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INTERGOVERNMENTAL AGREEMENT

CITY OF PORTLAND AGREEMENT NO.: 30006317

Project Name: Future Extreme Rainfall and Large-Scale Meteorological Patterns over the Bull Run Watershed

This Intergovernmental Agreement (IGA or Agreement) is entered into by and between the City of Portland, Oregon, acting by and through its Water Bureau, hereafter called "the City" and Portland State University for the benefit of the Institute for Sustainable Solutions, hereafter called "ISS" or "PSU". This IGA is authorized pursuant to ORS 190.110 and becomes effective upon full execution of this document.

RECITALS

- A. For purposes of long-term water supply planning and the operational management of the Bull Run watershed and drinking water system, the City desires to understand the large-scale meteorological patterns that cause extreme rainfall over the watershed, and how these weather systems could change in a warmer climate.
- B. Under previous Agreements with University of Washington and University of Idaho, the City downscaled climate data and developed a hydrologic model for the Bull Run Watershed to assess climate change impacts to the drinking water supply. These data and tools are currently being incorporated into long-term water supply planning efforts. However, a key limitation of this previous research is that it did not include investigation of how large-scale meteorological patterns drive extreme rainfall events over the Bull Run Watershed. The state of the science connecting regional and global meteorological patterns with local rainfall has developed in recent years, and the City seeks to conduct additional research to enhance understanding of whether changes in large-scale atmosphere and ocean dynamics could cause more frequent or more intense extreme storms over Bull Run in the future, or if there is a systematic shift in the character and seasonality of these storms. Changes to rainfall patterns could affect how the City plans for and operates its drinking water system.
- C. Once an Ordinance is approved by City Council, the City of Portland Water Bureau Administrator will be authorized to execute on behalf of the City an Intergovernmental Agreement to provide professional and technical expertise and research for the Project, in accordance with the scope of work for this agreement and as approved by the City Attorney's Office.
- D. The City desires to enter into a formal agreement with ISS in the not to exceed amount of \$60,000 for a period of two years for the Future Extreme Rainfall and Large-Scale Meteorological Patterns over the Bull Run Watershed Project, hereafter identified as "the Project." Funding of \$30,000 is available in the Fiscal Year 2018-19, and the Portland Water Bureau will request \$30,000 in the Fiscal Year 2019-20 Budget.

NOW, THEREFORE, THE PARTICIPANTS AGREE AS FOLLOWS:**1. SUMMARY STATEMENT OF WORK**

The following is a summary of required tasks and services for this Project that shall be completed by ISS. Attached as Exhibit A is the Statement of Work, which details the required tasks and services that shall be completed by ISS. Attached as Exhibit A1 is the budget detail that shall be used and followed by ISS throughout the term of the Agreement.

This research project aims to identify the different types of historical extreme rainfall events that impact the Bull Run supply, and to understand a range of plausible future climate-altered changes in these events to inform long-term water supply planning and operations. The research will focus on identifying, characterizing, and assessing large-scale meteorological patterns (LSMPs) that are associated with extreme rainfall over the watershed, including but not limited to atmospheric rivers.

The City's key research questions are:

- What type of storms historically have caused Bull Run flood events or turbidity events?
- What LSMPs have led to rain-on-snow events?
- What types of storms have led to quick reservoir refill in October and November?
- Are the largest storms all atmospheric rivers, or are there other meteorological mechanisms?
- Is there a seasonality to the most intense events?
- How might the historical LSMPs identified in the above questions change in a warmer climate?
- Do future climate projections indicate a change in frequency and intensity in these storms, or a shift to different storm patterns entirely?

This scope of work will focus on a set of tasks and associated outcomes and deliverables in order to answer these questions:

Task 1 – Observational Assessment: Identify the historical LSMPs associated with extreme rainfall events in the Bull Run Watershed. This task will entail using computerized algorithms for Self-Organizing Maps to classify and characterize historical extreme storms in Bull Run and then analyzing satellite data and snow data to correlate the different types of storms and rain-on-snow events to a range of LSMPs.

Task 2 – Model Evaluation: Assess if state-of-the-art climate models reproduce identified historical LSMPs with realistic frequency, magnitude, and physical characteristics in simulations of the historical climate. This task entails using statistical methods to assess the ability of an ensemble of global climate models to reproduce the historical probability distribution and meteorological characteristics of the LSMPs identified in Task 1.

Task 3 – Assessment of Future Projections: Determine if the global climate models project a systematic change in the frequency, magnitude, or character of LSMPs for future time periods. This task entails analyzing data from an ensemble of global climate models to assess the range of changes in LSMPs for future time periods compared to the past and quantifying the uncertainty.

2. TERM

Work shall commence on the effective date of this Agreement. The effective date of this Agreement shall be July 1, 2018. The expiration date of this Agreement shall be June 30, 2020.

3. BILLING PROCEDURES AND COMPENSATION

- A. The City has authorized a total not to exceed amount of \$60,000 to fund the services required under this Agreement. Funding of \$30,000 is available in the Fiscal Year 2018-19. The City's Fiscal Year is defined as July 1 through June 30 of the following year.
- B. Funding for this IGA shall only be disbursed upon the City's approval. In the event this Agreement is terminated, all unexpended funds shall be returned to the City within 60 days of said termination
- C. The City's policy to pay its invoices via electronic funds transfers through the automated clearing house (ACH) network. To initiate payment of invoices, ISS shall execute the City's standard ACH Vendor Payment Authorization Agreement which is available on the City's website at <http://www.portlandoregon.gov/bfs/article/409834?>

Upon verification of the data provided, the Payment Authorization Agreement shall authorize the City to deposit payment for services rendered directly into ISS accounts with financial institutions. All payments shall be in United States currency. Payment of any invoice, however, does not preclude the Collaborator from later determining that an error in payment was made and from withholding the disputed sum from the next monthly payment until the dispute is resolved.

- D. By the 15th of the month following the end of the previous month after the effective date, ISS shall submit to the City an invoice for work performed during the previous month. Each invoice shall identify the tasks that have been completed per the terms of this Agreement.
- E. Invoices shall only be submitted to the Portland Water Bureau Finance Office electronically. Email address is as follows: wbaps@portlandoregon.gov
- F. ISS shall fully cooperate with a City Audit of the records at any time. ISS shall also fully cooperate with an audit to account for all expenses if necessary.
- G. The City shall pay all amounts to which no dispute exists within 30 days of receipt of the invoice. Payment of any invoice, however, does not preclude the City from later determining that an error in payment was made and from withholding the disputed sum from the next progress payment until the dispute is resolved. ISS shall make full payment to its subcontractors within 10 business days following receipt of any payment made by the City to ISS.

4. NOTICES

Unless otherwise stated in this Agreement, the designees named below shall be the contact for all activities relating to the Work/Services to be performed under this Agreement.

Agency (Technical Contact):

Name: Dr. Paul Loikith
 Address: Portland State University,
 Department of Geography, PO BOX 751
 Portland, OR, 97207-0751
 Phone: 503-725-3078
 Email: ploikith@pdx.edu

City (Technical Contact/Project Manager):

Name: Kavita Heyn
 Address: Portland Water Bureau,
 1120 SW 5th Avenue, Rm 600,
 Portland, OR 97204
 Phone: 503-823-4724
 Email: kavita.heyn@portlandoregon.gov

Agency (Administrative):

Name: Tim Rinner
 Address: Portland State University
 Sponsored Projects Administration
 PO Box 751-SPA
 Portland, OR 97207
 Phone: 503-725-3418
 Email: trinner@pdx.edu

City (Administrative):

Name: Corrina Rodriguez
 Address: Portland Water Bureau,
 1120 SW 5th Avenue, Rm 600,
 Portland, OR, 97204
 Phone: 503-823-7550
 Email: Corrina.Rodriguez@portlandoregon.gov

Name: Beth Gilden
Address: Institute for Sustainable Solutions,
Portland State University, Mail Code: SUST,
PO BOX 751, Portland, OR, 97207-0751
Phone: 503-351-1967
Email: bgilden@pdx.edu

5. TERMINATION

This Agreement may be terminated by either party. The City on thirty (30) days written notice may terminate this Agreement. ISS, on ninety (90) days written notice may terminate this Agreement. The City may also terminate this agreement based on insufficient completion of project research deliverables based on the agreed upon scope of work and budget.

6. NON-DISCRIMINATION

In carrying out activities under this contract, neither party shall discriminate against any employee or applicant for employment because of race, color, religion, sex, age handicap, familial status or national origin. Either party shall take affirmative actions to insure that applicants for employment are employed and that employees are treated during employment, without regard to their race, color religion, sex, age, handicap, familial status or national origin. Such action shall include but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff of termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship.

7. ACCESS TO RECORDS

Both parties and their duly authorized representatives shall have access to the books, documents, and records which are directly pertinent to the specific Agreement for the purpose of making audit, examination, excerpts and transcript.

8. INDEMNIFICATION

Subject to the conditions and limitations of the Oregon Constitution, Article XI, Section 7, and Oregon Tort Claims Act, ORS 30.260 through 30.300, ISS shall indemnify, defend and hold harmless the City from and against all liability, loss and costs arising out of or resulting from the negligent or intentionally wrongful acts of ISS, its officers, employees and agents in the performance of this agreement.

Subject to the conditions and limitations of the Oregon Constitution, Article XI, Section 9, and the Oregon Tort Claims Act (ORS 30.260 to 30.300) City shall indemnify, defend and hold harmless ISS from and against all liability, loss and costs arising out of or resulting from the negligent or intentionally wrongful acts of City, its officers, employees and agents in the performance of this Agreement.

9. INSURANCE

ISS as part of Portland State University is self-insured through Brown & Brown Northwest. All ISS personnel, officers and employees, acting within the scope of their employment are covered by the Portland State University certificate of liability insurance.

ISS is a subject employer under the Oregon Workers' Compensations law in compliance with ORS 656.017, and shall maintain workers' compensation insurance through the duration of this Agreement.

10. SUBCONTRACTING AND ASSIGNMENT

ISS shall not subcontract its work under this Agreement, with the exception of work identified in this Agreement or attached Statement of Work, without the written consent of the other party. ISS shall assure that all subcontractors used to perform the services under this Agreement, meet the City's Codes pertaining to permits, workmen's compensation, licensing, and all other requirements.

11. DISPUTES

The signatories to this Agreement shall expend their best efforts to amicably resolve any dispute that may arise under this Agreement. Any dispute that the signatories are unable to resolve shall be submitted to the Director of the ISS or his/her designee and the City of Portland Water Bureau Administrator or his/her designee for resolution.

12. OREGON LAWS AND FORUM

This Agreement shall be construed according to the laws of the State of Oregon. Any litigation between the City and ISS arising under this contract or out of work performed under this contract shall occur, in the state courts, in the Multnomah County Court having jurisdiction thereof and if in the federal Courts, in the United States District Court for the State of Oregon.

13. FUNDS AVAILABLE AND AUTHORIZED

The City certifies that at the time the Agreement is written that sufficient funds are available and authorized for expenditure to finance costs of this Agreement within current appropriation and limitation. In the event of any extension or non-appropriation, the City shall notify ISS its intent to terminate this Agreement.

14. SEVERABILITY

If any term or provision of this Agreement is declared by a court of competent jurisdiction to be illegal or in conflict with any law, the validity of the remaining terms and provisions shall not be affected, and the rights and obligations of the parties shall be construed and enforced as if the Agreement did not contain the particular term or provision held to be invalid.

15. COMPLIANCE WITH APPLICABLE LAW

Both parties shall comply with all federal, state and local laws, regulations, executive orders and ordinances applicable to the Work under this IGA. Without limiting the generality of the foregoing, parties expressly agrees to comply with (i) Title VI of Civil Rights Act of 1964; (ii) Section V of the Rehabilitation Act of 1973; (iii) Oregon's Public Records Act; (iv) the Americans with Disabilities Act of 1990 and ORS 659.425; (v) all regulations and administrative rules established pursuant to the foregoing laws; (vi) Any applicable sections of ORS Chapter 279, and (vii) all other applicable requirements of Federal and State civil rights and rehabilitation statues, rules and regulations.

16. FORCE MAJEURE

Neither Party shall be held responsible for delay or default caused by fire, riot, acts of God and war which are beyond its reasonable control. The affected party shall, however, make all reasonable efforts to remove or eliminate such a cause of delay or default and shall, upon cessation of the cause, diligently pursue performance of its obligation under the Agreement.

17. NO THIRD PARTY BENEFICIARY

The City and ISS are the only parties to this Agreement and such are the only parties entitled to enforce its terms. Nothing contained in this Agreement gives or shall be construed to give or provide

any benefit, direct, indirect, or otherwise to third parties unless third persons are expressly described as intended to be beneficiaries of its terms.

18. MERGER CLAUSE

This Agreement constitutes the entire agreement between the parties. No waiver, consent, modification or change of terms of this Agreement shall bind either party unless in writing and signed by both parties. Such waiver, consent modification or change, if made, shall be effective only in the specific instance and for the specific purpose given. There are no understandings, agreements, or representations, oral or written not specified herein regarding this Agreement.

19. AMENDMENTS

The City and ISS may amend this Agreement at any time only by written amendment executed by the City and ISS. The City of Portland Water Bureau Administrator, upon approval by City Council, is authorized to approve amendments for the City to this Agreement that do not increase the total contract amount above 25% of the original Agreement amount. The ISS shall submit a written request to the City's Technical Contact/Project Manager prior to any amendments to the Agreement. Any amendment to the Agreement shall require the signature of both parties approving authorities.

20. OWNERSHIP OF DOCUMENTS

- A. The City and ISS shall jointly own any and all data, documents, plans copyrights, specifications, working papers, and any other materials produced in connection with this Agreement.
- B. ISS upon request by the City shall provide the City copies of the materials referred to above, including any electronic files containing the materials.
- C. Each Party is free to publish the information and data developed by the study; and Intellectual Property: No intellectual property is expected to be developed under the research effort. A copy of the data and the reports provided for in the Statement of Work section of this Agreement shall be delivered to City at the end of the term of this Agreement.

21. SEVERABILITY/SURVIVAL

If any of the provisions contained in this Agreement are held unconstitutional or unenforceable, the enforceability of the remaining provisions shall not be impaired. All provisions concerning the limitation of liability, indemnity and conflicts of interest shall survive the termination of this Agreement for any cause.

22. CONFLICTS OF INTEREST

No City Officer or employee, during his or her tenure or for one year thereafter, shall have any interest, direct, or indirect, in this Agreement or the proceeds thereof. No board of director member or employee of ISS during his or her tenure or for one year thereafter, shall have any direct financial interest in the Agreement or the proceeds thereof. No City Officer or employees who participated in the award of this agreement shall be employed by ISS Program Development and Evaluation Services during this Agreement.

23. COUNTERPARTS

This Agreement may be signed in two (2) or more counterparts, each of which shall be deemed an original, and which, when taken together, shall constitute one and the same Agreement.

CITY OF PORTLAND

APPROVED AS TO FORM:

Michael Stuhr, P.E.
Portland Water Bureau Administrator

Date

Karenal Myahar

City of Portland
City Attorney

6/1/18

Date

PORTLAND STATE UNIVERSITY

[Signature]

Tim Rinner, MS
Grants and Agreement Officer

5-3-18

Date

Exhibit A**Future Extreme Rainfall and Large-Scale Meteorological Patterns over the Bull Run Watershed**

Historically, several extreme rainfall events in the Bull Run Watershed have resulted in flooding, landslides and turbidity events, necessitating the shut-down of the supply to meet regulatory drinking water standards. Severe storms have also damaged conduits, roads, culverts and other infrastructure in and around the watershed. While these storms increase risks to the water system, the Bull Run supply is also very reliant on regular patterns of seasonal rainfall to fill (winter rains) and refill (fall rains) reservoirs before and after the peak summer supply season. Much of the extreme rainfall in the fall and winter arrives in the form of "atmospheric rivers"¹ which are driven by large-scale atmospheric circulation to bring moisture from the Pacific Ocean to the West Coast, highlighting the connection between local rainfall in Bull Run and large-scale meteorological patterns.

Anthropogenic climate change is projected to alter the amount and intensity of extreme rainfall events across the Northwest (Dalton *et al.*, 2017). The City is currently using downscaled climate models that are localized to the hydrology and topography of Bull Run to simulate shifts in rainfall intensity and frequency. However, these downscaled climate model data are limited in their ability to resolve the tails of the precipitation/rainfall probability distribution (i.e. larger rainfall events), and the downscaled data also do not simulate broader atmospheric patterns that drive such events, which are an important component in understanding global and regional changes in response to a warmer atmosphere.

Through this IGA, the City desires to understand the different types of historical extreme rainfall events that impact the Bull Run supply, and to understand a range of plausible future changes in these events to inform long-term water supply planning and operations. The research will focus on identifying, characterizing, and assessing large-scale meteorological patterns (LSMPs) that are associated with extreme rainfall over the watershed, including but not limited to atmospheric rivers. Similar work has been conducted by PSU for the City Bureau of Environmental Services for the Portland metro area as part of a PSU grant funded project that is coordinated with the City Bureau of Planning and Sustainability Portland Climate Action Collaborative. Lessons learned from that effort and a similar methodology will be applied for this research. However, the work to date has not covered the geographical area relevant to the Bull Run, where the types of storms could be significantly different based on topography and weather patterns.

The City has identified a set of research questions for this IGA:

- What type of storms historically have caused Bull Run flood events (e.g. over 5000 cubic feet per second at the Main Stem USGS Bull Run gage) or turbidity events (e.g. over 5 Nephelometric Turbidity Units).
- What LSMPs have led to rain-on-snow events?
- What types of storms have led to quick reservoir refill in October and November?
- Are the largest storms all atmospheric rivers, or are there other meteorological mechanisms?
- Is there a seasonality to the most intense events?
- How might the historical LSMPs identified in the above questions change in a warmer climate?
- Do future climate projections indicate an increased frequency and intensity in these storms, or a shift to different storm patterns entirely?

This scope of works focuses on a set of tasks and associated outcomes and deliverables in order to answer the above research questions:

¹ Atmospheric rivers are relatively long, narrow regions in the atmosphere that transport most of the water vapor outside of the tropics (NOAA).

Task 1 – Observational Assessment: Identify the historical LSMPs associated with extreme rainfall events in the Bull Run Watershed

To help define extreme rainfall and rain-on-snow events, ISS shall work with the City to understand the historical record of rainfall and snow water equivalent (SWE) and from local weather stations (i.e. Headworks, Timberline Lodge), snow data (i.e. SNOTEL sites), and snow reanalysis from SNODAS. ISS shall attempt to identify the storms that led to known impacts like flooding, turbidity and infrastructure damage in and around Bull Run from 1980 to the present. Once these events have been determined, ISS shall use computerized algorithms for Self-Organizing Maps (SOMs) to classify or characterize the different types of historical storms (e.g. atmospheric rivers or other types of storms).

Following the SOMs mapping, ISS shall use an historical atmospheric reanalysis dataset from NASA, which assimilated data from a range of sources including satellite remote sensing, to correlate the different types of storms to LSMPs. LSMPs shall include sea level pressure, atmospheric pressure (geopotential height), large-scale atmospheric wind, and integrated water vapor transport (IVT). The analysis shall identify different patterns at different atmospheric levels (near surface circulation, middle troposphere, and upper troposphere). The project team shall also reach out to regional weather forecasters with the National Weather Service to obtain input and feedback on storm patterns identified in this task.

The anticipated outcome of this task is a more detailed understanding of the climatology of storm events that lead to known impacts (such as flooding, turbidity) in the watershed (e.g. proportion of events associated with an atmospheric river, proportion of events associated with other meteorological forcings).

Meetings: The City and ISS shall participate in a two-hour project kick-off meeting to provide information on historical rainfall events and analysis the City has conducted on flooding and turbidity events in the Bull Run. ISS shall then collaborate with the City as needed during the analysis, including but not limited to at least one additional one-hour meeting with all project members, and other in-person meetings, email communications, and phone calls as needed.

Deliverables: Upon completion of the analysis, ISS shall provide a short technical memo with relevant graphics to summarize the SOMs classification of storms and associated LSMPs.

Timeline: Completion of this task by March 2019 (Year 1 of project).

Task 2 – Model Evaluation: Assess if state-of-the-art climate models reproduce identified historical LSMPs with realistic frequency, magnitude, and physical characteristics in simulations of the historical climate.

ISS shall use statistical methods to assess the ability of at least 20 CMIP5 or CMIP6 global climate models (GCMs) to reproduce the historical probability distribution and meteorological characteristics of the historical LSMPs identified in Task 1. This will entail developing new methodology to search for and identify features of LSMPs in a suite of climate models that were identified in Task 1 as important for extreme rainfall. Metrics of comparison shall be developed to quantify model skill across the suite and for the entire multi-model ensemble, providing a better constraint and understanding of the level of confidence that should be given to projections of future change. This approach alleviates the scale limitations that CMIP GCMs have due to their coarse resolution and inherent inability to resolve key topographical features around the Bull Run Watershed.

Meetings: ISS shall collaborate with the City as needed during the analysis, including but not limited to at least one one-hour meeting with all project members, and other in-person meetings, email communications, and phone calls as needed.

Deliverables: Upon completion of the analysis, ISS shall provide a short technical memo summarizing the skill of global climate models in reproducing different types of storm events, and identifying which GCMs exhibit the strongest skill in representing historical meteorological patterns.

Timeline: Completion of this task by June 2019 (Year 1 of project).

Task 3 – Assessment of Future Projections: Determine if the global climate models project a systematic change in the frequency, magnitude, or character of LSMPs for future time periods.

ISS shall analyze an ensemble of at least 20 CMIP5 or CMIP6 climate model simulations of future climate, based on a “business as usual” greenhouse forcing scenario (RCP 8.5) to assess whether LSMPs that are associated with different storm events are projected to change during the 21st century. Time periods of analysis will include a mid-century period (e.g. 2030s) and a late-century period (e.g. 2080s) using RCP 8.5 emissions. ISS shall compare statistics for historical and a range of future LSMPs using the ensemble of GCMs, and shall evaluate the extent to which these changes indicate increasing or decreasing frequency and/or intensity of storms defined in Task 1, or if changes indicate a less expected but possible systematic shift in the state of the climate where the seasonality and types of storms could fundamentally change. For example, could the Bull Run experience summer convective storms in the future? Or could the regular return of fall rains fundamentally shift to later in the season?

Accomplishing this goal will involve identifying LSMPs that are like those identified as important for extreme rainfall in the Bull Run Watershed in the future GCM projections. Then the difference in frequency, seasonality, and magnitude of the patterns shall be compared with those in the model projections of the historical past to quantify the change in LSMPs. Statistical significance shall be assessed and conclusions shall be made regarding the sign and magnitude of projected change, as well as confidence in the signal.

Meetings: ISS shall collaborate with the City as needed during the analysis, including but not limited to at least one one-hour meeting with all project members, and other in-person meetings, email communications, and phone calls as needed.

Deliverables: Upon completion of the analysis, ISS shall provide a short technical memo summarizing the future changes and range of uncertainty in LSMPs projected by climate models for different time periods, and an assessment of what these findings may mean for future extreme rainfall events in and around the Bull Run Watershed. If relevant, ISS shall also provide recommendations of how the City can use this information to conduct future analysis.

Timeline: Completion of this task by June 2020 (Year 2 of project).

Project Team & Responsibilities

Kavita Heyn shall manage the project for the City of Portland. She shall coordinate with the Principal Investigator (Paul Loikith), the graduate assistant, and Portland Water Bureau staff to organize meetings, track progress, and assess and review deliverables. Kavita Heyn shall also work with Beth Gilden at ISS to manage the project budget and ensure deliverable schedules are met on time.

Paul Loikith shall serve as Principal Investigator and shall lead the scientific investigation and supervise graduate assistant Christina Aragon. He shall be responsible for ensuring that the scientific and technical memo deliverable expectations are met and that there is sufficient communication with Kavita Heyn regarding results and research direction.

Christina Aragon shall be responsible for the majority of technical and scientific analysis and for preparation of the deliverables, working in consultation with and under the direction of Dr. Loikith.

Beth Gilden shall administer the interagency agreement on behalf of PSU, including tracking the budget, preparing invoices and receiving payments. She shall also coordinate with project team members on project milestones and deliverables.

Kristin Anderson shall provide technical expertise on Bull Run weather, hydrology and analysis conducted to date on historical storms and turbidity drivers, and availability of weather and hydrologic data.

Benjamin Beal shall provide modeling expertise on extreme rainfall and hydrologic modeling conducted to date.

Coproduction of data and scientific results

In the interest of coproduction of scientific information as part of this scope of work, ISS and the City agree to collaborate on any publication or dissemination of project results, data or visualizations. In addition to the Ownership of Documents agreement above:

- ISS researchers and the City shall allow the other party to comment on use and publication of results before publication;
- ISS researchers and the City shall allow the other party to coauthor any publications or external presentations pertaining to this research;
- ISS researchers and the City shall allow the other party to review any peer reviewed comments for publications, and shall discuss appropriate responses;
- ISS researchers acknowledge the City in published documents;
- The City properly attributes researchers when citing or distributing products or data;
- ISS researchers shall provide the City with the SOMs coding for the project, in addition to other data, visualizations and reports.

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Exhibit A1

Budget

Task	Description	Fiscal year	Cost
1	Observational assessment	2018-19	\$15,000
2	Model evaluation	2018-19	\$15,000
3	Assessment of future projections	2019-20	\$30,000
		Total:	\$60,000