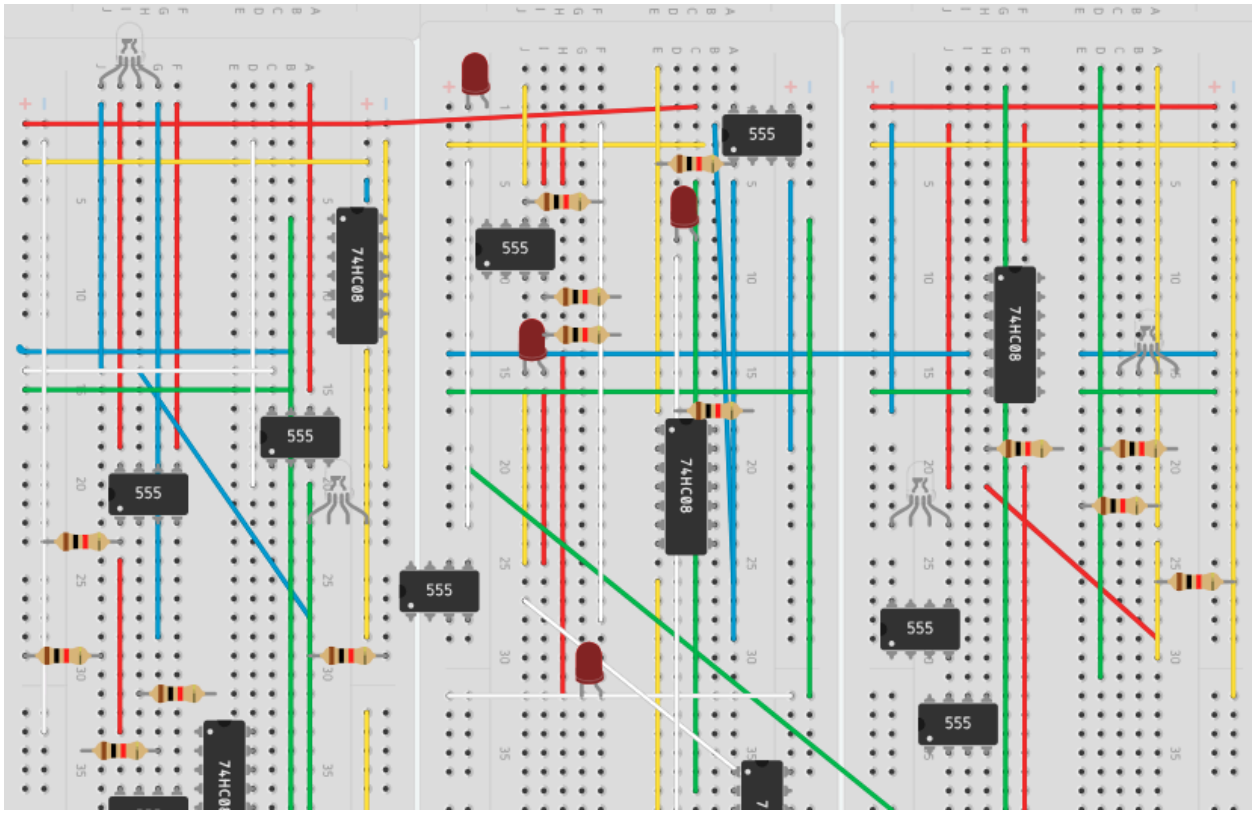


# Thermal Resistance Circuit

11.04.2025

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## Project Proposal Overview

A *Thermal Resistance Circui*t is a graphical representation of a heat transfer problem that simplifies analysis through an electrical circuit analogy. The same can be said about this large-scale, breadboard-based map of NYC that visualizes the correlations between heat waves, electricity consumption and public service calls. The project consists of a series of interconnected breadboards arranged to approximate the five boroughs, with color-coded solid-core wiring outlining boundaries such as major electrical corridors and locations of reported outages. On each breadboard, electronic components stand in for specific data features. LEDs indicate locations of frequent power outages or surges in demand, pulsing according to outage frequency drawn from 311 service call data. Capacitors charge and discharge to represent cycles of energy storage and release, echoing the ebb and flow of demand during heat waves. Resistors embody areas of strain or inefficiency in the grid, while integrated circuits mark substations or system nodes. The work offers a tactile, embodied encounter with how NYC's infrastructures and its communities endure cycles of stress, failure, and renewal.

## What makes your project unique?

The project steps off the screen and into the physical realm of electricity itself. Instead of simply representing data about energy, the work is built from the same medium, electrical components, that power the city. By using breadboards as the "map" of NYC and wiring as both geography and infrastructure, the project collapses the symbolic and the material. Capacitors will embody energy storage and strain, LEDs will show the flickering presence or absence of power, and resistors will serve as literal barriers to flow. By merging electrical engineering, data, art, and cartography, the piece invites viewers to feel the fragility and the resilience of the system and NYC's utility networks. With breadboards, the points of connection are labeled so they can be used to trace the project's construction digitally, so that viewers can remix or imagine their own variations.

## Theme Connections

### I. Cycles

Represented in the rolling patterns of heat waves and the charging/discharging of capacitors.

### II. Ecosystems

The breadboard/NYC environment as an ecosystem of flow, decay and renewal for solid-core wires and people alike.

### III. Interconnection

Wiring as literal and metaphorical connections between neighborhoods.

### IV. Regeneration

Illuminated through outages, surges and restoration cycles.

## Project Description

### Materials

- 57 breadboards ($5.95 each, so around $342 total)
- 24 AWG solid-core wire in 6 different colors, 30 ft per roll ($15.59)
- 2 breadboard power supply module 3.3 V ($5.69 each, so $11.38 total)
- 2 5 volt DC 2 amp wall power adapter ($8.79 each, so $17.58 total)
- 100 pack 5 mm LEDs ($8.99)
- 500 pc resistor assortment ($12.99)
- 3 10 pack of capacitors ($6.99 each, so $20.97 total)
- 5 Arduino nanos ($33.00 each, so $165.00 total)
- 10 pack NE555 timers ($4.99)
- 3 2N2222 ($6.00 each, so $18.00 total)

In total this project will cost $617.49.

### Installation

The installation will take the form of a  “map” of NYC, approximately 36 x 24 inches, constructed from breadboards. Solid-core wire in color-coded schemes will trace borough outlines and critical infrastructures. It will be laid out on a table and ideally be near an 3-prong wall outlet to power it although if that is not possible, it can be a standalone piece.

### Timeline

- **December 2025 - January 2026**: Source materials, begin assembly
- **February 2026**: Complete wiring, integrate data mappings
- **March 2026**: Install and calibrate in gallery

# Sketches, Mockups, and Diagrams

## Media

Breadboards, solid-core wire, LEDs, capacitors, resistors, microcontrollers and integrated circuit chips

## Dimensions of Each Component

Borough Coverage Estimates

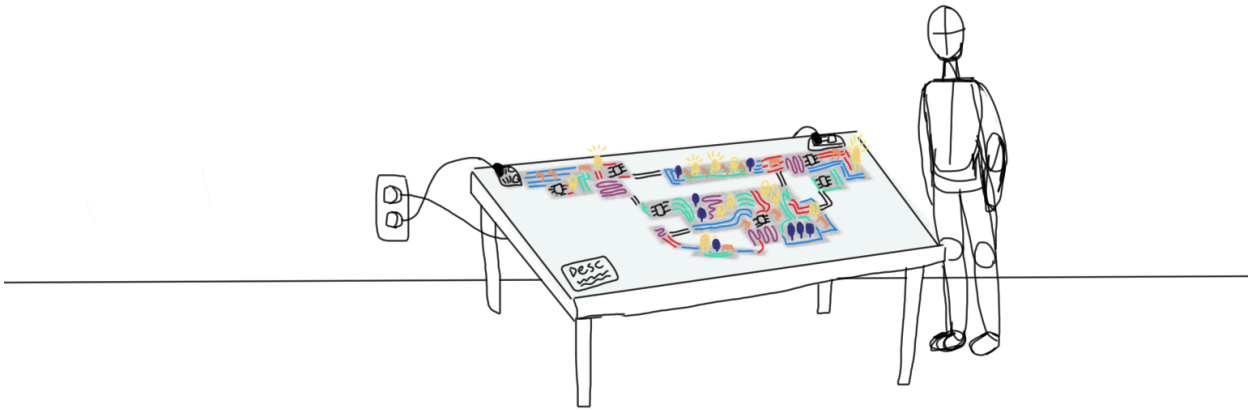
- Manhattan: 13 x 17 inches
- Brooklyn: 19 x 11 inches
- Queens: 32 x 13 inches
- Bronx: 15 x 11 inches
- Staten Island: 19 x 13 inches

When built, this project is expected to be within the bounds of 36 x 24 inches.

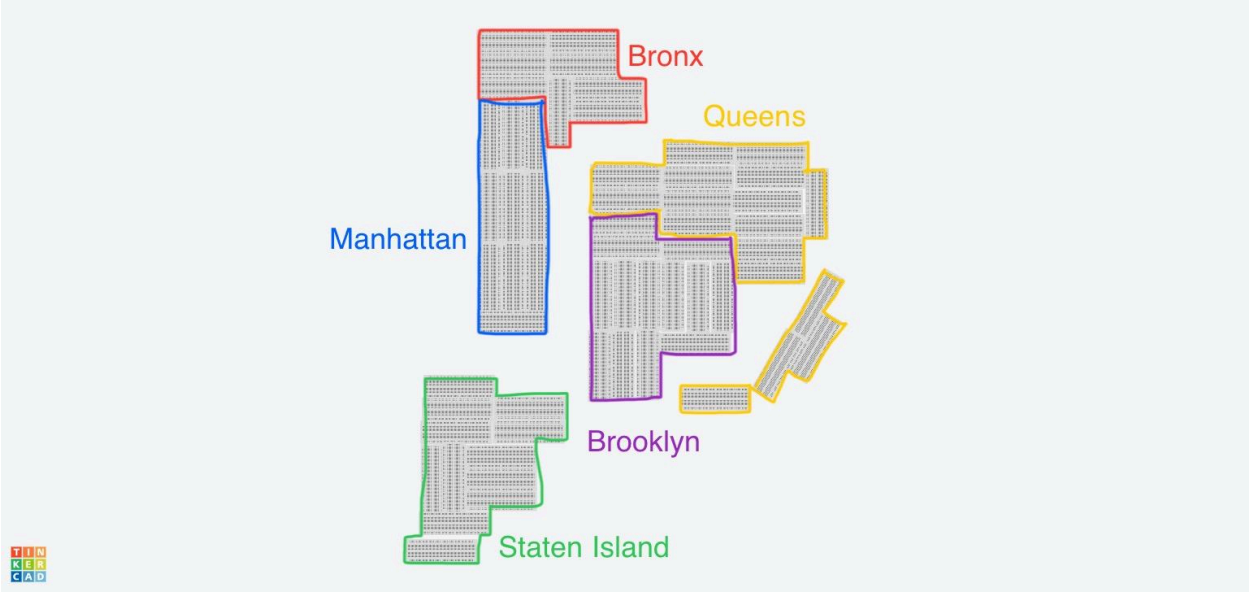
## Construction

The breadboards are joined to form a map of NYC's boroughs, with color-coded solid-core wire outlining boundaries and major corridors. Components such as LEDs, resistors, capacitors, and ICs are placed on the boards to represent data features, and all are interconnected using the breadboard power rails. The boards are powered by plug-in adapters connected to supply modules, letting the entire map function as a live, illuminated circuit.

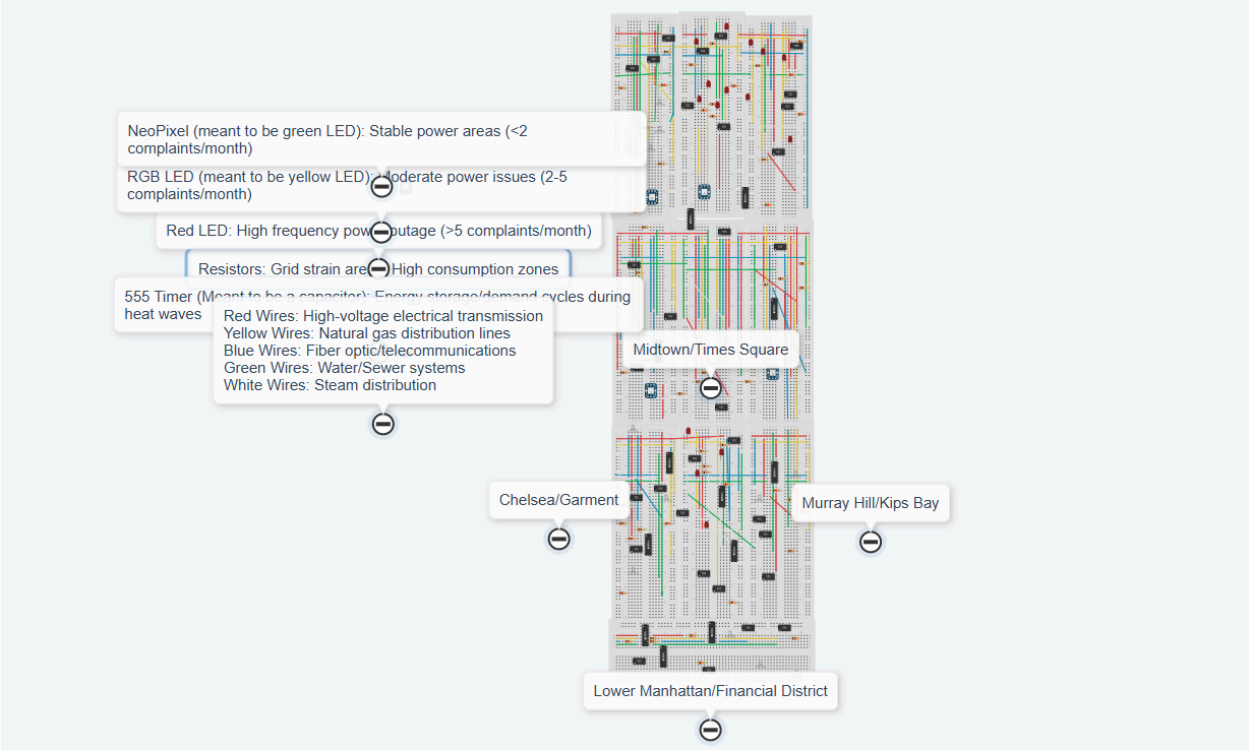
## Depiction of the Work in the Gallery



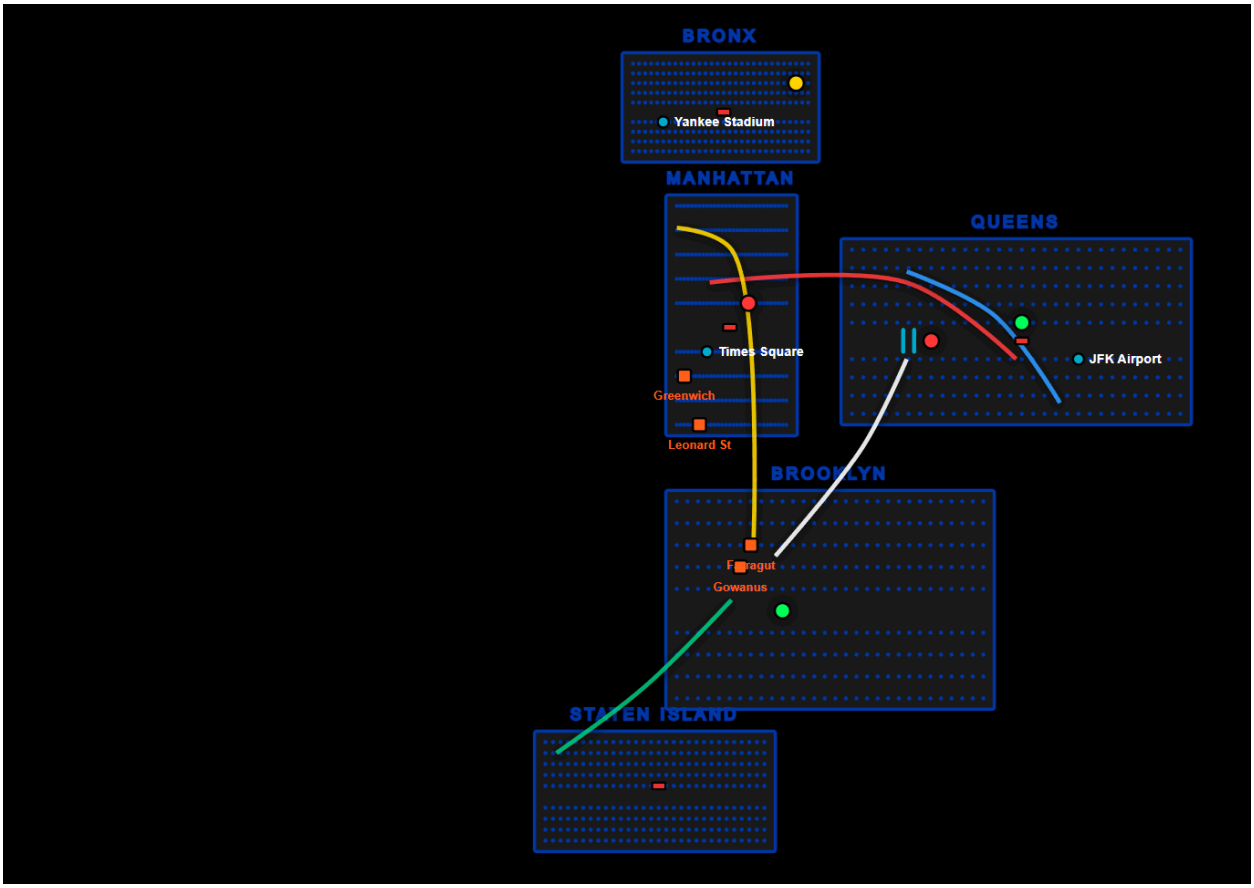

## Diagrams




Outlined Breadboard Borough Layout




Prototype of the Manhattan component, which can be Viewed Here




Interactive prototype of a couple of data points, which can be viewed Here

## Proposed Datasets

1. 311 Service Requests from 2010 to Present
2. Electrical Consumption And Cost (2010 - Feb 2025)
3. Hyperlocal Temperature Monitoring