Transportation Authority of Marin

DATE: April 23, 2026

TO: Transportation Authority of Marin Board of Commissioners

FROM: Anne Richman, Executive Director
Derek McGill, Director of Planning
Mikaela Hiatt, Senior Transportation Planner

SUBJECT: Lincoln Avenue Corridor Study Artificial Intelligence Pilot (Discussion), Agenda Item No. 9

RECOMMENDATION

The TAM Board receives an update on the Lincoln Avenue Corridor Study Artificial Intelligence Pilot.

BACKGROUND

With the adoption of the Countywide Transportation Plan 2050 (CTP 2050) in December 2024, TAM has identified key transportation networks throughout the county, including specific network strategies including an Active Transportation Network, a Transit Priority Network, activity hubs with a focus on walkable environments, a high collision network, wildfire evacuation network, and other spatial networks for advancing the CTP goals into network improvements. The implementation framework of the CTP provides an example of where these network priorities overlap and calls for the "collaboration and development of a corridor plan that provides co-benefits to address the range of needs and strategies" identified in the CTP.

To advance the CTP goals and implement the networks envisioned in the CTP, corridor plans are important efforts to balance the priorities of the CTP into actionable improvement plans including multimodal improvement. However, staff have seen challenges in multimodal planning and coordination between project stakeholders.

Over its history, TAM has conducted a number of local corridor plans, and has funded or participated in others, including the following TAM-led initiatives:

- US 101 Part Time Transit Lanes Feasibility Study (Completed 2021, $350,000)
- Fairfax San Rafael Transit Corridor Study (Completed 2015, $150,000)
- Central and Southern Marin Transit Study (Completed 2008, ~$300,000)

As costs for these efforts have grown over the years, and with increasing interest in additional corridor planning, staff have been exploring lower cost, alternative approaches.

At the October 23, 2025 TAM Innovation Workshop, the TAM Board engaged in discussion about top emerging trends in transportation innovation, including the role of artificial intelligence (AI). Staff presented efforts underway, including the use of AI to conduct a corridor plan for Lincoln Avenue in San Rafael, an area of interest for safety improvements, transit priority, and overall mobility and development opportunity for the city.

TAM staff are bringing this update to the TAM Board to discuss the findings from the Lincoln Avenue Study and to continue discussions regarding the role AI could play in advancing the CTP and multimodal planning at TAM.

DISCUSSION/ANALYSIS

In 2025, staff was approached by Waypoint Transit to explore AI tools to help streamline development of planning activities including corridor studies. TAM staff sought to initiate the Lincoln Avenue Pilot AI Corridor Study as an implementing action of the CTP to advance safety, equity, and multimodal mobility goals across the County. The study does not represent adopted City or TAM recommendations; it is an exploratory effort to evaluate tools and process, not to advance design.

In San Rafael, Lincoln Avenue functions simultaneously as a regional connector, local main street, and neighborhood access route, resulting in overlapping and sometimes competing demands among people driving, walking, biking, and using transit. The corridor has a documented history of modal conflicts, constrained right-of-way, low-income populations, and development opportunities identified in San Rafael's Housing Element. TAM staff, in conjunction with San Rafael and Marin Transit staff, identified the corridor as an opportunity to pilot the new AI technology developed by Waypoint Transit to proactively examine these challenges and to support CTP priorities. Working cooperatively amongst agencies, TAM staff led the scoping and data collection and provided ongoing project management to reduce administrative work on behalf of partner agencies.

The result of the study demonstrated the following:

- Waypoint Transit's AI tools (or similar tools) can be useful for corridor or other planning studies
- AI tools enhance, but do not replace the need for local expertise and policy decisions
- Areas of potential streamlining for cities and TAM include data gathering and packaging, existing conditions analysis, and developing potential treatments to align policy goals to improvements
- Aligning transportation policy with physical improvements can result in improved multimodal projects
- Staff at local agencies and TAM will still need to exercise professional judgement in the applicability of these treatments to local environments

TAM staff reviewed the draft study and resulting findings with the City of San Rafael and Marin Transit staff. The draft study was also presented by TAM staff to the City's Traffic Committee in January and Bicycle and Pedestrian Advisory Committee in February as requested by City of San Rafael staff. The respective committees provided positive feedback on the study, expressing interest in opportunities to expand the application of AI studies beyond Lincoln Avenue.

Staff presented a review of the Lincoln Avenue Corridor Study AI Pilot to the Funding, Programs and Legislative (FP&L) Executive Committee at its March 9, 2026 meeting to seek feedback on the study, its applicability in other areas of TAM work, and any additional guidance. The FP&L Executive Committee provided the following comments:

- Requested details around how the findings in the Pilot will inform future work.
- Inquired about other work Waypoint has developed and its potential applicability for other TAM work.
- Integration of before-and-after simulation of design alternatives and recommendations would be beneficial for communication with the public.
- For presentation to the Board, TAM staff should align the AI Policy item and the Lincoln Avenue Corridor Study to show how the two relate.

Staff will present the review of the Lincoln Avenue Corridor Study AI Pilot to the TAM Board, demonstrating how it relates to the AI Policy and how it may be integrated into future elements of TAM's work.

FISCAL CONSIDERATION

There is no fiscal impact with the review of the study.

RELATIONSHIP TO COUNTYWIDE TRANSPORTATION PLAN (CTP)

As discussed, implementation of the CTP from networks to improvement plans will require significant planning and coordination to balance the multiple needs of the transportation network. This pilot study provides a pathway for streamlined coordination and implementation of CTP priorities.

NEXT STEPS

Staff will finalize the study based on the input received; and return to the Executive Committees and TAM Board with further updates on the Innovation program and integration into TAM work.

ATTACHMENTS

Attachment A – Staff Presentation
Attachment B – Lincoln Avenue Corridor Study AI Pilot Executive Summary
Attachment C – Lincoln Avenue Corridor Study AI Pilot (hyperlink only)

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Lincoln Ave Corridor Study – AI Pilot Overview

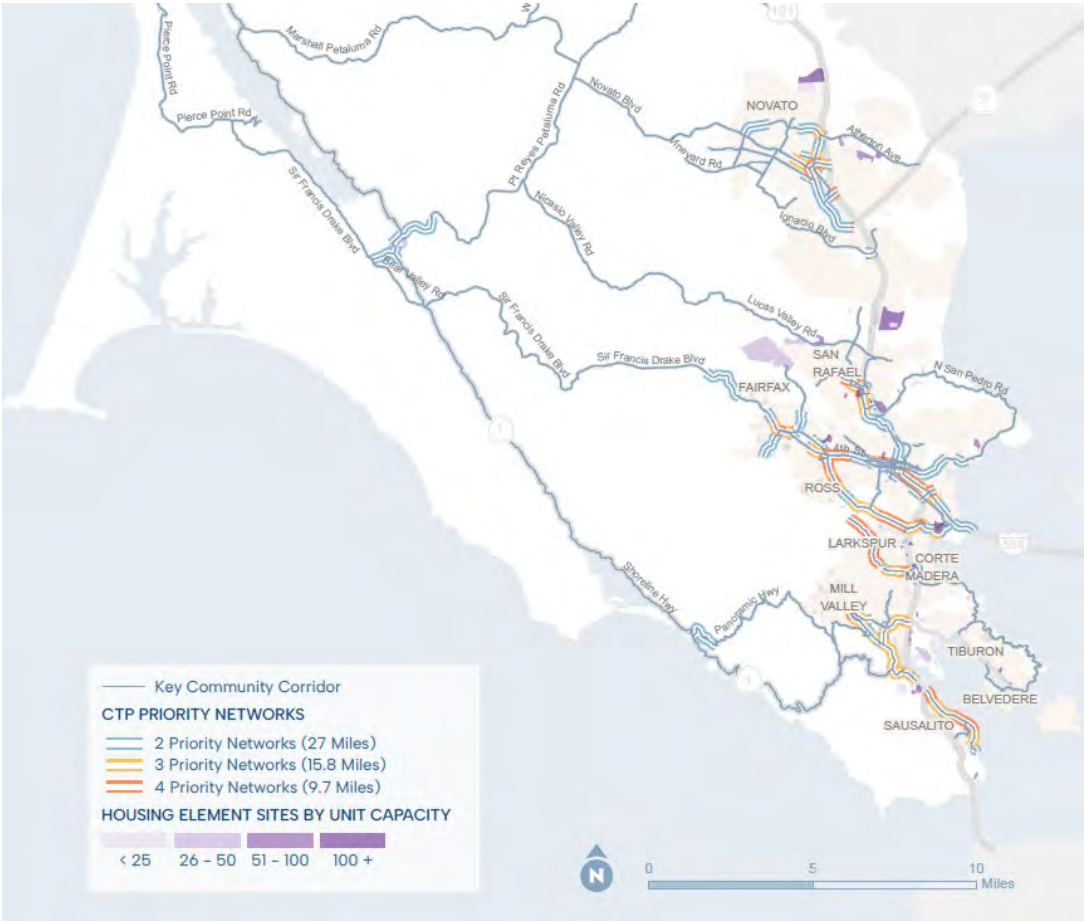
Transportation Authority of Marin

Board of Commissioners

April 23, 2026

Study Context – Why Pilot This Type of Corridor Study?

- Network approach of multiple CTP strategies
- Corridor Planning & Coordination to balance multiple needs & implement the CTP
- Full corridor studies can be resource intensive (staff time and funding)
- Opportunity to better integrate advances in AI
- **Goal**: understand feasibility/practicality of these tools
- Study does NOT represent adopted City or TAM recommendations; it is an exploratory effort to evaluate tools and process, not to advance design



How This Relates to the TAM AI Policy

The Lincoln Ave Corridor traffic study was conducted specifically using AI to test its capacity and applicability in assessing roadway corridor conditions as a basis for exploring policy and infrastructure improvements.

While the contract and study predate the policy, key elements were consistent:

- AI does not replace human expertise and judgement
- Human participation is necessary to review and form policy options
- Streamlined use of resources including staff time and data to form reasonable recommendations

Where they diverged:

- There are no specific guardrails against the identification or use of personally identifiable images in the analysis

Opportunities to explore:

- What guardrails exist or should exist in the use of openly available data by AI? Is it TAM's obligation to provide that protection if the data is open sourced?

THE STUDY TEAM

Waypoint Transit

Waypoint provides AI-powered planning automations trusted by agencies nationwide. Automations include:

- Planning studies
- Roadway safety audits
- New development review and permitting
- Economic development

1/5 the cost
of a traditional planning consultant

Up to 80% faster
than a traditional corridor study

Varun Tandon
CEO
Previously at Stanford, Microsoft

Ryan Johnston
CTO
Previously at Stanford, Apple

Bhargava Sana
Planning Advisor
Planner at SANDAG, Previously SFCTA

THE METHODOLOGY

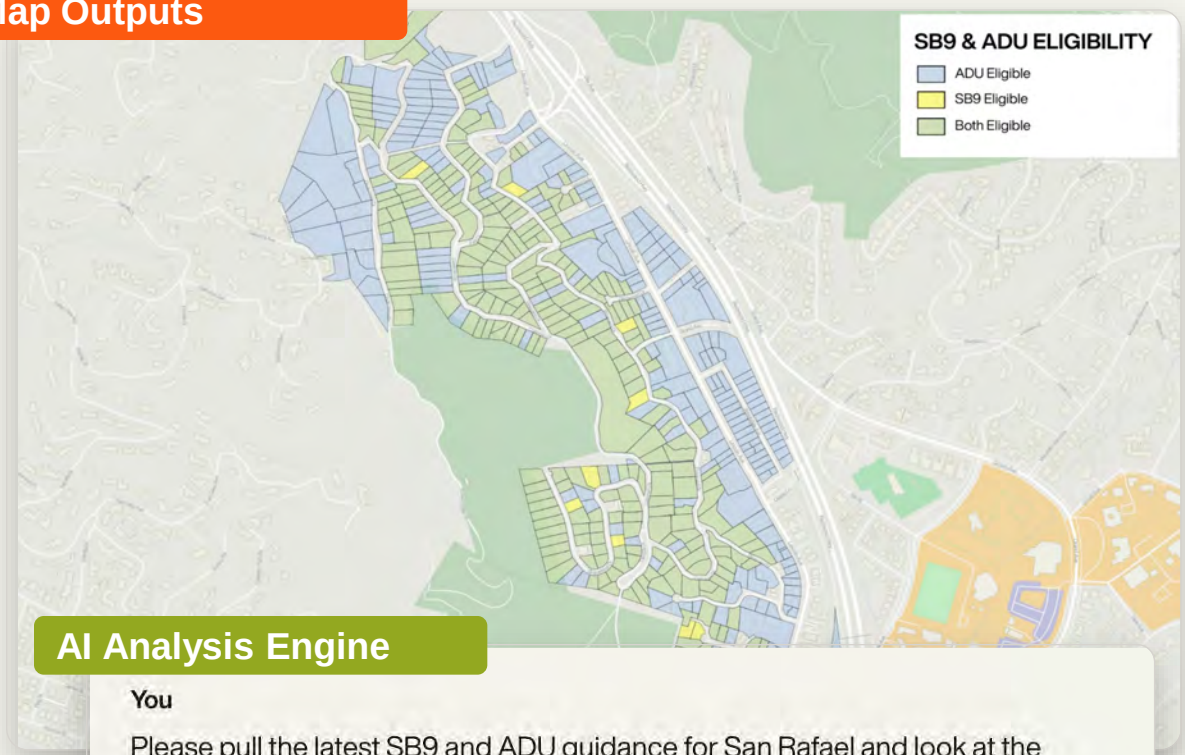
From AI Analysis to Finished Report

- Waypoint ran comprehensive analyses for the Lincoln Ave Corridor Study — land use, crash data, demographics, transit access — while cross-referencing municipal codes, planning documents, and city council records to connect spatial data to the policy landscape.
- These outputs built the existing conditions foundation in hours rather than weeks.
- Every AI output is refined and reviewed— this isn't AI replacing expertise, it's technology making planners more effective.

30+ analyses
completed

Minutes, not days
with AI automation

Map Outputs



AI Analysis Engine

You

Please pull the latest SB9 and ADU guidance for San Rafael and look at the parcels in our study area to determine which are ADU eligible, which are SB9 eligible, and which are eligible for both

Waypoint

Reasoning

I'll start by searching for local documents on SB9 and ADU guidance for San Rafael, and simultaneously check what map layers and parcels are already in our study area.

Study Context – Why Lincoln Avenue?

Corridor Challenges & Opportunities:

- Constrained right-of-way
- Development opportunities/housing element sites
- Low income & minority populations
- Local access & parking challenges
- High transit ridership, opportunities to improve transit operations
- Bicycle and pedestrian safety and connectivity
- Emergency and evacuation considerations
- Congestion relief

Coordination needed between local jurisdictions, transit operators and TAM in developing improvements in the corridor

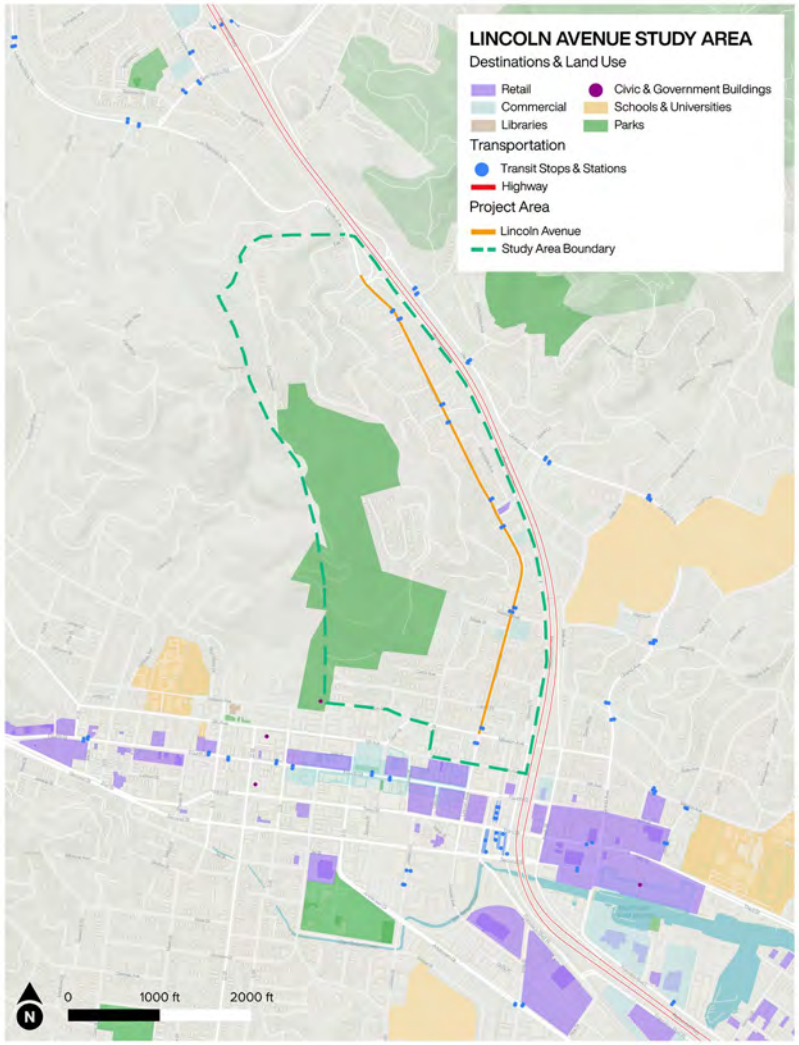
Left Image: Aerial view of Lincoln Avenue Corridor

Bottom Image: Street view of Lincoln Avenue

Summary – Study Area Overview & Role of the Corridor

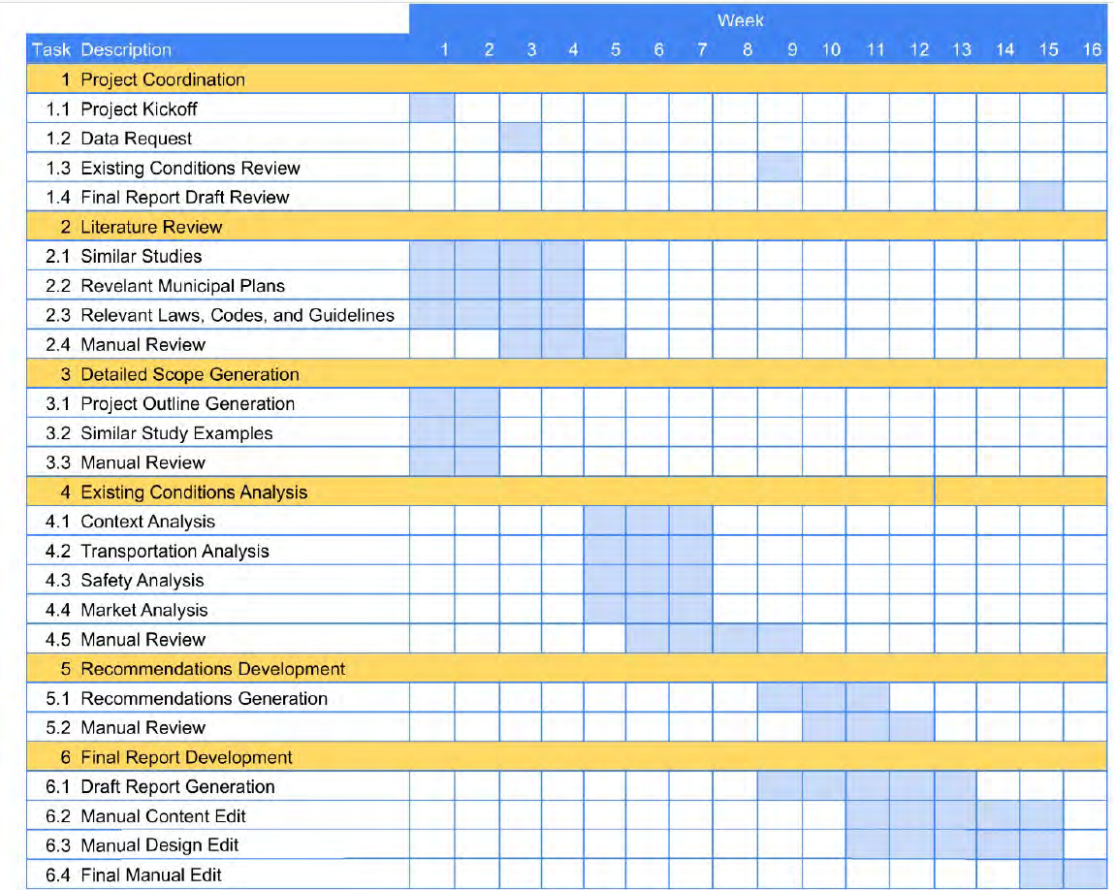
Lincoln Avenue: Study Area and Function

- 1.05-mile corridor from Mission Avenue to Prospect Drive
- Serves multiple roles:
  - Neighborhood access
  - Primary local transit corridor
  - Parallel relief route to US-101
- Adjacent to SMART rail and pathway
- Higher residential density than citywide average



Study Process

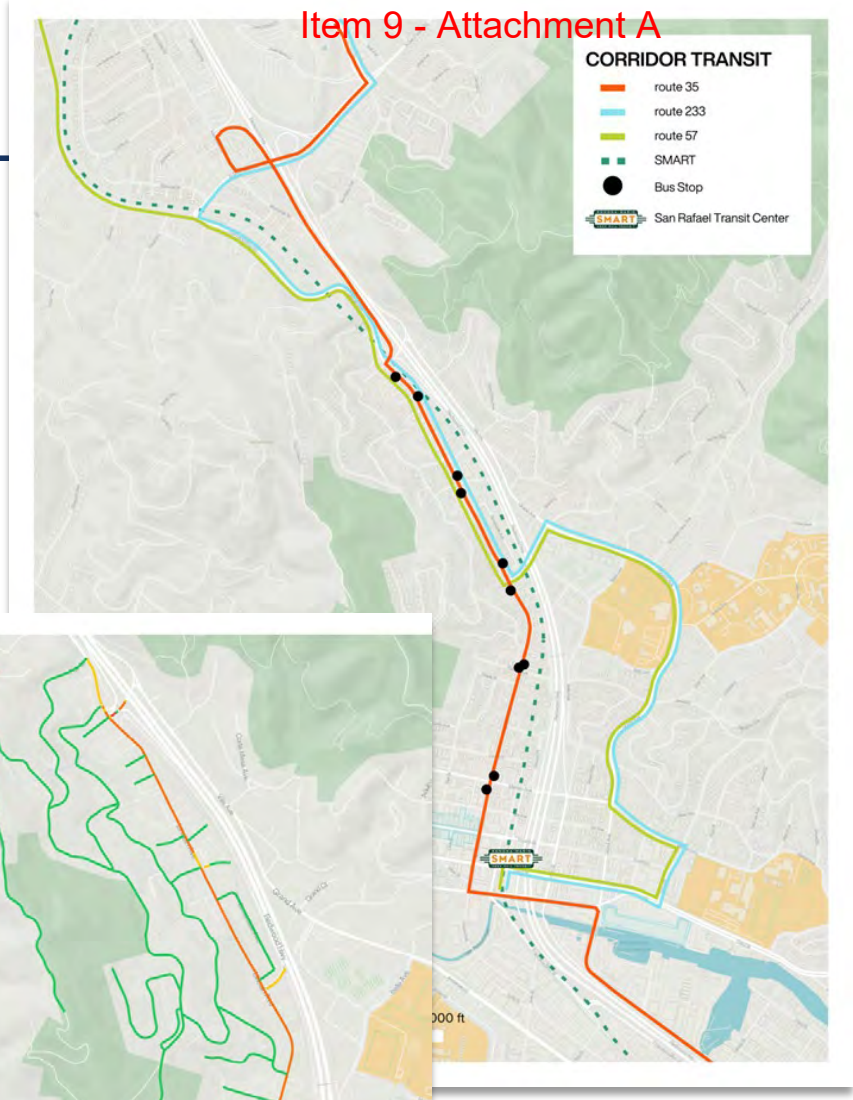
- Develop Schedule and Scope of Work with City DPW
- Kick off meeting with Waypoint to align goals of the Study
- TAM and City staff collected existing plans, studies, and data to share with Waypoint including but not limited to:
  - City of San Rafael General Plan 2040
  - Housing Element (2023-2031)
  - Marin Transit Short Range Transit Plan
  - High Collision Corridor Designations (Lincoln Ave Safety Corridor LRSP, Vision Zero Commitment)
  - Marin Wildfire Evacuation Route
- Waypoint downloaded the data and inventoried information relevant to Lincoln Avenue
- Waypoint synthesized the review into Findings and developed Potential Treatment Options
  - Developed maps based on the data provided

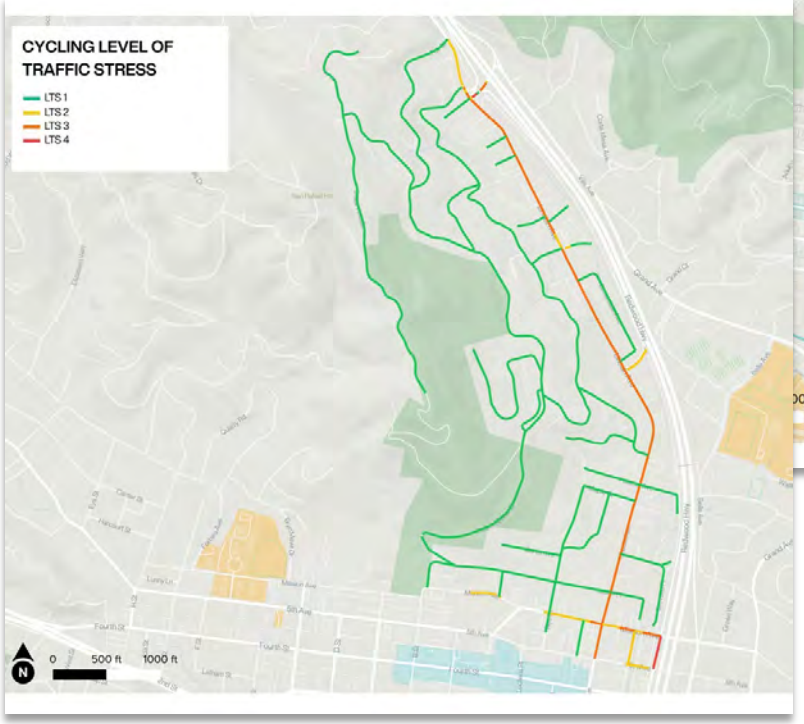


Existing Conditions Analysis

AI tool conducted multiple analysis types:

- Level of Traffic Stress Analysis
  - Both bicycle and pedestrian
- Land Use Assessment
- Parking and Daylighting Analysis
- Safety Assessment of the corridor using collision data
- Transit Reliability & Operations Analysis
- Corridor Analysis, Intersection by Intersection





Summary of Treatment Options

Focused actions within a constrained corridor

- Target safety where crashes occur
  - Intersection-based, proven countermeasures at high-risk locations.
- Improve transit reliability & operations
  - TSP, queue jumps, and stop placement adjustments, not necessarily new lanes.
- Direct cycling to lower-stress facilities
  - Use the SMART Pathway as the primary bikeway, with better access and wayfinding.
- Reduce pedestrian crossing stress
  - Shorter crossings, improved lighting, and targeted controls.
- Support incremental land use change
  - Align modest housing growth and parking policy with corridor capacity.

Lincoln Avenue And Linden Lane

EXISTING CONDITIONS:

- The north–south crossing across Linden Lane to the north is signalized and properly daylighted, but it is missing an ADA-compliant curb ramp on the north side of the crossing.
- Pedestrians on the west side of Lincoln Avenue lack a direct way to cross to the bus stop on the east side without a significant detour and multi-leg crossing maneuver.
- The north–south crossing across Linden Lane to the south is signalized and has ADA-compliant curb ramps.
- The single crossing across Lincoln Avenue has ADA-curb ramps.
- The left turn from Lincoln Avenue onto Linden Lane (southern intersection) is protected.

RECOMMENDED TREATMENTS:

1. Add an east–west crossing over Lincoln Avenue at/near the bus stop, using high-visibility markings and aligning details with the current HSIP designs.
2. Install the missing ADA-compliant curb ramp at the northeastern curb at the northern intersection with Linden Lane.
3. Ensure that the signalized pedestrian crossings have LPIs.
4. If geometry permits, consider curb extensions to shorten crossing distances.

Summary of Treatment Options

Study includes intersection level analysis of the treatment options and highlights where they would be applicable

Example of Mission and Paloma Avenue

- Transit Signal Priority for transit vehicles in both directions
- Relocate southbound bus stop to block between Paloma Avenue and Maple Street
- Bus stop pavement markings at both stops
- Add the south leg crossing to eliminate the three-leg configuration
- High-visibility crosswalk striping on all crossings
- Leading Pedestrian Intervals and Accessible Pedestrian Signals on all crossings
- Curb extensions on both Lincoln Avenue approach lanes
- ADA-compliant curb ramps at all four corners
- Wayfinding signage to the SMART trail
- New Redwood Bikeshare station

Results and Discussion

- Waypoint AI (or similar tools) can be useful for corridor or other planning studies
- Areas of potential streamlining for cities and TAM include data gathering and packaging, existing conditions analysis, and developing potential treatments to align policy goals to improvements
- Aligning transportation policy with physical improvements may result in improved multimodal projects
- Staff at local agencies and TAM will still need to exercise professional judgement in the applicability of these treatments to local environments
- Enhances, but does not replace the need for local expertise and policy decisions

Questions & Discussion

Thank you!

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LINCOLN AVENUE

San Rafael

September 2025

Corridor Study

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GLOSSARY

- **AADT (Average Annual Daily Traffic)**: The total volume of vehicle traffic on a highway or road for a year divided by 365 days.
- **ADU (Accessory Dwelling Unit)**: A secondary housing unit on a single-family lot, also known as a granny flat or in-law unit.
- **APS (Accessible Pedestrian Signal)**: A device that communicates information about pedestrian crossing phases in a non-visual format, such as audible tones, verbal messages, and vibrating surfaces, to assist pedestrians with vision or hearing impairments.
- **ATP (Active Transportation Program)**: A competitive California state grant program that provides funding for projects that encourage active modes of transportation, such as walking and bicycling.
- **CEQA (California Environmental Quality Act)**: A state law requiring agencies to identify and mitigate the significant environmental impacts of their actions. Transportation projects are often subject to CEQA review.
- **CIP (Capital Improvement Program)**: A multi-year plan outlining a city's intended capital projects and their financing. The safety improvements for Lincoln Avenue are part of San Rafael's CIP.
- **Class I shared use path**: Off-street path for bicycles and pedestrians.
- **Class II bike lane**: Exclusive on-street lane. A buffered Class II bike lane includes a painted buffer.
- **Class III bike route**: Shared lane; may include shared lane markings.
- **Class IV separated bikeway**: Protected on-street bikeway; also called a protected bike lane or cycle track.
- **Complete Streets**: A transportation policy and design approach that requires streets to be planned, designed, and operated to enable safe access for all users, including pedestrians, bicyclists, motorists, and transit riders of all ages and abilities.
- **Curb extension (bulb-out)**: Curb that extends into the parking lane at intersections or crosswalks, reducing crossing distances and improving visibility.
- **Daylighting**: Removing parking near intersections to improve visibility and sight lines for pedestrians and drivers, now mandated by California AB 413.
- **Far-side stop**: Transit stop located on the far side of an intersection (after crossing the intersection). Improves bus operations and integrates well with TSP.
- **HSIP (Highway Safety Improvement Program)**: Federal funding program for roadway safety improvements.
- **LOS (Level of Service)**: Qualitative measure (A through F) describing traffic operating conditions, with A representing free-flow conditions and F representing congested conditions.
- **LPI (Leading Pedestrian Interval)**: Pedestrian signal timing that gives

pedestrians a head start (typically 3-7 seconds) before vehicles receive a green light.

- **LRSP (Local Road Safety Plan)**: A data-driven plan that identifies and analyzes safety problems on local roads and proposes specific countermeasures to reduce collisions.
- **LTS (Level of Traffic Stress)**: A method for classifying roadways based on the level of stress and discomfort cyclists are likely to experience, helping to plan all-ages-and-abilities bicycle networks.
- **NACTO (National Association of City Transportation Officials)**: An influential organization that develops and promotes best-practice design guidance for urban streets, often cited in modern transportation planning.
- **Near-side stop**: Transit stop located before an intersection (on the near side relative to direction of travel).
- **PDA (Priority Development Area)**: Regional designation for areas planned for concentrated development and transit-oriented growth.
- **PLTS (Pedestrian Level of Traffic Stress)**: A method for assessing the comfort and safety experienced by pedestrians on roadway segments and at crossings, similar to LTS for cyclists.
- **Queue jump**: A transit priority treatment allowing buses to bypass vehicle queues at intersections using a short lane and special signal phase.
- **RHNA (Regional Housing Needs Allocation)**: State-mandated housing production target assigned to each jurisdiction (San Rafael: 3,220 units for 2023-2031).
- **RRFB (Rectangular Rapid Flashing Beacon)**: High-intensity LED warning lights that flash in a rapid pattern when activated by pedestrians at crosswalks.
- **SB 9**: California state law allowing ministerial lot splits and duplexes on single-family parcels.
- **SMART Pathway**: The SMART off-street shared use path.
- **TOD (Transit-Oriented Development)**: A type of development that maximizes the amount of residential, business, and leisure space within walking distance of public transport.
- **TNC (Transportation Network Company)**: App-based ride-hailing services such as Uber and Lyft that connect passengers with drivers through digital platforms.
- **TPA (Transit Priority Area)**: Area within one-half mile of a major transit stop, qualifying for streamlined development review under SB 743.
- **TSP (Transit Signal Priority)**: A traffic signal system that gives priority to transit vehicles by extending green lights or providing early green phases when a bus is detected.
- **TTI (Travel Time Index)**: A measure of traffic congestion, calculated as the ratio of the peak period travel time to the travel time in uncongested, free-flow conditions. A TTI of 1.30 means a trip takes 30% longer during the peak.
- **VHD (Vehicle Hours of Delay)**: The total amount of extra time vehicles spend in

traffic compared to what would be experienced in uncongested conditions. It's a key metric for quantifying the impact of congestion.

- **Vision Zero**: A strategy to eliminate all traffic fatalities and severe injuries, while increasing safe, healthy, and equitable mobility for all. It is the guiding principle for the city's safety initiatives.
- **VMT (Vehicle Miles Traveled)**: Total miles traveled by all vehicles, used for transportation planning and environmental analysis.

IMPORTANT NOTICE

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EXECUTIVE SUMMARY

The 1.05-mile Lincoln Avenue corridor plays a vital role in San Rafael, serving as a critical neighborhood artery for over 3,600 residents. The corridor supports diverse functions, simultaneously acting as a local connector, a key transit route, and an alternate relief route for the nearby U.S. 101 freeway. This report outlines targeted strategies to address existing safety, mobility, and livability challenges. These proposals align closely with San Rafael's established goals for Vision Zero, climate action, and housing production.

KEY FINDINGS

SAFETY FINDINGS

The corridor has a documented history of safety challenges, with **48 injury crashes** recorded between January 2022 and March 2025. These incidents disproportionately affect vulnerable road users; **23 percent** involved pedestrians and bicyclists. Current infrastructure conditions create elevated Pedestrian Level of Traffic Stress (PLTS) ratings at crossings and Cycling Level of Traffic Stress (LTS) throughout the corridor, falling short of established standards for all-ages-and-abilities accessibility.

RECURRING CONGESTION AND SMART PATHWAY ACCESS

Serving approximately **17,000 vehicles daily**, the corridor experiences peak-period congestion, with operations degrading to **Level of Service C** in key segments. This traffic directly delays bus service, a key mode on the corridor. While the adjacent SMART Pathway offers a low-stress cycling alternative, its effectiveness is currently undermined by indirect and cumbersome access points from Lincoln Avenue.

CONSTRAINED HOUSING AND LIVABILITY

Lincoln Avenue's community predominantly consists of renter households facing higher-than-average affordability challenges relative to the rest of the city. Yet, existing zoning regulations, lot layouts, and physical constraints significantly limit housing growth. Recent residential development has been minimal, primarily driven by Accessory Dwelling Units (ADUs) and publicly subsidized preservation efforts rather than new multifamily housing construction.

IMPLEMENTATION STRATEGY: KEY TREATMENTS

This study proposes a multi-layered strategy that coordinates infrastructure investment with forward-looking policy to improve safety and access along the corridor.

- **Infrastructure Actions: Prioritize Safety and Walkability.** The core of the strategy is to implement a systemic program of FHWA-proven safety countermeasures at every key pedestrian crossing. This includes deploying Rectangular Rapid Flashing Beacons (RRFBs), curb extensions to shorten crossing distances, and Leading Pedestrian Intervals (LPIs) at signals.
- **Connectivity Actions: Strengthen Bicycle and Transit Networks.** The study proposes shifting the primary cycling route away from Lincoln Avenue, instead enhancing direct, secure, and convenient access points to the adjacent SMART Pathway, establishing it as the corridor's principal bikeway. For transit, cost-effective enhancements such as implementing Transit Signal Priority (TSP) at four key intersections and strategically optimizing bus-stop placement will boost transit reliability and travel speed.
- **Policy Actions: Enable Smart Growth and Livability.** Addressing housing and livability constraints requires policy interventions aimed at reducing regulatory barriers. Proposed actions include adopting a Transit-Oriented Development (TOD) zoning overlay along the corridor's southern segment, eliminating parking minimum requirements for new developments while implementing demand-based parking pricing to optimize curb space utilization, and streamlining and assisting SB9 development processes to encourage more gradual, incremental housing growth.

IMPLEMENTATION AND PATH FORWARD

This strategy is designed for practical, phased implementation. An opportunity exists to **integrate these treatments with currently funded and planned capital projects.** By coordinating with the City's existing **Highway Safety Improvement Program (HSIP)** grant work, San Rafael can coordinate investments and deliver comprehensive improvements efficiently. This report provides a phased approach to improve safety and access on Lincoln Avenue, supporting reliable transit and active travel while better serving the needs of the San Rafael community.