# City of New Braunfels Walkability Analysis using Kernel Density

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## Introduction

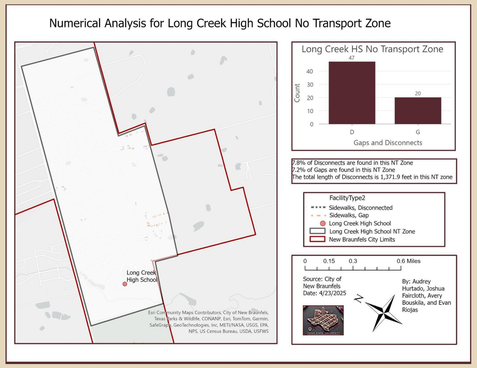
This project is to develop a Student Pedestrian Walkability GIS dataset for the City of New Braunfels. The primary goal is to analyze pedestrian network connectivity, generate relevant metrics, and produce maps highlighting student access to schools and parks, considering accessibility. This effort will inform the city's five-year plan for pedestrian infrastructure and provide valuable GIS skills development for participating students.

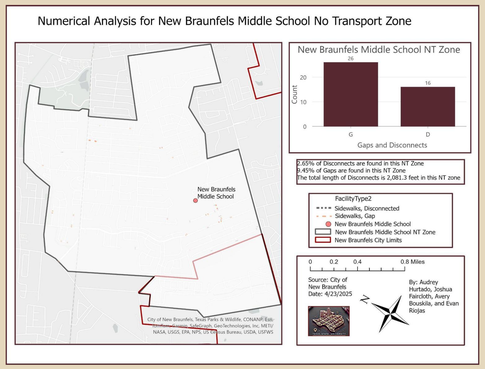
The purpose of this project is to develop a comprehensive **Student Pedestrian Walkability GIS dataset** for the City of New Braunfels to support planning and transportation initiatives.

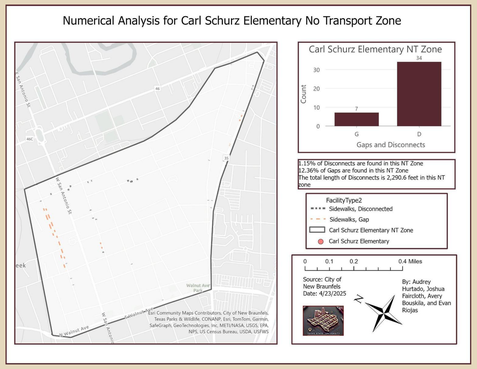
**The primary objective is to-**

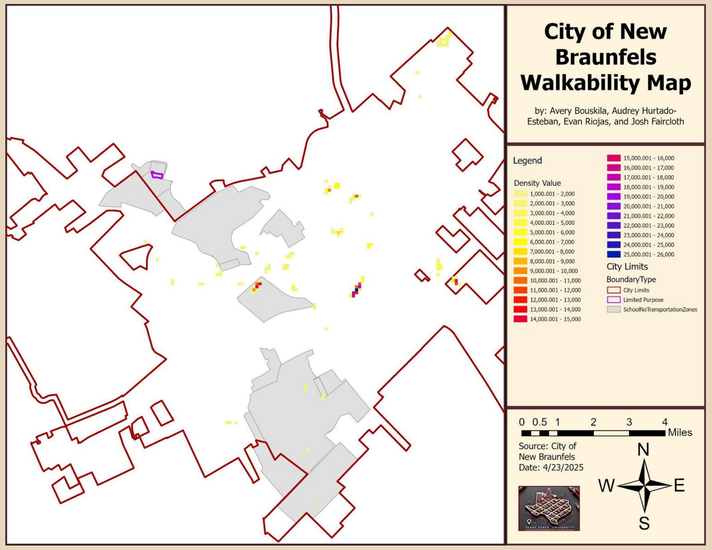
- Enable network connectivity analysis
- Generate relevant metrics
- Produce map end products
- Address key questions regarding student mobility
- Find disconnects and gaps with sidewalk infrastructure in new braunfels

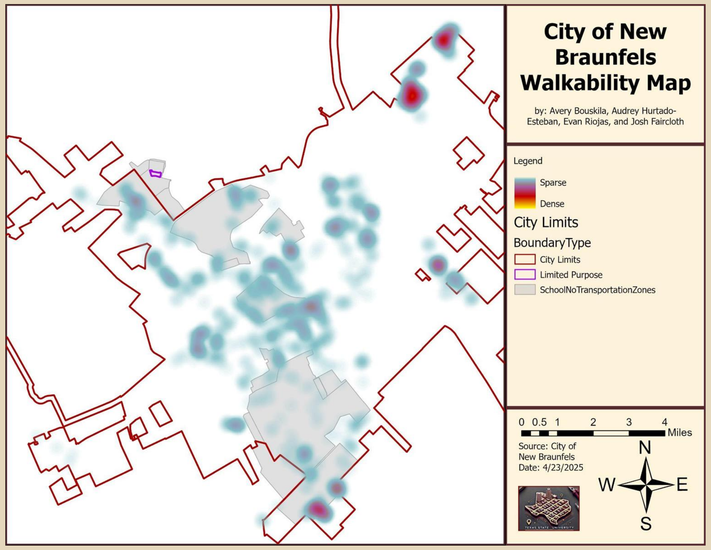
The project will include the attribution of these features with relevant information such as location, connectivity status (connected, disconnected, gap), and sidewalk width. Furthermore, the scope includes performing network connectivity analysis to identify gaps in pedestrian infrastructure and generating metrics related to student access to schools, parks, considering accessibility. The project will also involve quality assurance and quality control processes throughout the digitization and analysis phases. The final deliverables will include the completed GIS dataset (fcWalkabilityPrimary), a final project report, a website summarizing the project, and all necessary supporting files. The project is bounded by the available imagery, the defined grid system, and the project timeline running from January to April 2025.




## Kernel Density and Numerical Analysis

**Kernel Density** estimation is a spatial analysis technique that helps you visualize the concentration of these point features. Instead of just showing individual points, it creates a smooth, continuous surface where the "peaks" indicate areas with a higher density of features.

Kernel Density (Hot Spot) refers to using this technique to identify areas with a high concentration of sidewalk gaps and disconnects. These hot spots would be the areas where pedestrian connectivity is most problematic.

The numerical analysis is a process of using GIS tools to systematically count and categorize specific features (in this case, sidewalk gaps and disconnects) within a defined geographic area (the non-transportation zone).

It transforms spatial data (the locations and attributes of sidewalks) into quantifiable information ie. numbers and statistics.

## Data

The team used data from New Braunfels' GIS department, supplemented by Google Earth for sidewalk verification where aerial imagery was unclear. The city's data was accurate, though Google Earth's accuracy varied due to outdated imagery in some areas. This data was crucial for digitizing and analyzing sidewalks, identifying gaps, and applying relevant attributes. Aerial imagery guided the tracing of sidewalks and disconnects. Key attributes like street names (MSAGNamee) and feature types (featureType, featureType2) enabled classification of sidewalks, crosswalks, and their connectivity status (connected, gap, disconnected).

Three main datasets were used:

- fcWalkabilityEditing: For making edits to sidewalk features.
- fcWalkabilityExisting: The city's original data, used for attributing features, digitizing gaps, and quality control.
- fcWalkabilityPrimary: The final dataset where completed and quality-checked sidewalk grids will be added and connected.

Important fields included automatically generated IDs (OBJECTID), street names (MSAGNamee), sidewalk side (sideOfStreet), type of feature (featureType: Sidewalk, Crosswalk), connectivity status (featureType2: Connected, Gap, Disconnected), and sidewalk width.

## Methodology

To digitize pedestrian infrastructure in New Braunfels, team members claim prioritized grid sections in ArcGIS Pro. They then digitize sidewalks and crosswalks within their assigned grid in the "fcWalkabilityEditing" layer using orthoimagery, adhering to specific rules from the City of New Braunfels (e.g., using right angles, segmenting at key features, drawing centerlines, and noting width variations). They also update attribute data to indicate connectivity, gaps, and crosswalk details. This process aims to determine pedestrian network connectivity to key destinations and identify gaps. The bulk of the work involves efficiently digitizing the centerline of these features.


Figure 1

The image on the left is a gap, defined by the schema as “A section where the sidewalk ends and resumes within the same block, but there is an interruption in continuity.”. The picture on the right is a disconnect defined by the schema as “The terminal 10 feet of a sidewalk or crosswalk segment that does not connect to another segment or a crossing point at a block intersection.”.


Figure 2