using EPA's MOVES2010b tool. The emissions modeling was performed per guidance issued by the EPA, and it used the most recent emission model input parameters for Orange County as developed by the New York State Department of Environmental Conservation (NYSDEC) along with project specific speed distribution files and High Performance Monitoring System Vehicle Type files. The county level emissions inventory mode of MOVES2010b was used to generate the emission burdens for each analysis year.					

8	Title: District Department of Transportation Climate Action Plan, Washington, D.C				
Relevance	Climate action planning in the transportation sector of the MWCOG region				
Client	District Department of Transportation (DDOT)				
Contract Value	$500,000	Period of Performance	2009-2014	Key Staff	Alice Lovegrove (WSP) Edward Tadross (WSP)
Summary					
PB quantified and evaluated the GHG emissions of DDOT facilities and operations, including power requirements, employee trips, vehicle fleet usage, and building energy usage among other areas. PB used 2009 as a baseline year and forecasted emissions to 2040 to provide context for potential future emissions reductions targets. PB used this analysis to develop a climate action plan to outline strategies to reduce DDOT's greenhouse gas emissions.					

9	Title: Transportation Outlook 2040 Kansas City Regional Transportation Plan				
Relevance	Best practice recommendations from sector-specific policy and feasibility analyses				
Client	Mid-America Regional Council				
Contract Value		Period of Performance		Key Staff	Marsha Kaiser (WSP)
Summary					
MARC developed two alternative 2040 land use scenarios: a *baseline scenario* based on the comprehensive plans of local communities and various growth trends, and an *adaptive scenario* based on the vision of a more vibrant, connected, and green region, with projected growth directed more toward compact centers and priority corridors. The scenarios were subjected to several analyses including trip travel time, roadway congestion, and cost of new infrastructure. MARC retained Parsons Brinckerhoff to specifically evaluate the scenarios for their anticipated energy consumption and greenhouse gas (GHG) emissions. The screening tool was used to estimate GHG emissions from both vehicle travel and building energy consumption. It was also used to test the impacts of land use variables such as population density, employment density, and jobs-housing mix, as well as travel-demand management strategies like carpooling, fuel pricing, compressed work-week programs, and fuel economy.					

10	Title: Tysons Corner Urban Plan – Fairfax County, VA				
Relevance	Best practice recommendations from sector-specific policy and feasibility analyses				
Client	Fairfax County, VA				
Contract Value		Period of Performance		Key Staff	Marsha Kaiser (WSP)
Summary					
Parsons Brinckerhoff was retained by Fairfax County to provide a long term plan for transforming Tyson's Corner, a prototypical US "edge city", into a walkable sustainable transit oriented development. The work centered on land use planning, urban design and sketch-level evaluation of the impacts of various alternatives with regards to density, jobs-housing balance, travel, open space and sustainability impacts. To evaluate the alternatives for their GHG emissions, PB applied its screening tool method that estimated carbon emissions from two sources: auto trips generated by the land uses, and energy consumption according to the building type.					

11	Title: Development of Bioreactor Offset Protocol				
Relevance	Best practice recommendations from sector-specific policy and feasibility analyses				
Client	Climate Action Reserve				
Contract Value	$30,000	Period of Performance	2011/2012	Key Staff	Tim Kidman (WSP)
Summary					
WSP team member Tim Kidman, while employed with Leidos, led the research and writing of an issue paper analyzing the feasibility of bioreactor landfill protocol implementation for the Climate Action Reserve (CAR). The issue paper analyzed project eligibility, regulatory implications, monitoring, and GHG calculation methodologies. Using the final product, CAR determined whether to develop an offset protocol for bioreactor landfills. Mr. Kidman developed a performance standard to establish additionality for this project type in California and the U.S. by conducting a detailed review of current practices. This included identifying and characterizing bioreactors in the state, reviewing regulations and barriers affecting their implementation, identifying common practices, and recommending relevant baseline options.					

Task 3 and Task 4. Presentation of GHG Reduction Strategies for Analysis to MSWG and Analyzing Selected Strategies

Tasks 3 and 4 as described in the RFP, more so than the other tasks, need to be approached from an integrated perspective. Task 4 will require the greatest level of effort; however, the results of Task 3 will dictate how that effort is applied. Tasks 1 through 3 and 5 through 7, all require a level of effort that is largely independent of the results of the other tasks. This, therefore, implies a discrete level of effort remaining for Task 4, based on the budget proposed and schedule laid out by COG. The results of Task 3 will then have a very significant role in determining how that level of effort is allocated. For example, if the Sector Subgroups submit 10 strategies for consideration for each sector, and the full MSWG in Task 3 pushes for all 40 strategies to be included in the final list, the remaining level of effort and resources will have to be split among all 40 strategies. WSP would likely recommend that some subset of the strategies proposed from each sector under Task 2 be included in the final list developed in Task 3, so that the remaining level of effort can be applied to the most effectual strategies without sacrificing detail or

quality of the analysis. While it is not WSP's role to constrain the number of strategies coming out of the Sector Subgroups in Task 2, we would work with MSWG in Task 3 to communicate the necessary tradeoffs between quantity of strategies assessed and depth of analysis by taking into consideration the time and resources needed to properly analyze the GHG, Cost, and Co-benefit (air quality, economic impact, jobs, traffic congestion relief) impacts in our recommendations for the final list.

WSP will approach Task 3 and Task 4 in a combined fashion to ensure there is the proper balance between the number of strategies included and level of detail and complexity of the analysis applied to each. Often times expending the resources to apply a very complex and comprehensive economic model is not necessary and will not provide results with less uncertainty than a sketch model developed simply and specifically for this effort and the COG region. WSP key staff have experience working with both types of analytical tools and can confidently guide the MSWG in selecting the appropriate methods. This has been a lesson learned the hard way in past projects, where WSP staff have been asked to step in to rectify cost and schedule shortcomings resulting from overpromises of other firms who have promised clients more than they were able to deliver in order to secure a contract.

The primary goal of Task 3 is to present the results of our interactions with the Sector Subgroups to the overall MSWG and come to agreement on the final list of GHG strategies. Support from the MSWG will be critical to the success of the other tasks of the project, so ensuring the MSWG members are supportive and feel a sense of ownership over the final strategies list will be another top priority. As our work with Prince George's county showed us, involving the working group members throughout the project and leveraging them as a resource during the analysis phase helps build buy-in and allows for a more thorough analysis.

In order to facilitate consensus on the final list of strategies to be analyzed, WSP will prepare, provide and present a draft Technical Memorandum summarizing each proposed strategy at a high level. Within the Technical Memorandum, WSP will detail the overall approach, the strategies recommended and the methods for analysis. WSP will also include cost definitions, financial preferences for NPV calculations, such as discount and inflation rates, as well as the sector-specific information or criteria used to prioritize and narrow the initial draft list of strategies. WSP will use a standardized format to present the relevant information for each strategy to facilitate the discussion, including strategy descriptions, incentivizing actions, tracking metrics, GHG and cost quantification methodology, relevant co-benefits, data needs/availability and any other MSWG requested information. Figure 2 provides an example format used to present similar data to the working groups of past WSP projects. The EV strategy example was used to showcase this possible format. This will be modified and adapted based on the input from the Sector Subgroups during Task 2.

Figure 2 – Sample Technical Memo Strategy Summary Format with Illustrative Example Data

Transportation Strategy 1 – *Increase Proportion of Electric Vehicles in Fleet to 15% by 2030.* Incentivizing/Implementation Actions	Time Frame / Priority Tier	Implementing Entity and Cost Share	Data Needs / Availability
1. Having Utilities provide a reduced rate for home charging	Immediate	Utilities 50% Local Gov 50%	
2. Provide a buy down incentive to reduce the cost of purchasing a vehicle	Mid-Range	Gov 100%	
3. Install more regional public charging stations to reduce range anxiety	Immediate	Gov 30% Commercial 70%	
4. Work with Multi-Family buildings to overcome the challenges and costs of installing communal charging stations	Longer-Range	Unknown	
Tracking Metrics/Progress Indicators	Key Assumptions		
➢ Annual Tracking of EV Adoption ➢ Annual Incentive Cost totals ➢ Gasoline Savings	➢ Assumption 1 ➢ Assumption 2 ➢ Assumption 3		
GHG and Cost Estimation Methodology (*Example Only – Simplified Methodology*)			
Mass Balance based on Activity/Distance Data, Fuel Economy Data and Default Emission Factors ERMob = (AVehicle x FEVehicle x EFFuel x OFFuel) – (AVehicle x EVVehicle x EFElec) <u>Where:</u> ER(Mob) = CO2 emission reduction from mobile source A(Vehicle) = Measured activity or distance travelled for each vehicle FE(Vehicle) = Vehicle's fuel economy with respect to the selected distance metric (quantity of fuel / unit of distance) EV(Vehicle) = Electric Vehicle Efficiency with respect to selected distance metric (kWh / unit of distance) EF(Fuel) = Fuel specific emission factor (mass CO2/quantity fuel) EF(Elec) = Electricity Emission factor (mass CO2/kWh) OF(Def) = Default Oxidation factor; 99 % for liquid fuels, 99.5% for gaseous fuel			
Synergies Land Use Strategy 2, 3 Built Environment Strategy 1 Energy Strategy 5, 6	Potential Co-benefits for consideration Air Quality Impacts		
MSWG Member Comments			

Other prioritization criteria used in the preliminary qualitative analysis may also be included in this template to help communicate to the MSWG and Sector Subgroups the rationale behind WSP's recommendations. This straight forward standard format will allow the group to quickly review and provide comments on the strategies. WSP, where feasible within the constraints of the meeting, will address as many comments during the May 8th presentation as possible. Ideally the majority of comments will have been addressed at the Subgroup stage,

however it is expected there will be cross sector comments during this meeting. Comments that are not addressed during the meeting or received after the meeting will be reviewed and addressed prior to the finalization of the list of strategies. This will include follow-up with the MSWG member who made the comment to ensure agreement with the approach to address it.

GHG and Cost Analysis

Developing sector-specific goals to help provide insight into the regional targets of 20% below 2005 emission levels by 2020 and 80% below 2005 emission levels by 2050 requires that each sector be adequately addressed through the selected strategies. The implication here is that the final list will likely include a significant number of strategies for further analysis. To balance the expected number of strategies with the available resources and time constraints, WSP is recommending an approach utilizing sketch planning tools and models rather than complex comprehensive economic, environmental impact, and transportation demand modeling platforms. WSP staff have taken this approach in the past with Prince George's County, Maryland, Washington State, Boulder County, Colorado, SMUD and others to enable a larger and fully representative number of potential strategies to be included in the final analysis. In many cases the previous estimates done by COG, such as in the "What Would It Take – Transportation and Climate Change in the National Capital Region" from 2010 and the "National Capital Region Climate Change Report" from 2008 can be used directly as part of our analysis. The WSP team is quite familiar with the previous work done by COG. For example our team developed a report for American Association of State Highway and Transportation Officials, with funding provided through the National Cooperative Highway Research Program, that synthesized State DOT and MPO plans and strategies for reducing GHG emissions, including COG's National Capital Region Transportation Planning Board (TPB) scenario planning efforts. Utilizing COG and other MPO's previous work will conserve resources that can be applied to analyze new strategies or enhance the analysis done previously.

Despite the attraction of evaluating strategies over long time horizons – and the imperative to plan over them – data and methodological constraints necessarily limit the reliability of long term forecasts. When forecasting the costs of a strategy over a longer time frame, such as out to 2040 or 2050, the assumptions become so uncertain, and the impact of discount rates and inflation on NPV so dramatic that the long-term cost estimates may lead to poor decisions made on false premises. Additionally, because proper accounting requires costs and benefits to be discounted to net present value while GHG savings are not, results for the longest horizons tend to show an artificially low cost per ton of CO2 reduced. Notwithstanding the impact of discount rates and inflation, it can be very difficult to forecast energy prices accurately over a 5 year period, as we have seen by the fluctuations in gasoline prices the past year, let alone over 30 years. For these and other reasons, WSP recommends prioritizing the use of resources to provide cost estimates for near term strategies with time frames appropriate for analysis. Cost estimates projected to 2040 or 2050 will inherently, no matter what model, tool, or method you use, include

massive uncertainty and temporal bias, and if used for decision making can be counterproductive. Under the existing budget, WSP will include GHG reduction estimates for the 2012 to 2020, 2020 to 2040, and 2040 to 2050 timeframes but will only project cost through the near or mid-term. WSP recognizes that there are stakeholder who will clamor for cost projections even for long term strategies out to 2050, as if the provision of a number provides additional planning certainty. Should additional resources be available, WSP will work with COG to determine the priority of applying a simplified, transparent albeit highly uncertain method for develop long term cost estimates out to 2050. This should not have a significant impact on the majority of strategies, as it is expected the majority of costs and strategies will occur in the near or mid-term time frame.

Prior to beginning work on the initial SMUD marginal abatement cost curve (MACC) model, WSP staff (while employed at Leidos), including Christopher Bruno, Matthew Aberant, and Tim Kidman, conducted a comprehensive literature review of existing MACCs and estimates of the cost effectiveness of various GHG reduction strategies. Not surprisingly, research revealed wild variation across reputable sources for very similar measures. By enumerating the variation between these studies, the team found that some of the major drivers of difference were assumptions such as the discount rate, time horizon, or whether the analyses took a societal or industry focus in establishing the balance of costs and benefits. As WSP staff began crafting the SMUD MACC model, it was a clear imperative to construct a modeling environment in which these variables could be adjusted based on user inputs, rather than a static analysis. The resulting model was therefore a rigorous analytic assessment of the energy, GHG, and cost impacts, but also a highly customizable platform through which SMUD could analyze these costs and benefits on a variety of temporal horizons and from multiple perspectives. The model allowed them to understand both the costs to themselves as a public utility, but also the costs to their program participants, and finally, to their rate base as a whole. By unifying with consistent assumptions within a model run, the model allows the user to compare – on equal terms – seemingly disparate measures including energy efficiency, electric vehicles, renewable energy, distributed generation, fuel switching, and GHG offsets. Each model run evaluates impacts to customer bills, utility energy procurement costs, administrative costs, equipment and labor expenses, and transfers within society resulting from incentives.

Led by Deputy PM, Tim Kidman, with support from Matthew Aberant and Christopher Bruno, WSP staff developed a series of sketch models to support policy evaluation for the Washington State CLEW. Unlike the SMUD MACC model which was intended as an ongoing planning tool, the CLEW models had discrete and highly defined parameters. Based on a process very similar to the MSWG, staff worked with a fixed price budget and a discrete set of policies to balance the level of complexity for each individual model with the imperative to provide meaningful, directionally relevant results for all strategies. Early on, the team understood that to execute economic input-output modeling for this effort would have exhausted the entirety of the available budget on a single strategy. By employing sketch modeling techniques instead, WSP staff were able to use that same fixed price budget to deliver meaningful results for a suite of strategies. Staff modeled policies such as cap and trade, carbon tax, low carbon fuel standard, expansion of the zero emissions vehicle market, and others. The team developed a set of

consistent assumptions regarding how costs and benefits would be quantified, and used these as an overarching framework to unify results across multiple strategies with their own component models. Within each model, staff identified relevant cost inputs, pathways through which benefits would accrue, and GHG estimation methodologies. Costs, benefits, and GHG impacts were calculated over a predefined time horizon, aggregated in a consistent manner, and viewed from a consistent societal perspective. Through this process, the sketch models provided consistent, relevant, and policy actionable outputs for a variety of measures.

WSP's proposed Task 4 approach will follow a very similar framework to that developed for the Washington CLEW. As we did with the CLEW, WSP staff will work closely with MSWG to understand the tradeoffs inherent in balancing breadth of strategies with achievable depth of analysis, and strike a balance that provides actionable results while ensuring a complete menu of options have been considered.

Another example of how we have approached this type of analysis in the past relates to the built environment sector. It is clear from our past carbon mitigation work that it is necessary to include aggressive energy efficiency (EE) in a GHG strategy such as the one COG is contemplating. EE is the most cost-effective sustainable energy resource. From a GHG emissions perspective, each megawatt-hour (MWh) of electricity saved through EE carries the same impact as a MWh of renewable electricity generation, but at a fraction of the marginal cost. WSP has a road-tested approach to EE that we have successfully applied on previous projects of similar economy-wide scope to the MWCOG scope and thus know from experience that it produces excellent results. While new building construction must not be ignored – aggressive green building codes must be widely implemented, for example – the fact is that the buildings standing today in the COG jurisdiction produce, and will continue to produce for their lifetimes, something like 90 - 95% of the carbon emissions from the buildings sector in any given year. Therefore, the approach described below focuses on the existing building stock. WSP understands that an EE strategy focusing on the existing building stock may not necessarily be included in the final list of strategies, but it would be one of our initial recommendations for consideration. This approach is an example of a full scale analysis, and may require simplification in order to fit in with the entire scope of work identified by COG.

An analysis would be performed on the existing commercial and residential buildings of the COG jurisdiction, likely using the earlier inventory reports to create the basis for estimating the potential for GHG reduction opportunities, including estimates of the electricity and natural gas consumption and the associated utility costs in the jurisdiction-wide stock of existing buildings. Second, up to three energy efficiency scenarios would be constructed and the energy savings and cost savings potential of each would be established. This type of analysis represents a "bottom up" approach, wherein energy efficiency opportunities are considered for several building types and extrapolated across the entire building stock to determine the GHG reduction potential in the sector.

Due to wide-ranging variations in energy use patterns within commercial building types, the building sector would also divided into sub-classifications. These sub-classifications are chosen to strike a balance between maintaining a manageable analysis work scope and producing meaningful results. Building energy simulation software would

be used to construct prototypical energy usage models for each of the building types treated by this analysis. Specifically, the simulation software would be used to establish base case electricity and natural gas usage intensities and also to quantify the energy savings resulting from installation of energy efficiency measures (EEMs). Bundles of EEMs would be defined for each building type and the potential energy savings and cost savings would be established for each bundle by modifying the base case energy models to reflect the implementation of each energy efficiency bundle. Market penetration rates would be estimated for each bundle and applied to estimate the energy savings. Jurisdiction-wide savings would be estimated by extrapolating modeling results for each prototype across the stock of each building type using actual total square footage data by building type. Square footage data would be acquired from either COG, utilities, each local government, or a combination of these sources.

WSP believes there may be a significant opportunity to leverage our work with Arlington County in this space. WSP PM, Matt Aberant, recently support the County's effort to complete a building energy consumption survey to establish energy use intensities by building type and end use. Not only were Arlington County data sources utilized in this project, but other local data such as Washington DC District Department of the Environment's Energy Performance Benchmarking for Privately-Owned Buildings 2012 disclosure data. WSP is also under contract to provide services in support of Arlington County's District Energy program. Energy audits of commercial and multifamily buildings and assessments of on-site solar energy opportunities will be key aspects of our scope. Depending on the timing, WSP will attempt to identify ways to apply the information developed by these activities to the MWCOG project, thereby stretching the MWCOG project budget. We will be identifying specific EEM and solar opportunities, quantifying energy savings, establishing implementation costs, and characterizing Simple Paybacks. These details will be directly transferable to the MWCOG project to inform the Built Environment Sector analysis described above

For our Transportation and Land Use based projects, WSP will likely be able to provide GHG and air quality analysis using a more complex set of tools and models. Due to our Team's experience in utilizing these tools for previous clients like NYSDOT, District Department of Transportation, and the Maryland Transit Administration, we learned to leverage these resources very efficiently using an integrated approach that evaluates and compares the changes in criteria pollutants, energy use and greenhouse gases.

A regional, or mesoscale, analysis of a project determines the annual "pollutant burden" levels for each of the project alternatives, as well as the No-Action Alternative, in order to provide a basis of comparison for regional emissions of each of the criteria pollutants and GHGs under the different project alternatives. For a roadway transportation project, a regional analysis is performed using the latest version of US EPA's Motor Vehicle Emissions Simulator (MOVES) emissions program. The MOVES program incorporates project-generated VMT on a link-by-link (roadway segment) basis; the model also incorporates specific MOVES input factors, such as inspection and maintenance programs, fleet mix, and speed profiles, for the traffic network being analyzed. These MOVES input factors are geographically specific, as they are obtained from the appropriate MPOs (in this case COG) for the project area. The output of the MOVES model includes regional criteria pollutant burdens, GHG

emissions, as well as energy use, re-emphasizing the integrated approach of transportation modeling for air quality, energy and greenhouse gases.

Where the MOVES model may not be appropriate or provide the level of detailed required, WSP will utilize our subcontractor Gallop Corporation, who specializes in transportation modeling and is intimately familiar with the COG transportation demand model (TDM). Gallop's experience allows them to implement the following methodology relatively quickly and efficiently, having worked closely with COG in the past, to develop inputs for our GHG, criteria pollutant, and potential co-benefit analysis methodologies. In order to prepare Gallop's modeling tools to perform travel demand analysis and forecasting work, Gallop will request information from COG such as:

- The driver/control files and input data files required to execute COG's most updated; regional TDM from the latest CLRP and TIP Air Quality Conformity modeling process for all the available simulation years;
- All available documents to support the above model executing process; and
- Forecasts of population, households, and employment from the latest Round of the COG Cooperative Forecasting process (in electronic data file format and by TAZ).

Gallop will investigate the performance of the COG model, in terms of representing the base year travel and traffic demand conditions in the study area, and to make any necessary adjustments or enhancements to the model based on review of network coding, land use data, traffic assignments from the COG model and refining and expanding network details. Gallop will develop the traffic forecasts for future year No-Build scenario utilizing the current forecasts under the COG model. This scenario will consider any necessary refinements identified from the base year validation run through the following efforts. Results from this task will be used as the benchmark forecast for evaluating the Build Scenarios. The process will include:

- Review network and land use changes (assumptions) in the study;
- Perform the COG model run;
- Retrieve and summarize model results; and
- Review the changes of traffic patterns in the study area (as compared to base year results) to ensure the model is reliable enough for alternative evaluation

Gallop will then develop travel and traffic forecasts and investigate the traffic impacts for future year build scenarios (which will be built on top of the future year No-Build Scenario analyzed in Task 3) through the following efforts:

- Modify the highway network coding to reflect the proposed changes;
- Make any necessary zonal access coding (zonal connectors) of the model to appropriately reflect the highway network changes;
- Perform the COG model run; and

- Retrieve and summarize model results

This more detailed analysis utilizing the COG model will be used for selected strategies where this greater level of detail is warranted.

Another example of a sketch planning tool used by the WSP team as part of our approach to Land Use is CarbonFIT. This package of computing tools was developed by WSP to help clients make the connection between land use choices and greenhouse gas (GHG) emissions. The tool can be used to analyze alternative land use/transportation scenarios, estimate amounts of greenhouse gas emissions and energy consumption and provide real-time analysis and data visualization. It includes modules to calculate emissions from building operations, traffic generated by land use patterns, and building construction. It is designed to run on top of the ArcGIS platform and to utilize the CommunityViz suite. When connected to visualization tools such as the in-house package Decision Commons, the tool helps decision-makers such as those in the MSWG to easily understand the benefits of alternative strategies.

Co-Benefits Analysis

While emission reductions and costs typically drive decision making for investments in GHG management strategies, other potential benefits should also be considered carefully, especially when the differences in cost and GHG reductions are minor amongst investment alternatives. Co-benefits are the set of potential additional benefits a strategy may provide. This includes additional internal benefits and potential positive externalities of a project relative to the typical decision making criteria. Through our work with non-profit organizations such as Community Conservation Solutions (CCS), and the Water Environment Research Foundation (WERF), WSP staff have learned that while GHG reductions and costs drive decision making at the organization level, co-benefits often drive public support and community buy-in.

The primary co-benefits COG is interested in, such as criteria pollutants impacting air quality and traffic congestion relief, will be calculated along with our estimates of GHG's as they require similar methods and data inputs. Criteria pollutants for example use the same basic methodology as estimating GHG emissions, activity data multiplied by an emission factor, and in most cases the activity data (e.g. amount of fuel consumed or vehicle miles traveled) is the same and only the emission factor changes. Like criteria pollutant emissions, traffic congestion relief will often be an output from the models described above and will not require an independent effort to include.

Under the existing budget and in order to maximize use of limited resources and provide ease of use when selecting reduction strategies, WSP will focus on a qualitative evaluation (high, medium, low) for many of the potential co-benefits that go beyond criteria pollutants and relief of traffic congestion . If additional funds become available, then select strategies from the final list, and for key co-benefits shown to have strong influence over decision makers, a quantified analysis can be done. As described above, the WSP Team understands that

executing an economic input-output modeling effort could easily exhaust the entirety of the available budget on a single strategy, and will still recommend employing sketch modeling techniques to evaluate economic or job creation co-benefits.

The following table provides a list of additional potential co-benefits, beyond air quality and traffic congestion relief, and criteria that should be considered when evaluating new strategies. Each criterion is described in the table as to whether they can be evaluated quantitatively or qualitatively, and the area of its geographical impact.

Table 3. Potential Co-benefits for Inclusion and Possible Evaluation Methods

Potential Co-Benefits	Location	Evaluation Method
Relationship With Other Initiatives	Local/Regional	Qualitative (support or conflict with other internal or external initiatives)
Impact on Jobs	Local, Regional, or National (depending on location of industry)	Qualitative, based on existing literature, unless additional funds support a quantitative analysis
Energy Security • Ability to meet demand • Power Reliability • Price Stability	National	Qualitative (looking at changes to availability, accessibility, affordability, and acceptability of energy)
Human Health	Local/Regional	Qualitative (based on air quality to reduce related health problems)
Environmental Impacts • Water Availability • Water Quality • Land Use/Wildlife	Local / Regional	Qualitative (Reduce fossil fuel related water consumption and degradation, impact on land and local ecosystems)
Leadership	Local/Regional	Qualitative (provide an example others could implement to broaden technology adoption and increase overall benefits? Positive public perception?)
Poverty Alleviation	Local	Qualitative (Can savings be passed on to in-need communities or will overall savings and improvements lead to cheaper and better service?)

The following are additional sample of projects that the proposed WSP staff have completed that detail our experience in developing a wide range of analytical tools and methods to analyze GHG reduction Strategies.

12	Title: Marginal Abatement Cost Curve Model				
Relevance	GHG/Economic evaluation tool development for multiple cross-sector strategy types				
Client	Sacramento Municipal Utility District (SMUD)				
Contract Value	$96,500	Period of Performance	2013	Key Staff	Tim Kidman (WSP) Matthew Aberant (WSP) Christopher Bruno (WSP)

12	Title: Marginal Abatement Cost Curve Model
Relevance	GHG/Economic evaluation tool development for multiple cross-sector strategy types

Summary

Following a comprehensive literature review of existing marginal abatement cost curves, WSP Team members, while employed with Leidos, developed a MACC model to help SMUD understand the potential GHG benefits and cost implications of GHG emissions abatement options in the future, considering such variables as time and perspective. The MACC model is a parameterized modeling environment that allows users to generate MACCs. The SMUD MACC model is highly customizable, providing results tailored to user inputs, while relying on SMUD-specific data sources and robust underlying models. The model can analyze many measure types including energy efficiency measures, renewable energy measures, building electrification, vehicle electrification, distributed renewable energy measures, and GHG offset measures. The major features of the SMUD MACC model are:

1. Inclusion of multiple mitigation measure types (multiple measures per type);
2. Presentation of the marginal cost of measures once all other benefits have been accounted for;
3. Quantification of the costs and benefits across multiple categories to enable calculation of net costs based on the user-specified cost test;
4. All costs and benefits are discounted to a user-specified year (2013-2024), and according to a user-specified discount rate (3 percent, 6 percent, 10 percent);
5. All costs are presented in user-specified dollars, and are subject to a specified inflation rate;
6. Ability to summarize costs using a Cumulative or Annual accounting methodology;
7. Use of SMUD hourly GHG emission factors and energy prices;
8. Use of measure-specific loadshapes and capacity profiles;
9. Can model results in a range of implementation scenarios, including projected fuel prices;
10. Incorporation of previous work performed for SMUD by Navigant and Black & Veatch;
11. Highly expandable and dynamic, with the ability to add or update measures; and
12. Visual and tabular presentation of results, and simplified export of results.

13	Title: Green Energy Life Cycle Assessment Tool (GELCAT)				
Relevance	Water and energy benefits, cost and co-benefits analysis framework development				
Client	Water Research Foundation, Denver, CO				
Contract Value	$480,000	Period of Performance	2009 - 2014	Key Staff	Matt Aberant (WSP)

Summary

Matt Aberant, as part of a larger task while at Leidos, developed a framework for water and waste water utilities to evaluate a range of social and environmental costs and co-benefits associated with implementing renewable energy projects as part of the Green Energy Life Cycle Assessment Tool (GELCAT). The tool is designed for screening selected renewable electric technologies – solar photovoltaic, wind, and hydro turbine generators - for application at wastewater treatment facilities. The tool provides estimates of renewable electricity generated and associated reductions in electricity operating costs and avoided emissions. Various economic metrics (e.g. simple payback period, internal rate of return, net present value) are also calculated, based on capital and operating costs and assumed funding/financing arrangements. Under the current contract with the Water Research Foundation, GELCAT is being adapted to meet the needs of drinking water utilities. The project objectives are to:

- Demonstrate the application of the current version of GELCAT at drinking water utilities;
- Explore opportunities to reference new information and improve graphic outputs for drinking water utilities;
- Develop two new modules that evaluate at a screening level, the economic viability, and energy and environmental benefits/costs of in-conduit hydro turbines for drinking water utilities, and geothermal heat pumps for water and waste water utilities; and

Utility participants will be involved in various stages of the project to serve in a review capacity, and to provide specific suggestions to enhance GELCAT 2.

14	Title: Electrification Technology Cost Effectiveness Model				
Relevance	Sketch planning model development for benefits, costs, and co-benefits analysis				
Client	Sacramento Municipal Utility District (SMUD)				
Contract Value	$46,000	Period of Performance	2014	Key Staff	Matthew Aberant (WSP)
Summary					
WSP PM, while employed at Leidos, created a scenario-based model that will determine conditions under which electrification is a cost effective model for GHG abatement. The principal objectives were to develop a spreadsheet tool for analyzing the conditions under which air source heat pumps and heat pump water heaters are cost-effective in different residential and commercial building types and providing information on heat pump technology benefits in addition to potential economic and GHG reduction benefits, such as changes in peak demand.					

15	Title: Ethanol Carbon Life-Cycle Analysis Tool				
Relevance	Sketch planning model development for emissions and energy life cycle analysis				
Client	ICM, Inc.				
Contract Value	Confidential	Period of Performance		Key Staff	Mike Huisenga (WSP)
Summary					
WSP produced an Excel-based tool (known as the ICM/Econergy model) which evaluates the "field-to-wheels" life-cycle GHG emissions and primary energy consumption of ethanol produced by individual dry-grind and dry-fractionation ethanol plants in the US and world-wide. Using detailed plant-specific inputs, the tool determines emissions and energy usage for each step in the ethanol production process as well as for distribution of ethanol to market and for conversion of ethanol to motive power. The tool also employs agricultural data from the US Department of Agriculture and the UN's Food and Agricultural Organization, emissions factors from the UN Intergovernmental Panel on Climate Change and EPA, default values from the Greenhouse Gases, Regulated Emissions, and Energy Use in Transportation (GREET) model, and other published data and factors. This tool is used to generate a net life-cycle GHG emissions and energy balance for new-construction ethanol projects in the US and abroad as well as for existing plants whose owners want to evaluate their ethanol product's carbon intensity. Each project is compared with the baseline case (conventional and reformulated gasoline) as well as with Brazilian sugarcane ethanol. Emissions mitigation options are built into the tool so users can choose to adopt carbon emissions-reduction practices and determine their impact on the product's net carbon and primary energy balances. The tool has received a favorable review by Argonne National Laboratory and the National Renewable Energy Laboratory. The life-cycle carbon and energy outputs of this tool have been favorably validated against both the GREET and Biofuel Energy Systems Simulator (BESS) models.					

16	Title: Preliminary Feasibility Assessment of Stand – Alone Micro-grid and District Energy System				
Relevance	Energy model development, cost analysis, and feasibility assessment				
Client	Glorious Land Company				
Contract Value	$30,000	Period of Performance	May 2014 - December 2014	Key Staff	Evan Evans (WSP) Mike Huisenga (WSP) John Reed (WSP)
Summary					
WSP recently completed a micro-grid study for a planned new community being developed near Palm Springs, California, by Glorious Land Company. A micro-grid concept was developed to serve the 2 million square feet of commercial and public buildings, and the 8,400 single family and multi-family dwelling units of the community. The concept will provide total energy needs (electrical, heating, cooling) utilizing distributed renewable energy sources and a micro-grid and district energy system anchored by a central natural gas-fired CHP					

16	Title: Preliminary Feasibility Assessment of Stand – Alone Micro-grid and District Energy System
Relevance	Energy model development, cost analysis, and feasibility assessment

plant. The central plant comprises a combustion turbine, fuel cells, thermal energy storage, and a hydrolyzer with hydrogen storage. WSP conducted environmental permitting analysis, energy resource analysis, building energy load analysis, and energy production modeling to simulate typical weather-year loads and dispatch of generating resources. Discounted cash flow analysis was used to compare net present total costs of the proposed micro-grid solution with a conventional electric utility grid-connected solution. The proposed wholly independent micro-grid provides lower net present cost, so a detailed commercial feasibility study is the next step for the project.

17	Title: Development of Grasslands Offset Protocol				
Relevance	Land use model development and workgroup facilitation and consensus building				
Client	Climate Action Reserve				
Contract Value	$65,000	Period of Performance	2014/2015	Key Staff	Tim Kidman (WSP) Michael Mondshine (WSP)

Summary

WSP is supporting the Climate Action Reserve as their technical contractor during development of a GHG offsets protocol for the avoided conversion of grasslands to croplands. WSP developed a methodology for estimating baseline GHG emissions from soil carbon, nitrous oxide, and fuel for projects on varying soil types, geographies, and prior land uses. To ensure maximum standardization, reduce implementation costs, and eliminate gaming risk, WSP established a composite baseline approach that pulled together data from multiple national datasets, applied baseline assumptions stochastically to over 300,000 individual sample grasslands, and conducted biogeochemical modeling using the DAYCENT model and Colorado State University's parallel computing capabilities for over 31 million point years. The results were stratified based on ecoregion, prior land use, and soil texture, to generate emission factors for soil carbon, nitrous oxide and fuels in ten year increments for each of over 1,000 unique strata and 40,000 unique emission factors.

In addition to developing the stratification regime, baseline modeling approach, and executing the modeling, WSP supported CAR in drafting protocol language and rules around quantification, uncertainty, eligibility, and additionality. WSP staff presented results and engaged with CAR's expert workgroup to ensure buy-in and understanding, and solicit feedback that could improve project outcomes. CAR's grasslands protocol is currently under final review by its workgroup, and is expected to be adopted by its board in summer 2015. A further goal of the effort is to promote the methodology and protocol for adoption by California Air Resources Board.

18	Title: Sustainable Energy Master Planning and Feasibility Assessment				
Relevance	Sustainable energy analysis and master planning in the built environment				
Client	Destiny USA				
Contract Value	Confidential	Period of Performance	2007-2008	Key Staff	Evan Evans (WSP)

Summary

WSP developed the sustainable energy master plan for a 4 million square foot mixed-use commercial real estate development on the shore of Lake Onondaga. WSP then performed the investment-grade feasibility study and developed the Engineering Procurement Construction (EPC) bid package for an energy solution that will supply 100% of the energy needs with renewable energy. The program comprises a mix of retail, office, and 'edutainment' features along with a 400-room hotel and associated conference center. WSP engineers first assessed the condition of the HVAC, lighting, and controls systems in the existing regional shopping mall which will remain a key feature of the project. This task identified opportunities to upgrade lighting and controls and replace all-electric rooftop HVAC units with 4-pipe fan coils. The resulting heating, cooling, and electric loads of the mall were combined with those anticipated for the new construction elements of the project to define the overall site loads. The sustainable energy-supply solution that emerged consists of a central CHP anchored by a gasifier that converts pelletized MSW and wood waste into syngas which is burned in boilers that produce steam that in turn drives 17 MW of turbine-generators and absorption chillers. The steam plant is supplemented by 2.4 MW of fuel cells operating in CHP mode that are fueled by biogas produced by the adjacent sewage treatment plant. The CHP is sized to supply all of the

18	Title: Sustainable Energy Master Planning and Feasibility Assessment
Relevance	Sustainable energy analysis and master planning in the built environment

space heating, chilled water, and electricity required by the 4 million sqft Phase 1 of the Destiny project. In addition, 5 MW of solar PV and 200 kW of vertical-axis wind turbines are part of the energy mix.

WSP also performed the technical and financial analyses, conducted the environmental impact assessment, completed the biomass resource assessment, wrote the technical specifications, developed the Request for Proposals that the owner used to solicit EPC contractors, evaluated EPC bid documents, supported the financial structuring of the project, and supported Power Purchase Agreement negotiations between the Special Purpose Corporation that will build, own, and operate the CHP and the individual energy off-takers occupying the site.

19	Title: Strategic Campus Energy Master Plan				
Relevance	Energy master planning and stakeholder engagement and consensus building				
Client	Georgetown University				
Contract Value	$500,000	Period of Performance	2013- 2015	Key Staff	Evan Evans (WSP) Dan Sobrinski (WSP) Mike Huisenga (WSP)

Summary

WSP is developing a comprehensive Campus Energy Master Plan (CEMP) for Georgetown University. Key CEMP elements include energy efficiency, renewable energy, a combined heat and power plant, behavior-change strategies, operational optimization, real-time energy monitoring and diagnostics, energy project finance mechanisms, and carbon offsets.

Carbon offsets.

In developing the CEMP, WSP collaborated with Georgetown University (GU) to establish a Business As Usual energy usage and carbon emissions trajectory out to 2022, benchmarked GU energy/carbon profile and goals against those of a set of peer universities, characterized gaps between outcomes expected from existing GU policies/programs and outcomes required to meet goals, and developed a specific road map by which a comprehensive CEMP could be developed. WSP also conducted a stakeholder engagement process by which input was solicited from key players within the GU organization and key non-GU players, buy-in was achieved from key stakeholders on strategic objectives, and required business outcomes to be delivered by the CEMP process were clearly defined. Energy audits and technical and financial analysis of energy efficiency and renewable energy projects opportunities were completed to develop a realistic estimate of total potential for cost-effective campus-wide energy efficiency and renewable energy implementation.

The building energy assessments identified energy efficiency retrofit opportunities that together can cost-effectively reduce annual energy spend in GU's existing building stock by about 35%. Expected reductions in chilled water demand in existing buildings, resulting from retrofits, will eliminate about 2,300 tons of future chiller plant capacity expansion that would otherwise be needed to accommodate planned new building construction. Peak electric demand reduction of 11 MW will come from 4 MW of peak reduction in existing buildings and another 7 MW from a gas-fired CHP.

20	Title: Federal Center South – U.S. Army Corps of Engineers HQ				
Relevance	Energy, GHG and technology analysis for green building design and engineering				
Client	U.S. General Services Administration				
Contract Value	$72M (Total Cost)	Period of Performance	2009 - 2012	Key Staff	Alan Shepherd (WSP)

Summary

As an integral part of the design-build team, WSP's Built Ecology Practice were awarded the design for a new office building on the Federal Center South campus for the Seattle District of the U.S. Army Corps of Engineers (USACE). The new, 209,000 sqft USACE office consists of three floors open to a central atrium. As required by the American Recovery and Reinvestment Act (ARRA) legislation,

20	Title: Federal Center South – U.S. Army Corps of Engineers HQ
Relevance	Energy, GHG and technology analysis for green building design and engineering

the facility was designed to be a high performing green building (HPGB) and meets the current federal energy goals. Siting, orientation, building form and massing, material selection, and construction are all structured to provide the most ideal workplace environment and breathe new life into the historic campus. The project goal was to meet LEED-NC Gold rating requirements and an Energy Use Index (EUI) of 20.3 kBtu/sqft/year. Reaching these goals allowed the building to meet the 2030 Challenge's energy and carbon reduction requirements, as well as obtain an ENERGY STAR rating of 100 and come in 40% below 2007 ASHRAE benchmarks.

Building 1202 includes an integrated design approach that focuses on energy conservation measures in order to meet the project energy use goals rather than expensive on-site energy generation strategies. The floor depth and façade design were optimized to reduce heating and cooling requirements along with extensive daylighting. Several innovative technologies implemented into the design to meet the project goals include: chilled beams, thermal storage using phase change material and 100% outside air delivery through a raised floor system with heat recovery.

For this project, our firm provided mechanical, electrical, plumbing, architectural lighting, low voltage systems and High Performance Green Building (HPGB) consulting; including estimating the GHG impacts of the various energy efficiency and technology design features.

Anticipated to be in the top 1% of office buildings in the U.S. for energy performance, some key high performance design solutions include:

Rainwater reuse system captures water from the roof and stores it in a 25,000 gallon cistern for toilet flushing, irrigation, rooftop cooling tower and water features in the atrium.
Optimization of floor depth and façade design enables extensive daylighting with 90% of the building naturally lit.
Thermal storage tanks with phase change materials (PCM) store cooling energy for future use.
Geothermal heating and cooling combined with structural piles (one of the first projects in the region to combine both systems).
Ventilation air provided by five rooftop air handling units with heat recovery and distributed via an underfloor air system.

Federal Center South was awarded a 2013 National Design Award in the Office Building category by the Design-Build Institute of America.

Task 5. Prepare and Present Interim Technical Report

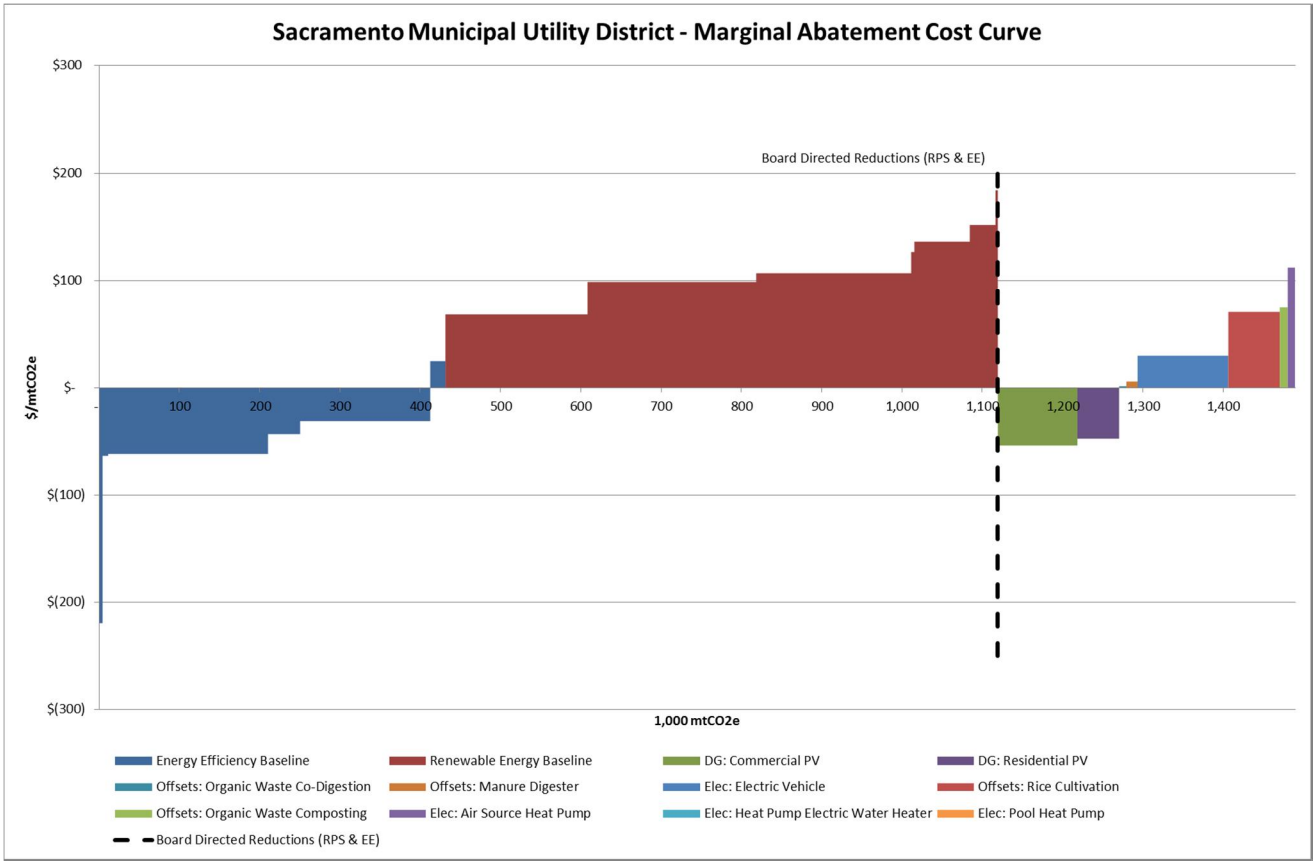
The primary purpose of Task 5 is to develop a clear and concise draft technical report that communicates the results of the full analyses completed on the final list of strategies and present that report to the MSWG at their July 31st meeting. The other component of Task 5 is preparing and assisting the MSWG with presenting the results to staff from the TPB, MWAQC, CEEPC, and the COG Board in September. The draft final report prepared by WSP will build on the Technical Memorandum prepared in earlier tasks and also summarize the project process up this point. The report will summarize each strategy, sector by sector, and the resulting GHG, cost, and co-benefit analysis results using a similar format as shown under Task 3. Accompanying these summary tables will be a narrative providing additional detail about the methods, data sources, assumptions, and tools used to complete the analysis as well as a discussion about how to interpret and apply the results going forward.

Through WSP's previous work with organizations like SMUD, we have learned there is typically a clear threshold at which GHG reductions move from being cost effective to not being cost effective. To identify this threshold, it is important to understand both the cost of reductions across strategies and the magnitude of reductions across strategies. Understanding the amount of reductions that can be obtained at different price points can clearly

identify where the marginal cost to reduce emissions by another ton exceeds the level at which reductions are more expensive than the social cost of carbon or the cost at which emissions could be offset or reductions purchased through compliance markets, RECs or some other means. WSP will provide a visual representation of the results as part of the final draft report both for all the strategies together and for each sector separately.

WSP has created numerous tools to compare and contrast GHG reduction strategies and measures in the past. The MACC models developed for SMUD, as described above under Task 4, plot the average annual cost per metric ton of GHG reductions for each strategy against the magnitude of possible reductions. This allows for a quick comparison against, not only other strategies, but the social or compliance market cost of carbon. Figure 3 below shows an example of the MACC output from a model developed for SMUD to analyze GHG reduction measures.

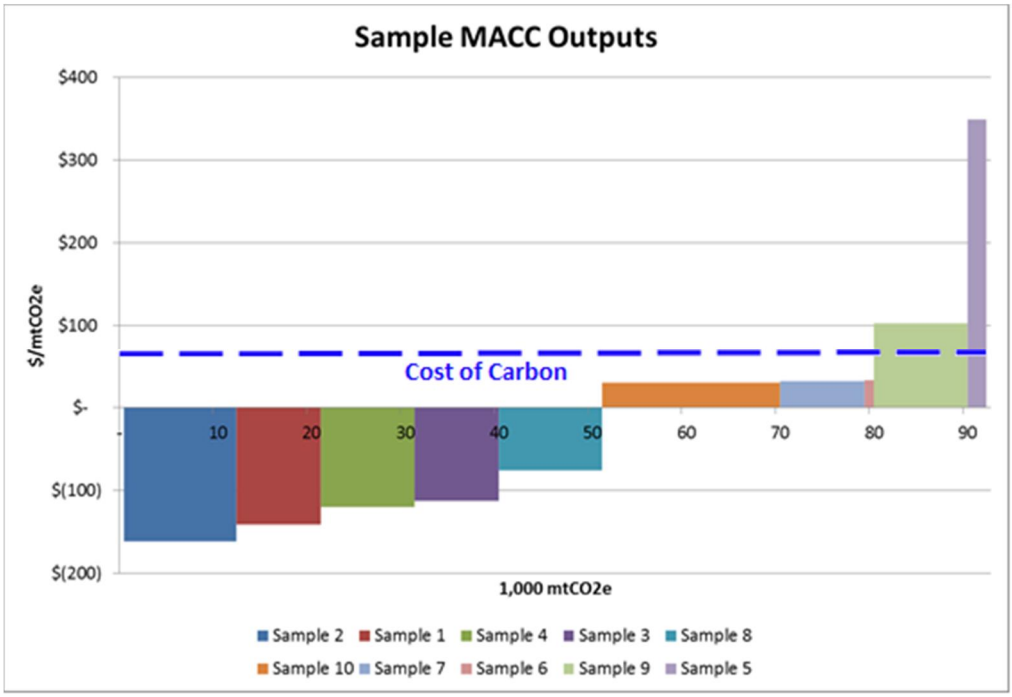
Figure 3. Example Output - Marginal Abatement MACC Curve



As shown in the figure above, Key staff at WSP divided the MACC curve done for SMUD by reductions from board directed measures that were already included in the strategic plan and potential new measures for possible inclusion. For COG, WSP could similarly divide the MACC Primary and Stretch goals. WSP could also show similar results across all strategies and also use different levels of aggregation to simplify the results, such as

showing the average cost per ton of reductions by sector. A simplified sample version of this same type of output is shown in Figure 4 below, which represents a MACC developed using higher levels of aggregation, lumping like strategies or measures together, and this time also showing a fixed cost of carbon threshold.

Figure 4. Simplified MACC - Higher Level of Aggregation and Set Cost of Carbon



There are many other metrics that can be used to compare and contrast the effectiveness of GHG reduction strategies. WSP will work with the MSWG to identify what metrics will be most useful for deciding which measures to move forward with in future planning efforts and in communicating the results and their recommendations to the other engaged groups including the TPB, MWAQC, CEEPC, and the COG Board.

WSP will solicit comments and questions during the July 31st meeting with MSWG during which the results of Task 4 are presented. WSP will work with members of MSWG to prioritize the comments received. The highest priority comments will be addressed prior to the September presentation by MSWG to COG. Any comments or additional analysis not completed prior to the MSWG presentation to COG will be captured as part of Task 7 and included in the final report.

As part of Task 5, WSP will also help prepare the MSWG to present these results and their overall recommendations based on WSP's analysis to the COG groups in September of 2015. The WSP Team's senior staff proposed for this project have made scores of formal presentations to corporate management, executives and board members. Our staff are experienced at summarizing and explaining complex topics in clear and concise ways to help facilitate understanding and productivity. Examples include presentations to the Washington State

Climate Legislative and Executive Workgroup (CLEW), Goldman Sachs, Dominion Power, Pacific Gas and Electric (PG&E), Entergy, and Anheuser Busch among others.

The PM, Matt Aberant, has presented on GHG management through conferences such as the World Energy Engineering Congress (WEEC) and at the Climate Leadership Awards at the request of EPA, as well as part of expert panels for workshops with EPA's Climate Leaders Program, and through trainings and workgroup facilitation with previous local government clients. Our Deputy PM, Tim Kidman, and Senior Technical Expert, Michael Mondshine, presented before a public hearing of the Washington State CLEW, led by Governor Jay Inslee, on the impact of existing state regulations and programs on future GHG emission levels and modeled forecasts of pending Federal regulations on future Washington State emissions. In 2014, Mr. Kidman presented an overview of cap and trade and the low carbon fuel standard as part of a presentation to C-suite and senior executives of California's oil and gas and refining industries at an executive roundtable in Carmel, California. Furthermore, Mr. Mondshine presented on the potential for a micro-grid in Tyson's Corner, Virginia, to representatives of Dominion Energy including their CEO, and to the Mayor of Fresno and representatives of PG&E on a potential sustainable district in Fresno, California.

Task 6. Explore GHG Goals and Targets in each Sector

COG has set ambitious goals to reduce greenhouse gas emissions by 20 percent below 2005 levels by 2020, and by 80 percent below 2005 levels by 2050. WSP and its staff have been at the forefront of energy and GHG goal setting for more than a decade, helping over 100 organizations across all sectors, including local governments and transportation organization, prepare inventories, assess reduction opportunities, and set reduction goals to position them at the forefront of the sustainability market. We have supported these clients in establishing aggressive, innovative, and achievable goals. In working with EPA's Climate Leaders Program from its inception, WSP has in-depth perspective and experience on what it takes to set goals tailored to an organization's needs and capabilities. For the Washington State government, WSP members evaluated state programs and the impact from existing and planned state, regional and federal polices, and recommended a set of actions and policies to reduce GHG emissions, that, if implemented, would ensure achievement of the State's emissions reductions targets set by the legislature. Furthermore, one of the WSP team's most recent innovations was the development of an internal carbon fee to help Microsoft reach its goal of carbon neutrality for data centers, software development labs, offices, and employee air travel. These examples illustrate our team's versatility across sectors in understanding client needs and setting goals based on regional context, economic and technical feasibility, and stakeholder demands.

Energy and GHG goals should be based on a strong analytical foundation that incorporates an evaluation of COG's current footprint as well as forecasted emissions based on current and proposed policies and implementation strategies. COG is taking a strategic approach to consider sector-specific achievable and stretch goals to reach overall GHG emissions reduction targets, but should recognize that reaching the ambitious 2050 target of reducing

GHG emissions by 80 percent below 2005 levels will be difficult without a major stretch measure such as a region-specific carbon tax or cap and trade system. In completing a similar task for the State of Washington, WSP team members learned that developing and achieving energy and GHG goals and targets requires a carefully planned suite of policy and market mechanisms that must strengthen and evolve over time as new circumstances arise and advanced technology emerges to potentially decrease the cost of implementing these mechanisms and reducing GHG emissions.

Identify Metropolitan Regions for Comparison

Researching peer metropolitan programs will be an important step in identifying and validating sector-specific goals and targets to reduce COG GHG emissions. The first step in conducting a meaningful and useful review of greenhouse gas (GHG) reduction goals and targets in other metropolitan areas is the proper selection of the candidate jurisdictions for review. WSP will efficiently utilize resources, and focus on programs from other metropolitan regions that align with the sector-specific approach taken by COG. Regions with similar sector-specific approaches will make results on the viability, achievability, effectiveness, and co-benefits of goals and targets in these jurisdictions far more applicable and transferrable to COG. The following list provides example programs to consider and will be modified based on further discussion with and input from MSWG members:

- **Transportation and Land Use:** Association of Bay Area Governments (San Francisco, CA), Southern California Association of Governments (Los Angeles, CA), San Diego Association of Governments (San Diego, CA), Metro (Portland, OR), Sacramento Area Council of Governments (Sacramento, CA), Puget Sound Regional Council (Seattle, WA)
- **Energy and the Built Environment:** Delaware Valley Regional Planning Commission (Philadelphia, PA), Sacramento Area Council of Governments (Sacramento, CA), New York City (New York, NY), Metropolitan Area Planning Council (Boston, MA)

WSP will summarize the goals and targets established to reduce GHG emissions in other metropolitan regions and outline the key high-level approaches implemented to achieve them. To ensure that WSP's assessment of these other goals is efficient, effective and consistent throughout, WSP will consider the following questions and criteria:

- *Does the metropolitan region have similar overall GHG emissions reduction targets as COG?* WSP will benchmark overall GHG goals and targets from other regions to evaluate how COG's goals align with other metropolitan areas. WSP will focus on areas where goals and targets are similar to COG, and provide a review as to how these regions expect to achieve goals and how sector-specific goals relate to overall regional GHG emissions reduction targets. For jurisdictions where goals are different, analysis will be limited to a high level overview of goals and important program elements.

- *Did the metropolitan region establish sector-specific achievable and stretch goals based on state, local and federal government policies and standards?* Understanding how other regions establish and address sector-specific achievable and stretch goals will inform COG on the process of setting practical and effective goals for reducing GHG emissions. WSP's research into regions with similar goals will provide context as to how other regions integrate multiple state and local jurisdictions into regional targets while also accounting for the potential impacts of federal policies on one or multiple sectors.
- *What goal- and target-setting approach has been implemented to reduce GHG emissions within the region? Have these approaches been successful thus far?* WSP will briefly summarize key regional approaches to achieve sector-specific goals to inform MSWG approaches. Like COG, some metropolitan regions take a multi-sector approach to goal setting and strategy implementation while others focus on one sector (e.g., California concentrates heavily on transportation). This exercise will be informative for understanding how goals, targets and strategies interact within a sector and across sectors. For example, this research may yield results on how emissions goals are apportioned to sectors and if those goals sum to the regional target. To the extent possible based on information and data availability, WSP will qualitatively assess near-term successes and failures of these approaches in order to inform MSWG goal and target development with regards to feasibility and viability.

Identify Range of Potential GHG Goals and Targets

COG has taken an important near-term step to achieving its 2020 GHG emissions reduction goal of 20% below 2005 levels by establishing a sector specific action plan for 2013-2016. This plan puts COG in a strong position to define sector-specific goals and targets by outlining implementation actions for regional GHG reductions, the built environment and infrastructure, renewable energy, transportation and land use, sustainability and resiliency, and outreach. WSP will use this plan along with strategies agreed upon by MSWG to inform and establish sector-specific achievable and stretch goals while also evaluating how future federal regulations might impact these goals.

Achievable and Stretch Goals

WSP will build upon the Task 4 analysis to identify a range of potential achievable and stretch GHG goals and targets. WSP will employ a simple sector by sector approach of summing reduction estimates from achievable strategies within each sector to identify achievable goals to develop tier 1 sector based goals and targets. By summing reductions from our analysis of stretch strategies to the tier 1 goals, WSP will develop potential tier 2 sector based goals and targets for consideration. It is important to recognize that there may be interactions among strategies within each sector and across sectors as mentioned in Task 4, and the final reduction estimates will qualitatively account for these interactions before goals are set. Example equations to inform sector-specific goal-setting are below:

$\mathbf{2020\ Achievable\ Goal}_{Transportation}(\mathbf{mtCO_2e})$ = 2020 Transportation$_1$ Reductions + 2020 Transportation$_2$ Reductions $+ \cdots +$ 2020 Transportation$_n$ Reductions

$\mathbf{2020\ Stretch\ Goal}_{\mathbf{Transportation}}(\mathbf{mtCO_2e})$ =
2020 Achievable Goal$_{Transportation}$ Reductions + 2020 Transportation$_{Stretch\ 1}$ Reductions +
2020 Transportation$_{Stretch\ 2}$ Reductions $+ \cdots +$ 2020 Transportation$_{Stretch\ n}$ Reductions

These sector-specific goals can then be summed to assess potential progress towards MWCOG's 2020 and 2050 regional targets of 20 percent and 80 percent below 2005 levels, respectively. An example equation might look something like this:

$\mathbf{Target}_{MWCOG\ Region}(\mathbf{mtCO_2e})$
= Goal$_{Transportation}$ Reductions + Goal$_{Energy}$ Reductions + Goal$_{Built\ Environment}$ Reductions
+ Goal$_{Land\ Use}$ Reductions

This exercise will allow MWCOG to gauge progress towards current goals, and provide context as to what MWCOG will need to accomplish to reach the ambitious 2050 target. As described below, federal policies may contribute to emissions reductions within the region and will likely play a significant role in reaching regional targets.

Goals Requiring Action from Other Levels of Government

Because they affect all states in the nation, the impact of federal policies on a single metropolitan region cannot be quantitatively assessed without first assessing full nationwide implementation. For example, the effect of Clean Air Act requirements on natural gas production in western states will ripple through the economy and impact the COG region through price signals, even if the natural gas consumed by COG jurisdictions does not originate in the western states. Not considering the national impacts and only viewing the COG region in isolation would result in a miscalculation of the contribution of federal policies to meeting COG's GHG emission targets. WSP team members have extensive experience in evaluating how federal policies can impact emissions reductions at the state, regional, and local levels through projects such as Washington State where we downscaled national modeling results to the state level in order to analyze state emissions reductions as a result of federal and state policy interactions.

WSP will collaborate with the MSWG to develop a list and choose federal policies relevant to each sector for analysis. This analysis will limit the possible federal policies examined given the remaining budget and time constraints. Potential federal policies to consider include further increase to the federal CAFE standards, carbon sequestration requirements, carbon tax, national cap and trade, or other future stretch strategies that could be established by higher levels of government (State or Federal).

This effort will build off the work that has been previously done by COG. The "What Would It Take – Transportation and Climate Change in the National Capital Region" report from 2010 already did significant analysis on this for the transportation sector. WSP would utilize these results, and other relevant work by COG, and apply it to our analysis to help develop the tier 3 goal options as described in the RFP. Where existing analysis was not adequate for the selected policies, WSP will complete a literature review and use existing studies and modeling results to scale national emissions reduction estimates to the MWCOG region using available metrics. WSP will review existing policy documentation, data and implementation history to understand policy evolution, requirements and other datasets available for reference, if any. Metrics for scaling national results to the regional level could include population, energy consumption, vehicle miles traveled (VMT), building square footage, or land area. These metrics will be chosen based on available data in collaboration with the MSWG. Where possible, applicable sector-specific metrics (e.g., VMT for transportation) will be used to provide a sector-relevant downscaling factor for national emissions data.

Based on data, results and experience from analyzing how federal policies impacted Washington State in reaching their GHG emissions reductions targets, the WSP Team learned that federal policies can have varying impacts on GHG emissions reductions depending on interactions with state and local policies as well as the region's energy mix. For example, benefits of the CAFE standards were already accounted for in Washington's Clean Cars Policy, so the federal standards had no additional effects on emissions. Furthermore, Clean Air Act rules for stationary combustion had little effect on Washington State's emissions because the state relies mostly on hydropower rather than coal-fired generation. In contrast, our region does rely on coal and therefore EPA's draft Clean Power Plan targets for MD, DC and VA, which limits emissions from existing power plants, could have significant impacts on the COG region. The federal RFS was the only federal policy analyzed where impacts to Washington State were not superseded by state laws. It is important to note that Washington State had already implemented several progressive policies that mirrored or were more stringent than federal standards. COG's regional context and state and local policy mix will play a key role in choosing relevant federal policies for further analysis. It is not realistic to complete a thorough interactions analysis for state, local and federal policies, but, where possible and reliant upon available data and time, WSP will provide a qualitative high-level overview of policy interactions to help MWCOG understand the possible effects on the region's sector-specific goals and overall targets.

Goal-setting Expectations

Based on prior experience on projects with Washington State and SMUD, WSP recognizes that the Primary sector strategies chosen by MSWG likely will support achievement of the 2050 regional target set by COG, without both the inclusion of stretch strategies and federal policies. Achieving energy and GHG targets requires a carefully planned suite of policy and market strategies that must strengthen and evolve over time as new circumstances in the region arise and advanced technology emerges. In the case that reductions from achievable, stretch and

federal government action strategies and policies do not meet COG's 2050 target, WSP will suggest allocations for sectors from which further emissions reductions should come. WSP could propose other potential strategies to analyze later as follow-on to this scope of work.

Task 7. Prepare and Present Final Technical Report

The WSP PM will be responsible for delivery of the final technical report. The primary purpose of this task is to incorporate all the information generate throughout the entire project process in a comprehensive and cohesive document that be useful as part of future planning efforts. The final report will build off the Interim Technical Report developed under Task 5 and will include the results of the potential GHG goal and target setting effort under Task 6. The final report will address any remaining comments raised by the working groups, TPB, MWAQC, CEEPC, or the COG Board during or subsequent to the September meeting, that were not addressed in the Interim report. Similar to Task 5, WSP will assist COG staff in preparing for and making a final presentation in January to these same groups.

Chapter 3. Services Pricing and Schedule

Cost

WSP proposes to complete the work plan outlined in Chapter 2, under Task 1 for a fixed price of $199,895. The anticipated allocation of these funds by Task and Team member are outlined in Table 4 below. WSP reserves the right to alter the mix of resources by Task and Team member (with no alteration in total price) to ensure best value to MWCOG during project delivery. Following Table 4, you will find our DBE Participation Plan, including letters of certification.

Table 4. Allocation of Funds Within WSP Fixed Price Proposal

Task	WSP	Gallop Inc. (DBE)	Straughan Environmental (DBE)	Total DBE	Grand Total
Task 1.	$2,216.00	$0.00	$0.00	$0.00	$2,216.00
Task 2.	$20,380.56	$1,580.90	$1,736.16	$3,317.06	$23,697.62
Task 3.	$15,094.88	$1,580.90	$2,073.44	$3,654.34	$18,749.22
Task 4.	$61,879.94	$14,228.10	$15,118.60	$29,346.70	$91,226.64
Task 5.	$20,630.78	$1,422.81	$5,049.90	$6,472.71	$27,103.49
Task 6.	$14,190.12	$0.00	$791.90	$791.90	$14,982.02
Task 7.	$15,471.92	$1,264.72	$5,183.60	$6,448.32	$21,920.24
Cost - All Tasks	$149,864.20	$20,077.43	$29,953.60	$50,031	$199,895
% of Dollar Value	75.0%	10.0%	15.0%	25.0%	100%

Schedule

WSP's draft schedule is laid out in Table 2, in Chapter 2 as part of our discussion of Task 1. Please refer to this section for a detailed draft work plan. The draft schedule will be discussed and finalized with the MSWG and COG as part of Task 1 after contract award.

DBE Participation Plan

WSP has carefully crafted its team to achieve COG's complementary objectives of ensuring technical excellence in the delivery of a Multi-sector Approach to Reducing Greenhouse Gas Emissions in the Metropolitan Washington Region and exceeding COG's established DBE goal of 19%. Accordingly, rather than merely identifying a portion of revenues for DBEs that is simply assigned to meet participation goals and which may or may not be delivered ,we have selected two DBEs with directly relevant capabilities and identified specific work assignments for each, should our team be awarded this contract. As outlined in Table 5 below, our plan allocates 25 percent of revenues to DBE subcontractors. The first, Straughan Environmental will provide support on our analysis of strategies in the built environmental sector as well as broader co-benefits analysis. We expect this work will cover 15 percent of project revenues. The second DBE, Gallop Corporation, will focus on modeling support in the transportation sector and is expected to receive 10 percent of anticipated project revenues. Please see DBE certification letters for each subcontractor below.

Table 5. DBE Participation Plan

DBE Subcontractors		Percentage of Contract
Subcontractor: Straughan Environmental, Inc.		15 %
Address: 10245 Old Columbia Road, Columbia, MD 21046		
Certifying State MD	DBE Certification # 97-190	
Subcontractor: Gallop Corporation		10%
Address: 451 Hungerford Drive, Suite 612, Rockville, MD 20850		
Certifying State: MD	DBE Certification # 95-110	

Maryland Department of Transportation
The Secretary's Office

Martin O'Malley
Governor

Anthony G. Brown
Lt. Governor

James T. Smith, Jr.
Secretary

May 20, 2014

EILEEN K. STRAUGHAN
STRAUGHAN ENVIRONMENTAL, INC.
10245 OLD COLUMBIA ROAD
COLUMBIA, MD 21046

Certification No. 97-190

Dear EILEEN K. STRAUGHAN:

We are pleased to inform you that your company has been found eligible to continue its certification as a Minority Business Enterprise (MBE), Disadvantaged Business Enterprise (DBE), Small Business Enterprise (SBE), and/or Airport Concessions Disadvantaged Business Enterprise (ACDBE) effective May 20, 2014.

Your firm remains certified for the services for which you have been approved and officially notified in writing. Your current certification status can be found in the Maryland Department of Transportation's (MDOT) Directory of Certified MBE/DBE/SBE/ACDBE Firms available online at http://mbe.mdot.state.md.us/directory. MDOT's online directory is the official record of your firm's certification status. It is important that you carefully review the accuracy of your listing in the Directory. If you have any questions about your firm's certification status, contact MDOT's Office of Minority Business Enterprise (OMBE) immediately at 410-865-1269 or 1-800-544-6056.

If you wish to expand the area(s) of work for which your firm is currently certified, you may request an **Expansion of Services**. The application for expansion of services can be found at http://www.mdot.maryland.gov/Office of Minority Business Enterprise/ExpansionCover.html Please submit your application request to:

Maryland Department of Transportation
Office of Minority Business Enterprise
7201 Corporate Center Drive
Hanover, MD 21076
410-865-1309 (fax) or mbe@mdot.state.md.us

Your firm must be recertified annually in order to maintain its certification. We will contact you when it is time to begin the next recertification process.

Sincerely,

Randy Reynolds
Director, Minority Business Enterprise

My telephone number is _____
Toll Free Number 1-888-713-1414 TTY Users Call Via MD Relay
7201 Corporate Center Drive, Hanover, Maryland 21076

Maryland Department of Transportation
The Secretary's Office

Lawrence J. Hogan, Jr.
Governor

Boyd K. Rutherford
Lt. Governor

Pete K. Rahn
Acting Secretary

February 18, 2015

DR. CHAWN-YAW JENG
GALLOP CORPORATION
451 HUNGERFORD DRIVE, SUITE 612
ROCKVILLE, MD 20850

Dear DR. CHAWN-YAW JENG (cert # 95-110):

We are pleased to inform you that your company has been found eligible to continue its certification as a Minority Business Enterprise (MBE), Disadvantaged Business Enterprise (DBE), Small Business Enterprise (SBE), and/or Airport Concessions Disadvantaged Business Enterprise (ACDBE) effective February 18, 2015.

Your firm remains certified for the services for which you have been approved and officially notified in writing. Your current certification status can be found in the Maryland Department of Transportation's (MDOT) Directory of Certified MBE/DBE/SBE/ACDBE Firms available online at http://mbe.mdot.state.md.us/directory. MDOT's online directory is the official record of your firm's certification status. It is important that you carefully review the accuracy of your listing in the Directory. If you have any questions about your firm's certification status, contact MDOT's Office of Minority Business Enterprise (OMBE) immediately at 410-865-1269 or 1-800-544-6056.

If you wish to expand the area(s) of work for which your firm is currently certified, you may request an Expansion of Services. The application for expansion of services can be found at http://www.mdot.maryland.gov/Office of Minority Business Enterprise/ExpansionCover.html Please submit your application request to:

Maryland Department of Transportation
Office of Minority Business Enterprise
7201 Corporate Center Drive
Hanover, MD 21076
410-865-1309 (fax) or mbe@mdot.state.md.us

Your firm must be recertified annually in order to maintain its certification. We will contact you when it is time to begin the next recertification process.

Sincerely,

Randy Reynolds
Director, Minority Business Enterprise

My telephone number is _____
Toll Free Number 1-888-713-1414 TTY Users Call Via MD Relay
7201 Corporate Center Drive, Hanover, Maryland 21076

Chapter 4. References:

WSP is pleased to provide three references for each of the members of the WSP Team whom COG May contact regarding similar work performed. Accompanying the WSP reference from Boulder County, Colorado is a letter of reference

WSP

Reference #1	
Client	Boulder County, Colorado
Project	Comprehensive GHG Management Plan
Contact	Susan Strife, PhD
Title	Sustainability Director
Address	Boulder Office of Sustainability, 1325 Pearl St, Boulder. CO, 80302
Phone Number	303 441-4565
Email Address	strife@bouldercounty.org
Team Members Part of Proposed Team	Evan Evans, Mike Huisenga, Derek Fehrer, Kealy Devoy

Reference #2	
Client	Arlington County
Project	GHG Inventory and Community Energy Plan Support
Contact	John Morrill
Title	Energy Manager
Address	2100 Clarendon Boulevard, Suite 705, Arlington, VA 22201
Phone Number	703 228-4426
Email Address	jmorrill@arlingtonva.us
Team Members Part of Proposed Team	Matt Aberant, Michael Mondshine, Tim Kidman, Chris Bruno

Reference #3	
Client	New York State Department of Transportation
Contact	Dr. Shengxin Jin
Title	
Address	NYSDOT Main Office, 50 Wolf Road, Albany, NY 12232
Phone Number	518-485-1406
Email Address	Shengxin.Jin@dot.ny.gov
Team Members Part of Proposed Team	Alice Lovegrove, Edward Tadross

March 6, 2015

Mr. George Hohmann
Contracts and Purchasing Manager
Metropolitan Washington Council of Governments
777 North Capitol Street, NE, Suite 300
Washington, DC 20002

Dear Mr. Hohmann:

By this letter I wish to provide a reference for WSP in the context of their response to MWCOG's RFP No. 15-010, Multi-sector Approach to Reducing Greenhouse Gas Emission in the Metropolitan Washington Region.

During the 2006 – 2013 period, specific WSP staff, including Evan Evans, Mike Huisenga, Derek Fehrer, and Kealy Devoy, have supported Boulder County on work very similar to that delineated in your RFP. Specifically, their work has included analysis of GHG emissions mitigation actions that are applicable to the Transportation and Buildings sectors of Boulder County's economy. The technical components of the work they delivered have been consistently strong, responsive to the needs of the County, and applied using the most appropriate methodologies. Finally, I have continued to rely on their expertise even after their contract ended, which has been invaluable for decision making about greenhouse gas reduction strategies.

Mr. Evans served as Project Manager and deployed personnel in an efficient manager to maximize value to the County. His team's support contributed to the County's ongoing progress in addressing its GHG profile.

Respectfully,

Susie Strife, PhD
Sustainability Director
Boulder County
office: (303) 441-4565
email: sstrife@bouldercounty.org

Straughan Environmental

Reference #1	
Client	University of Maryland Department of Capital Projects
Project	UM Landscape Services Building
Contact	Richard Poley
Title	Project Manager
Address	University of Maryland, Building 006, College Park Maryland
Phone Number	301 405-0230
Email Address	rpoley@fm.umd.edu
Team Members Part of Proposed Team	Sara Berman, Diane Gutierrez

Reference #2	
Client	Global Resource Recyclers
Project	Methodology for Pavement Application Using Foam Stabilized Base
Contact	Harold Green
Title	Principal
Address	162 Lafayette Avenue, Laurel, MD 20707
Phone Number	301 575-1085
Email Address	haroldgreen@chamberlaincontractors.com
Team Members Part of Proposed Team	Sara Berman

Reference #3	
Client	University of Maryland
Project	UM Landscape Services Building
Contact	Qingbin Cui
Title	Assistant Professor, Department of Civil and Environmental Engineering
Address	1173 Glenn L Martin Hall, College Park, MD 20742
Phone Number	301 405 8104
Email Address	cui@umd.edu
Team Members Part of Proposed Team	Sara Berman, Diane Gutierrez

Gallop Corporation

Reference #1	
Client	Maryland Mass Transit Administration
Project	Southern Maryland Transit Corridor Preservation Study
Contact	Ernest Baisden
Title	Project Manager
Address	6 Saint Paul St, Baltimore, Maryland
Phone Number	410 767-3754
Email Address	EBaisden@mtamaryland.com
Team Members Part of Proposed Team	C.Y. Jeng

Reference #2	
Client	Washington DC Department of Transportation
Project	South Capitol Street Final EIS Study
Contact	Faisal Hameed
Title	Manager
Address	64 New York Avenue, N.E., Washington, D.C. 20002
Phone Number	202 671-2326
Email Address	Faisal.hameed@dc.gov
Team Members Part of Proposed Team	C.Y. Jeng

Reference #3	
Client	Metropolitan Washington Council of Governments
Project	Development and Application of the MWCOG/NCRTPB Travel Demand Model
Contact	Ronald Milone
Title	Travel Forecasting Program Director
Address	777 N. Capitol Street, NE/ Suite 300, Washington, DC 20002
Phone Number	202962-3283
Email Address	rmilone@mwcog.org
Team Members Part of Proposed Team	C.Y. Jeng

Appendix A – Key Staff Resumes

MATTHEW ABERANT

PROGRAM MANAGER

WSP

ARLINGTON, VA

12 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- GHG Emission Accounting
- State and Local GHG and Sustainability Planning
- Model and Tool Development
- Prior COG Experience
- Climate Science
- Policy Analysis
- Program Management
- Data Management
- GIS

EDUCATION:

M.S., Earth Systems Science, George Mason University, Fairfax Virginia

B.S. Integrated Science and Technology (Environment and Engineering), James Madison University, Harrisonburg, VA

PROFILE

Mr. Aberant was the practice lead for climate change services at Leidos and now is a project director for WSP. He has over 12 years of professional experience in the areas of climate change, environmental science, modeling, and environmental information technology. Mr. Aberant has a long history of leadership in the development, management, and evaluation of climate change issues and programs. He has significant experience supporting and managing projects for the U.S. Federal government, Local and State Government, commercial clients, and utilities where he is responsible for not only technical analysis and support but the staffing, scheduling, budget control, quality assurance, and client communications as well.

PROJECT ROLE

TIME ALLOCATION: 50%

As the Program Manager, Mr. Aberant will be responsible for maintaining positive control over the program of activities underway at any given time, ensuring clear lines of communication between COG and the WSP team, and providing resources to WSP Sector leads. He will serve as the primary contact point for COG on all matters related to contract execution and administration, and will work closely with COG staff and WSP's other Key Staff to execute each of the 7 tasks, track task budgets, and apply appropriate resources from across the WSP team. In addition, Mr. Aberant will apply his technical expertise in GHG accounting, state and local climate action and sustainability planning, and tool development to support the Multi-Sector Working Group in developing and analyzing selected emission reduction strategies and presenting the results.

APPLICABLE PROJECT EXPERIENCE

Sacramento Municipal Utility District

As the Program Manager for the previous Sacramento Municipal Utility District (SMUD) Contract; Mr. Aberant recommended, defined, and executed a variety of projects including the development of specific modules for a dynamic marginal abatement cost curve model to evaluate and prioritize renewable energy, energy efficiency, and electrification GHG emission mitigation projects. Other projects included geologic sequestration studies, electric vehicle investment option analysis and model, and updating an analysis on a range of options for SMUD to respond to the physical, regulatory, and societal demands of climate change. This included analyzing identifying key efficiency improvement and technology development areas that may have nearer term impacts and implications for planning decisions.

Washington Gas and Light

For Washington Gas, Mr. Aberant completed a goal setting project where he was responsible for analyzing and quantifying future reductions based on current and planned programs and actions by Washington Gas. The reduction goals resulting from this analysis were adopted and publically announced by Washington Gas. Currently, Mr. Aberant is supporting an enhance GHG inventory analysis and tool development project to combine their internal and external GHG inventory requirements.

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MATTHEW ABERANT

State and Local Governments

Mr. Aberant recently led a building energy study for Arlington County to help focus future program efforts on key segments and end uses. This included a benchmarking analysis based on available building data and the development of multiple data analysis tools to true up known utility consumption with estimated building segment and end use energy intensities.

Mr. Aberant helped design and test a GIS based tool to calculate GHG emissions for land use changes at the county or regional level.

Mr. Aberant managed the completion of a full environmental footprint for a three year period for the state of Maryland. He developed government operations and community GHG inventories for Montgomery County (Md.), Arlington County (Va.), and the city of Colorado Springs (CO). He was the technical lead for the Prince George's County's (MD) Sustainability Action Group and managed the support contract for the County's overall climate change and sustainability efforts.

State of Washington Climate Legislative and Executive Workgroup

For the State of Washington, Mr. Aberant was a technical resource and provided research into existing GHG policies in Washington State and other jurisdictions to explore their potential to achieve emission reductions. Mr. Aberant also provided quantification methods and forecasted GHG emission reductions and associated costs for existing state policies (RPS, EE, FIT) and potential new state policies (Cap and Trade). The research contributed to an effort led by Governor Inslee to better understand potential policy options to achieve established GHG reduction targets.

United States Environmental Protection Agency

Mr. Aberant served as Project Manager supporting EPA's Climate Leaders Program. He provided analysis and technical assistance to the Program and its corporate partners for setting aggressive yet attainable GHG reduction goals. He ran a model designed to set benchmarks for specific industry sectors in energy consumption, fuel prices, GHG intensity, and economic revenue. Mr. Aberant served as an expert panellist in several Climate Leaders web-based seminars on goal-setting. Mr. Aberant provided subject matter expertise on the technical reporting requirements for EPA's GHG Reporting Program web-based reporting tool e-GGRT and developed Excel based reporting tools to implement the calculation protocols across program subparts.

Department of Defense

Mr. Aberant was the program manager for support of the Office of the Deputy Under Secretary of Defense (Installations and Environment) in responding to the GHG reporting requirements of EO 13514. This included facilitating DoD's GHG Accounting Working Group meetings and activities, the development of key guidance and data collection strategy documents, reviewing Federal GHG guidance, involvement in the GHG accounting and Vendor and Supply Chain Federal Working Groups, and overseeing the data gathering, data aggregation, and verification efforts. This also includes supporting DoD's development of internal climate vulnerability assessments and adaptation plans and policies.

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LAURA ALDRETE, AICP PARSONS BRINCKERHOFF

TRANSPORTATION & LAND USE SENIOR SUPPORT STAFF DENVER, CO

20 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Land Use Analysis and Development
- Transit-oriented Development
- Urban Planning
- Meeting Facilitation
- Translating Services

EDUCATION:

Master of Arts, Urban Planning, University of California, Los Angeles, 1996

Master of Arts, Latin American Studies, University of California, Los Angeles, 1996

Bachelor of Arts, Anthropology, University of Colorado, Boulder, 1991

PROFILE

Laura Aldrete has participated in development and transportation projects in the private and public sector throughout her career. As a nationally recognized urban planner with redevelopment expertise, she applies her comprehensive understanding of the land use and transportation knowledge to redevelopment projects. In a world that no longer operates in isolation, the application of Laura's knowledge on many transit-oriented development projects renders a more robust and successful project for the agency, developer and the community. Laura is a bilingual Spanish speaker and can conduct charrettes and public meetings in Spanish. Previous to her position at Parsons Brinckerhoff, she served as the assistant director of the Denver Urban Renewal Authority (DURA), special projects director in Denver's Office of Economic Development and the Stapleton project manager in the Denver Mayor's Office.

PROJECT ROLE TIME ALLOCATION: 30%

As a land use and transportation development expert, Ms. Aldrete will support the Transportation and Land Use sector leads in providing insight into transit-oriented development ideas and communicating strategy and goal setting ideas to the sector subgroups. Where necessary, Ms. Aldrete will contribute to developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

Broadway West End Alternatives Analysis
Ms. Aldrete was responsible for the land use analysis who directed several community charrettes, station area planning and policy analysis to assess the potential economic and community development of transit to this bustling corridor. The City of Nashville is defining its future through planning of a more robust transit system. In this first step the city identified an alignment and bus rapid transit (BRT) as the preferred mode to ensure the viability of their main commercial corridor.

Jackson County Commuter Corridors Alternatives Analysis
Ms. Aldrete is serving as task lead for the land use analysis. The project's main goal is to identify a preferred alternative for the east and southeast corridors in the Kansas City metropolitan region. The land use analysis is examining potential economic and community development benefits that can be leveraged through transit supportive land use policies and will make recommendations for implementing policies.

Regional Transportation District (RTD) Transit Oriented Development (TOD) Advisory Consultation
Ms. Aldrete assists the RTD's TOD team with strategies for TOD development at RTD rail stations and corridors. Laura has participated in joint development deal structures, TOD corridor workshops, TOD and joint development policy development, transit access guidelines and urban design criteria and metrics. RTD's FasTracks is a $4.7 billion voter initiative to implement six transit corridors throughout the Denver region that will introduce 57 new stations to Denver's existing transit system.

TOD Development Viability Analysis & Brand
Ms. Aldrete led a multi-disciplinary team of real estate economists, planners and brand marketing specialists to assess a 9-station light rail corridor. The development viability

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analysis examined the current market and trends coupled with connectivity and public investment assessment to assist the City in prioritizing those stations that were most market ready. A brand for the line was developed along with expression and an implementation strategy for both TOD development and brand.

Overlake Transit Village Strategy
The Overlake Village neighborhood in the City of Redmond will host a new Light Rail Transit Station in 2023. To help kick-start development and ready the parcels for TOD, Ms. Aldrete refined the site plan, confirmed infrastructure costs, tested market viability of building development footprints and uses, recommended financing mechanisms and tools, and created pre-development schedules to strategize financing and market readiness.

Arvada Olde Town TOD Developer Solicitation
Ms. Aldrete, as part of the Regional Transportation District (RTD) TOD Advisory role, worked with the transit agency, City of Arvada and Urban Renewal Authority to craft a process to select a developer for an 8-acre TOD development opportunity. The initial step was to craft a decision-making body and process between the three public agencies, next was to identify critical issues for the developer community to respond to in a formalized Request for Proposals, and finally develop clear guidelines for developer selection and negotiation. Currently a contractor has been selected for phase I of the project that is set to complete construction by December 2015. The development calls for a mix of uses including hotel, residential, office, hotel, parking garage and integrated bus facility.

Denver Union Station Redevelopment
Ms. Aldrete worked with five public agencies to coordinate timing and schedules of design, construction, finance and governance, and public involvement to ensure successful delivery of the project. Denver Union Station is the regional transit hub for the $6.7 B FasTracks transit system in the Denver Metropolitan region. Laura's work on this project also included a master plan amendment, tax increment financing, and metropolitan district structure development, process and approval.

Station Area Master Infrastructure Plan (MIP) for TOD
Ms. Aldrete served as project manager for this effort and oversaw planning civil engineering for all major utilities within two TOD station areas. The project entailed development of a master infrastructure plan for two city of Lakewood light rail transit (LRT) stations that have been previously planned and rezoned for TOD. The challenge was to provide a tool kit of urban infrastructure and public finance solutions for varying levels of density and neighborhood character depending on the proximity to the station.

RTD TOD Urban Design Criteria and Metrics
The Regional Transportation District began soliciting interest in joint development with developers and needed to provide clear and predictable expectations for transit-oriented development (TOD) urban design elements. Ms. Aldrete developed core principles, intent statements, standards and guidelines with accompanying graphics that developers could understand at the outset of the design process. Quantitative urban design metrics were also developed to measure the impact of the criteria over longer term development of TOD areas. Metrics are taken every two years.

CHRISTOPHER BRUNO

ENERGY & LAND USE SUPPORT STAFF

WSP

BOULDER, CO

3 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Project Management
- GHG Emission Accounting and Reporting
- State and Local GHG and Sustainability Planning
- Climate Science and Policy Analysis
- Data Management, Modeling and Tool Development
- GIS and Geospatial Analysis

EDUCATION:

M.E.M., Environmental Management, Duke University, Durham, NC

B.S., Environmental Studies, Gettysburg College, Gettysburg, PA

PROFILE

Mr. Bruno is currently an Associate Consultant on WSP's Sustainability and Energy team. With an educational background in environmental management, Mr. Bruno brings knowledge of national and international environmental and climate change science and policies. Mr. Bruno has management experience on greenhouse gas accounting and reduction analysis projects, and continually utilizes his quantitative analytical skills in data collection, modeling, statistical evaluation and geospatial analysis. Mr. Bruno has worked with local, state, and Federal government agencies as well as non-governmental organizations to provide analytical tools, survey analyses, research papers, strategic plans, and policy recommendations based on the study of environmental science, policies and data.

PROJECT ROLE — TIME ALLOCATION: 30%

As a member of the WSP team, Mr. Bruno will support the Energy and Land Use sector leads in developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

State of Washington Climate Legislative and Executive Workgroup
For Washington State, Mr. Bruno contributed to an effort to present potential policy options that will allow the State to achieve established GHG reduction targets in 2020, 2035, and 2050. Personal work included analyses and modeling of energy efficiency and emissions reductions from the State's renewable portfolio standard, appliance standards, and clean cars program. Mr. Bruno also evaluated transportation, energy, and economy-wide emissions reduction policies such as electric vehicle and alternatively fueled vehicle purchasing incentives and infrastructure support in other states and jurisdictions in order to apply lessons learned to Washington.

Sacramento Municipal Utility District
Mr. Bruno has contributed to several Sacramento Municipal Utility District (SMUD) projects such as developing a dynamic marginal abatement cost curve (MACC), evaluating the technical and economic potential for SMUD investment in offset protocols, scoping paper for a potential updated to Sacramento County's GHG inventory, and geospatially analyzing geologic sequestration options. These projects have allowed SMUD to economically assess the cost and benefits as well as the technical and financial feasibility of options for implementing measures to achieve current and future goals in energy efficiency, renewable energy, and emissions reductions. Personal contributions included collecting and analyzing emissions, offsets and electrification data, technical writing on relevant policies and data, and conducting GIS analysis to inform SMUD decision-making.

Department of Defense
Mr. Bruno was the deputy project manager supporting the Office of the Deputy Under Secretary of Defense (Installations and Environment). Mr. Bruno facilitated DoD GHG working group meetings, provided guidance, recommendations and data collection strategies for mandated requirements under Executive Order 13514, and supported DoD's development of internal climate vulnerability assessments and adaptation plans

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and policies. Mr. Bruno also provided support to DOD by collecting, aggregating and verifying energy and GHG emissions data to ensure consistent reporting to the Federal Energy Management Program. Mr. Bruno used these data to write and revise a data collection and emissions reduction plan to benefit DOD's mission in the future.

Arlington County, Virginia
In support of Arlington County's GHG emissions inventory, Mr. Bruno contributed to data collection, analysis, quantification, and memos that outlined recommendations on how to incorporate Renewable Energy Credits (RECs) and public transit emissions analyses into the inventory. Mr. Bruno evaluated water utility data to calculate emissions for comprehensive assessment of wastewater facilities. This project employed the Local Government Operation (LGO) Protocol, and referenced the International Council for Local Environmental Initiatives (ICLEI) Protocol.

United States Environmental Protection Agency
Mr. Bruno supported the implementation, operation, and improvement of the U.S. Environmental Protection Agency's Greenhouse Gas Reporting Program (GHGRP). Mr. Bruno developed help content for Subparts C (General Stationary Fuel Combustion Sources), D (Electricity Generation), R (Lead Production), V (Nitric Acid Production), HH (Municipal Solid Waste Landfills), SS (Electrical Equipment Manufacture or Refurbishment), and TT (Industrial Solid Waste Landfills) to support GHGRP reporters with inquiries about the subject matter material and how the GHGRP system operates. Mr. Bruno has also responded to complex questions regarding the Rule (40 CFR, Part 98) and reporting process. This task involved a detailed understanding of GHG emissions accounting practices and in depth knowledge of 40 CFR, Part 98.

Geographic Information Systems (GIS) Experience
Mr. Bruno has 7 years of experience working with ESRI's ArcGIS software. Mr. Bruno has worked on projects that have included criteria relating to geoprocessing, spatial analysis, climate modeling, land use and land cover, change detection, site suitability, topology, raster analysis, networks, georeferencing, and geodatabase management, among others. GIS data formats familiar to Mr. Bruno include shapefiles, rasters, LIDAR, coverages, personal and file geodatabases, KML files, and many associated file formats used to store environmental data (e.g., ASCII, .dbf, and .csv).

ERIC W. CHRISTENSEN

SENIOR GOAL SETTING EXPERT AND ADVISOR

WSP

BOULDER, CO

18 YEARS OF RELEVANT EXPERIENCE AREAS OF PRACTICE

APPLICABLE EXPERTISE AND SKILLS:

- Sustainability Strategy
- Goal Setting
- Product and Supply Chain Management
- GHG and Resources Management
- Sustainable Energy
- Climate Preparedness

EDUCATION:

B.S. with Distinction, Environmental Technology, Stanford University, Stanford, CA

M.S. Building Systems Engineering, University of Colorado, Boulder, CO

PROFILE

Eric Christensen leads WSP's Greenhouse Gas (GHG) and Resource Management practice. He is an engineer with over 15 years of experience in GHG emissions analysis, sustainable building design, and building energy efficiency. He has supported over 50 organizations in developing GHG inventories, Carbon Disclosure Project responses, and GHG management plans, including companies such as Bank of America, General Dynamics, Cummins, Gap, Wells Fargo, and Genzyme.

Mr. Christensen has performed engineering analysis of GHG reduction projects for submission for certification under the Kyoto Protocol and Verified Carbon Standard. He has assessed the design of ethanol production and power generation facilities, photovoltaic systems and other renewable energy projects. He has also assisted design teams to improve the energy efficiency and sustainability of new buildings and to qualify for LEED certification. He is proficient with building energy modeling software used to guide design teams on a wide range of energy efficiency and renewable energy options.

PROJECT ROLE — TIME ALLOCATION: 30%

An expert in goal setting, Mr. Christensen will support the Energy, Built Environment, Transportation, and Land Use sector leads in identifying and setting achievable and stretch goals for the MWCOG region. With his federal sector experience, he will also provide insight into how federal strategies to reduce greenhouse gas emissions could impact and interaction with MWCOG strategies. Where necessary, Mr. Christensen will contribute to developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

GHG and Sustainability Assistance, Financial Institution
Since 2006, Mr. Christensen has supported the bank in developing a global Scope 1, 2, and 3 GHG inventory and reporting emissions to the Carbon Disclosure Project, and the bank's corporate social responsibility report. He has supported the bank in developing GHG reduction goals and evaluation of GHG reduction projects, and leads the development of the bank's inventories of water use and waste generation.

Climate Leaders, U.S. Environmental Protection Agency (EPA)
Mr. Christensen provided technical assistance to nearly 50 U.S. corporations participating in Climate Leaders, a voluntary program in which companies inventory their GHG emissions and set a GHG reduction goal. He aided participants in developing comprehensive GHG inventories and inventory management plans.

GHG Management and Reporting, General Dynamics
Mr. Christensen worked with General Dynamics to develop a corporate-wide GHG inventory. He developed and continues to maintain an Inventory Management System that aggregates annual inventory data, calculates GHG emissions, and generates

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summary charts and tables. He wrote an Inventory Management Plan and assisted General Dynamics in assessing and complying with GHG reporting requirements and with identifying, evaluating, and implementing GHG reduction projects.

GHG Reduction Planning, Financial Institution
Mr. Christensen supported Goldman Sachs in developing a plan to procure sufficient GHG offsets and green power to achieve its GHG goals. He assisted in defining the quality standard for purchased offsets and green power and assisted in defining a procurement strategy and in the development of a Request for Proposals and subsequently with the evaluation of vendor proposals.

Greenhouse Gas Management Services, Shaklee Corporation
Mr. Christensen is currently supporting Shaklee Corporation to develop a cost-effective strategy to offset corporate emissions to achieve net zero impact on global warming. He identified providers of renewable energy and carbon offsets and assisted in writing an RFP and subsequently evaluated the type and quality of renewable energy and carbon offsets proposed to ensure that they met EPA guidelines. He assisted Shaklee in making its 50th Anniversary Conference climate neutral by quantifying the GHG emissions resulting from the travel and energy use associated with the conference, and quantifying needed GHG offsets.

GHG Software Selection and Implementation, Financial Institution
Mr. Christensen assisted Wells Fargo in selecting a GHG management software product by providing support in the defining the functional requirements for the software, developing a Request for Proposals issued to vendors, evaluating proposals and selecting the software. He assisted in the implementation of the software.

Carbon Value Analysis Tool Review, World Resources Institute
For the World Resources Institute (WRI), Mr. Christensen performed an evaluation of WRI's Carbon Value Analysis Tool (CVAT). This work involved 1) review of CVAT to identify beneficial upgrades and added features based on our experience evaluating GHG reduction projects; 2) review of CVAT's calculation methodologies, assumptions, emissions factors, and other constants; and 3) testing of CVAT to identify potential errors, including a comparison of CVAT with results of tools developed by WSP.

GHG Emission Reduction Projects
Mr. Christensen wrote an original methodology by which carbon offsets produced by a coal mine methane project at an abandoned mine are quantified, monitored, and verified. He developed documentation necessary for submission of projects to the CDM Executive Board and/or buyers of emission reductions.

Ahmedabad Electricity Co. for USAID
Mr. Christensen performed an engineering analysis of an electric vehicle program in Ahmedabad, India. He evaluated the impacts on the electric utility's load shape and operating efficiency and quantified emissions of GHGs and local air pollutants.

Sustainable Design Assistance
Mr. Christensen assisted the design teams of numerous projects to improve the energy efficiency and sustainability of new buildings. He recommended energy efficiency upgrades to the building envelope, mechanical systems, and lighting systems, and performed computer energy modeling to quantify energy savings of the upgrades and to determine energy performance points earned toward LEED scoring.

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KEALY DEVOY

BUILT ENVIRONMENT SUPPORT STAFF

WSP

BOULDER, CO

6 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Sustainability Planning
- Energy Modeling
- GHG Management and Accounting
- Public Reporting
- Energy Efficiency
- Energy Audits
- Offset Project Development

EDUCATION:

M.S., Environmental Management, Energy and the Environment Concentration, Duke University, Durham, NC, 2012

B.A., Environmental Studies, cum laude, Davidson College, Davidson, NC, 2008

PROFILE

Kealy Devoy provides analytical support to WSP's clients through greenhouse gas (GHG) emissions inventory, reporting and reduction planning projects. She has calculated GHG and water inventories, performed water risk assessments and analyzed carbon mitigation strategies for various corporate, higher education and local government clients. She has experience with data collection and management, GHG software implementation, water risk assessment tools and supporting the development of Carbon Disclosure Project responses. Ms. Devoy has worked with a range of organizations, including those with mature sustainability programs and those just beginning on a path to sustainability.

PROJECT ROLE — TIME ALLOCATION: 30%

As a member of the WSP team, Ms. Devoy will support the Built Environment sector lead in developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

Resources Management and Sustainability Assistance
Ms. Devoy worked with a leading financial institution on sustainability programs and reporting, specifically Ms. Devoy developed a water inventory tool, completed a global water use inventory and performed water risk assessments. She conducted stakeholder interviews to investigate water governance, risks, and opportunities to inform the development of a Carbon Disclosure Project water response. Ms. Devoy completed a supply chain analysis of purchased goods and services for inclusion with a comprehensive GHG inventory for reporting to CDP and the organizations corporate sustainability report.

Climate Action Planning and Carbon Neutrality
For a liberal arts college, Ms. Devoy developed a Climate Action Plan, with a strategic approach to carbon neutrality, which included a range of projects in the energy, transportation, education and student engagement sectors. She also completed an inaugural GHG emissions inventory to comply with the American Colleges and Universities President's Climate Commitment.

Energy Modeling
Ms. Devoy created an energy model for existing campus building using Trace 700 software (Trane) to assess the impact of lighting, HVAC, sighting, design and scheduling practices on the building's energy consumption. She constructed an energy efficiency supply curve illustrating costs and benefits of potential building design techniques to meet the requirements of North Carolina's 2012 Energy Conservation Code in new campus construction projects.

GHG Software Implementation
Ms. Devoy assisted with the implementation of Hara software to manage data and complete GHG emission reports.

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KEALY DEVOY

Energy Audit and Energy Efficiency Project Development
Ms. Devoy developed energy efficiency upgrade plans for 7 fire stations and the main municipal buildings for a small town in North Carolina. Site visits included a basic energy audit and interviews with personnel. She completed a ROI analysis of potential energy efficiency projects and prioritized them based on payback and expected greenhouse gas emissions reductions.

GHG Assurance
Ms. Devoy supported GHG assurances in accordance with the requirements of the ISO 14064-3 standard and to satisfy the CDP requirements for external verification.

Carbon Offsets Project Development
Ms. Devoy developed pilot program to assess the ability of residential energy efficiency retrofits at a major university to generate quantifiable carbon offsets. She outlined the financing model, defined a research population, created marketing strategies, secured funding, formulated retrofit protocols and trained undergraduate interns to carry out retrofits and analyze results.

GHG Software Implementation
Ms. Devoy worked with a storage technology manufacturer to implement and use WSP's Inventory Management System to collect and manage data and to generate a Scope 1, 2 and 3 GHG emissions and a water use inventory, which included withdrawals, consumption, recycled water and discharges.

Sustainability Strategy
Ms. Devoy developed CDP Responses and CDP Water Responses for an adhesives manufacturer, a storage technology manufacturer, and an auto parts manufacturer. :

GHG Mitigation Projects, Local municipal government
Ms. Devoy analyzed energy efficiency and GHG mitigation projects to assess their potential to contribute to the overall Sustainable Energy Plan. She updated the plan with recommended strategies to achieve aggressive GHG mitigation targets.

Energy Efficiency Project Analysis
Ms. Devoy assessed potential energy efficiency initiatives for dorms and other campus buildings of a major university. She compiled a comprehensive report describing recommended projects and estimated impacts, costs and savings of each project.

Energy Management Planning, Local municipal government
Ms. Devoy created a roadmap for development of a long term, comprehensive energy management plan for a local municipal government. She worked with facilities management team to identify strengths and weaknesses, particular areas of concern, and resource needs. She worked with the financing department to determine possible funding strategies.

CHRISTOPHER DORNEY, AICP PARSONS BRINCKERHOFF

TRANSPORTATION & LAND USE SUPPORT STAFF BALTIMORE, MD

8 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Land Use Planning
- Transportation Analysis
- GIS and Geospatial Analysis
- Climate Preparedness

EDUCATION:

Candidate, PhD, Land Use Planning, University of Maryland

M.S., Land Use Planning, University of Maryland, 2006 (including a certificate in historic preservation)

B.S., Geography, Pennsylvania State University, 2004 (including a minor in Geographic Information Systems [GIS])

PROFILE

Christopher Dorney is a transportation and land use planner working for Parsons Brinckerhoff in Baltimore. He is also pursuing a PhD in planning at the University of Maryland. Mr. Dorney has training and work experience in land use planning, transportation planning, climate change adaptation, and historic preservation. He is also proficient in GIS, a tool he uses often to support the planning and preservation work he undertakes.

PROJECT ROLE TIME ALLOCATION: 30%

As a member of the WSP team, Mr. Dorney will support the Transportation and Land Use sector leads in developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

Carroll County Industrial and Commercial Land Use Plan
Mr. Dorney assisted senior Parsons Brinckerhoff staff with the preparation and selection of candidate industrial and commercial sites for this suburbanizing community near Baltimore and Washington, DC. This project involved extensive use of GIS to isolate potential commercial and industrial parcels and to estimate the supply of suitable land available.

Gwinnett County Unified Plan
Mr. Dorney conducted a GIS analysis to determine the rezoning that will be necessary to achieve the land use goals expressed in an allocation model that Parsons Brinckerhoff helped develop for the county. Mr. Dorney also assisted with other elements of plan preparation including ensuring compliance with Georgia's statewide planning consistency goals and an analysis for locating a county service center in an economically challenged portion of the county.

Washington Metropolitan Transportation Authority (WMATA), Analysis of Joint Development Potential
Mr. Dorney assisted in the preparation of maps and reports assessing the potential for transit oriented development around specific Metro station sites in the Washington area. Stations studied included Branch Avenue and Franconia-Springfield.

Dense Residential Infill Development within Single Family Neighborhoods
Mr. Dorney is currently conducting his dissertation research on the positive and negative impacts of dense infill development within single-family neighborhoods.

I-270 Multi-Modal Corridor Study
Mr. Dorney worked on the economic impact section of a supplemental environmental assessment document for this large-scale transportation improvement in suburban Washington, DC. The supplemental report was necessary to evaluate the economic impacts of various express toll lane alternatives. Mr. Dorney has also coordinated GIS mapping efforts for an analysis of alternative transit alignments and has helped assess the impacts of these alternatives on transit operations.

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CHRISTOPHER DORNEY, AICP

NCHRP 25-25 Task 22, Forecasting Indirect Land Use Effects of Transportation Projects
Mr. Dorney co-authored a guidebook on how to forecast indirect land use effects of highway projects with Uri Avin, Robert Cervero, and Terry Moore. Mr. Dorney conducted the literature review of existing guidance and assisted with researching and creating appropriate forecasting methodologies.

Maryland Scenarios Project
While a graduate assistant at the University of Maryland's National Center for Smart Growth (NCSG), Mr. Dorney worked closely on this effort which aims to create an integrated transportation, land use, and impact modeling framework for the state. Mr. Dorney has contributed especially to the compilation and clean-up of a state employment dataset that is used to calculate the state's zoned employment capacity.

US 301 Waldorf Area Transportation Improvements DEIS, Indirect and Cumulative Impacts Analysis
Mr. Dorney helped Parsons Brinckerhoff conduct an assessment of induced growth potential for a proposed bypass in a rapidly growing area on the outskirts of Washington, DC. There is concern this project could expand the urban growth footprint of the DC region towards environmentally sensitive wetland areas.

Maryland State Highway Administration (SHA) Climate Change Adaptation Policy
Mr. Dorney is responsible for the development of a policy approach for dealing with climate change impacts on Maryland's highway system. Interviews were conducted with senior staff throughout the agency that identified, at a high level of detail, the opportunities and constraints for incorporating adaptation into SHA's activities. Special attention was given to legal, regulatory, and institutional barriers to action. The findings are now being incorporated into a set of policy recommendations for the agency.

National Cooperative Highway Research Program (NCHRP) 20-83(05) Climate Change and the Highway System
NCHRP 20-83(05) is an ongoing multi-year research project that will develop the methodologies and tools practitioners need to translate climate projections into on-the-ground adaptation actions. Mr. Dorney conducted the literature review for this project and has helped develop a diagnostic framework that can be used to assess the climate threat to an agency and formulate appropriate policy responses. Mr. Dorney has also helped provide input on a benefit-cost model for assessing the financial viability of various climate adaptation actions.

Western Federal Lands (WFL) Highway Division Climate Change Adaptation Guidance
Mr. Dorney assisted WFL create a guidance document that its engineers can use to begin incorporating climate projections into their designs. Mr. Dorney conducted a literature review for and helped assemble pertinent climate data used in this document.

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EVAN A. EVANS, P.E.

BUILT ENVIRONMENT SECTOR LEAD

WSP

BOULDER, CO

36 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Renewable Energy
- Electricity Generation Performance Improvement
- Energy Efficiency
- Carbon Monetization Methods
- Next Gen Fossil and Renewable Generation Technologies
- Program Management
- Innovation and Project Development

EDUCATION:

BSc, Bachelor of Science, Urban Planning , Southern Methodist University

MSc, Master of Science, Energy Engineering , University of Colorado,

PROFESSIONAL QUALIFICATIONS:

Professional Engineer

PROFILE

Evan A. Evans is expert in energy efficiency, renewable energy, and greenhouse gas emissions management, working exclusively in these fields since 1979. Evan directs WSP USA's Sustainable Energy practice which provides comprehensive corporate energy management strategies; sustainable energy infrastructure master planning; renewable energy resource assessments; feasibility studies; investment due diligence; and monetization of carbon offsets from efficiency and renewable energy projects. His project work has taken him to nearly 40 countries in North America, Latin America, Europe, Africa, and Asia

A registered professional engineer, Mr. Evans has a 36-year track record of feasibility studies of the full gamut of renewable energy technologies and central energy plant performance improvements; energy performance improvements in industrial facilities; and technical assessments of emerging sustainable energy technologies. He began his career in 1979 at the Solar Energy Research Institute (now the National Renewable Energy Laboratory). His recent focus has been on next-generation technologies for producing renewable electricity, renewable thermal energy, renewable natural gas, and renewable liquid fuels from biomass and municipal solid waste (MSW).

Mr. Evans has been at the forefront of the carbon monetization arena. He contributed to original Kyoto CDM methodologies for sugarcane bagasse-fired combined heat and power (CHP), industrial wastewater biogas-fired CHP, and small-scale run-of-river hydroelectric projects. The sugarcane bagasse methodology was the world's very first methodology submitted to the CDM governing bodies.

PROJECT ROLE — TIME ALLOCATION: 25%

Mr. Evans will serve as the Built Environment Sector Lead on this project, and will collaborate directly and closely with the Energy Sector Lead, Mike Huisenga, to provide insight into opportunities for establishing micro-grids and district energy use, implementing advanced building technologies and passive energy technologies, and exceeding LEED building certification standards. Mr. Evans will also evaluate the potential for increasing the proportion of new housing in MWCOG Activity Centers to 75 percent by 2040. Located in Colorado, Mr. Evans will guide technical support staff in developing methodologies and analyzing sector strategies, and will teleconference into meetings and have Michael Mondshine, WSP Executive Sponsor of this project, assist in facilitating sector subgroup meetings when necessary.

APPLICABLE PROJECT EXPERIENCE

City of Boulder Strategic Plan

Evan developed a sustainable energy and climate action plan for the City of Boulder, Colorado that included innovative policy and programmatic concepts aimed at the stock of existing commercial buildings, since this sector was shown to make the largest contribution to Boulder's economy-wide GHG emissions. This work led directly to the first carbon tax in the USA, with proceeds being used to finance local carbon mitigation actions. Separately, he directed development of an economy-wide climate action plan for Boulder County, advised on the design of carbon mitigation policies and programs, and evaluated the impacts of such programs.

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EVAN EVANS, P.E.

Paradise Valley Micro-grid and District Energy System
Evan led the assessment of technical and financial feasibility of a stand-alone district energy system and micro-grid that would provide 100% of the energy requirements of a new community being developed near Palm Springs, CA. The assessment showed that a DE/micro-grid would provide a lower life cycle cost than the electric grid.

Green Bonds Strategic Plan
Evan developed a comprehensive sustainability design plan for a consortium of commercial real estate developers. The plan provided a specific roadmap to achieve extremely aggressive goals involving SO_2 emissions reductions of 10 tons/day, displacement of 150 MW of grid-supplied electricity with non-conventional site-generated electricity, deployment of 25 MW of fuel cell capacity, and installation of 11 MW of solar PV capacity. The consortium aimed to achieve LEED certification for 75% of the commercial building space in these projects – more than 50 million square feet of LEED-rated buildings. Achieving these technical benchmarks qualified the projects for special 'green bond' financing and established these projects as national leaders in alternative energy technology deployment and sustainable design.

New Sky Energy CO_2 Sequestration
Evan led the technical evaluation of an innovative process that absorbs CO_2 directly from the atmosphere and uses it to produce high-quality carbonates such as calcium carbonate, soda ash, and sodium bicarbonate. The carbonates can in turn be used in lieu of conventional carbonates such as in the calcination process used to make concrete. In addition to producing a net reduction in GHG emissions, the New Sky technology produces desalinated water from brackish water or seawater and permanently sequesters carbon when New Sky carbonates are used in the manufacture of plastics and construction materials.

State of Castilla y Leon, Spain Climate Action Plan
Evan led the development of GHG emissions inventories, performed technical and economic analysis of emissions mitigation measures, and performed macroeconomic analysis of a package of recommended mitigation measures for the electric power, cement, pulp & paper, and livestock sectors of Spain's geographically largest state. In addition, an economy-wide GHG inventory was developed for the region to provide a framework for a comprehensive GHG emissions management plan for Castilla y Leon which in turn provides a framework for strategically important economic development initiatives by the regional government. Plans for development of a wind turbine manufacturing and energy services industry, and a biofuels industry were delineated.

Belize National Energy Plan
Evan led energy assessments that identified energy efficiency retrofit opportunities that together can cost-effectively reduce annual energy spend in Belize's economy by about 24%. This work demonstrated that 2035 annual electric demand of ~ 1 TWh (after efficiency savings) can be supplied cost effectively with 95% renewables. A follow on analysis of the Belizian electric grid will determine the volume of distributed renewable electricity that can be supported by existing T&D capacity expansion plans.

Compania Licorera de Nicaragua Biogas
Evan provided technical advisory services on two biodigesters for the anaerobic treatment of the wastewater generated in the production of rum from sugarcane molasses. The project will substantially reduce CLN´s use of fuel oil and grid-supplied electricity and will also produce significant volumes of carbon emissions offsets that can be sold on the international carbon markets.

DEREK FEHRER

ENERGY & BUILT ENVIRONMENT SUPPORT STAFF

WSP

BOULDER, CO

6 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- GHG Accounting
- Emission Reduction Planning
- Energy Efficiency
- Software Development and Implementation
- Public Reporting
- Goal Setting
- Feasibility Studies

EDUCATION:

B.S., Environmental Engineering; Tufts University, Medford, MA

PROFILE

Derek Fehrer provides technical support, sustainable energy planning, and greenhouse gas (GHG) emissions analysis to WSP's clients. He has over six years of experience providing these services to corporations, academic institutions, and local governments. Mr. Fehrer has helped dozens of clients through the inventory process and created custom GHG inventory management and modeling software. He has evaluated energy efficiency projects and supported their implementation across corporate real-estate portfolios and large infrastructures.

Mr. Fehrer has provided GHG software selection and implementation support to numerous clients. He recently helped guide an S&P 500 company to recognition in the Carbon Disclosure Project Leadership Index (CDPLI) for excellent internal data management practices and understanding of their GHG emissions. He worked with many academic institutions to create GHG Inventories and devise reduction strategies for the American College and University Presidents' Climate Commitment (ACUPCC). Mr. Fehrer also worked with local governments to develop and maintain their GHG Inventories and evaluate, prioritize, and implement emissions reduction strategies.

PROJECT ROLE — TIME ALLOCATION: 30%

As a member of the WSP team, Mr. Fehrer will support the Energy and Built Environment sector leads in developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

CDP Climate Change: Microsoft, Wells Fargo, Seagate, Ecolab, Turner Construction, CDM Smith, Gilead Sciences
Mr. Fehrer has reviewed and written dozen of CDP Climate Change responses for companies across sectors to report emissions and energy data accurately and transparently in accordance with CDP and other relevant guidance. Additionally, Mr. Fehrer is an experienced with the Management and Risks & Opportunities sections, also using them as an internally tool for evaluation.

GHG Emissions Goal Setting: SalesForce, ACE Group
Mr. Fehrer modeled future growth and achievable reductions, accounting for the exponential growth often seen in the ICT sector, as well as growth through acquisitions. Mr. Fehrer also used his technical expertise to model potential energy and emission reductions in the building and business operations portfolios. By evaluating several different forecast scenarios and including the results of peer-benchmarking, achievable, aggressive and action oriented goals were created and publically communicated.

GHG Management, Local Government
Mr. Fehrer worked with Boulder County and the City of Boulder to quantify and forecasting their future GHG emissions to include the impact of Colorado's Renewable Portfolio Standard will have on GHG emissions associated with end-use electricity usage.

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DEREK FEHRER

GHG Management, EPA Climate Leaders
Mr. Fehrer provided technical support to numerous companies participating in this program. He assisted them with establishing their emissions inventory baseline, developing customized Inventory Management Plans, emissions quantification and reporting, and supporting their annual reporting to the Climate Leaders program.

GHG Management, Enterprise Carbon Accounting Platform
Mr. Fehrer designed a specialized platform for several Fortune 500 corporations including Microsoft, Symantec, and Seagate, among others, to quantify and track annual GHG emissions across multiple business units. The platform incorporates the most current emission factors and provides automated energy usage estimation. By translating inventory outputs into a relational database, we were able to provide companies with valuable analyses showing the largest sources of GHG emissions by operational activity, region, and business group.

GHG Software Selection and Implementation, Wells Fargo
Mr. Fehrer assisted Wells Fargo in selecting a GHG management software product. He provided support in the defining the functional requirements for the software, developing a Request for Proposals issued to vendors, evaluating proposals, and selecting the software. He also assisted in the implementation of the selected software to achieve transparency, accuracy, and repeatability in the environmental metrics inventory.

Emission Reduction Planning, Transnet
Mr. Fehrer evaluated the feasibility of various renewable energy technologies including solar PV, wind, biomass combustion, and large-scale regenerative braking for the large infrastructure company, incorporating grid receptivity, energy costs, and carbon emissions into the analysis.

Landfill Gas Evaluation, General Dynamics
Mr. Fehrer evaluated the feasibility of a major defense contractor's manufacturing facilities for use of Landfill Gas (LFG). Work included evaluating requisite plant energy loads and examining the potential LFG supply stream, both in terms of quantity and longevity, from local landfills in proximity to client facilities.

Sustainable Design, Cataldo Fellowship
Mr. Fehrer researched the feasibility of using a turnkey system to install green roofs in New England for the Cataldo Fellowship at Tufts University. He evaluated different plant species and soil aggregates, including an experimental aggregate made from fly ash and recycled high density polyethylene.

Sustainable Energy Infrastructure
Analyzed sustainable energy strategies by which clients could incorporate cost-effective energy efficiency and renewable energy projects into their capital planning processes as elements of a comprehensive corporate sustainability strategy.

MIKE HUISENGA, MSC, P.E.

ENERGY SECTOR LEAD

WSP

BOULDER, CO

6 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Renewable Energy
- Technology Evaluation
- Economic Feasibility
- Energy Policy
- Program and Project Development
- Methane Emissions
- Energy Audits
- Strategic Planning
- Program Management

EDUCATION:

MSc, Mechanical Engineering with specialization in Sustainable Power Generation, Royal Institute of Technology/KTH, Stockholm, Sweden

B.S., Mechanical Engineering, University of Iowa, Iowa City, IA

PROFESSIONAL QUALIFICATIONS:

Professional Engineer

PROFILE

Mike Huisenga is a senior consultant in WSP's Sustainability and Energy practice with eight years of professional consulting experience in renewable energy project development, GHG mitigation projects and corporate sustainability services. Areas of technical expertise include resource assessment, combined heat and power, solar power, financial analysis, industrial energy efficiency, and life cycle assessment. He is an expert user of various specialized software tools used in the energy and Life Cycle Assessment industries including SAM, HOMER Energy, Thermoflex, GREET, GaBi and SimaPro.

Over the course of his career, Mr. Huisenga has focused on both domestic and international work with direct experience in Japan, China, Vietnam, Mexico, Guatemala, Honduras, Nicaragua, Belize, and South Africa supporting clean energy policy, program and project development. Mr. Huisenga also has sector expertise in projects that mitigate methane emissions at coal mines and natural gas fields. He has authored two original GHG Baseline and Quantification methodologies for the Verified Carbon Standard, and has provided input to the development of the mine methane protocol used in the California compliance offset market. He has provided assistance to project operators with the verification and monetization of over 300,000 tonnes of carbon offsets.

PROJECT ROLE — TIME ALLOCATION: 30%

As the Energy Sector Lead, Mr. Huisenga will coordinate directly and closely with the Built Environment Sector Lead, Evan Evans, to apply their joint expertise to triple renewable energy production by 2020, integrate renewable energy production into the built environment, and research the potential for the development of advanced power solutions such combined heat and power or district energy systems in the MWCOG region. Mr. Huisenga will consider the interaction of regulatory policies with the deployment of advanced energy technology to identify obstacles and opportunities. Located in Colorado, Mr. Huisenga will guide technical support staff in developing methodologies and analyzing sector strategies, and will teleconference into meetings and have Michael Mondshine, WSP Executive Sponsor of this project, assist in facilitating sector subgroup meetings when necessary.

APPLICABLE PROJECT EXPERIENCE

Commercial Building Rooftop Solar PV Feasibility Study, Project Manager
WSP USA is leading a study in Cape Town, South Africa evaluating the feasibility of installing rooftop solar PV systems at 13 commercial buildings owned by the Western Cape Government. The study is being carried out for the GreenCape Sector Development Agency with grant funding from the US Trade and Development Agency. Mr. Huisenga is acting as the project manager coordinating all sub-contractors and project deliverables and is lead technical consultant responsible for the techno-economic analysis at each site.

Combined Power and Cooling feasibility Study for Commercial Building and Data Center, Project Manager, Leading Technology Company
Mr. Huisenga conducted an analysis of available natural gas fired CHP technologies to determine the lowest life cycle cost option for providing power and cooling at a data center owned by a leading US technology firm. A feasibility study was conducted on

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the lowest cost option and included detailed pro forma analysis, process flow diagrams, electrical single line drawings, and heat and mass balance calculations.

Environmental and Energy Strategy, Technical Consultant, Leading Central American Sugar Producer
WSP provided support to a large Central American sugar producer on the development of and environmental strategy focusing on energy and water. Mr. Huisenga participated on WSP's international project delivery team and was responsible for assessing energy efficiency and power generation uprating opportunities at the sugar refineries and sugar-cane bagasse fired cogeneration plants. Opportunities that were evaluated included anaerobic digestion of vinasse, bagasse drying, high pressure bagasse fired boilers, and replacing back-pressure steam turbines with extraction condensing steam turbines.

Commercial Building Level 3 Energy Audit and Feasibility Study, Technical Consultant, Central Bank of Belize
WSP delivered an ASHRAE Level 3 Energy Audit for the Central Bank of Belize. The energy audit involved detailed building energy systems assessments, data logging, and detailed hourly simulation using eQuest. The computer model was used to analyze the technical and financial performance of various energy efficiency measures. Following this, WSP conducted a more detailed feasibility study for replacing the existing air-cooled chiller with new high efficiency units.

Biomass Heat and Power Pre-feasibility Studies – Lead Technical Consultant – Confidential Consumer Products Manufacturer
This project involved providing technical and financial screening to determine the viability of using biomass to produce electricity and steam at four industrial plants. Mr. Huisenga's work consisted of selecting appropriate process technologies, developing power cycle configurations, heat and mass balance calculations, and developing installed and operating cost estimates. WSP made use of Thermoflex, a thermal power simulation tool, to develop the power cycle heat and mass balance calculations.

Waste Heat Recovery CDM Project – Project Manager and Lead Consultant – Samancor Chrome – Steelpoort, South Africa
WSP provided assistance to a South African ferro-chrome producer in the scoping and evaluation of a prospective CDM project recovering waste heat from electric arc furnaces to generate electricity. Power produced by the plant displaces grid electricity that is derived almost entirely from coal. Mr. Huisenga managed all activities of the project include writing of the PDD and verification assistance.

Sustainability Support – Project Manager and Lead Technical Consultant – Gevo, Inc. – Denver, CO
Mr. Huisenga provides on-going sustainability support services to a leading advanced biofuels company. Activities include managing LCA studies on biofuel and biochemical production processes and pathways; Project Manager on a study investigating the sustainability of corn production in the supply chain of Bio-butanol plant in Luverne, Minnesota; and strategy and analysis for developing EPA compliant advanced biofuel pathways. One recent project involved producing a life cycle assessment and preliminary mass and energy balance for Gevo's Alcohol to Jet (ATJ) process using forestry residuals materials as feedstock.

MARSHA KAISER

LAND USE SECTOR LEAD

PARSONS BRINCKERHOFF

WASHINGTON D.C.

34 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Program Management
- Land Use Development
- Transportation Planning
- PlaceMaking

EDUCATION:

M.S., Public Administration/Urban Planning, Shippensburg University, 1979

B.S., Social Welfare, Lock Haven University, 1976

PROFILE

Marsha Kaiser serves as the National Director of PlaceMaking Services. The PlaceMaking services within Parson Brinckerhoff are directed to projects which serve to build and revitalize communities through the integration of land use and transportation investment. Her extensive experience in planning is focused on land use, economic and development impacts of transportation projects. She specializes in context sensitive solutions that are geared to weaving transportation infrastructure into the fabric of communities. Prior to joining Parsons Brinckerhoff, she served for eight years as the Planning Director for the Maryland Department of Transportation, involved in directing and guiding innovative multi-modal transportation solutions throughout the state.

PROJECT ROLE — TIME ALLOCATION: 40%

As the Land Use Sector Lead, Ms. Kaiser will work closely with the Transportation Sector Lead, Alice Lovegrove, to evaluate a wide range of GHG reduction strategies in the land use and transportation sectors since many of the impacts and co-benefits of those sectors are inextricably bound to the design of residential communities, zoning, and alterations in traffic patterns. Located in Washington, D.C., Ms. Kaiser will attend working group meeting in-person and will apply her facilitation skills during meetings with sector subgroups to review proposed strategies and reach consensus on strategy selection. Ms. Kaiser will also guide technical support staff in developing methodologies, analyzing sector strategies, and will present results to sector subgroups for discussion and comment.

APPLICABLE PROJECT EXPERIENCE

Maryland Avenue SW Transportation Plan
Ms. Kaiser is managing the feasibility study of completing a visual and physical connection from the National Capital Building to the Southwest Waterfront, a prominent connection envision in the L'Enfant Plan for Washington, DC. Currently rail lines, an Interstate ramp, and diverse typography create barriers to this connection. The US General Services Administration is soliciting developers for many parcels in the study area to convert historical US government office space to vibrant mixed-use development. Creative options developed include capping over the CSX rail lines to provide a connection. The cap was planned as a plaza/park serving as a visual and physical connection long missing from the L'Enfant plan for DC.

North Carolina DOT Complete Streets Planning and Design Guidelines
Ms. Kaiser managed the development of guideline documents that will transform the manner in which streets, from parkways to rural roads, are planned and designed statewide in North Carolina. A Complete Streets Toolbox was created to fuel implementation of the guidelines including a process for planning and designing streets that consider all modes as well as the model ordinances, trade-off analysis mechanisms and a compatibility matrix to measure multi-modal facility performance.

Peel Region Road Characterization Study
Ms. Kaiser provided strategic advice and support in the development of guidelines for classifying and designing roadway types dependent upon land use characteristics in the portion of the province that reaches from the more urbanized Lake Ontario region

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to the very rural Caledon area. Experiencing rapid growth in the region, government officials and residents alike desire as means to address the correlating transportation needs through an approach towards land use integration and an emphasis on the pedestrian and cyclist as well as the automobile.

Baltimore Penn Station Passenger, Facilities and Precinct Plan
Ms. Kaiser managed a multi-dimension conceptual plan to create an urban district through the interconnection of the Historic Baltimore Penn Station with the neighborhoods north and south of the station. Project includes plans for redevelopment of the internal station to accommodate future passenger and revenue generating growth, complete streets and land development concepts to connect the city better to the station.

Tyson's Corner Urban Center Study
Ms. Kaiser served as deputy project manager in the development of comprehensive land use/transportation plan to convert this 1,700 acre suburban "edge city" into a walkable, vibrant urban center using four proposed new metro rail stations as the catalyst for the land development changes. The plan included design guidelines, context sensitive urban street cross sections, and alternative transit networks. Ms. Kaiser managed the application of proprietary software to determine reduction in carbon emissions at various stages of plan implementation.

Takoma-Langley Crossroads Sector Plan
Ms. Kaiser directed development of coordinated widespread revitalization plan for highly diverse section along the Purple Line Transit Corridor. Assessed TOD potential at two proposed stations, developed urban context sensitive urban street designs and facilitated public work sessions. Ultimate sector plan included development pattern, infrastructure, park and recreation and community character elements.

Westphalia Sector Plan and Sectional Map Amendment
Ms. Kaiser facilitated the development of plan for 6,000 acres of primarily farm land minutes from downtown Washington, DC, into an Urban Center, two mixed use activity centers and four smaller neighborhood centers. The plan includes design principals and guidance on open space and parkland, multi-modal transportation network, environmental features, recreation elements and a public facilities financial plan.

New Carrolton Transit Development District Plan
Ms. Kaiser directed the development of a transit development district plan adopted by council to transform this Metro station into a nearly 9 million sqft. of commercial retail and office space, 8,000 residential units to create a vibrant mixed-use community.

West Baltimore MARC Station TOD Study
Ms. Kaiser directed the consultant team in the State/City/Community collaborative assessment of development potential for TOD, economic development and land use relative to proposed Red Line Transit Study. Ms. Kaiser worked with community coalition in assisting their education of state and local transportation, economic development and housing planning processes and funding program to address the implementation of TOD. Ms. Kaiser facilitated the coalition's conduct of a community work session which served as the inputs to the final plan for the Station Area.

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TIM KIDMAN

DEPUTY PROGRAM MANAGER

WSP

LOS ANGELES, CA

8 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Program Management
- Carbon Market Expertise
- GHG and Energy Modeling
- Tool Development
- Climate Science
- Policy Analysis
- Strategic Planning
- Public Communications

EDUCATION:

M.S., Environmental Science & Management, University of California, Santa Barbara Bren School, Santa Barbara, CA. 2008

B.A. Philosophy. Wesleyan University. 2002

PROFILE

Tim Kidman is a Senior Consultant who works on greenhouse gas (GHG) mitigation, offsets, and adaptation, sustainable strategy, and related sectors including energy efficiency, renewable energy, and transportation. He has in-depth knowledge of California's AB 32, carbon pricing mechanisms, the offset market, standards development process, verification, and project monitoring. He has worked with public and private sector clients on projects ranging from offsets analysis and procurement to GHG mitigation opportunity prioritization. He holds a Master of Environmental Science & Management from the University of California, Santa Barbara, and a B.A. from Wesleyan University.

PROJECT ROLE

TIME ALLOCATION: 50%

As the Deputy Program Manager, Mr. Kidman will be the secondary contact for MWCOG in the absence or unavailability of the PM. Mr. Kidman will assist the PM in oversight of cost and technical quality of the project work, and will help ensure clear lines of communication between MWCOG and the WSP team. Additionally, Mr. Kidman will employ his technical expertise in GHG accounting, state and local climate action and sustainability planning, and tool development to provide oversight and guidance to support staff on the implementation of sketch planning models, identification of GHG emissions mitigation strategies, and establishment of goals based on MWCOG needs and ideas from other relevant metropolitan regions.

APPLICABLE PROJECT EXPERIENCE

State of Washington Climate Legislative and Executive Workgroup
Mr. Kidman led research into GHG policies in other jurisdictions to explore their potential to achieve emission reductions if implemented in Washington. The research contributed to an effort led by Governor Inslee to better understand potential policy options for the State to achieve established GHG reduction targets.

Sacramento Municipal Utility District Climate Change Impact Assessment
Mr. Kidman evaluated the potential impacts from climate change on SMUD's infrastructure, demand profile, generation capacity, transmission systems, and other risk factors, and recommended actions to increase readiness and resiliency.

Sacramento Municipal Utility District Offsets Scoping
Mr. Kidman led an effort to analyze through multi-criteria assessment select GHG offset project types not yet adopted by California ARB, to assist SMUD in understanding opportunities to participate in protocol development or execution of pilot projects.

Sacramento Municipal Utility District MACC Model
Mr. Kidman led a team to analyzing all available climate mitigation opportunities to create a dynamic GHG marginal abatement cost curve model. This included analysis of energy efficiency, renewable energy, building and vehicle electrification, and greenhouse gas offset measures.

Climate Action Reserve Grasslands Emission Reduction Modeling
Mr. Kidman developed quantification methodology and modeling for GHG offset project protocol for the Avoided Conversion of Grasslands. He coordinated modeling

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effort of 31.7 million point years to develop composite, standardized emissions estimates.

Climate Adaptation and Vulnerability Assessment
Mr. Kidman is conducting analysis of climate change impacts on varying geographic and temporal scales, and assessing the likely impacts on the operations and exposure of client facilities and investments.

Offsets Verification Support
Mr. Kidman supported a GHG offset project developer in getting Early Action Offset Credits (EAOCs) successfully verified and issued by the Offset Project Registry (OPR) under California's cap and trade program.

Low Carbon Fuel Standard Modeling and Application Support
Mr. Kidman conducted multiple assessments of the lifecycle GHG emissions from biofuel production to support new pathways under California's Low Carbon Fuel Standard.

Port of Long Beach CEQA GHG Mitigation
Mr. Kidman advised the Port on setting policy for meeting tenant CEQA mitigation obligations using various instruments including offsets and RECs.

CA Air Resources Board and U.S. EPA GHG Reporting
Mr. Kidman supported the California ARB and U.S. EPA in implementation of their respective GHG reporting program.

Sacramento Municipal Utility District Offsets Request for Offers
Mr. Kidman assisted SMUD in developing a Request for Offers for compliance GHG offsets within California's cap and trade program by drafting contract language in consultation with SMUD staff, and briefing SMUD on risk exposure and mitigation measures regarding delivery, conversion, counter-party, and invalidation risks.

Pierce County, WA Waste Diversion Analysis
Mr. Kidman quantified the lifecycle GHG benefit of seven distinct food waste diversion scenarios, considering the use of both composting and anaerobic digestion.

Climate Action Reserve Offsets Issues Paper
Mr. Kidman led the research and writing of an issue paper analyzing the feasibility of bioreactor landfill protocol implementation, analyzing project eligibility, regulatory implications, monitoring, and GHG calculation methodologies.

Sacramento Municipal Utility District Green Power Assessment
Mr. Kidman prepared a report informing the direction of SMUD's green power program, considering trends in voluntary renewable energy purchases, drivers of residential and non-residential participation, review and critical assessment of the debate around use of renewable energy credits, and analysis of the likely interactions between voluntary renewable electricity purchases and California's RPS and cap and trade regime.

ALICE LOVEGROVE

TRANSPORTATION SECTOR LEAD

PARSONS BRINCKERHOFF

NEW YORK, NY

26 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Program Management
- Federal, State, and Local Transportation Planning
- Tool and Model Development
- Transportation Air Quality Analysis
- GHG Emissions and Energy Analysis

EDUCATION:

M.S., Environmental and Waste Management, State University of New York at Stony Brook, 1992

B.E., Engineering Science, State University of New York at Stony Brook, 1987

PROFILE

Alice Lovegrove has extensive experience in environmental engineering emphasizing global climate change, energy analysis and mobile source air quality modeling for both operational and construction phases of a project. Ms. Lovegrove has detailed knowledge of the requirements set in the Environmental Protection Agency's (EPA) New Clean Air Act Amendments and Final Conformity Ruling. Her work for Parsons Brinckerhoff includes conducting environmental analyses and resolving conformity issues for bridges, rail (light, heavy and high speed) and highways across the United States. Ms. Lovegrove has prepared and managed major air quality and energy studies for the Federal Transit Administration (FTA), the Federal Highway Administration (FHWA), EPA and several state and local agencies. She has extensive experience with many emission and dispersion models including MOVES, MOBILE, EMFAC, EMIT, NONROAD, URBEMIS, CALEEMOD, CALINE4 and CAL3QHC. She received the 2008 PB Americas Award in the area of sustainability for her work in the field of climate change and was the 2009 PB Americas Professional Publications award winner for a paper she co-wrote regarding greenhouse gas analysis techniques in National Environmental Policy Act (NEPA) documentation. She is also the primary developer of the C-MISSION Construction Emission Tool, which integrates equations from the NONROAD model with actual construction scheduling, allowing the user to estimate daily, monthly and/or annual construction energy usage and criteria pollutants and greenhouse gas emissions.

PROJECT ROLE — TIME AVAILABILITY: 40%

As the Transportation Sector Lead, Ms. Lovegrove will work closely with the Land Use Sector Lead, Marsha Kaiser, to evaluate a wide range of GHG reduction strategies in the land use and transportation sectors since many of the impacts and co-benefits of those sectors are inextricably bound to the design of residential communities, zoning, and alterations in traffic patterns. Ms. Lovegrove will also oversee implementation of the US EPA MOVES model and transportation demand models for evaluation of GHG emissions reduction benefits, costs and co-benefits in the MWCOG region. Located in New York, Ms. Lovegrove will guide technical support staff in developing methodologies and analyzing sector strategies. When possible, Ms. Lovegrove will attend workgroup meetings in-person, but will often teleconference into meetings and have Michael Mondshine, WSP Executive Sponsor of this project, assist in facilitating sector subgroup meetings when necessary.

APPLICABLE PROJECT EXPERIENCE

Purple Line Corridor Transit Study, Washington DC Metro Area
Ms. Lovegrove managed the air quality analysis of the proposed 16 mile (25.7 kilometer) connection between the Metrorail Red Line, Green Line and Orange Line.. The project analyzed both Light Rail and Bus Rapid Transit alternatives within the corridor. The analysis included determining energy usage of mobile source transportation including motor vehicles and transit vehicles and determining appropriate greenhouse gas emission factors.

District Department of Transportation (DDOT) Climate Action Plan
Ms. Lovegrove was the task leader responsible for quantifying and evaluating the greenhouse gas emissions of DDOT facilities and operations as well as aiding in the

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development of a climate action plan for the reduction of DDOT's greenhouse gas emissions.

California High Speed Rail Program Study
Ms. Lovegrove was the energy analysis and air quality task leader/air quality program manager for the planned 700-mile-long (1,126-kilometer-long) high-speed train system capable of speeds in excess of 200 miles per hour (321 kilometers per hour) between Los Angeles and the San Francisco Bay Area. The air quality analysis included a detailed regional emission study which estimated the carbon dioxide emissions resulting from increased power demands needed to operate the system as well as estimating carbon dioxide emissions, based on energy usage, from planes and roadway traffic. The energy analysis included a detailed statewide analysis which calculated the power requirements needed to operate the system as well as energy savings due to decreased plane and automobile travel.

MidCoast Corridor, San Diego, California
Ms. Lovegrove conducted the energy and climate change analysis for the proposed extension of the San Diego Trolley (LRT) from Old Town north along the I-5 corridor to University of California San Diego (UCSD). The extension includes seven new stations and several park-and-ride facilities. The energy analysis included roadway (on-road vehicles) energy as well as energy of the LRT system. The greenhouse gas analysis included roadway (on-road vehicles) emissions as well as emissions from the electrical requirements (power plants) of the LRT system. Both the energy and greenhouse gas analyses also analyzed the construction impacts of the project.

Alaska Way Viaduct, Seattle, Washington
Ms. Lovegrove conducted the greenhouse gas analysis using EPA's MOVES emission and energy factor program and EPA's Nonroad model. The project analyzed both the construction and operational impacts of the proposed project alternatives, which included tunnel options. Construction impacts were quantified using the equipment inventory method which accounted for each individual piece of equipment proposed for use, the construction schedule, hours of operation, engine tiering, equipment utilization, and load factors.

Sound Transit, Seattle, Washington
Ms. Lovegrove conducted the greenhouse gas analysis to determine how proposed development plans could affect overall greenhouse gas emission burdens within the study area. Included in the analysis were greenhouse gas emissions, reported in terms of carbon dioxide equivalents, resulting from: proposed changes in power demands needed to operate the Sound Transit system, proposed changes in vehicle miles traveled for other transit modes including; commuter rail, buses and trolleys and proposed changes in vehicle miles traveled on general roadway traffic. The analysis utilized area specific power generation emission factors as well as incorporating projected future vehicle fuel efficiencies.

New York City Congestion Pricing Analysis, New York
Ms. Lovegrove conducted a carbon dioxide emission analysis for various congestion pricing alternatives for New York City. The study zones extended into Connecticut, Westchester, New Jersey and Long Island. A link by link analysis of vehicle miles traveled (VMT) and vehicle hours traveled (VHT) was used to determine emission levels.

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MICHAEL MONDSHINE

WSP

EXECUTIVE SPONSOR AND SENIOR TECHNICAL EXPERT

ARLINGTON, VA

22 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Policy Analysis
- Strategic Planning
- Regulatory Review
- Carbon Market Expertise
- Program Management
- Public Communications
- Meeting Facilitation
- Regional GHG experience

EDUCATION:

M.P.P Regulatory Policy. Georgetown Univ. Washington DC.1993

B.A. Government and Politics. Univ. of Maryland 1989

PROFILE

Mr. Mondshine, Vice President for Sustainability and Energy at WSP, is an internationally recognized expert in the fields of energy, sustainability and climate change, with 22 years of experience in greenhouse gas (GHG) accounting, policy development and mitigation. His prior experience includes development of climate action plan for the State of Maryland, under which he contributed to the review of more than 50 possible mitigation strategies, support for the Climate Legislative and Executive Workgroup of Washington State for which he provided modeled analysis of the impact of Federal regulations on future emission levels within the state, and assistance to Arlington County in the preparation of community GHG inventories and development of their Community Energy Plan. He currently serves as senior client liaison on a contract to support development of district energy systems in Arlington. Mr. Mondshine is on the United Nations Framework Convention Roster of Experts for inventory preparation and has been recognized by the Intergovernmental Panel on Climate Change (IPCC) for his contributions to their receipt of the 2007 Nobel Peace Prize. He currently serves as Board Chair of the Association of Climate Change Officers (ACCO).

PROJECT ROLE — TIME AVAILABILITY: 20%

Mr. Mondshine will serve as the WSP Executive Sponsor of this project. In that role he will ensure that our PM and MWCOG have all resources necessary to meet and exceed project objectives. Mr. Mondshine will also apply his facilitation skills during meetings with sector subgroups to review proposed strategies and reach consensus on strategy selection. He will also call upon his policy analysis and strategic planning skills during the prioritization and evaluation of the selected strategies.

APPLICABLE PROJECT EXPERIENCE

Washington State Climate, Legislative and Executive Workgroup
Mr. Mondshine, as part of a project to evaluate approaches to reduce greenhouse gas emissions in Washington State to statutory targets in 2020, 2035, and 2050, evaluated impact of federal policies on future state GHG emission levels. He conducted literature review and reviewed NEMS modeling results for CAFE standards, Renewable Fuel Standards, tax incentives for renewable energy (PTC/ITC) and Clean Air Act Requirements on stationary generation sources. Mr. Mondshine testified before Climate Legislative and Executive Workgroup (CLEW) consisting of the Governor and two members from each political party within the legislature.

Arlington County Community Energy Plan
Mr. Mondshine managed a contract to provide energy and climate analysis for Arlington, County, Virginia. He provided technical input into their development of a GHG inventory and community energy plan.

EPA GHG Emissions Offsets Guidance
Mr. Mondshine, on behalf of the EPA's Climate Change Division, developed a three-volume set of guidance for project developers seeking to generate GHG emission offsets under the Climate Leaders Program including a volume on Climate Change Project Boundaries with recommendations for eight project types.

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MICHAEL MONDSHINE

Fresno Sustainable Food Processing District
Mr. Mondshine managed a project to develop sustainable food processing district that reduces energy costs and provides competitive advantages to industrial occupants in Fresno, CA. He identified potential locations, evaluated available infrastructure, reached out to potential developers and coordinated efforts with the City's Mayor's office and Pacific Gas and Electric.

Maryland Climate Change Action Plan
Mr. Mondshine managed development of a Climate Change Action Plan for the state of Maryland that reviewed 63 potential policies for their contributions to emission reductions, economic costs and benefits, impacts on jobs, political feasibility and implementation approaches. He presented results at public workshops for review and comment.

Design, Development, and Implementation of Low Carbon Investment Plan
Mr. Mondshine supported development, measurement, and monitoring of $70 billion low carbon and zero carbon investment portfolio for Fortune 50 financial institution. He assisted in coordination of initiative and collaboration with interested NGOs and media.

Global Review of Carbon Regulatory Programs
Mr. Mondshine conducted a global review of current and planned carbon pricing regimes around the world for a Fortune 50 IT company seeking to integrate carbon pricing into their energy efficiency, clean energy and compliance strategies. Supported strategy to incorporate future carbon costs into return-on-investment calculations for clean energy and energy efficiency spend.

Mission Support Services Contract for U.S. EPA Climate Change Division
Mr. Mondshine managed a mission services support contract to U.S. EPA's Climate Change Division. Under that contract he led development of carbon content coefficients used in Subpart C, Subpart MM, and Subpart NN of the Greenhouse Gas Reporting Program and served as a domain expert in the requirements analysis for development of the Internet-based, e-GGRT reporting system used to implement the program.

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EDWARD C. TADROSS PARSONS BRINCKERHOFF

TRANSPORTATION & LAND USE SUPPORT STAFF NEW YORK, NY

14 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Program Management
- Federal, State, and Local Transportation Planning
- Transportation Air Quality Analysis
- GHG Emissions and Energy Analysis

EDUCATION:

B.A., Earth Sciences, Tulane University, 1998

B.A., Environmental Studies, Tulane University, 1998

PROFESSIONAL QUALIFICATIONS:

Certified Greenhouse Gas Technical Expert, American National Standards Institute, 2008

PROFILE

Edward Tadross is a Lead Environmental Planner with Parsons Brinckerhoff. He has specialized in air quality and noise, including performing transportation analyses studies using dispersion, emission and noise programs. He has also performed Phase I analyses and transit field studies for various public and private clients. He has more recently been involved with the management of projects as well as the preparation of environmental documents, including environmental assessments (EA/EAF) and environmental impact statements (EIS). He has also recently expanded his air quality expertise with the analysis of greenhouse gas emissions and energy use and he assisted with the development of the Parsons Brinckerhoff program C-MISSION for estimating construction emissions and energy use. Mr. Tadross is the content coordinator for the Practice Area Network (PAN) 14 (Environmental) intranet site and administrator for the PAN 14 ProjectSolve2 site.

PROJECT ROLE TIME AVAILABILITY: 30%

As a member of the WSP team, Mr. Tadross will support the Transportation and Land Use sector leads in developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

No. 7 Subway Extension Project, New York City
Mr. Tadross was the Environmental Engineering Manager who oversaw all environmental work on the No. 7 Subway Extension Project, a $2 billion plan to extend the No. 7 subway train west to the Jacob Javits Center. Project includes a new subway station and approximately 0.5-miles (0.8-kilometers) of new tunnels, constructed with boring machines (tunnels) and blasting (station caverns). Environmental work included the preparation of an environmental impact statement (EIS) technical memo to address all project changes and accompanying environmental impacts since the EIS was approved two years prior (2005). Revised Historical Resource Management Report (HRMPP) and Design for Environment Management Matrix (DfE) to update project changes in the past two years. Also coordinated and oversaw all hazardous materials work, including the asbestos abatement of existing tunnels, manholes and equipment, as well as various soil contamination issues.

California High Speed Rail Program Study
Mr. Tadross assisted with air quality, energy and greenhouse gas analysis for the planned 700-mile-long (1,126-kilometer-long) high-speed train system capable of speeds in excess of 200 miles per hour (321 kilometers per hour) between Los Angeles and the San Francisco Bay Area. The air quality analysis included a detailed regional emission study which estimated the carbon dioxide emissions resulting from increased power demands needed to operate the system as well as estimating carbon dioxide emissions, based on energy usage, from planes and roadway traffic. The energy analysis included a detailed statewide analysis which calculated the power requirements needed to operate the system as well as energy savings due to decreased plane and automobile travel.

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EDWARD C. TADROSS

MidCoast Corridor, San Diego, California
Mr. Tadross assisted with energy and greenhouse gas analysis for the proposed extension of the San Diego Trolley (LRT) from Old Town north along the I-5 corridor to UCSD. The extension includes seven new stations and several park-and-ride facilities. The energy analysis included both roadway (on-road vehicles) energy as well as energy of the LRT system. The greenhouse gas analysis included both roadway (on-road vehicles) emissions as well as emissions from the electrical requirements (power plants) of the LRT system. Both the energy and greenhouse gas analyses also analyzed the construction impacts of the project.

District Department of Transportation (DDOT) Climate Action Plan
Mr. Tadross evaluated greenhouse gas emissions for Washington D.C.'s DDOT facilities and operations as well as aiding in the development of a climate action plan for the reduction of DDOT's greenhouse gas emissions.

Purple Line Corridor Transit Study, Washington DC Metro Area
Ms. Tadross assisted in analyzing greenhouse gas emissions from the proposed 16-mile (25.7-kilometer) connection between the Metrorail Red Line, Green Line and Orange Line. The project analyzed both Light Rail and Bus Rapid Transit alternatives within the corridor. The analysis included determining energy usage of mobile source transportation including motor vehicles and transit vehicles and determining appropriate greenhouse gas emission factors.

Metro Gold Line Foothills Extension, California
Mr. Tadross assisted with the climate change analysis for the 12.6-mile (20-kilometer) Metro Gold Line light rail transit (LRT) extension from Azusa to Montclair (east of Los Angeles). The new extension includes six stations and several park-and-ride facilities. The climate change analysis included both roadway (on-road vehicles) emissions as well as emissions from the electrical requirements (power plants) of the LRT system.

Northwest Corridor (I-75/I-575) High-Occupancy Vehicle (HOV)/BRT, Atlanta, Georgia
Mr. Tadross assisted with air quality analysis for a combined HOV and bus rapid transit project in the northwest corridor between downtown Atlanta and the northwest suburban counties in the metropolitan Atlanta area. The project included evaluating mobile source air toxics using the EMIT model, and evaluating the project's impacts on carbon monoxide and particulate matter emissions.

Brent Spence Bridge, Cincinnati, Ohio
Mr. Tadross assisted with the air quality analysis for the replacement of the Brent Spence Bridge which serves traffic for both I-71 and I-75, over the Ohio River, between the City of Cincinnati and the City of Covington. Parsons Brinckerhoff was hired by the Ohio Department of Transportation and the Kentucky Transportation Cabinet to reconstruct portions of I-71 and I-75 to add capacity to effectively handle the high traffic volumes and reduce traffic accidents. Following both Ohio and Kentucky air quality regulations, the project is being analyzed for both local and regional impacts including particulate matter and mobile source air toxics.

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BRENNEN D. WALSH

ENERGY SUPPORT STAFF

WSP

BOULDER, CO

11 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- GHG Accounting
- GHG Emission Mitigation
- Public Reporting
- Verification
- Policy Analysis
- Strategic Planning
- Project Management
- GHG Emission Modeling

EDUCATION:

M.E., Mechanical and Aerospace Engineering, University of Virginia, Charlottesville, VA, 2003

B.S., Integrated Science and Technology, Double Concentration: Energy and Environment, English Minor, James Madison University, Harrisonburg, VA, 2000

PROFILE

Brennen D. Walsh is an engineer/environmental consultant with over 10 years of experience in greenhouse gas (GHG) emissions management, economic analysis of energy markets, and energy policy design / analysis. He is currently working with a number of major corporations to help them develop GHG inventories, Carbon Disclosure Project responses, GHG management plans, and GHG reduction strategies. Mr. Walsh has led numerous GHG assurance reviews for firms in financial services and other sectors. He has supported multiple organizations in achieving compliance with the EPA's mandatory GHG reporting rule. Mr. Walsh has also worked with several different U.S. government agencies to help them implement national greenhouse gas programs and provide statistical analysis of energy markets. He is experienced in energy policy and has been involved with a number of influential energy policy reports and recommendations.

PROJECT ROLE — TIME ALLOCATION: 30%

As a member of the WSP team, Mr. Walsh will support the Energy sector lead in developing methodologies, tools and models for GHG reduction, benefits, costs and co-benefits analyses, analyzing the GHG reduction potential of sector-specific strategies, setting goals, and writing technical memorandums and program communications.

APPLICABLE PROJECT EXPERIENCE

GHG and Resource Management
Mr. Walsh provides technical support and greenhouse gas emissions analysis to major corporations. He is currently participating in the development of greenhouse gas inventories and management plans for a number of major corporations including Goldman Sachs, Varian Medical, Raytheon, Cummins, Emergent Biosolutions, Green Mountain Energy, Federal Mogul and others.

GHG Assurance
Mr. Walsh has performed numerous GHG Assurance reviews for corporate clients including The Hartford, NYSE Euronext, DuPont, CenturyLink.

EPA Mandatory GHG Reporting Rule
Mr. Walsh worked with multiple corporate clients in helping them achieve compliance with EPA's mandatory greenhouse gas reporting program including Centerpoint Energy, General Dynamics, Raytheon, and others.

U.S. National GHG Inventory
Mr. Walsh assisted the U.S. Department of Energy's (DOE) Energy Information Administration (EIA) in preparing their annual national greenhouse gas inventory report, "Emissions of Greenhouse Gases in the United States 2005". He contributed to the development of the enhanced forms and guidelines for the EIA's 1605(b) Voluntary Reporting of Greenhouse Gases Program.

GHG Program Participation
Mr. Walsh worked with a number of major corporations through the U.S. EPA's Climate Leaders Program including ConAgra Foods, Avaya, Meredith Corporation, Publix Supermarkets, Applied Materials, Alticor, and others. He is currently working

with the Carbon Disclosure Project with a number of major corporations in preparing and reviewing their annual response to the Carbon Disclosure Project.

Energy Management and Energy Market Analysis
Mr. Walsh assisted the Natural Gas Division of the Department of Energy's Energy Information Administration (EIA) in conducting research and economic analysis concerning natural gas market conditions. For the Department of Energy's National Energy Technology Laboratory (NETL), Mr. Walsh completed an analysis of the current state of greenhouse emissions trading in the United States as well as an analysis of the different policy proposals currently being considered for the Kyoto Protocol post 2012. He also supported NETL in the development of several "bottom-up" emissions models pertaining to the coal fired power sector in China, India, and South Africa.

Energy Policy Development
Mr. Walsh performed research and analysis at the National Commission on Energy Policy, contributing to the influential report "Ending the Energy Stalemate: A Bipartisan Strategy to meet America's Energy Challenges."

Sub-Contractor Staff Resumes

SARA BERMAN

ENVIRONMENTAL PLANNER

STRAUGHAN ENVIRONMENTAL

COLUMBIA, MD

6 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- LEED Expertise
- GHG Accounting
- Environmental Policy Specialist
- Community Facilitation
- Land Use Planning

EDUCATION:

M.S. Environmental Science and Policy, Johns Hopkins University 2009

B.S. International Political Economy, University of Puget Sound, 2004.

PROFILE

Ms. Berman is an environmental planner with six years of experience in land use planning, socioeconomic and economic analysis, LEED certification, NEPA documentation, and greenhouse gas methodology development. She is active in her community promoting sustainability, alternative transportation and climate change adaptation. She promotes green initiatives to reduce the heat island effect of the built environment.

PROJECT ROLE

TIME AVAILABILITY: 20%

As an Environmental Planner for the Straughan Environmental team, Ms. Berman will support the WSP built environment team in analyzing advanced building technology, the impact of expansion of LEED certified buildings, and the interactions of land use planning with the built environment. She will also collaborate with the WSP co-benefits analysis team and provide on-site meeting and consensus building support to sector subgroups as needed.

APPLICABLE PROJECT EXPERIENCE

Development of a Foam Stabilized Base Green House Gas Accounting Methodology, College Park, Maryland

Task Manager responsible for working with a team of academic experts, engineers, and pavement industry professionals to develop a greenhouse gas accounting methodology for foam stabilized base (FSB) pavement. The purpose of project was to submit a methodology to the Verified Carbon Standard (VCS) that would enable users of FSB to acquire carbon credits for energy savings over traditional hot mix asphalt. The methodology will be among the Verified Carbon Standard's first greenhouse gas accounting methodology in the pavement industry and one of the first to use a standardized approached to carbon crediting. Ms. Berman's role involved coordinating a team of academic, industry, NGO and, legislative representatives to provide a formal review in the submission of the methodology. She is coordinating the effort for the methodology submission. She has reached out to pavers across the country to request permission to collect original data, ensuring consistency with VCS' technical requirements, liaising between the team and VCS, and identifying peer reviewers for the methodology.

LEED—East Baltimore Community School

The new East Baltimore Community School is a 90,000 square foot new public/private partnership school in Baltimore City designed and constructed to meet the Baltimore City Green Building Standards at the two Star rating level, equivalent to a LEED Silver certification. Ms. Berman was responsible for identifying both LEED and Baltimore City Green Building Standards requirements and documenting compliance with requirements related to construction waste management, regional and Baltimore City sourced materials, recycled content and low-emitting materials. Ms. Sward also helped prepare a LEED documentation binder. The overall scope of the project was to help the building architect and contractor document compliance with the Baltimore City Green Building Standards while East Baltimore Community School in Baltimore, MD.

LEED & Green Globes— University of Maryland LBS Office Building (2014)

Landscape Services Office Building that consolidates four UM facility departments into one 12,000 square foot two-story building on an existing site at the University of

Maryland College Park. The project goal is to achieve a LEED for New Construction v.3 Silver certification and a two Green Globes certification. Ms. Berman coordinated the LEED and Green Globes development of the sustainability project goals during the design phase. She coordinated the documentation and achievement of two systems credits. She developed resources to educate the team as per Green Globes requirements. Ms. Berman worked with Green Globes representatives in order to stage the timing of the two systems requirements and resources.

LEED — NASA Building 26
The Goddard Space Flight Center in Greenbelt, Maryland is a 50,000-square-foot building renovation project of the 45 year old Building 26 to accommodate staff from three principal user groups in one building. The redesigned and repurposed building was designed to meet a Leading in Energy and Environmental Design (LEED) for New Construction version 3 2009 Gold certification. Developed LEED documentation, coordinated Design Teams and worked with suppliers in order to achieve meet and achieve LEED accreditation. Ms. Berman developed the action plan to achieve project requirements for environmental, mechanical and building and environmental program requirements. She verified and documented the credit requirements. She tracked building and site materials to meet recycled content and regional materials goals.

Washington Suburban Sanitary Commission [WSSC] Environmental Clearing House Right of Entry Coordination
Coordinated engineer teams in the submission of public entry coordination and access. Environmental Planner providing technical and programmatic support in the management of the ROE process. Developed a trend and tracking analysis to assist in the timely completion of 10,000+ unique tasks.

Mission Sustainability Department of Defense (DOD), Patuxent River, Maryland
Environmental Analyst responsible for the development of NEPA documentation and document review. The project worked towards the development of a Water Range Assessment. Assisted in the development and implementation of a “Green Team”. Responsible for the creation of a project ranking system to engage senior management and staff in development of innovative and mission specific sustainable initiatives.

University of Maryland Center for Environmental Science, Solomons, Maryland
Researcher targeting the economic impact of ecosystem services in the restoration of the Chesapeake Bay. Responsible for the acquisition and analysis of economic datasets for long-term (50 years+) analysis of regional trends.

Environmental Policy Analyst Dewberry, Fairfax, Virginia
Policy analyst targeting international and national initiatives towards climate change adaptation. Responsible for the coordination of international proposal development and identification new relevant policy relevant to client demands.

Consultant, International Finance Corporation (IFC), Washington, D.C.
Environmental consultant responsible for the development of web content to educate global clients on IFC Environmental and Social Performance Standards,
Requirements and international regulations. The ultimate goal of the project was to increase and maintain compliance with IFC regulations. Tasks included working with web developer, and developing a client survey to identify information gaps.

ALVERNA R. DURHAM, JR. STRAUGHAN ENVIRONMENTAL

ENVIRONMENTAL PLANNER COLUMBIA, MD

10 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- NEPA Expertise
- Public Outreach Specialist
- Community Facilitation
- Environmental Justice
- Air Quality

EDUCATION:

B.S. Industrial Technology, NC A&T State University 1999

PROFILE

Mr. Durham is an environmental planner with experience in multiple areas including NEPA and Section 4(f) documentation, socioeconomic impact assessments, environmental justice studies, emergency action plans, sustainability studies, hazardous materials assessments, mobile source air quality analysis, and public outreach. He has served as a project manager and worked with various federal, state, and local agencies on multiple types of projects including highways, transit and utilities. He has led public outreach materials and facilitated coordination with project stakeholders, including public interest groups and elected officials.

PROJECT ROLE TIME AVAILABILITY: 20%

As a member of the Straughan Environmental team, Mr. Durham will focus on cost and co-benefits analyses with the WSP team, considering environmental justice issues and disadvantaged communities as they relate to bus rapid transit and light rail transit. Mr. Durham will also provide on-site meeting facilitation for sector Subgroups as needed.

APPLICABLE PROJECT EXPERIENCE

State Highway Administration Total Maximum Daily Load Public Outreach, 2014
Task Manager responsible for providing public outreach support for the SHAs TMDL program. Duties include property owner identification and notification, development of educational products for a variety of audiences, and producing program informational text for inclusion in SHA produced press releases, webpage, and social media sites

Red Line Transit Study Environmental Justice and Cultural Resources, Baltimore, Maryland, 2009
Planner responsible for developing the environmental justice program including the environmental justice impacts and benefits analyses, researching community characteristics and profiles, planning and executing public outreach events in local grocery stores and community centers, conducting interviews for community analysis, and preparing DEIS and FEIS sections. Studies supported NEPA assessment of 14 potential Bus Rapid Transit or Light Rail alignments connecting central Baltimore with its western suburbs in Baltimore County.

Cleans Rivers Project – Anacostia River Projects – NEPA Compliance, Washington, DC 2011
Conducted NEPA compliance of a District of Columbia Water and Sewer Authority project with impacts on multiple properties within the District, including National Park Service property. Planner tasked with identifying and determining the impact of the proposed Anacostia River Tunnel construction to multiple socioeconomical resources and potential environmental justice populations within the affected park and surrounding neighborhoods, preparing the required NEPA documentation (Environmental Assessment), and assisting with public outreach meetings and materials. This project was completed in coordination with the NPS, the Army Corps of Engineers, U.S. Navy, District of Columbia Historic Preservation Office, and various District of Columbia agencies and stakeholders.

Emergency Action Plans, River Levees, Prince George's County, MD 2013
Task Manager responsible for assisting the Prince George's County, Maryland's Department of Public Works and Transportation develop Emergency Action Plans for

the Anacostia Levee System. The development of the Emergency Action Plans included a review of federal levee manuals and standards, coordination with multiple local jurisdictions, and producing documentation and mapping for Emergency Action Plans for each of the six levees in the Anacostia Levee System.

Maryland Port Administration Air Pollution Reduction Project- Baltimore, 2011
Completed public outreach and administrative tasks in conjunction with the Maryland Port Administration's Clean Diesel Program to combat air pollution and global climate change related to commercial activities at the Port of Baltimore. Tasks included attendance at Clean Diesel Program Committee meetings; preparation of lessons learned documentation covering outreach and selection process of the Clean Diesel Program; development of Clean Diesel Program logo and poster displays.

Baltimore County Sustainability, Baltimore County, Maryland 2011
PO for the countywide sustainability plan; assisted in sustainability group council meeting facilitation; developed community-wide sustainable initiatives for residents of Balto Co. Mr. Durham assisted the Baltimore County Office of Sustainability and the County appointed Sustainability Network in creating an outreach and education strategy as part of the Community-wide Sustainability Plan. The strategy will consist of a community involvement and education campaign for Baltimore County employees, residents, and business community.

Intercounty Connector Environmental Justice Assessment and Community Impact Analysis, Montgomery & Prince George's Counties, Maryland 2006
Planner responsible for researching and documenting the location of concentrations of minority and low-income populations in Montgomery and Prince George's counties, documenting project effects on all communities, and conducting map analysis to evaluate the potential for disproportionate high and adverse effects on minority and low-income communities. In addition, responsible for preparing outreach materials, planning, and participating in targeted outreach designed to inform citizens in environmental justice areas of transportation projects benefits and impacts; interviewing citizens regarding project effects during public workshops, and assembling and analyzing citizen input into project evaluation process. Study supported the NEPA analysis of 18-mile road on new alignment through populous counties.

Public Outreach Port of Baltimore Environmental Communication Analysis, Baltimore, Maryland 2005
Planner responsible for developing criteria for evaluating the environmental portion of the Port of Baltimore's website. Responsibilities included developing criteria to evaluate current websites of 10 US ports; performing research and conducting phone interviews to obtain information regarding the environmental segments of other US port websites; recommendations regarding the Port of Baltimore's website; and producing the accompanying documentation of the process.

US 301 Waldorf Air Quality Assessment, Waldorf, Maryland 2009
Task Manager responsible for the analysis of carbon monoxide (CO) concentrations in the study area in accordance with federal and local guidelines. Applied the CAL3QHC model to evaluate mobile air quality with emphasis on Carbon Monoxide.

DIANE GUTIERREZ STRAUGHAN ENVIRONMENTAL

SUSTAINABILITY SPECIALIST COLUMBIA, MD

15 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- LEED AP BD+C
- USGBC MD Board of Directors
- Experienced Educator
- Program Management
- Public Communications
- Meeting Facilitation
- Goal Setting

EDUCATION:

M.S. Civil Engineering
Oregon State Univ.2007

B.S. Natural Science,
Towson University 1989

PROFILE

Ms. Gutierrez is a Sustainability Specialist with experience providing green building consulting for property developers, architects, and construction contractors in the public and private commercial building sector. Her previous 15 years of education experience in environmental teaching and site-related sustainability add to her expertise in leading teams to set, implement, and achieve their sustainability goals. Ms. Gutierrez has been a project team member for more than 30 LEED, Green Globes, Green Communities, and Sustainable Site Initiative (SITES) projects. A technical background complements the LEED consulting practice adding expertise in sustainable site development.

PROJECT ROLE TIME AVAILABILITY: 20%

As a member of the Straughan Environmental team, Ms. Gutierrez will support the land use, transportation and built environment project aspects. She will also support on-site meeting facilitation as needed. Additionally, Ms. Gutierrez will apply her expertise to provide insight into the use of green building standards in institutional settings such as school and government buildings in support of the WSP co-benefits analysis team.

APPLICABLE PROJECT EXPERIENCE

East Baltimore Community School 2013
Sustainability consultant for the first new public school in the Baltimore City (90,000 sf, 39 M) designed and constructed to meet the Baltimore City Green Building Standards. Straughan was hired by the building contractor to work with the contractor and design architect to meet the green standards during the 3 phases of school construction. The school opened to students in January 2014 and the project green building documentation turned over to Baltimore City in February 2014.

University of Maryland Building Landscape Services Office Building, College Park, Maryland 2013
Sustainability consultant for the Design Build project team for a new Landscape Services Office Building. The project goal is to achieve a LEED for New Construction v.3 Silver certification and a two Green Globes certification. Services include working with the owner and project team to develop a Green Building Action Plan early in design, provide and review specification language for the construction documents, review construction submittals for sustainability requirements, track building and site materials during construction to document the implementation of the sustainable design criteria during construction. LEED and Green Globes certification is expected early in 2014.

Oxford Square Neighborhood Planning & Design including Howard County Middle School No. 20, Hanover, Maryland 2010-2014
Sustainability consultant for Howard County and the project architect to provide sustainability team charettes and technical support for the Oxford Square development during design as it seeks a Howard County Green Neighborhoods certification. Straughan provided research, cost estimates, calculations, public outreach support, and Green Resident and Green Operations Manuals for the project. The project also included the design of a new middle school and Straughan provided LEED consulting to the construction contractor.

DIANE GUTTIEREZ

Defense Information School Addition, Ft. Meade, Maryland 2013
Sustainability consultant for the Design Build project team for a 64,000 sf building military school addition project in Fort Meade, MD. The project goal is to achieve a LEED for New Construction v.3 Gold certification, expected in early 2015.

Facility Expansion for Derwood Bible Church, City of Rockville, Maryland 2012
LEED Consultant for the Design Build contractor on a new 18,000 sf church meeting space and classroom expansion project. Straughan led the project team during the design and construction phases to set sustainability goals and implement these goals into design strategies for the building and the site through construction administration. The project is seeking to achieve the project goal of a LEED v.3 Certified building. Certification is expected in early 2014.

C. Avery Bunting School of Pharmacy, Notre Dame of Maryland University, Baltimore, Maryland
Sustainability Consultant for the design and construction of a School of Pharmacy, an addition to an existing building (30,880 sf, 11M). The primary goal was to achieve a LEED Silver rating by setting and implementing sustainability goals. Responsible for working closely with the architect to finalize and document sustainable design criteria during the projects Construction Documents phase. Services also included overseeing the implementation of these design features during construction in order to meet the project sustainability goals. All sustainability criteria were formally documented using an online protocol. This project achieved a LEED for New Construction v3 Silver certification.

Patuxent Wildlife Refuge, Prince Georges County, Maryland
Site Sustainability consultant for the project architect for the design of two new buildings. The primary goal of the project was to provide expertise in sustainable site design to the project team during the conceptual, schematic and design phases. Services include educating the project team using the Sustainable Sites Initiative (SITES) framework for site sustainability and utilizing this as a decision matrix during design.

Evans Parkway Park, Silver Spring, Maryland
Sustainable Sites Initiative (SITES) consultant for the construction contractor for a neighbor park. Services included overseeing the implementation of sustainable design features in order to document the SITES criteria for this Maryland National Parks and Planning Commission neighborhood park. Straughan worked with the project team during construction to formally document the sustainable sites criteria. The project is a pilot project for the SITES Rating System and is on track to achieve a SITES rating at the 2-3 star level.

University of Maryland Building Landscape Services Office Building, College Park, Maryland 2012
Green Globes and LEED Consultant for the Design Build team to set sustainability goals and implement goals on an approximately 20,000 square foot office building seeking both LEED and Green Globes certification. Working with the owner, architect, and the entire project team to plan and implement sustainable design features to meet the two green rating system criteria. This project is seeking a 2 Green Globes and LEED Silver certification, scheduled for substantial completion in December 2013.

ERIC P. HO, PH.D., P.E.

PRINCIPAL/SENIOR TRANSPORTATION PLANNER

GALLOP CORPORATION

ROCKVILLE, MD

15 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Program Management
- Transportation Planning
- Travel Demand Modeling
- Air Quality Analysis
- Traffic Operation Analysis
- Aviation System Planning

EDUCATION:

Ph.D. Transportation Engineering. University of Maryland

M.S. Computer Engineering. National Taiwan University

B.S. Computer Engineering. National Taiwan University

PROFESSIONAL QUALIFICATIONS:

Professional Engineer

MEMBERSHIPS:

ASCE, Member
ITE, Member
TRB, Member

PROFILE

Dr. Ho is a co-founder of Gallop Corporation. He has over 15 years of professional experience in travel demand model development and application, traffic operation analysis, GIS and transportation information systems, quantitative and statistical analyses. He has actively been involved in the development and update of travel demand models in many metropolitan areas, using various transportation planning software systems, such as Cube, TRANSCAD, TRANPLAN, EMME/2, and TRANPLAN. He also conducted traffic and ridership analyses in many multi-modal transportation studies in metropolitan areas of Washington. D.C., Baltimore, Philadelphia, Trenton, Newark, Pittsburgh, Salt Lake City, and Las Vegas.

PROJECT ROLE — TIME AVAILABILITY: 30%

As the co-founder of Gallop Corporation and a Senior Transportation Planner, Mr. Ho will support transportation sector analyses and the implementation of the US EPA MOVES model and transportation demand models for the MWCOG region. He will apply his knowledge of multi-modal transportation studies and the environmental benefits, costs and co-benefits of rail line expansion, bus rapid transit and surface street rationalization when evaluating GHG reduction methodologies and strategies.

APPLICABLE PROJECT EXPERIENCE

Baltimore Red Line AA/DEIS Study, Baltimore, Maryland – Senior Transportation Planner
Performed rail patronage analysis for the proposed light rail Line from Social Security Mall to Downtown area in Baltimore and developed various user benefits measures as required by the FTA New Starts projects.

Conformity Determination and Regional Emissions Modeling for NJTPA – Senior Transportation Planner
Assisted the study team to update the model network and validate the coding of the TIP projects.

Validation of North Jersey Regional Transportation Model – Senior Transportation Planner
Assisted the study team to integrate transit network of the New Jersey Transit Regional Model into the NJTPA Regional model and validated the transit line coding that was implemented based on the refined highway network.

I-270/US15 Multi-Modal Corridor Study – Senior Transportation Planner
Conducted traffic forecasts and patronage analyses using the Washington metropolitan regional travel demand model implemented in MinUTP, and estimated various measures of effectiveness for alternative analysis.

Capital Beltway Corridor Transportation Study – Senior Transportation Planner
Performed transit patronage analysis using the Washington metropolitan regional travel demand model for a series of transit alternatives covering various transit modes and technologies.

ERIC P. HO

Baltimore Region Travel Demand Model Improvement Project, Baltimore, Maryland – Travel Demand Modeler
Developed GIS-based programs to automate transit access coding of the Baltimore regional transportation planning model, as well as complied and analyzed travel data for the calibration of the mode choice model.

Tappan Zee Bridge/I-287 Corridor Alternative Analysis/EIS – Transportation Model Specialist
Assisted the study team to analyze the Cross-Hudson travel demand, to refine the newly developed New York Metropolitan Transportation Council (NYMTC) regional travel demand model for the study corridor, and to develop traffic and ridership forecasts for a wide range of multi-modal alternatives using the refined NYMTC regional model.

Southern New Jersey Light Rail Transit System Study – Senior Transportation Planner
Conducted rail patronage analysis using the TRANPLAN-based Delaware Valley Regional Planning Commission (DVRPC) regional travel demand model for a light rail project linking Camden and Trenton in New Jersey.

C.Y. JENG

GALLOP CORPORATION

PRINCIPAL/SENIOR TRANSPORTATION PLANNER

ROCKVILLE, MD

21 YEARS OF RELEVANT EXPERIENCE

APPLICABLE EXPERTISE AND SKILLS:

- Program Management
- Transportation Planning
- Travel Demand Modeling
- Air Quality Analysis
- Traffic Operation Analysis
- Aviation System Planning

EDUCATION:

Ph.D. Transportation Engineering. University of California, Berkeley, 1987

M.S. Computer Engineering. National Taiwan University, 1980

B.S. National Chiao-Tung University, 1978

MEMBERSHIPS:

ASCE, Member
ITE, Member
TRB, Member

PROFILE

Dr. C. Y. Jeng is the President of Gallop Corporation. He has over 20 years of experience in modeling. His expertise includes transportation planning and travel demand modeling (TDM), TDM and air quality analysis, traffic operation analysis, quantitative methods and aviation system planning. He was the task leader in updating the travel demand model for Salt Lake City. Dr. Jeng has also been involved in either developing or reviewing the transportation planning models for the metropolitan areas such as Washington, D.C., Vega Baja and San Juan of Puerto Rico, St. Louis, Dallas, Baltimore, Pittsburgh, and Seattle. Dr. Jeng has recently completed the transit demand forecasting tasks in developing PE/FEIS of the Georgetown Branch Transitway/Trail Study and Metro Bethesda Station Study. For the latest highway projects, he has developed traffic forecasts for South Capitol Street Corridor and Middle Anacostia Crossing EIS Studies, Maryland Department of Transportation's CMMS Study, and I-95 Corridor Project Planning Studies. Currently, he is working on the transit projects such as Purple Line in the D.C. region and Red Line in the Baltimore Region as well as highway projects such as 14th Street Bridge EIS and South Capitol Street Final EIS.

PROJECT ROLE

TIME AVAILABILITY: 30%

As the President of Gallop Corporation and a Senior Transportation Planner, Mr. Jeng will support transportation sector analyses and the implementation of the US EPA MOVES model and transportation demand models for the MWCOG region. He will apply his deep knowledge of the environmental benefits, costs and co-benefits of rail line expansion, bus rapid transit and surface street rationalization when evaluating GHG reduction methodologies and strategies.

APPLICABLE PROJECT EXPERIENCE

Maryland Transit Administration, Purple Line Corridor Transit Study, Montgomery/PG Counties, Maryland - Senior Travel Demand Modeler
Responsible for network evaluation and alternative analysis forecasts for a bi-county transitway intersecting with four major Metro rail stations. As part of the project, the MWCOG regional travel demand model will be re-calibrated and validated to ensure its readiness for the FTA New Start requirement.

Maryland Transit Administration, Corridor Cities Transitway (CCT) Study, Gaithersburg, Maryland - Senior Travel Demand Modeler
Provided primary modeling supports for developing ridership forecasts and analyses of various fixed guideway systems such as BRT and LRT for the corridor connecting between upper Montgomery County and Shady Grove Metro station using the MDAA II transit post processing travel demand model.

Maryland Transit Administration, Capital Beltway South Side Transit (CBSST) Study, Suitland, Maryland - Senior Travel Demand Modeler
Assisted the development of rideship forecasts for a total of 9 alternatives including Mixed Traffic, At-Grade Dedicated ROW, and Grade-Separated ROW transit options through adapting MDAA II transit post processing travel demand model for developing and evaluating transit alternatives that would use the Woodrow Wilson Bridge (WWB).

C.Y. JENG

Federal Highway Administration, 14th Street Bridge Corridor EIS Study, Washington, DC - Lead Task Manager
Responsible for the travel demand modeling task for base year model validation and refinements, modeling future years no-build alternative and numerous conceptual and preliminary alternatives for the most congested bridge connecting between Northern Virginia and Washington DC

DC Department of Transportation, South Capitol Street Final EIS Study, Washington, DC - Lead Task Manager
Responsible for the travel demand modeling task for base year model validation and refinements, modeling construction year and design year's no-build alternative and numerous improvement alternatives, and the selected traffic data items were retrieved, summarized, and post-processed from the raw model outputs and submitted to client for further reviews and analyses.

Maryland Transit Administration, Travel Demand Forecasts of Maryland 5/US 301 Transit Service Staging Plan Study, Southern Maryland, Maryland - Project Manager
Performed the travel forecasting services task to support MD 5/US 301 Transit Service Staging Plan Study which evaluates the potential for the proposed transit alternatives to meet the projected demand for service to year 2025.

Appendix B ï Certification Regarding Debarment, Suspension, and Other Responsibility Matters

ATTACHMENT B
CERTIFICATION REGARDING
DEBARMENT, SUSPENSION, AND OTHER
RESPONSIBILITY MATTERS

The prospective vendor certifies to the best of its knowledge and belief that it and its principals:

- Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
- Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any department or agency of the District of Columbia, State of Maryland or the Commonwealth of Virginia or any of the 22 jurisdictions comprising the membership of the Metropolitan Washington Council of Governments (COG);
- Have not within a three year period preceding this date been convicted of or had a civil judgment rendered against them for commission of fraud or criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
- Are not presently indicted for or otherwise criminally or civilly charged by a government entity (Federal, State or local) with commission of any of the offenses enumerated above of this certification; and
- Have not within a three-year period preceding this date had one or more public transactions (Federal, State or local) terminated for cause or default.

Vendor understands that a false statement on this certification may be grounds for rejection of any submitted proposal or quotation or termination of any award. In addition, under 18 USC Sec. 1001, a false statement may result in a fine of up to $10,000 or imprisonment for up to 5 years, or both if federal funds are being used to support the procurement.

WSP USA

Typed Name of Vendor

Jan Chizzonite, Executive Vice President

Typed Name & Title of Authorized Representative

Jan Chizzonite 3/6/15

Signature of Authorized Representative Date

Appendix C ï Contact Information Sheet

ATTACHMENT C
CONTACT INFORMATION SHEET

(THIS PAGE MUST BE COMPLETED AND SUBMITTED WITH THE PROPOSAL)

RFP/RFQ No.: 15-010 Federal Tax ID No.: 13 1730785

Name of Offeror: WSP USA Corp

Address of Offeror: 1600 Wilson Blvd, Suite 1200, Arlington, VA 22209

Telephone No: 571 527 2102 Fax No.: _____ Website: www.wspgroup.com

Name of Authorized Representative: Jan Chizzonite

Mailing Address (If different from Above): 11190 Sunrise Valley Drive, Suite 300 Reston, VA 20191

Telephone No.: 703 318 3905 Mobile No.: 571 217 6756 Other: _____

Email Address: Jan.Chizzonite@WSPGroup.com

Name of Contact Person for this RFP/RFQ: Michael Mondshine

Title of Contact Person: Vice President, Sustainability & Energy

Telephone No.: 571 527 202 Mobile No.: 703 861-0844 Other: _____

Email Address: Michael.Mondshine@WSPGroup.com

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