AZAVEA

SUMMER of MAPS

Public Laboratory for Open Technology and Science

Tools for Assessing and Managing Human Impacts on Maine's Harbors

Prepared by

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Public Laboratory for Open Technology and Science

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Executive Summary

Congratulations! Your organization has been awarded a grant for pro bono services from Azavea's Data Analytics Team under our Summer of Maps (SoM) program. SoM is a program that offers stipends to undergraduate and graduate students with GIS analysis skills. Over a three-month period in the summer, the SoM fellows work with our Data Analytics Team to perform geospatial data analysis for select non-profit organizations.

As a social enterprise, Azavea's mission is to apply spatial analysis technology to improving communities while advancing the state-of-the-art through research. The Summer of Maps program is part of our commitment to operate our company in a socially responsible manner while also encouraging the use of geographic data to solve the complex problems our world faces.

We want to make sure this engagement is valuable both to your organization as well as a learning opportunity for the SoM Fellow. This document will outline a scope of work for completing the project, and is intended to both confirm Azavea's understanding of the project objectives as well as outline a clear set of mutual expectations.

Our Understanding

The Public Laboratory for Open Technology and Science is a community which develops and applies open-source tools to environment exploration and investigation by partnering with interested community groups. For this project, Public Lab will be partnering with Friends of Penobscot Bay(FOBP), who have a vested interest in the health and prosperity of the bay ecosystem.

This project will include a number of tasks based on discussions and review of the Public Lab and Friends of Penobscot Bay's application materials. Azavea will measure the percent change in forest cover for each town on the coast of Penobscot Bay from 1992-2011 using the National Land Cover Database. Data on the extension of the sewer system will be used to measure the change in human development in in the Penobscot Bay area.

Following the analysis stage, all data given to Azavea by the organization or created during the analysis will be cataloged and entered into a geodatabase for easy access and management. The products of the analytical tasks and other relevant datasets will be used to create a high resolution reference map for display and strategic planning.

Scope of Work

Task 1: Data Review and Assembly

The Fellow will review the data sets that you provide. They will identify additional data sets from Azavea's in-house data library that may be useful to the project In collaboration with a member of Azavea's Data Analytics team. After reviewing the data, the Fellow will respond with questions, feedback, concerns or other observations regarding the data. Data sets are both the key to a good analysis project and almost never what we think they will be, so we expect that this data review process will be iterative.

FOBP Deliverables: Delivery of data sets as soon as is feasible. If data sets cannot be provided by the end of June, it may be necessary to cancel the project and transfer the analysis grant to another organization.

Azavea Deliverables: Review of databases provided by FOPB. Provide questions, concerns and clarifications. Assemble additional data sets from Azavea's data library that will support the project.

Task 2: Analysis of Forest Cover Change

Using the data sets from the National Land Cover Database (NLCD), the Summer of Maps Fellow will develop up to five visualizations to document change in forest cover from 1992-2011 in the Penobscot Bay area. These analyses may include products such as the following:

- Map of forest cover change from 1992 – 2011 using data from the NLCD
- Zonal analysis showing percent change in forest cover by town border
- Choropleth maps and tables showing percent change by town and watershed

Azavea Deliverables: Up to 5 different visualizations that explore forest cover change in the Penobscot Bay area from 1992 to 2011.

FOPB Deliverables: Provide timely feedback in response to interim work products.

Task 3: Analysis Sewer Service Extension

Using the same NLCD datasets from task 3, the fellow will develop up to four different visualizations that investigate the land use change in the areas surrounding the sewer extension along US Route 1. These deliverables may include:

- Map of land use change in relation to the sewer extension following US Route 1
- A predictive model showing the possible impact of future sewer extensions

Azavea Deliverables: The Fellow will deliver up to four different visualizations exploring the effects of sewer service extensions on the land in the Penobscot Bay area.

Task 4: Bay Reference Map

Fellow will create a high resolution reference map using selected data provided by Public Lab and FOPB.The high resolution map can be printed for display at meetings with local lawmakers and developers as well as for internal use to identify issues that are affecting the entire bay. The map will be provided in up to four different file formats utilizing software such as; Tilemill, Mapbox Studio, QGIS, ArcGIS and GIMP in order to create a visually appealing and legible high-resolution map.

Potential Datasets to be Included:

- Wildlife Habitats
- Sewer Extensions
- Heavily deforested areas
- Roads

Azavea Deliverables: A high resolution reference map in up to four different file formats.

Organization Deliverables: Any and all datasets the organization wishes to be displayed in the final map

Task 5: Catalog Data and Create Geodatabase

The Fellow will create a geodatabase using the available data and a catalog of each dataset by category in order to make the data easily accessible. The Fellow will also create a data dictionary with short descriptions for each dataset that was produced by the analysis.

Potential Data Categories:

- Environmental- Physical Geography and Land cover of the bay
- Human- Development and social characterisitcs
- Plants- Distribution data
- Pollution- Biotoxins and bacteria
- Wildlife- Aviary and marine wildlife habitats

Azavea Deliverable: A geodatabase that contains all provided and produced data. A metadata reference (data dictionary) that details the data sets produced in the analysis with field and methodology descriptions.

Task 6: Present Results

The results of the analysis project will be presented to Friends of Penobscot Bay and Public Lab. This may include a presentation to your executive team, Board of Directors or other stakeholders. The SoM Fellow will prepare a professional presentation that will either be performed at your organization's offices or, if travel is not feasible, through a web conference. Azavea will provide travel or a web conference system its own expense.

Azavea Deliverables: A professional presentation describing the outcome and observations from the analysis and research project.

Organization Deliverables: Provide feedback to the material presented to your group

Assumptions

The timeline and budget estimates are based on the following assumptions:

- Public Lab and FOPB will provide the necessary data sets in a timely manner.
- Public Lab and FOPB will provide timely feedback on interim results.
- The accuracy, completeness, and compatibility of the data available will be subject to the original data creators.
- Azavea will provide all necessary software licenses required to implement the project.
- Azavea will cover the costs of all salaries to perform the work.

Timeline

The following timeline outlines a three-month schedule, organized into increments of approximately 2 weeks. Each number refers to the month of the year. A is the first half of each month, B is the second half.

Tasks	6-A	6-B	7-A	7-B	8-A	8-B
Task 1: Data Review and Assembly						
Task 2: Analysis of Forest Cover Change						
Task 3: Analysis of Sewer Extension						
Task 4: Bay Reference Map						
Task 5: Catalog Data and Create Geodatabase						
Task 6: Present Results						

Budget

The following budget is an estimate for the cost of implementing the proposed project.

Tasks	Commercial Amount	Non-Profit Discount	Total
Task 1: Data Review and Assembly	$ 4,691	$ (469)	$ 4,222
Task 2: Analysis of Forest Cover Change	4,199	(420)	3,779
Task 3: Analysis of Sewer Service Extension	4,128	(413)	3,715
Task 4: Bay Reference Map	8,818	(882)	7,936
Task 5: Catalog Data and Create Geodatabase	3,101	(310)	2,791
Task 6: Present Results	3,854	(385)	3,469
Labor Subtotal	**$ 28,791**	**$ (2,879)**	**$ 25,812**
Licenses			--
Materials			--
Travel (2 people, train, public transit or car share)			250
Other Subtotal			***$ 250***
Total			***$ 25,812***
Discount: Azavea Summer of Maps Program			(25,812)
Total			***$ --***

Intellectual Property

The following guidelines will be observed in terms of ownership of intellectual property that may arise from the project:

Data – All data assembled from 3rd party sources shall remain the property of the respective owner. All data delivered to Azavea by Friends of Penobscot Bay shall remain the property of Friends of Penobscot Bay.

Maps – All maps delivered to Friends of Penobscot Bay will become the property of Friends of Penobscot Bay. Azavea reserves the right to display the maps for the purposes of marketing its products and services, provided publication does reveal confidential information.

Graphic Design and Web Site Content – All graphic design elements such as stylesheets, color palettes, project logos and design elements that are specific to this project shall become the property of Friends of Penobscot Bay.

Trademarks – All logos, organization names and other trademarks will remain the property of the respective owners.

Publicity and Marketing

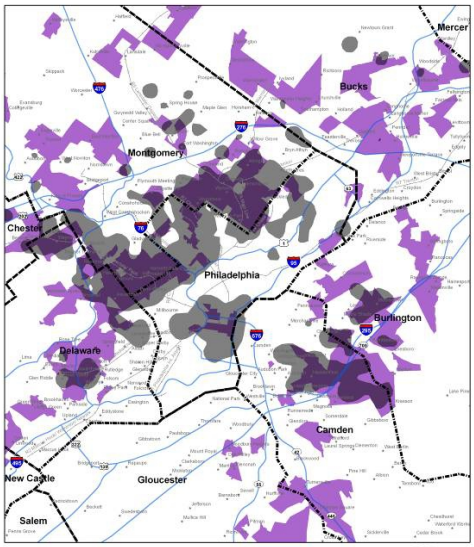
As Azavea will be performing the spatial analysis on a pro bono basis, the chief value Azavea will derive will be from the value of the social relationships, marketing and PR arising from the work. In order to ensure we all have clear expectations of what this will mean, both Public and Azavea will observe the following guidelines:

- **Presentations** – When performing a presentation of which the primary topic is this results of the Summer of Maps project, both Azavea and Public Lab will acknowledge the other party's role in development of the material.
- **Press Releases** – Following public release of the project, both Azavea and Friends of Penobscot Bay shall have the right to issue one or more press releases describing the project. In any press release, both parties will acknowledge the other party's role in development of the project. When feasible, these may be "joint" press releases. Both parties shall have the right to review the text of the other party's press release.
- **Newsletters, Blogs and Articles** – Both parties shall have the right to write and publish articles in the respective organization's newsletter, blog or other media outlet. In addition, both parties will have the right to write and publish articles in the GIS, technology trade, and other applicable press outlets. When conducting such publishing activities, both parties agree to acknowledge the other party's role in development of the project. Both parties shall have the right to review the text of the other party's articles for newsletters and trade press articles. If previously reviewed text from one outlet is being re-used in another outlet, it will not be necessary to have the other party review the text.

- **Logos and Acknowledgements** – Unless specified otherwise, the logos of both parties will be displayed on the work that results from the collaboration. In addition, if a public web site is one of the outcomes and there is an 'About' or 'Acknowledgements' page(s), descriptive information about each organization will appear with a description of their role on the project and links to their respective web sites.
- **Public Release –** Should Friends of Penobscot Bay decide to organize an official launch or release of the material in a press conference or similar event, Friends of Penobscot Bay and Azavea will discuss how the event might be beneficial for both parties.

About Azavea

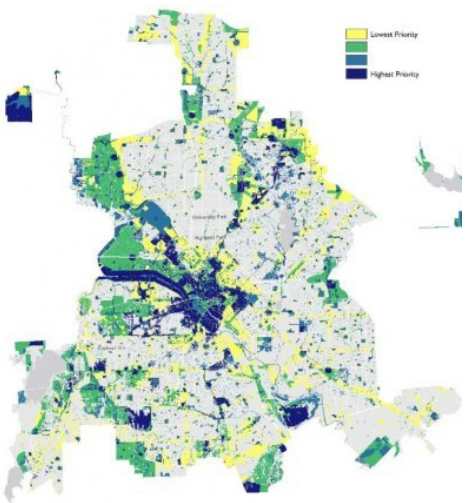
Azavea is an award-winning geospatial software and data analytics company based in Philadelphia. The firm was organized in 2000 to create advanced software for geospatial data visualization and analysis. Azavea is a certified B Corporation, a commercial enterprise that operates with a social mission. Our mission is to apply geospatial technology for civic and social impact and to advance the state-of-the-art through research. Azavea provides a range of services that include:



- Mapping and geospatial analysis
- Spatial data mining and modeling
- User interface and experience (UI/UX) design
- Web and mobile software development
- Research and development

The firm has designed and implemented geographic solutions for a variety of domains including: economic development, elections, urban forestry, crime analysis, humanities and land conservation.

Data Analytics



Useful metrics and models of our world enable us to make better decisions. Azavea's extensive experience with spatial analysis, database design and customized software development enables us to work directly with our clients to conceptualize, build, and automate the use of geospatial data to support these processes.

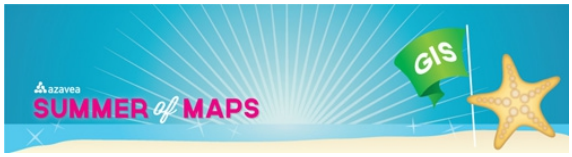
We combine geospatial information with statistics and visualization to answer complex questions. Utilizing both an organization's internal data and available demographic or market research data, we can create highly customized maps crafted for an organization's unique planning, resource prioritization and decision-making needs. By mapping the spatial patterns underlying your data and producing concise and dynamic visualizations of the results, we are able to create tools to:

- Identify hidden patterns
- Prioritize and plan operations
- Streamline your decision-making process
- Effectively utilize your resources

- Visually communicate these patterns to others

Commitment to Community

Azavea is committed to working on projects with a strong social value component. Each of Azavea's projects, products and pro bono engagements showcases this commitment. We seek out projects that enhance communities, foster economic development and improve decision-making. Azavea also organizes a national fellowship program, Summer Maps, that matches talented students with non-profit organizations that have spatial analysis projects that will have significant social impact.



Technology and Partners

Azavea's developers work with a broad range of tools and have particularly strong backgrounds with the .Net, Java, Python, Django and Scala frameworks. The firm has also established a number of strategic partnerships to enhance our capabilities.

Azavea is an Esri Business Partner and has extensive experience with development and deployment on the ArcGIS platform. Azavea was named ESRI Business Partner-of-the-Year or Foundation Partner-of-the-Year in 2006, 2007 and 2010.

Azavea is also an authorized CartoDB partner and has experience implementing solutions using the CartoDB infrastructure. In addition, Azavea is a Microsoft business partner with substantial experience developing the .Net Framework, SQL Server and Windows Server platforms.

Azavea is a member of the Amazon Partner Network, which provides us with a higher level of support for the products and services we host in the Amazon Web Services environment.

Azavea staff is experienced creating web software solutions that use online API's such as CartoDB, Google Maps, MapBox, ArcGIS Online and OpenStreetMap. The firm also works with a range of open source tools that accelerate and lower the cost of our software development work. In particular, Azavea has significant experience with creating solutions that combine the strengths of both commercial and open source toolkits to create high quality and visually attractive applications. The firm not only has experience with open source solutions, but also contributes to them, including significant contributions to OpenLayers and PostGIS.

Azavea R&D

Azavea has an active research and development program through which the firm invests substantial resources toward the development of new solutions and techniques. Each employee is encouraged to develop a personal research project that will both engage the employee and extend the capabilities of the organization. Current research projects include: an effort to apply genetic algorithms to generate transit routes; UI/UX design experiments with Google Glass; application of the OpenCV computer vision framework to recognizing trees in Google Street View; better PostGIS import tools; Emacs integration with Django; and an exploration of machine learning algorithms for space-time forecasting. While not all of these research projects results in measurable commercial success, they are an important part of a culture at Azavea that encourages and takes pride in innovative applications of geospatial technology.

Products and Solutions

In addition to Azavea's professional services work, the firm has developed a broad range of reusable components and software tools that can be applied to many different scenarios. They include:

GeoTrellis ***High performance geoprocessing engine***

An open source high performance geoprocessing engine that transforms user interaction with geospatial data through speed and scale.

HunchLab ***Next generation predictive policing***

Developed with support from the National Science Foundation, HunchLab's advanced software combines many data sources into a unified forecast of crime risk to support effective resource allocation.

DistrictBuilder ***Web-based collaborative redistricting software***

An open source redistricting solution that can be applied to both legislative districts and other types of districts such as school and police districts.

opentreemap ***Collaborative urban ecosystem tools***

A collaborative, open source platform for tree inventory, community engagement, ecosystem services calculations, and urban forestry analysis.

cicero ***Legislative district and elected official database***

Legislative district and elected officials database for batch geocoding, district assignment, advocacy, and district mapping to support citizen engagement in the United States and other countries. The Cicero database supports Google's new Civic Information API.