Transit-Oriented Development (TOD) Analysis.

in County District 26, Queens, New York City
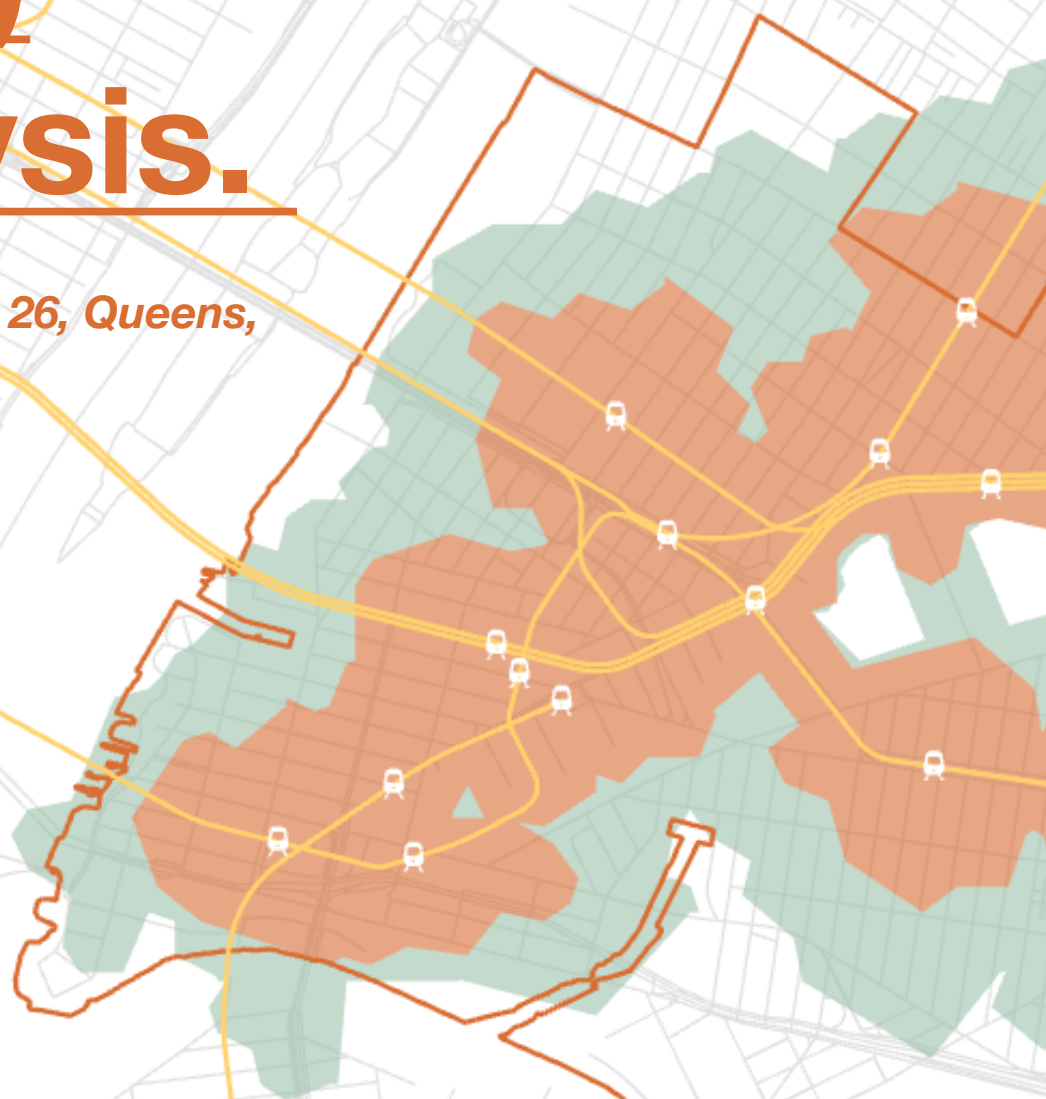
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GIS Final Project | Fall 2023

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Introduction.

Purpose of the Memo.

This memo serves as a comprehensive report for the GIS final project, which assesses Transit-Oriented Development (TOD) suitability in District 26, Queens, NYC. It aims to present findings on how current land use, demographic patterns, and public transit accessibility impact the potential for TOD.

The ultimate goal is to provide data-driven recommendations for urban development that align with sustainable transport policies and address the pressing need for affordable housing in the district. This document outlines the project's methodology, analysis, and strategic insights that could inform future urban planning decisions.

Brief Overview of TOD

Transit-Oriented Development (TOD) is a concept in urban planning that aims to create high-density, mixed-use development near public transportation infrastructure. This approach is designed to reduce reliance on personal vehicles, encourage public transit use, and create walkable communities. The benefits of TOD include increased economic activity, reduced traffic congestion, and improved environmental quality.

In the context of District 26, Queens, NYC, implementing TOD can address critical issues like housing affordability, transit accessibility, and sustainable urban growth.

Project Background & Context.

Overview of District 26

District 26, located in Queens, New York City, encompasses the vibrant and diverse neighborhoods of Long Island City, Sunnyside, Woodside, and Astoria. This district is characterized by a mix of residential areas, bustling commercial corridors, and industrial zones. It boasts a rich cultural tapestry, reflective of its varied population demographics.

With its proximity to Manhattan and several major transit hubs, District 26 stands as a critical area for potential urban development and sustainable growth through Transit-Oriented Development strategies.

Map of City Council District 26

Source: NYC Department of City Planning, 2022

New York City

City Council District 26
Queens
New York City

0   2.5   5   10 Miles

Astoria

Rikers Island

Manhattan

FDR Dr N

Robert F Kennedy

FDR Dr S

Long Island City

Woodside

Jackson Heights

Sunnyside

Elmhurst

Queens Expy W

Long Island Expy

Brooklyn Queens Expy

Newtown Creek

Haberman

Maspeth

Long Island Expy

Brooklyn Queens Expy

Williamsburg

Linden Hill

Bushwick Junction

Middle Village

0   0.25   0.5   1 Miles
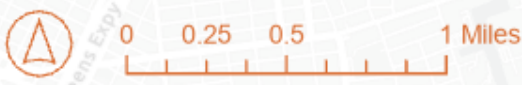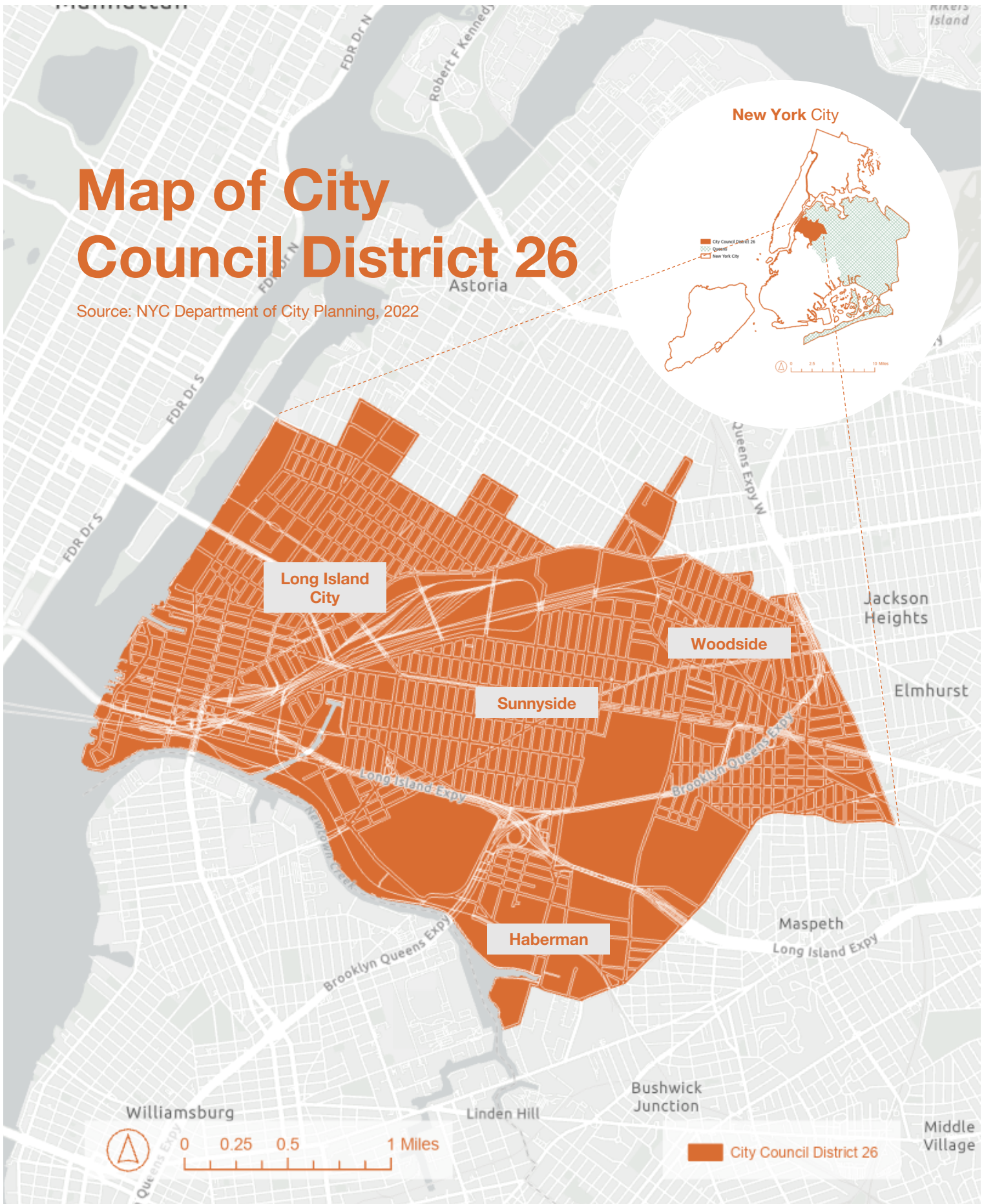
■ City Council District 26

Urban Planning Challenge

The urban planning landscape in District 26 faces challenges including outdated zoning regulations that restrict high-density development, a mismatch between the existing infrastructure and the needs of a growing population, and a lack of green spaces.

There's also the issue of balancing the preservation of neighborhood character with the need for development. These challenges are compounded by the housing affordability crisis, making it imperative to seek innovative development strategies that can accommodate growth while ensuring accessibility to public transit.

Map of Transit Landscape and Sidewalk Network in District 26

Source: Metropolitan Transportation Authority and NYC Department of City Planning, 2022

Train Stations
Sidewalk
City Council District 26
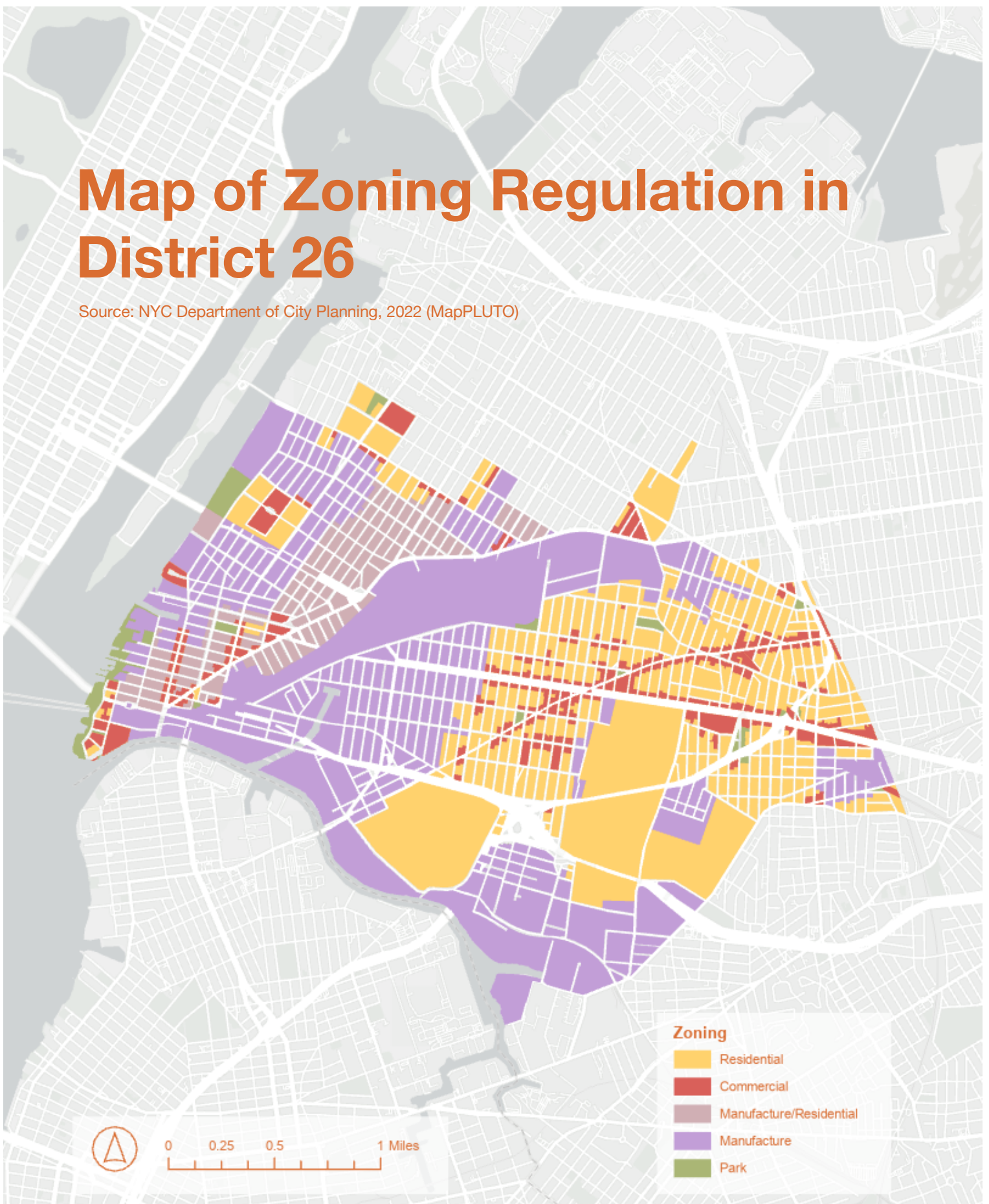Subway Line

0   0.25   0.5   1 Miles
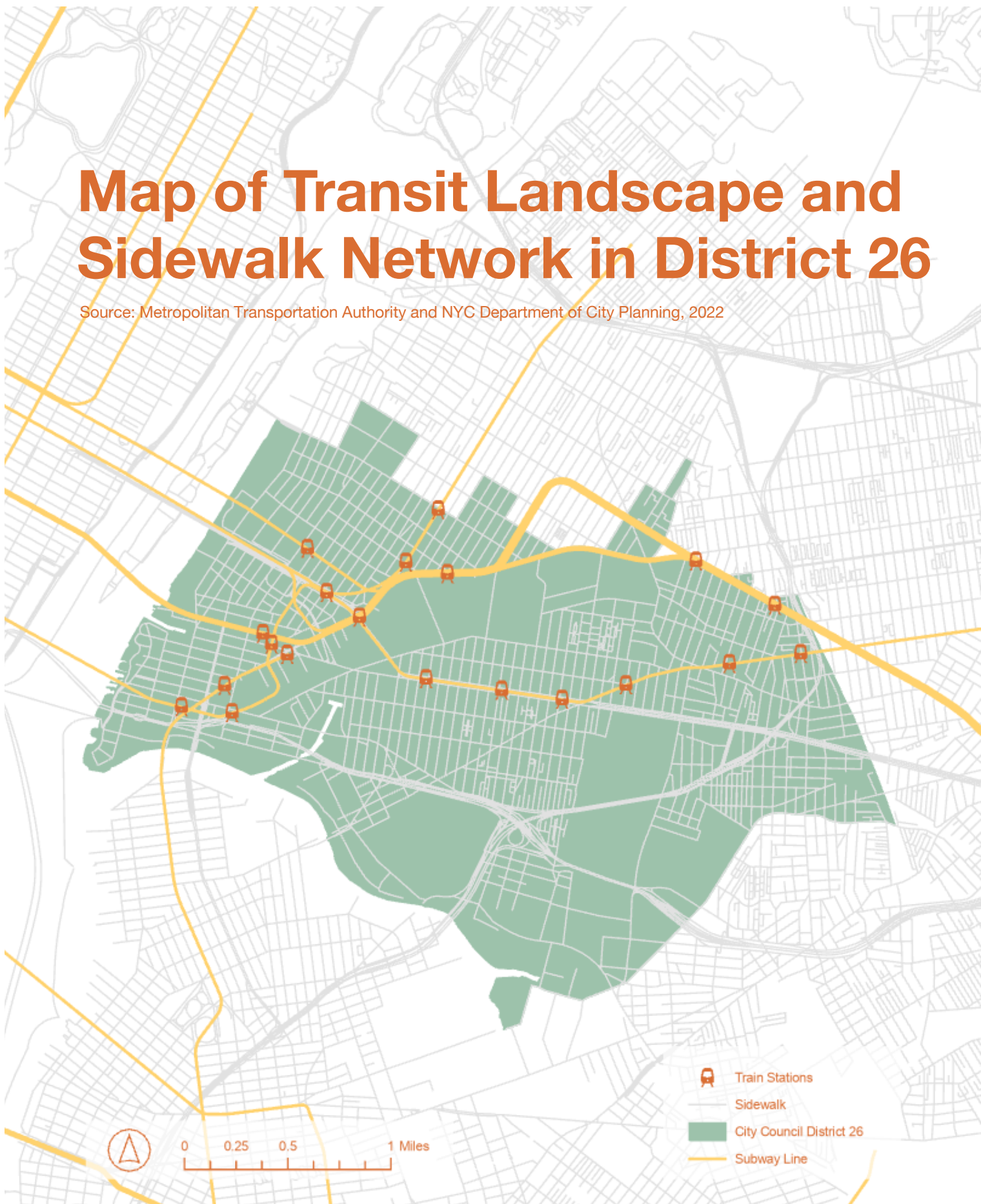
Zoning & Development Constraints

District 26's development is significantly influenced by its zoning laws, which shape the density and types of buildings allowed. These regulations, some dating back decades, often limit the capacity for new housing and commercial space, restricting vertical expansion and the creation of mixed-use developments.

Additionally, the zoning policies have not kept pace with the evolving demands for affordable housing and the need for more efficient land use. The result is a disconnect between what is needed for modern urban living and what is permitted by law, creating a major hurdle in the path to sustainable development.

Map of Zoning Regulation in District 26

Source: NYC Department of City Planning, 2022 (MapPLUTO)

Zoning

- Residential
- Commercial
- Manufacture/Residential
- Manufacture
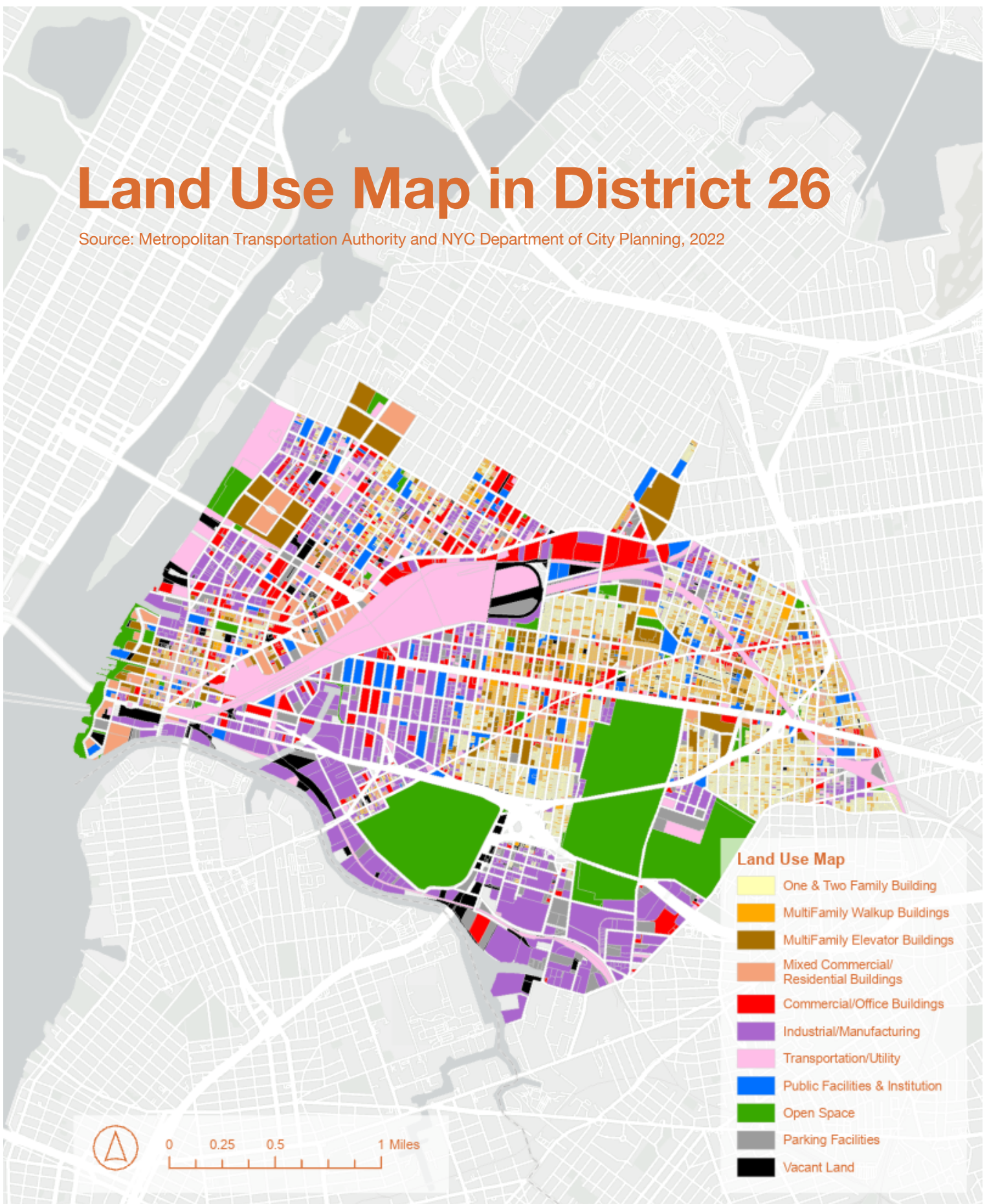- Park

0   0.25   0.5   1 Miles

Zoning & Development Constraints

Current land use in District 26 is diverse, with residential zones primarily composed of single and multi-family homes. Commercial areas are concentrated along main thoroughfares, while industrial spaces are located in specific zones, often buffered from residential areas. Public facilities, green spaces, and vacant lands also feature within the district's urban fabric.

These patterns are key to understanding the district's developmental dynamics and identifying areas where TOD can be effectively implemented to optimize land use and improve community cohesion.

Land Use Map in District 26

Source: Metropolitan Transportation Authority and NYC Department of City Planning, 2022

Land Use Map

- One & Two Family Building
- MultiFamily Walkup Buildings
- MultiFamily Elevator Buildings
- Mixed Commercial/ Residential Buildings
- Commercial/Office Buildings
- Industrial/Manufacturing
- Transportation/Utility
- Public Facilities & Institution
- Open Space
- Parking Facilities
- Vacant Land

0   0.25   0.5   1 Miles

Research Questions & Methodology.

1

How do **the locations of major transit stations** in City Council District 26, Queens, NYC, correlate with the number of **workers in the district who rely on public transportation** for their daily commute?
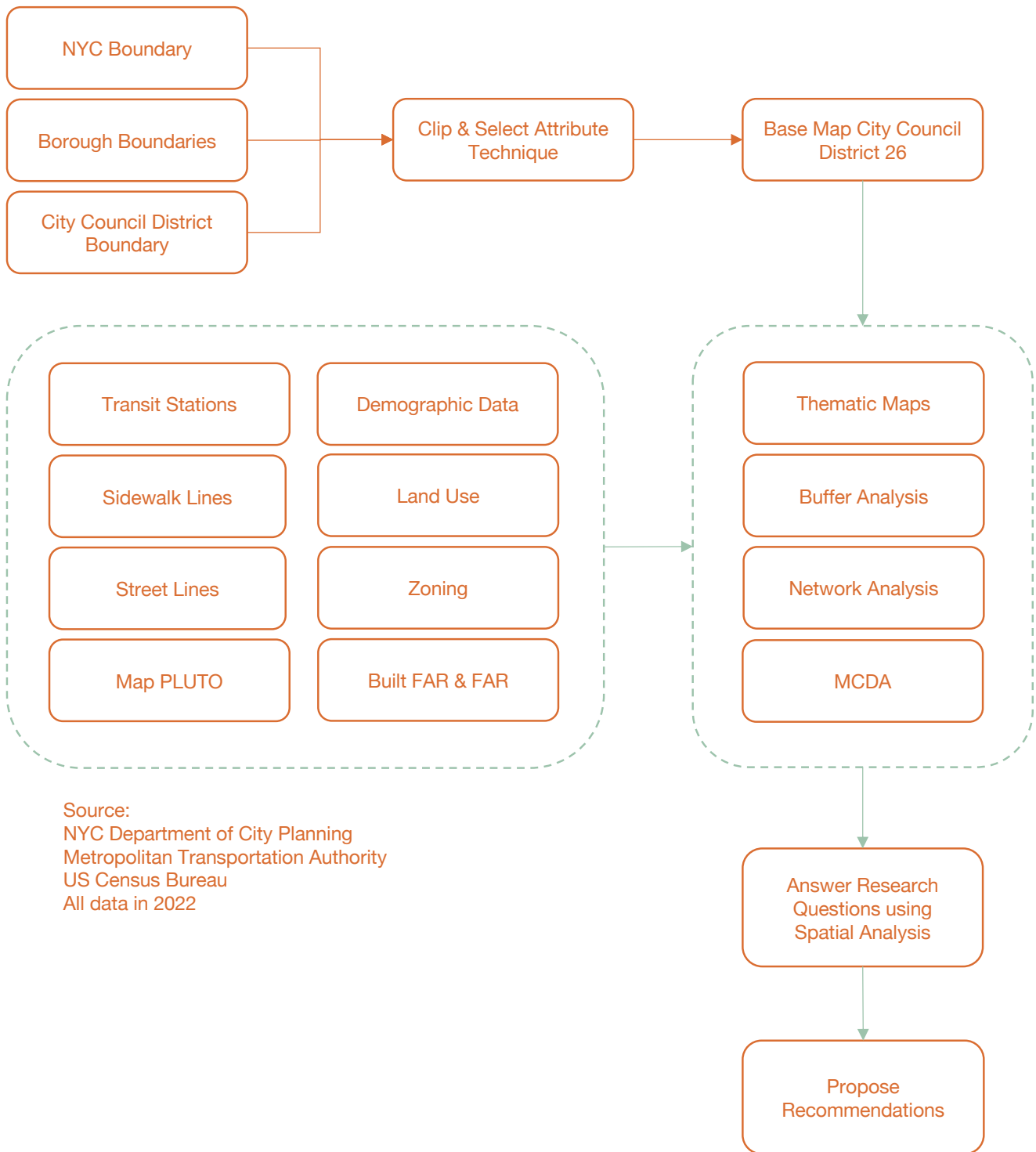
2

How do current **land use patterns within a walking-distance radius of major transit stations** in City Council District 26, Queens, NYC, influence transit-oriented development opportunities?

3

How does the analysis of **potential Floor Area Ratio (FAR) and residential FAR** in City Council District 26, Queens, NYC, reveal opportunities for TOD development to **address the housing affordability** challenge?
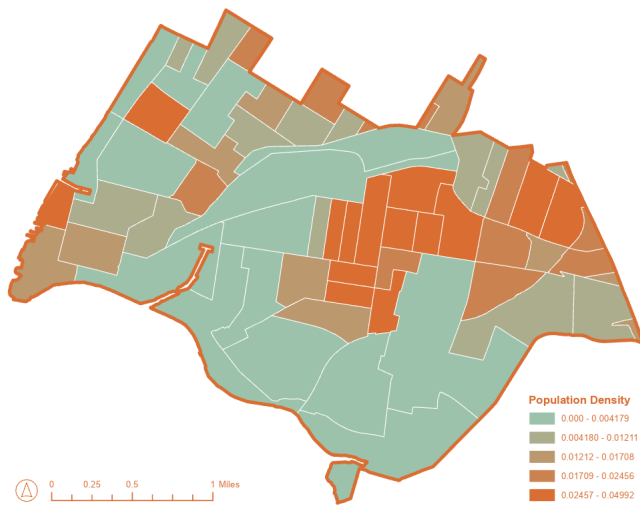
4

How can we identify **the most suitable areas for Transit-Oriented Development** in City Council District 26, Queens, NYC, by evaluating various factors such as proximity to transit stations, land use compatibility, population density, and existing infrastructure?
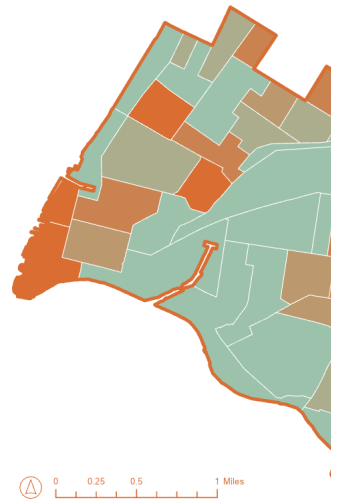
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│  NYC Boundary   │──────┐
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┌─────────────────┐      │        │ Clip & Select    │       │ Base Map City    │
│    Borough      │──────┼───────▶│    Attribute     │──────▶│ Council          │
│   Boundaries    │      │        │   Technique      │       │ District 26      │
└─────────────────┘      │        └──────────────────┘       └──────────────────┘
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┌─────────────────┐      │
│ City Council    │──────┘
│ District        │
│ Boundary        │
└─────────────────┘
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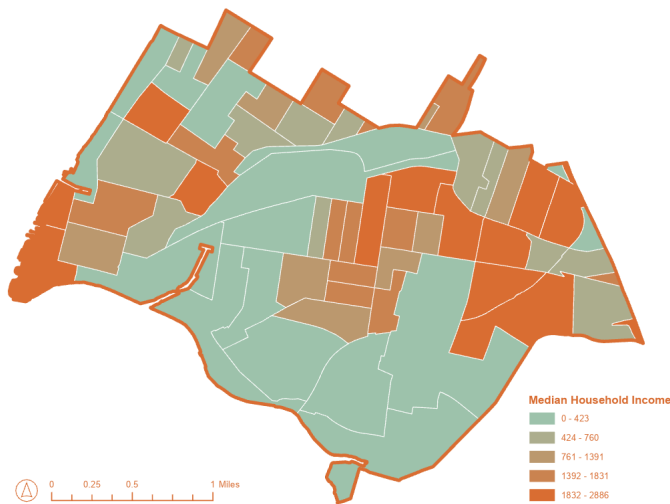
Transit Stations	Demographic Data
Sidewalk Lines	Land Use
Street Lines	Zoning
Map PLUTO	Built FAR & FAR

Thematic Maps
Buffer Analysis
Network Analysis
MCDA

Source:
NYC Department of City Planning
Metropolitan Transportation Authority
US Census Bureau
All data in 2022

Answer Research Questions using Spatial Analysis

Propose Recommendations

Demographic Analysis.

Population Density
in District 26, 2022

Population Density

- 0.000 - 0.004179
- 0.004180 - 0.01211
- 0.01212 - 0.01708
- 0.01709 - 0.02456
- 0.02457 - 0.04992

0   0.25   0.5   1 Miles

Population Age 16 & Over
in District 26, 2022

0   0.25   0.5   1 Miles

Median Household Income
in District 26, 2022

Median Household Income

- 0 - 423
- 424 - 760
- 761 - 1391
- 1392 - 1831
- 1832 - 2886

0   0.25   0.5   1 Miles

Workers Commute using Public Transportation
in District 26, 2022

0   0.25   0.5   1 Miles

Total population age 16 years and over
- 0 - 1028
- 1029 - 1894
- 1895 - 2725
- 2726 - 3970
- 3971 - 5926
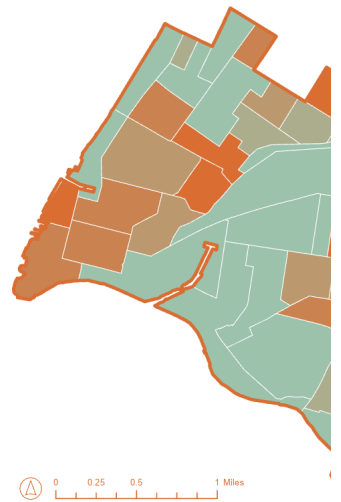
Demographic Maps

This maps delves into the population characteristics of District 26. It examines population density to understand how residents are spatially distributed, which is vital for planning services and infrastructure. Median household income is analyzed to gauge economic diversity and identify income-related development needs. Age distribution provides insights into the local demographic profile, influencing facility requirements and transportation needs. Finally, commuting patterns are studied to understand travel behaviors and public transit reliance, informing the development of TOD strategies.

Workers Commute Using Public Transport
- 0 - 286
- 287 - 512
- 513 - 1100
- 1101 - 1353
- 1354 - 2602
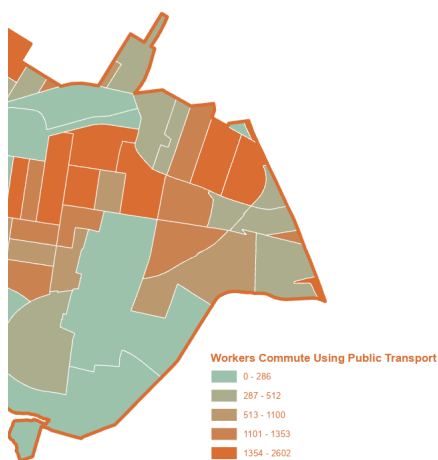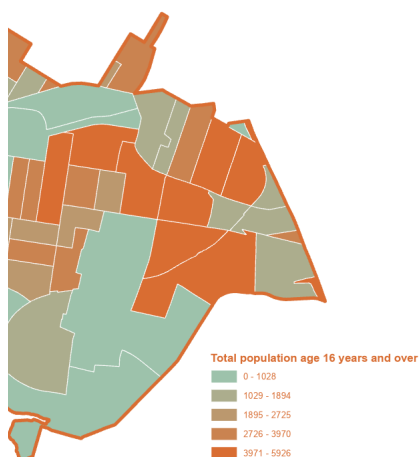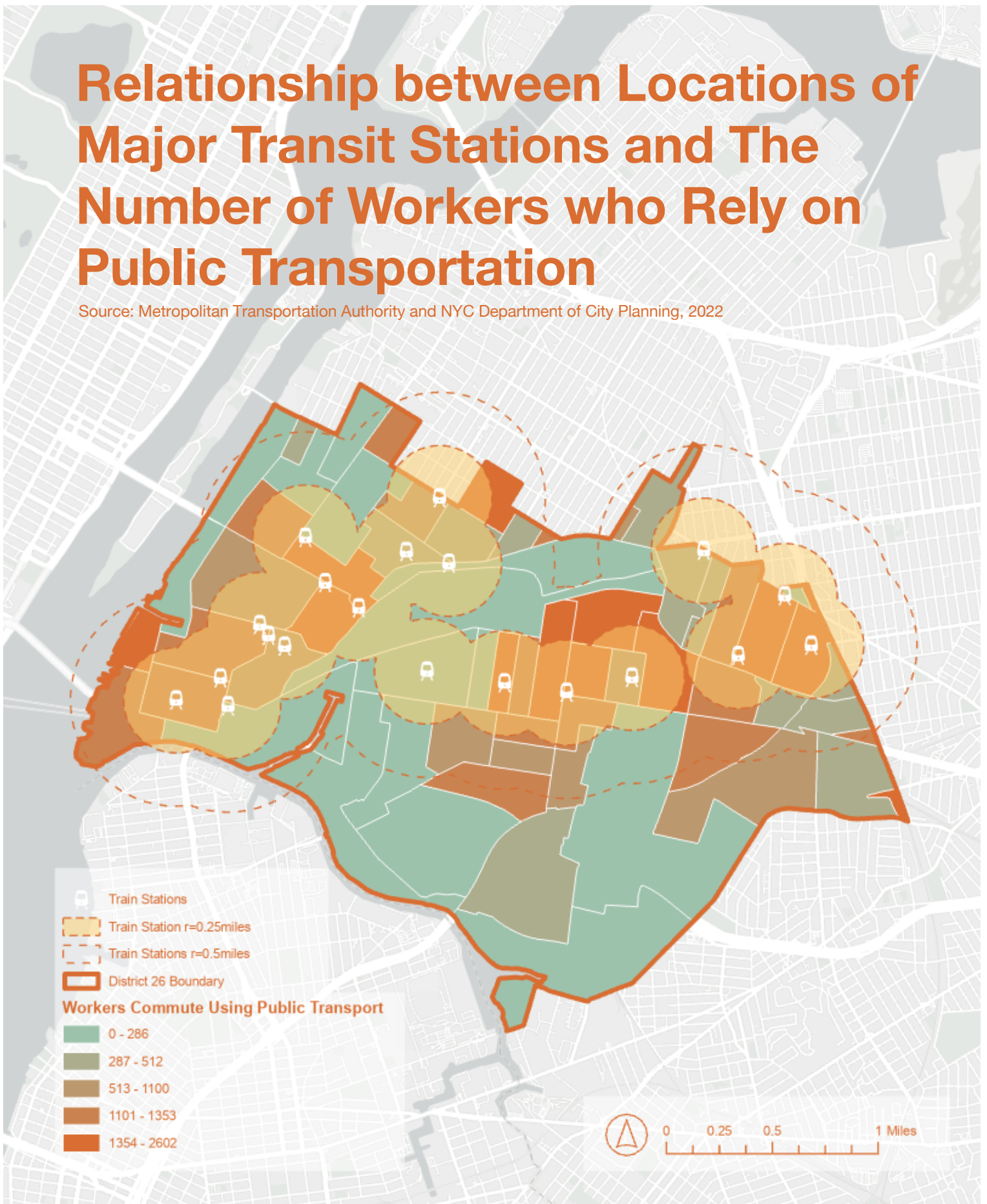
Chapter 4:

Transit Accessibility.

Accessibility to Transit Stations

This maps examines the spatial relationship between transit station locations and the reliance of District 26's workforce on public transportation.
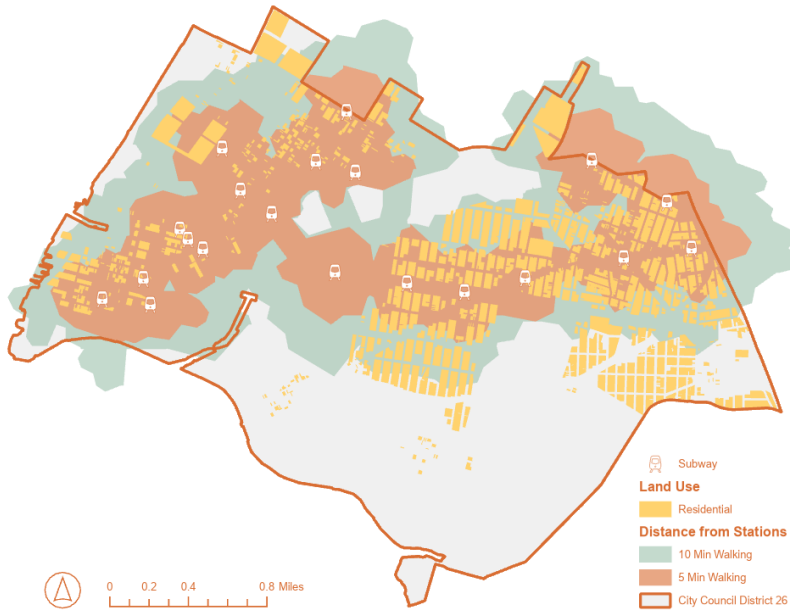
The gradations of color reflect the density of workers who commute by public transit, with darker shades indicating higher usage. This analysis identifies key areas where improvements to transit infrastructure could greatly enhance accessibility, thereby supporting the development of more efficient, transit-centric communities.

Relationship between Locations of Major Transit Stations and The Number of Workers who Rely on Public Transportation
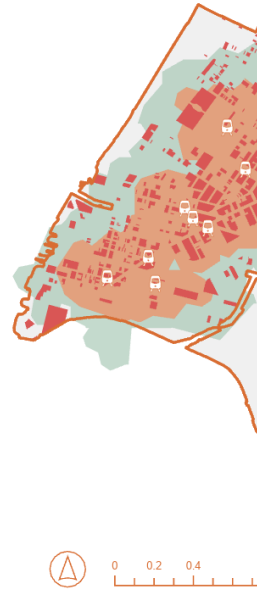
Source: Metropolitan Transportation Authority and NYC Department of City Planning, 2022
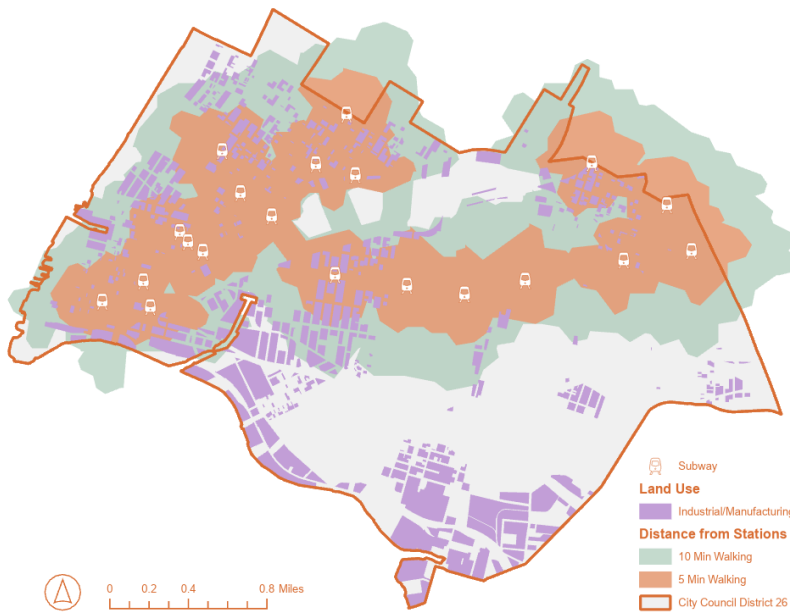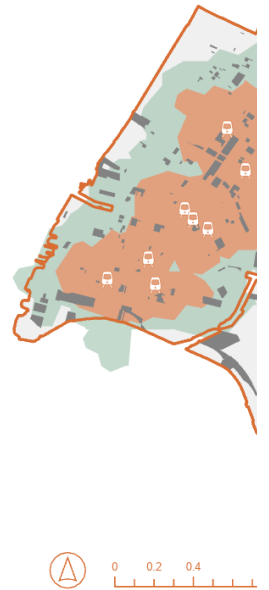
Train Stations

Train Station r=0.25miles

Train Stations r=0.5miles

District 26 Boundary

Workers Commute Using Public Transport

0 - 286

287 - 512

513 - 1100

1101 - 1353

1354 - 2602

0   0.25   0.5   1 Miles

Residential.

Subway
Land Use
  Residential
Distance from Stations
  10 Min Walking
  5 Min Walking
  City Council District 26

0   0.2   0.4   0.8 Miles

Commercial.

0   0.2   0.4

Industrial.

Subway
Land Use
  Industrial/Manufacturing
Distance from Stations
  10 Min Walking
  5 Min Walking
  City Council District 26

0   0.2   0.4   0.8 Miles

Vacant.

0   0.2   0.4

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0.8 Miles

Subway
Land Use
Commercial / Office
Distance from Stations
10 Min Walking
5 Min Walking
City Council District 26

0.8 Miles

Subway
Land Use
Parking Facilities; Vacant Land
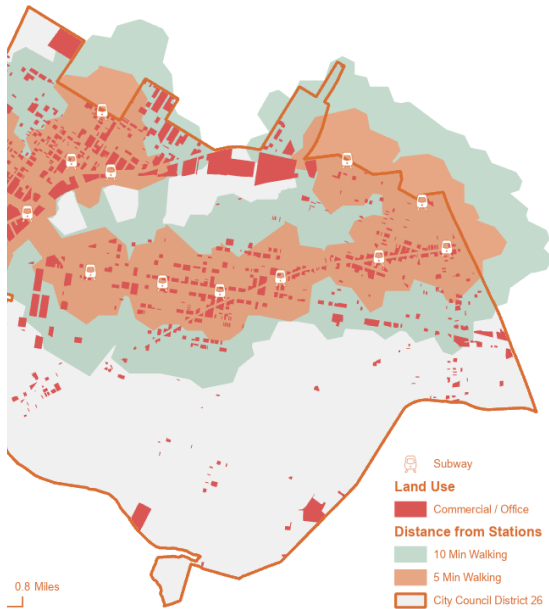**Distance from Stations**
10 Min Walking
5 Min Walking
City Council District 26

Land Use x Sidewalk Network Analysis to Transit Stations

Utilizing network analysis with a pedestrian sidewalk network, this map showcases the land use within 5 and 10-minute walking distances from subway stations in District 26.

The analysis provides insights into how well the current land use supports the principles of Transit-Oriented Development, identifying residential, commercial, industrial, and vacant areas. This detailed view aids in pinpointing opportunities where enhancements in pedestrian infrastructure can stimulate TOD, ensuring that future developments are strategically aligned with accessible public transit options.
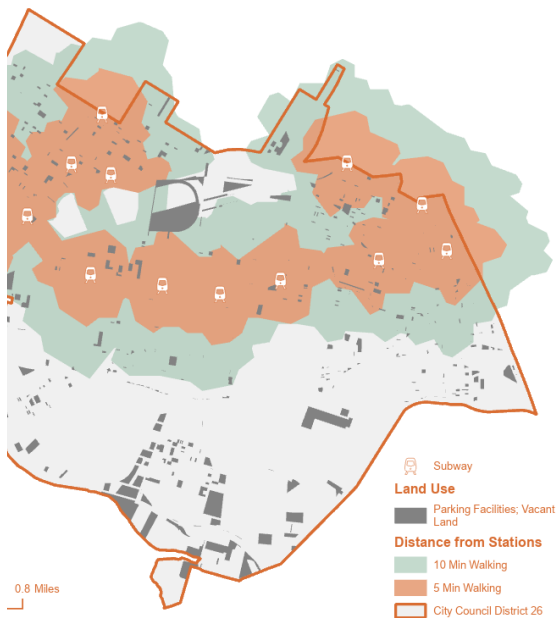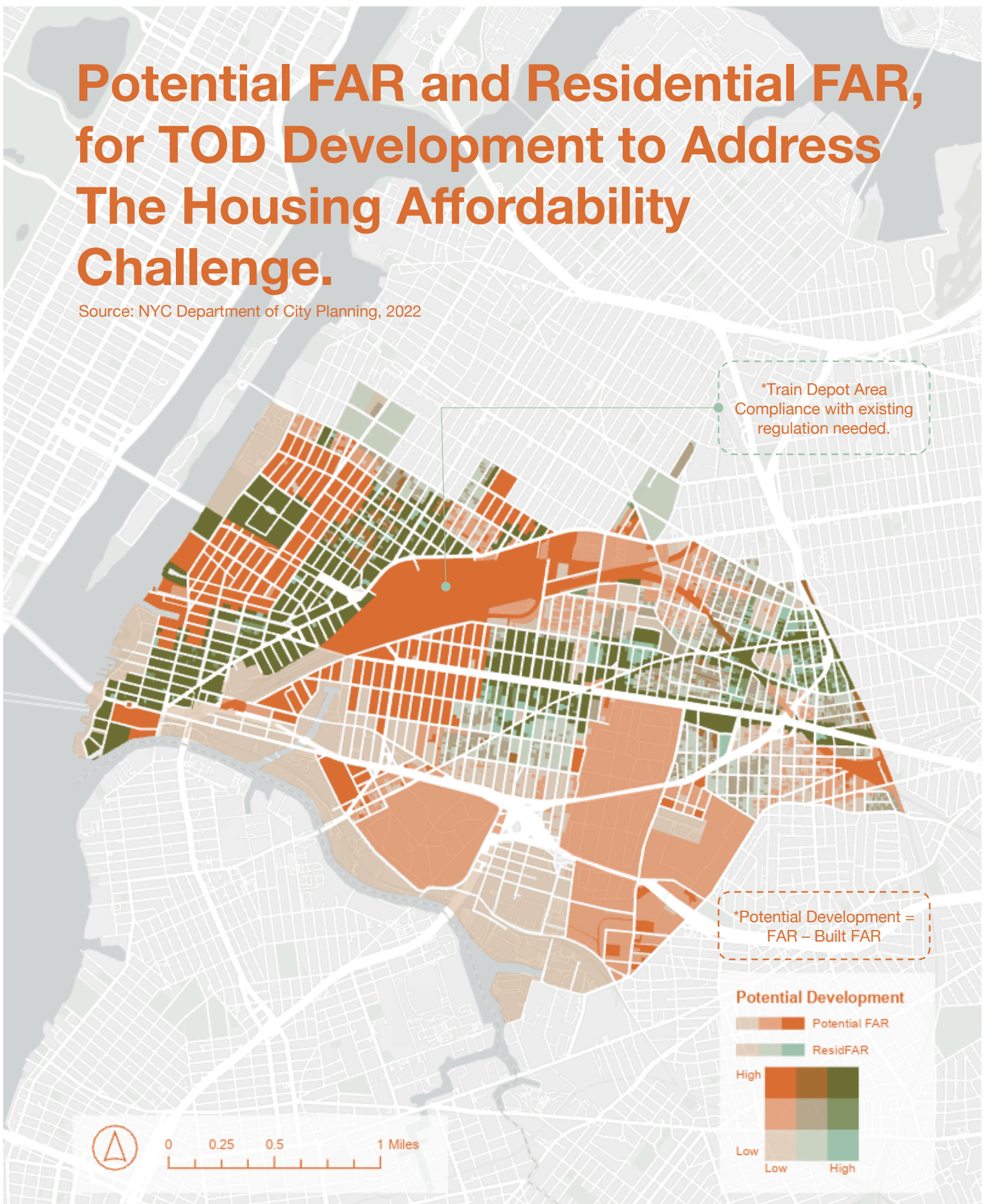
Housing Affordability & TOD Suitability.

Potential Development for Housing

This map uses bivariate analysis to assess how TOD can contribute to housing affordability. The analysis considers Potential FAR, derived from the allowed FAR minus the accumulated built FAR, highlighting areas with development potential.

This map reveals locations within District 26 where TOD can maximize housing units by utilizing available FAR, thus offering a strategy to mitigate the district's affordability issues.

Potential FAR and Residential FAR, for TOD Development to Address The Housing Affordability Challenge.

Source: NYC Department of City Planning, 2022

*Train Depot Area Compliance with existing regulation needed.

*Potential Development = FAR – Built FAR

Potential Development

Potential FAR

ResidFAR

High

Low

Low   High

0   0.25   0.5   1 Miles

TOD Suitability

This map, created using Multi-Criteria Decision Analysis (MCDA), evaluates areas within District 26 for Transit-Oriented Development (TOD) suitability.
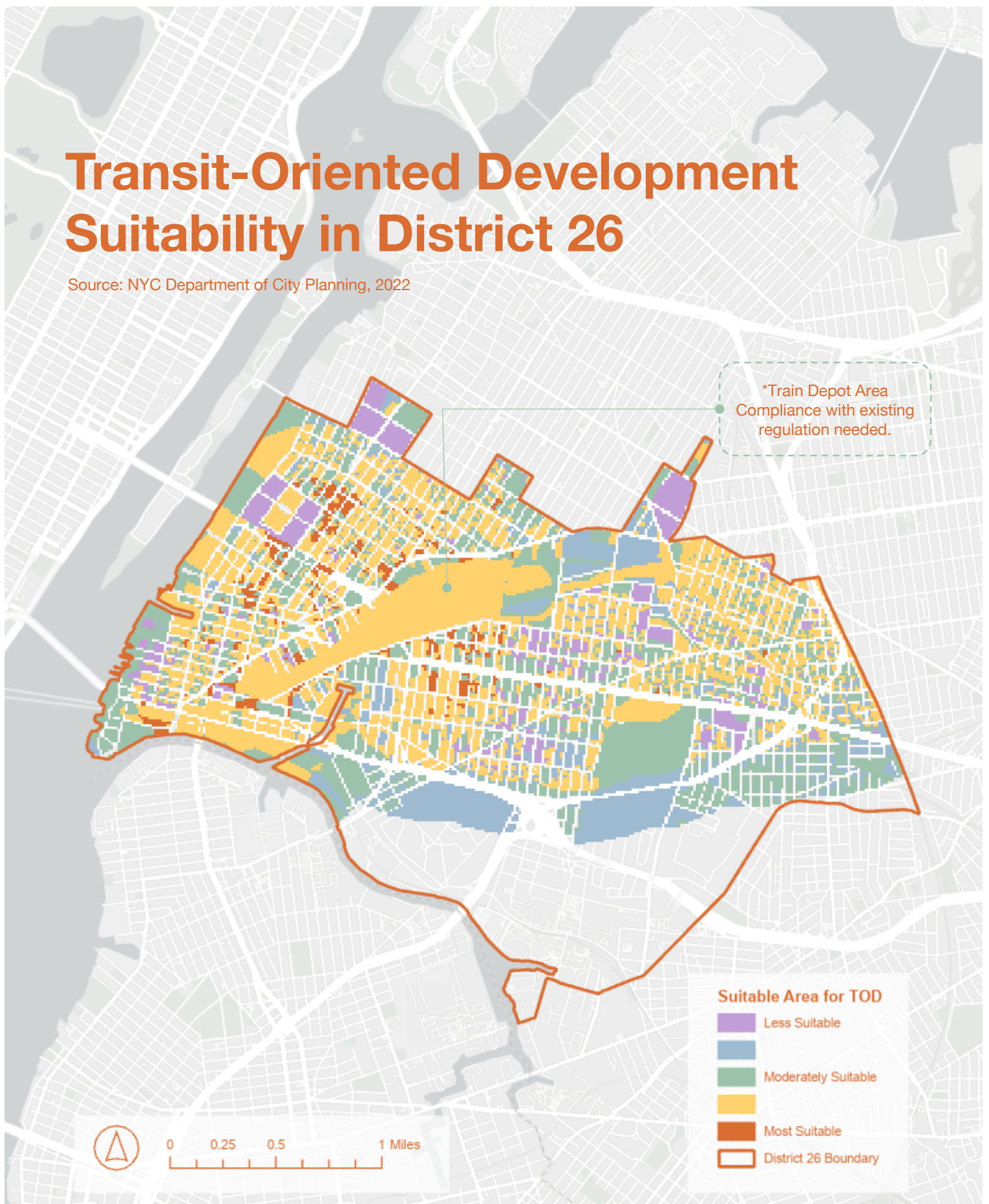
Weights for the MCDA are assigned as follows:
- Major transit stations   : 35%
- Potential FAR   : 35%
- Land use   : 30%

This weighted analysis provides a detailed picture of where TOD initiatives may be most effectively implemented, considering proximity to transit, development potential, and existing land uses. The map categorizes areas by suitability, from 'Less Suitable' to 'Most Suitable', guiding strategic planning efforts for future development.

Transit-Oriented Development Suitability in District 26

Source: NYC Department of City Planning, 2022

*Train Depot Area Compliance with existing regulation needed.

Suitable Area for TOD

- Less Suitable
- Moderately Suitable
- Most Suitable
- District 26 Boundary

0   0.25   0.5   1 Miles

TOD Suitability

Most Suitable

District 26 Boundary

0   0.25   0.5   1 Miles

'Most Suitable' Areas for TOD

Areas identified as 'Most Suitable' for TOD, marked in dark orange, should be prioritized for mixed-use development, combining residential, commercial, and community spaces.

Zoning adjustments is recommended to allow increased density in these areas, particularly where current FAR is underutilized.

Improving pedestrian and cycling infrastructure in these 'Most Suitable' areas will enhance connectivity and encourage the use of public transit.

Infill development in vacant lots, especially those within close proximity to transit hubs, can be expedited to address the pressing need for affordable housing.

Recommendations & Limitations.

Improve and expand public transit services in areas with a high number of workers relying on public transport. Consider incentives for businesses to relocate or establish near major transit hubs to reduce commuting distances.

Develop mixed-use zones within a half-mile radius of major transit stations to enhance accessibility and encourage TOD. Prioritize pedestrian-friendly infrastructure to connect residential areas with transit stations effectively.

Re-evaluate and potentially increase FAR limits in specific zones to allow for higher-density residential development. This could facilitate the creation of more affordable housing units and combat the housing affordability issue.
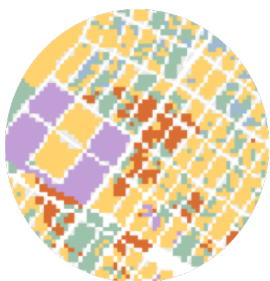
Identify and prioritize areas for TOD. Focus on locations with high transit accessibility, suitable land use, and significant population density. Implement policy changes to support development in these identified areas.
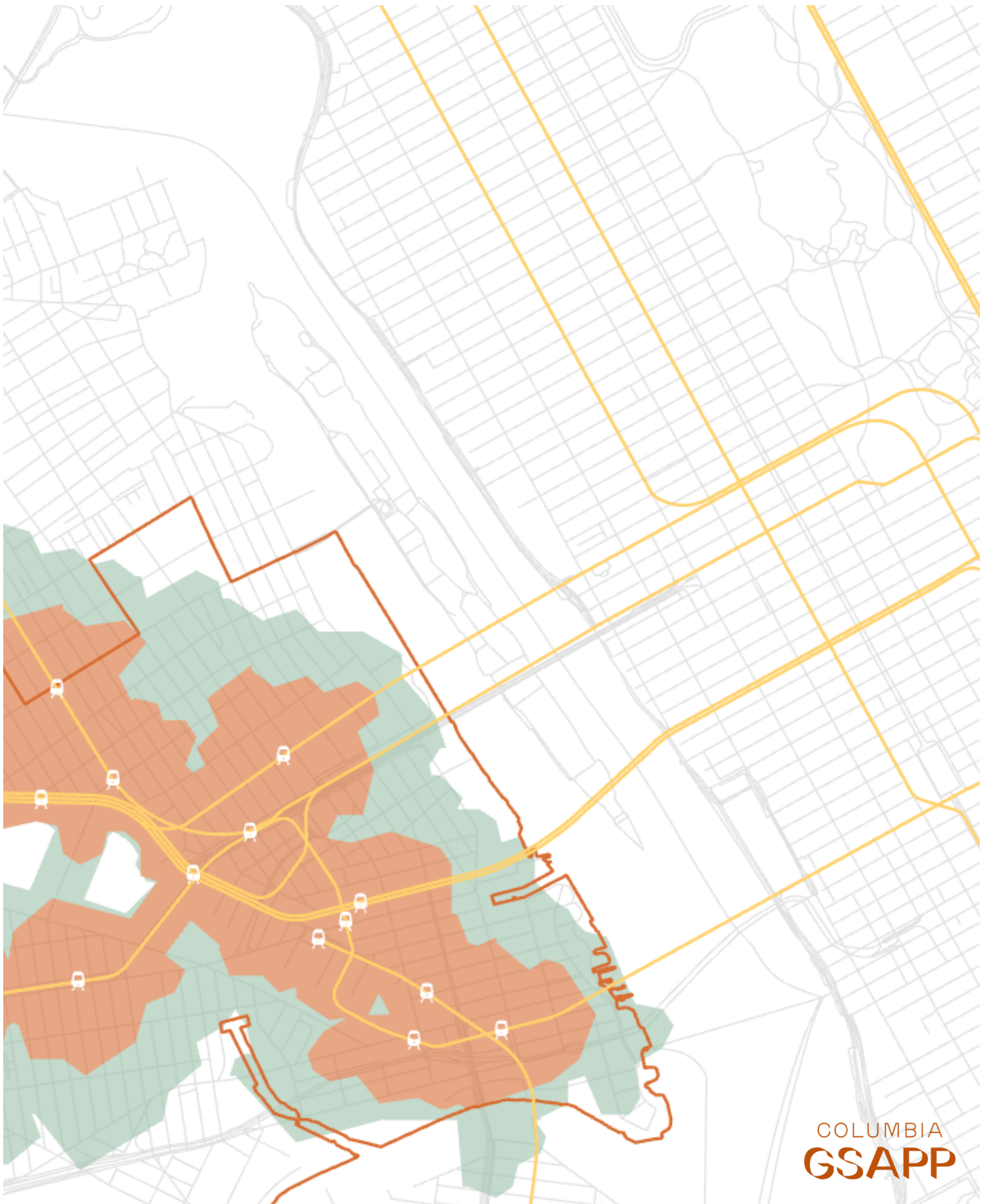
Limitations

- The study reliances on current zoning and land use data, which may not capture recent changes or approved developments.
- The MCDA model's weight assignment, while reflective of our priorities, might not encompass all stakeholder views.
- The study's timeframe does not allow for long-term trend analysis, and the focus on District 26 may not represent broader regional dynamics.
- Data accuracy and resolution limitations also constrain the analysis's precision.

Conclusions.

In conclusion, this study has provided valuable insights into the potential for Transit-Oriented Development (TOD) in District 26, revealing significant opportunities for sustainable urban growth and housing affordability. Through a detailed GIS analysis incorporating MCDA, we have identified key areas suitable for TOD initiatives, including proximity to major transit stations, potential FAR, and existing land use patterns.

While acknowledging the limitations in this study, the findings underscore the critical role of data-driven analysis in urban development. Moving forward, it is essential to continuously refine the methodologies and incorporate updated data to ensure that the developmental strategies remain responsive to the changing urban landscape and the needs of the community in District 26 and beyond.

Thank you!