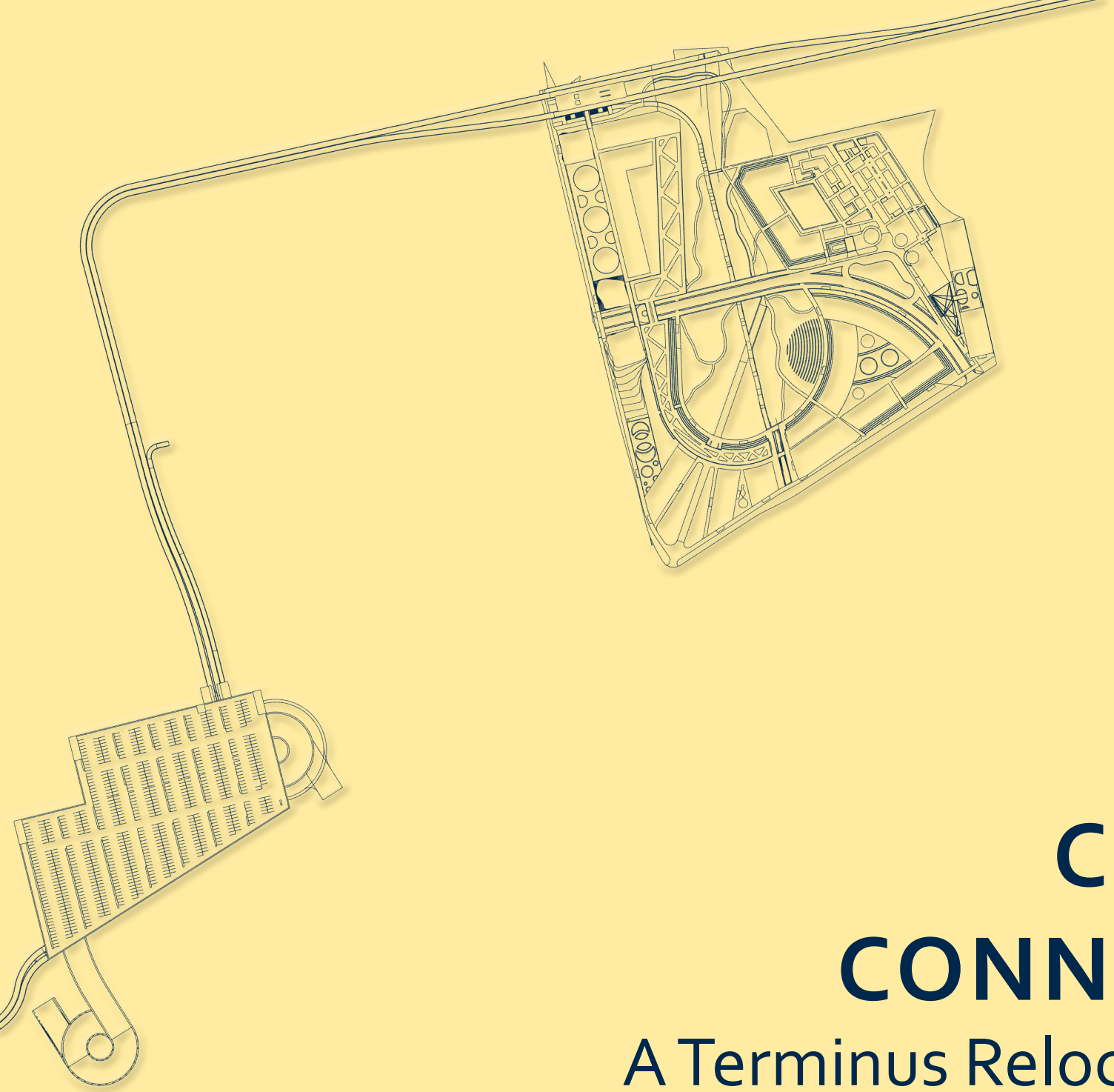


CREATING CONNECTIONS:

A Terminus Relocation Proposal

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2025 Master of Urban & Regional Planning Capstone

Goal

Resolve conflict points between the existing University of Michigan proposal for the northeastern terminus of the Campus Connector and growing community around the Plymouth & Green TC1 zone.

Objectives

- Identify locations and routings for an alternative terminus
- Develop alternative plans for the University site at Plymouth & Green

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Glossary of Acronyms

AAATA:	Ann Arbor Area Transit Authority
ATS:	Automated Transit System
BRT:	Bus Rapid Transit
CLT:	Community Land Trusts
LODES:	LEHD Origin-Destination Employment Statistics
LRT:	Light Rail Transit
MDOT:	Michigan Department of Transportation
TC1:	Transit Corridor 1
U-M:	University of Michigan

EXECUTIVE SUMMARY

Background & Context

History and Evolution of the Connector

Over the last century, the University of Michigan's (U-M) campus has expanded considerably, including the construction of multiple new campus centers separate from the historic central campus, creating growing mobility challenges between the increasingly distant academic and medical hubs. Recognizing the inherent challenges posed by this horizontal growth, historic and modern planning documents have consistently emphasized the need for stronger intercampus transit, the Campus Connector proposal being a logical constitution of this focus. Although initially conceptualized as a city-university partnership as the Ann Arbor Connector, by 2016 the connector project had become a U-M led initiative, with various transit modes including Bus Rapid Transit (BRT) and Light Rail Transit (LRT) considered by The University, before selecting to move forward on the project using Automated Transit System (ATS) technology. The working proposal calls for six stations over a 3.5 mile route. In addition to providing an alternative to the significant congestion plaguing the U-M bus system, the Connector supports regional integration and sustainability goals, allows for campus growth even with constrained space for parking, and is projected to accommodate up to 5,500 peak-hour riders.

Background of the Site & Surrounding Area

The area currently slated to be developed as the Campus Connector's eastern terminus has been significantly transformed over the past century. Originally an agricultural area on the outskirts of Ann Arbor, it now hosts widespread suburban development, including both residential neighborhoods and multiple commercial shopping malls. Amidst this growth, Plymouth road has emerged as an important transit arterial for a growing Ann Arbor. In 2021, the City of Ann Arbor introduced Transit Corridor 1 (TC1) zoning to promote compact, mixed-use, transit-oriented development along major transit corridors, with many parcels in Northeast Ann Arbor adjacent to Plymouth Road rezoned to TC1 as part of this initiative. These standards encourage higher density, reduced parking, pedestrian-friendly streetscapes, and integrated building placement in keeping with the zoning district's emphasis on walkability, green infrastructure and access to multi-modal transit.

Analysis of Current Proposed Terminus at Plymouth & Green

Commuter and Traffic Flow Impact

The University's existing proposal for the ATS terminus is located at the southwest corner of the Plymouth-Green intersection in northeast Ann Arbor. This intersection is located approximately one third of a mile away from the Plymouth and US-23 interchange, both of which deal with heavy amounts of vehicular traffic moving into and out of Ann Arbor with peoples' daily commutes. The potential for an ATS terminus and accompanying 4,000 spot garage at this intersection would stress both roadways, with the left turn lane from Plymouth to Green alone expected to facilitate the arrival of most of these 4,000 vehicles in a two-to-three hour period. In addition, private car throughput along this corridor may be further constrained by the City of Ann Arbor's ongoing efforts to reduce traffic-related injuries and prioritize the reconfiguration of arterials such as Plymouth Road.

Given the number of shopping destinations between the proposed terminus and the US-23 interchange, along with several residential neighborhoods to the north and south of the Plymouth-Green intersection, the influx of vehicles from this terminus would not only heavily increase traffic congestion, but put pedestrians at higher risk and interfere with bus service such as the Ride, operated by the Ann Arbor Area Transit Authority (AAATA) and the U-M Blue Buses.

Carbon Emissions and Environmental Impact

Though the ATS system would ideally limit the amount of driving done for commuters traveling to and from of the University's campuses and Michigan Medicine, the flow of vehicles to Plymouth & Green would lead to widespread stop-and-go traffic with heavy amounts of idling, exacerbating emissions on that stretch of roadway as commuters wait to enter and exit the garage. This goes against the University's intended climate goals, making vehicle dependance to access the terminus from the Plymouth and US-23 interchange an unfortunate necessity.

Land Use and Urban Planning Compatibility

Flows of cars from US-23 and westbound Plymouth Road in the morning and to US-23 and eastbound Plymouth in the afternoon make this entire area a transit corridor, leading to its designation as a TC1 district. The designation recognized the city's housing shortage and AAATA's desire to establish high-capacity bus service along Plymouth Rd. The ATS terminus, while not subject to the requirements of the TC1 district, has the potential to heavily interfere with the corridor and prevent further growth and enhanced connectivity, especially for surrounding neighborhoods. The terminus and garage are ultimately incompatible with surrounding land uses, and would serve to degrade the area's cohesion. The University could voluntarily adopt TC1 standards for this site to better align with surrounding land use goals.

Economic Feasibility

Though the site's undeveloped nature allows for construction to begin at any given time, its use for the terminus and garage prevents its development for other purposes, including commercial and residential units among other potential University projects. This loss of potential not only harms the University, but once again impacts surrounding areas and their own investment potential, breaking continuity that could otherwise be wisely maintained by the University.

Alternative Terminus Site Options & Analysis

With the Plymouth-Green intersection entailing disadvantages ATS terminus and garage, this report presents several alternative sites in the area surrounding the Plymouth and US-23 interchange with a focus on minimizing driving distances from US-23, while simultaneously limiting ATS track extensions to control costs.

Plymouth Park & Ride Alternative:

Utilizing the existing Park & Ride parking lot within the southwestern cloverleaf of the interchange, this alternative would be located within Michigan Department of Transportation's (MDOT) right-of-way. This would seamlessly integrate with commuters using both US-23 and Plymouth Rd., along with hosting AAATA and U-M Blue Bus services. An initial garage would support 3,000 parking spaces, with an additional garage option in the northwestern cloverleaf able to accommodate another 1,000 spaces, making this a more flexible and cheaper investment than building all 4,000 spaces at once.

US-23 Air Rights Alternative:

A derivative of the Plymouth Park & Ride scenario, the air rights scenario constructs the parking garage across both sides of US-23 This entails an elevated structure of approximately 4,000 spaces traversing the highway, while allowing for both northbound and southbound US-23 traffic access. It would establish direct ramp-to-garage access from north and southbound US-23, and in spanning both directions gives a second use to otherwise restricted right-of-way.

Earhart Road Alternative:

The terminus could also be sited on U-M-owned land east of US-23, which has the advantage of being less dependent on MDOT approval while providing the easiest alignment for future extensions to the East Medical Campus. This alternative would remove related congestion from the interchange and the TC1 corridor.

The alternative Campus Connector terminus scenarios are more expensive than the University's current proposal, with an estimated cost increase ranging from 5-19% compared to the original site depending on the alternative. The additional costs associated with the alternative options stem from the capital costs of additional elevated guideway construction and potential land acquisition costs. However, the sustainability benefits of shifting the terminus to be more aligned with public transit options aligns with the sustainability goals of both the city of Ann Arbor and U-M. Construction of alternative options located at the Plymouth Park & Ride would be contingent on MDOT approval, which remains uncertain until formal proposals are submitted. Additionally, relocation to any alternative site will require easements to allow for the Campus Connector track to cross private properties, of which all the alternatives will need.

Alternative Use for Plymouth & Green Site

As the fourth-largest vacant land parcel in the City of Ann Arbor, the site at Plymouth & Green offers numerous opportunities for development if the terminus site is moved elsewhere. The suitability of this site to development is highlighted by its proximity to campus and public transportation options, showcasing the potential of residential development on this site to shorten commutes into Ann Arbor, where a combination of high demand and restrictive zoning laws have resulted in high housing costs. These high housing costs have had an especially pronounced impact on lower income university employees, but also on faculty and higher paid staff as well, in both cases making recruitment and retention of talent more difficult for U-M, a problem which alternative uses of the site at Plymouth & Green can help alleviate.

Ideally, the alternative development of the Plymouth and Green site should align with TC1 zoning in the form of mid-rise, mixed-use development relying on vertical density and open space. The Plymouth and Green site would allow for an estimated 2,500–3,000 units (studio to 2-bedroom) averaging 850 sq. ft. The team developed options that limited parking ratios, and (for cost considerations) emphasized structured over underground parking. Design priorities for the site could include large green spaces and ground-floor retail for placemaking, transit integration with University and City bus systems, and support for e-bikes and e-scooters to align with carbon neutrality goals.

Our potential design concept is highlighted by the following attributes:

- 2.3 million ft² residential (2,700 units at an average of roughly 850 ft²)
- 200,000 ft² retail
- 300,000 ft² structured parking (1,800 spaces across 5 garages)
- 7-acre interior public park

Such capacity illustrates the high potential for a dense, mixed-use development on the site. Compared to the University's current plans for a garage structure in the same location, this concept better aligns with future mixed-use development goals for the surrounding TC1 corridor.

Conclusion & Recommended Next Steps

Our analysis shows that siting the Campus Connector's northeastern terminus at Plymouth and Green would negatively impact the surrounding community in several regards, including severe congestion during rush hour traffic and decreased walkability in an area the city of Ann Arbor has designated for future mixed use development

Given the early stage of development, U-M has the opportunity to re-evaluate the location of the terminus before a significant amount of effort has been put forth. Our team's primary proposal is twofold:

1. Locate the northeastern terminus of the Campus Connector at the US-23 Park & Ride, within the highway cloverleafs, to improve ease of access for commuters, regional transit connectivity, and future opportunities for expansion.

   Weigh the additional benefits of the Air Rights alternative (primarily improved US-23 access) against its increased cost.

2. Keep the proposed Green Rd. ATS terminus as an intermediate station, and develop the Plymouth & Green site as a high density, mixed-use faculty/staff housing community.

We additionally suggest the University incorporates evaluation of alternative sites into the ongoing development and stakeholder engagement process.

BACKGROUND & CONTEXT

History and Evolution of the Connector

Early History

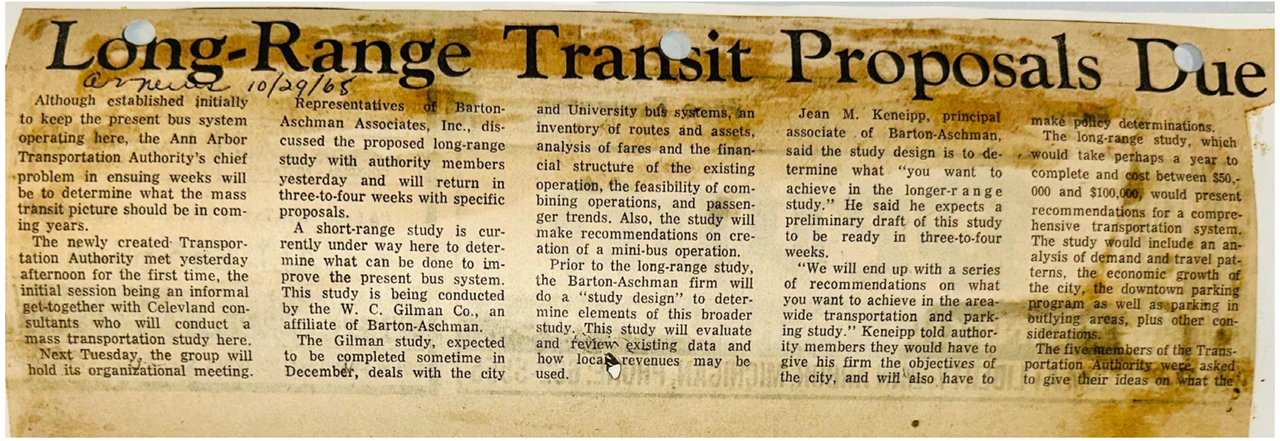
The University of Michigan's (U-M) growth during nearly two centuries has resulted in the development of a multi-campus system, each phase dictated by increasing enrollment, shifting academic requirements, and the needs for geographically concentrated research and medical facilities. This growth has also introduced significant mobility challenges, as students, faculty, and staff had to navigate larger distances between university districts.

Central Campus, the initial core of the university, expanded significantly in the 19th and early 20th centuries, encroaching on land east and south of the Diag to accommodate new academic buildings, libraries, and student facilities. By the 1890s, medical space requirements led to the development of the Medical Campus, and the initial hospital buildings were constructed on Catherine Street in 1891.[1] With the growth of the university's medical programs, the campus expanded into the Ingalls District and the Wall Street District. Ingalls District, north of Central Campus, then became an interface area between educational and medical purposes, with room for administrative space, outpatient clinics, and the School of Nursing. The Wall Street District, to the north of the Huron River, was purchased by U-M progressively from the 1980s onward to accommodate room for Michigan Medicine's expanding research and healthcare facilities.[2] This area also accommodated structures such as the Kellogg Eye Center and Brehm Tower, serving as an extension of the core Medical Campus.

By the 1920s–40s, continued expansion further solidified the growing separation of Central and Medical Campuses, and in 1986, the new University Hospital construction made travel connections between these regions even more imperative. With room on Central Campus further constrained, U-M acquired over 800 acres north of the Huron River in the 1950s, and North Campus was formed.[3] The first buildings were constructed in 1953, and during the 1960s–1980s, North Campus contained Michigan Engineering, the School of Music, and the College of Architecture and Urban Planning. Physical separation from Central Campus, however, brought severe connectivity issues, with students and faculty relying on personal automobiles or Ann Arbor's public transit network. In response, U-M introduced its first dedicated campus bus system in 1946, which provided essential connections, but was not designed for long-term expansion.

At the time, the Ann Arbor Area Transportation Authority (AAATA) did not yet exist, necessitating a separate transit system to serve the university's expanding campuses (Figure 1). When AAATA was founded in 1965, Ann Arbor's long-range transit planning program began to take shape, aiming to create a coordinated city-wide mass transit system.[5] AAATA started considering existing transit routes, fares, and whether additional rapid transit means could be added to improve connectivity. The planning process highlighted the necessity of combining distinct transit systems into a unified and multimodal network, a topic that continues to be pivotal in current transit debates. Additionally, initiatives were being taken to obtain state and federal grants for transit enhancements, including plans to expand services beyond city boundaries to areas such as Pittsfield Township.[6]

In the 1990s, continued medical expansion required additional space, and in 1993-94, 390 acres in Ann Arbor Township were purchased for the East Medical Campus.[7] Of that, 200 acres were designated for outpatient and specialty care structures, helping to reduce traffic at the main Medical Campus. The building of this campus also expanded the distance between the major university districts further, necessitating easier intercampus travel. By the early 2000s, U-M's research activity increased significantly, leading to the 2009 acquisition of the erstwhile Pfizer research complex.[8] The acquisition added 174 acres and 28 buildings to North Campus, forming the North Campus Research Complex. Previously U-M property prior to being sold off to Parke-Davis and later Pfizer, the re-acquired land made North Campus a leading research center that increased the overall number of professors and researchers commuting between the North Campus and the Medical Campus. The addition of North Campus Research Complex, combined with the continuous growth of Michigan Medicine and the expansion of East Medical Campus, placed even greater strain on the university's transit infrastructure.



Long-Range Transit Proposals Due

Arnett 10/29/65

Although established initially to keep the present bus system operating here, the Ann Arbor Transportation Authority's chief problem in ensuing weeks will be to determine what the mass transit picture should be in coming years.

The newly created Transportation Authority met yesterday afternoon for the first time, the initial session being an informal get-together with Celevland consultants who will conduct a mass transportation study here.

Next Tuesday, the group will hold its organizational meeting.

Representatives of Barton-Aschman Associates, Inc., discussed the proposed long-range study with authority members yesterday and will return in three-to-four weeks with specific proposals.

A short-range study is currently under way here to determine what can be done to improve the present bus system. This study is being conducted by the W. C. Gilman Co., an affiliate of Barton-Aschman.

The Gilman study, expected to be completed sometime in December, deals with the city and University bus systems, an inventory of routes and assets, analysis of fares and the financial structure of the existing operation, the feasibility of combining operations, and passenger trends. Also, the study will make recommendations on creation of a mini-bus operation.

Prior to the long-range study, the Barton-Aschman firm will do a "study design" to determine elements of this broader study. This study will evaluate and review existing data and how local revenues may be used.

Jean M. Keneipp, principal associate of Barton-Aschman, said the study design is to determine what "you want to achieve in the longer-range study." He said he expects a preliminary draft of this study to be ready in three-to-four weeks.

"We will end up with a series of recommendations on what you want to achieve in the area-wide transportation and parking study." Keneipp told authority members they would have to give his firm the objectives of the city, and will also have to make policy determinations.

The long-range study, which would take perhaps a year to complete and cost between $50,000 and $100,000, would present recommendations for a comprehensive transportation system. The study would include an analysis of demand and travel patterns, the economic growth of the city, the downtown parking program as well as parking in outlying areas, plus other considerations.

The five members of the Transportation Authority were asked to give their ideas on what the

Figure 1: Article on need for long-term transit planning in Ann Arbor from 1965[4]

1 University of Michigan, Campus Plan 2050: Blueprint for Our Future (Ann Arbor, MI: University of Michigan, 2024), 138.
2 Campus Plan 2050 (2024), 138.
3 Campus Plan 2050 (2024), 182.
4 Peter A. Ostafin, *Buses, 1969–1972*, in Peter A. Ostafin Papers, 1939–1982, Transportation Series, Box 5, Bentley Historical Library, University of Michigan.
5 Ostafin, *Buses*, 1969–1972
6 Campus Plan 2050 (2024), 174.
7 Campus Plan 2050 (2024), 182
8 University of Michigan Architecture, Engineering and Construction, "Campus Planning," accessed March 11, 2025, https://umaec.umich.edu/campus-planning/.

Identifying the Need for Expansion

The existing U-M bus system has long served as the primary mode of intercampus travel, connecting Central, North, and Medical campuses. However, the bus system's shortcomings —such as crowding, long commutes, and traffic delays — became more noticeable as university populations increased and traffic congestion worsened. After realizing these difficulties, the university started looking into more scalable and effective transportation options, which resulted in decades of planning and the creation of the U-M Campus Connector Project. Johnson, Johnson, and Roy presented a framework for campus circulation and stressed the significance of strengthening ties between campuses in their 1963 Central Campus Plan, which was the first official attempt to address campus mobility.[9] This was followed by the 1984 North Campus Planning Study, which highlighted the growing disconnect between Central and North Campuses and the need for a stronger, more reliable transit link. As North Campus became a major academic and research hub, the necessity for efficient intercampus transit became even more urgent. In 1997, the planning firm Venturi, Scott Brown and Associates conducted a broad master planning study focused on all U-M Ann Arbor campuses.[10] Their strategy placed a strong emphasis on the value of a flexible, ongoing planning process that can be adjusted to meet changing demands over time. The study's 1998 Overview Report highlighted the university's increasing mobility issues and offered suggestions for ways to increase connectivity.[11] Although overall campus planning was the primary concern of the report, it reiterated the necessity of integrating future transit solutions that could potentially connect the university's primary research and academic hubs.

The 2005 Medical Campus Master Plan Update further advanced the conversation on campus mobility, particularly in addressing the complex needs of Michigan Medicine. The plan put high emphasis on the dependable transit connections between the East Medical Campus, Medical Center, and other U-M destinations. It envisioned a system of transit hubs to serve the growing medical complex, with two large terminals in the Medical Center core and a third transit hub in the Wall Street district.[12] The transit hubs were located where transfers between local and campus-wide transit systems would be convenient and easy and would include sheltered waiting spaces, bicycle facilities, and real-time transit signs to further enhance user convenience and safety. The Wall Street district, identified as a future hub for ambulatory care and research, was envisioned as a key node within this transit network, with the dedicated transit center strengthening connections between Wall Street, the Medical Center, and surrounding neighborhoods.

The 2008 North Campus Master Plan Update also continued to push for high-capacity, sustainable transit solutions. As North Campus emerged as a growing hub of engineering, arts, and research, the need for greater transit connectivity became even more pressing. The plan called for the establishment of a high-capacity transit corridor on Fuller Road, Murfin Avenue, and Bonisteel Boulevard connecting Central Campus, the Medical Center, and North Campus, with a potential future extension to the East Medical Campus via Plymouth Road.[13] The corridor was designed both to improve existing bus operations and to reserve space for potential future transit modes that would be capable of meeting growing ridership demands. As part of this vision, the plan proposed the development of key transit facilities throughout North Campus. A primary transit hub near Pierpont Commons was envisioned as the central gateway to North Campus, serving as the main entry and exit point for students, faculty, and staff. To further support growing campus needs, a future transit center was planned along Murfin Avenue near the North Campus Recreation Building. The proposal also envisioned improved bus stops at major locations such as Bursley Hall, Beal Avenue, and the Hayward Street parking ramp to enhance accessibility and customer experience.[14] The planned facilities were aimed at reducing reliance on private automobiles, facilitating campus traffic, and delivering an improved and more effective transit system.

9 "Campus Planning," accessed March 11, 2025.
10 Venturi, Scott Brown and Associates, Inc., The University of Michigan Campus Plan: Phase 1 Overview (Ann Arbor, MI: University of Michigan, 1998), 82-84.
11 University of Michigan, Medical Center Campus and East Medical Campus Master Plan Update (Ann Arbor, MI: University of Michigan, 2005),16-21.
12 University of Michigan, North Campus Master Plan Update (Ann Arbor, MI: University of Michigan, 2008), 16.
13 North Campus Master Plan Update (2008), 56.
14 City of Ann Arbor et al., Ann Arbor Connector Feasibility Study: City Council Presentation (Ann Arbor, MI, October 10, 2011), slide 3.

Building on these foundational plans, the Ann Arbor Connector Study was launched in the early 2010s as a collaboration between the University of Michigan, the City of Ann Arbor, the Ann Arbor Downtown Development Authority, and AAATA.[15] The study explored various high-capacity public transit options such as light rail, streetcars, and Bus Rapid Transit (BRT) as alternatives to meet increasing ridership demands and projected growth estimates. The 2011 Feasibility Study identified main corridors of highest potential ridership and considered several options for routes before developing an integrated route linking the East Medical Campus, North Campus, the Medical Center, and Central Campus before traversing downtown Ann Arbor and terminating at Briarwood Mall.[16] This alignment was chosen for its ability to connect the university's highest-density areas while also integrating with key commercial centers and existing city transit networks. Alternative routes were considered, including options that focused more narrowly on the Central-North Campus corridor, but the comprehensive East-to-South alignment was ultimately favored for its broader long-term benefits and potential for future regional transit integration.

A significant shift in project leadership occurred in 2016, when the University of Michigan took direct control of the Connector project, transitioning from a city-university partnership to a university-led initiative. This allowed the university to focus more directly on its specific campus mobility needs and conduct in-depth analyses of route alignments, environmental impacts, and community engagement strategies. Earlier planning documents, such as the Ann Arbor in Motion report completed in 2016 as part of an independent study at U-M, explored multiple alignments and potential phasing strategies, including an extension to Briarwood Mall and downtown Ann Arbor.[17]

As part of the feasibility study, the project evaluated BRT and Light Rail Transit (LRT) as potential technologies for the Connector.[18] While BRT is less expensive in terms of capital and offers greater flexibility, it remains partially constrained by roadway congestion and requires periodic fleet replacement and infrastructure maintenance. LRT, by contrast, provides higher passenger capacity, improved operational efficiency, and longer infrastructure lifespan, with rail systems lasting over 100 years with proper maintenance, compared to the limited lifespan of dedicated busways.[19] LRT also provides improved operational speeds (50-65 mph compared to 35-40 mph for BRT) and improved acceleration and deceleration, leading to reduced travel times and improved service reliability.[20] These advantages positioned LRT as the preferred long-term solution, though final mode selection remained contingent on cost evaluations, environmental considerations, and funding availability.

Current Status

As the project progressed, the proposed route and transit mode underwent further refinement. By 2024, the latest Request for Qualifications (RFQ) for the Campus Connector project outlined a more focused, high-capacity Automated Transit System (ATS) with a dedicated corridor between North Campus, Central Campus, and the Medical Center, prioritizing university-specific mobility needs over commercial areas.[21] The updated proposal defines a 3.5-mile route with six strategically placed stations at Central Campus Transit Center, the Medical Campus, Pierpont Commons, Hubbard/Murfin, the North Campus Research Complex, and Green Road. The system is designed as an elevated dual-lane automated transit system, operating at peak frequencies as often as every three minutes to meet high demand. Initial ridership projections estimate a peak of 4,000 passengers per hour per direction (pphpd) within the first ten years, with potential future expansion

15 City of Ann Arbor et al., Ann Arbor Connector Feasibility Study (2011), slide 8.
16 Jordan Solano-Reed, Ann Arbor in Motion: The Campus Connector (Ann Arbor, MI: University of Michigan, 2016), 7.
17 Case studies on University-Municipality collaboration for transit projects can be found in Appendix D.
18 Jordan Solano-Reed, Ann Arbor in Motion (2016), 14.
19 Jordan Solano-Reed, Ann Arbor in Motion (2016), 13.
20 University of Michigan, Campus Connector Project: Request for Qualifications (RFQ-0010396-UMPS-2023-CE/SE), Version 1 (Ann Arbor, MI: University of Michigan, 2024), 5.
21 Campus Connector Project RFQ (2024), 6.

reaching 5,500 pphpd as the system integrates with broader regional transit networks.[22]

In early 2025, the university issued a formal Request for Proposals (RFP) to identify delivery patterns for the ATS component. However, the project remains in the early planning phase. A finalized route has not yet been selected and will require approval from the Board of Regents. Completion is likely several years away, with a route decision expected no earlier than 2026.[23] While the 2024 RFQ established a working proposal, the university continues to elevate equipment, route alignments, and community feedback as part of its long-range planning process.

The Campus Connector's path along arterial travel corridors, such as Plymouth Road near the US-23 interchange, can also position it to be a part of regional transit networks, providing the possibility of linking the surrounding communities such as Ypsilanti, Brighton, and other parts of Washtenaw County and southeast Michigan. By offering a fast and reliable alternative to personal vehicles, the Campus Connector can provide an alternative to traffic congestion within Ann Arbor and promote broader sustainability goals by lowering carbon emissions and supporting the city's long-term transit strategies.

Background of the Site & Surrounding Area

The intersection of Green Road and Plymouth Road and the Plymouth Park & Ride have evolved alongside the City–originally rural, but since urbanized due to suburbanization, transportation growth, and shifts in economic activity. This section follows the evolution of this project's study area in northeast Ann Arbor.

Early Settlement & Agricultural Origins

The northeastern part of Ann Arbor, where Plymouth and Green Roads intersect, remained largely agricultural throughout the 19th and early 20th centuries. Farms, orchards, and small homesteads characterized the landscape, with limited development due to its distance from the city center. Ann Arbor's growth gradually shaped the area, but until the mid-20th century, it remained largely untouched by urbanization. Notable agricultural estates in the broader vicinity included areas around Geddes Road, Nixon Road, and Earhart Road, which housed early farmsteads and small mills along the Huron River.

Some of the early settlements near this area were associated with the farming community surrounding Dixboro, a small village founded in the 1820s about three miles northeast of the intersection. The Dixboro General Store (established in 1840) and Dixboro United Methodist Church (1858) are among the oldest landmarks reflecting the region's history before suburban expansion. Plymouth Road itself originated as a segment of the Detroit, Plymouth, and Ann Arbor Turnpike, a plank road constructed in the mid-19th century to facilitate transportation between these key cities.[24][25] Farmers used this road to transport goods such as grains and dairy to Ann Arbor's growing market. Nearby Geddes Road, Nixon Road, and Earhart Road housed prominent agricultural estates and small mills along the Huron River, supporting early economic activity.

Suburbanization & Residential Growth

Suburbanization transformed the post-World War II period. As housing demand increased, developers took over farmland to build single-family residences, apartment buildings, and commercial sites. During the 1950s and 1960s, subdivisions such as Orchard Hills, Traver Lakes, and Green Brier were developed, catering to professionals and faculty from the University of Michigan. One of the earliest commercial developments was Plymouth Mall (built in the 1960s), one of the first suburban shopping centers in this corridor. It housed a variety of retailers, including grocery stores and service businesses that signaled the shift from a rural to a suburban landscape. By the 1970s and 1980s, additional residential developments arose around

22 University of Michigan, "Automated Transit System," *Campus Plan 2050 Updates*, last modified March 28, 2025, https://campusplan2050.umich.edu/updates/automated-transit-system/.

23 Peter A. Ostafin, *Buses, 1969–1972*

24 Ann Arbor District Library. *Map of Ann Arbor and Vicinity*. Accessed March 23, 2025. https://aadl.org/sites/default/files/photos/mapo01.gif.

25 Washtenaw County Historical Society. "Impressions." *Impressions*, vol. 22, no. 1, 1986, p. 3. https://www.washtenawhistory.org/_files/ugd/708faa_d21c3d58f7834b3b962644f95f2c740e.pdf

Green Road, including the Glacier Highlands and Thurston neighborhoods, which were established to accommodate a growing middle-class population.

Commercial Expansion & the Role of Busch's Fresh Food Market

A defining moment in the area's commercial growth was the establishment of Busch's Fresh Food Market in 1975.[26] Founded by Joe Busch and Charlie Mattis, Busch's evolved from a small-town grocer into a major regional chain. The store became an anchor for local retail, spurring further commercial development along Plymouth Road. Over the following decades, the area attracted restaurants, office spaces, medical centers, and service-oriented businesses, cementing its role as a commercial hub. Other key commercial developments include:

- Traver Village Shopping Center (1984) – This retail center became home to popular chains like Kroger, Rite Aid, and various restaurants, serving as a shopping destination for surrounding residential communities.
- Arbor Hills Office Park (1990s-2000s) – A major commercial development featuring corporate offices, banks, and healthcare facilities.
- Glacier Hills Senior Living Community – Established near Earhart Road, this retirement community contributed to the mix of uses in the region.

Today, Plymouth Road is home to an array of businesses, from local establishments such as Cardamom Indian Restaurant and Sweetwaters Coffee & Tea to national chains like Starbucks and Panera Bread.

Infrastructure & Transportation Development

The rapid growth in residential and commercial activity led to significant transportation upgrades. Plymouth Road, originally a two-lane rural route, underwent multiple expansions to handle increasing vehicle traffic.[27]

The intersection at Green Road became a major access point for both local commuters and university traffic, prompting the addition of traffic signals, turn lanes, and pedestrian infrastructure (1970s-1980s). Public transportation also changed, with AAATA bus routes reaching out to this burgeoning corridor and integrating it into Ann Arbor's transit system (1990s-present).

Broader Historical Context & Urban Planning Developments

The transformation of northeastern Ann Arbor follows a broader trend of rural-to-suburban development seen in many growing cities. What began as farmland and scattered settlements evolved into a structured suburban environment, driven by economic expansion and improved transportation infrastructure.

Recent efforts to enhance Ann Arbor's transit network and land use planning continue to shape the region. The first key initiative is the US-23 Improvement Study conducted by the Michigan Department of Transportation (MDOT), a long-term project focused on traffic management and safety enhancements along the corridor.[28] The study includes consideration of improvements to accommodate public transit on US-23, making it imperative that the Campus Connector address those plans. The second is rezoning for high-density development, as the City of Ann Arbor has adjusted its zoning policies to promote mixed-use, transit-oriented growth along key corridors like Plymouth Road.

Transit Corridor 1 Zoning

As U-M property, the site at Plymouth & Green is not subject to city zoning.[29] The University can nevertheless be guided, on a voluntary basis, by zoning principles that will align development on the site with the

26 AnnArbor.com, "Busch's Fresh Food Market Celebrates 35 Years in an Ever-Changing Market," *AnnArbor.com*, September 22, 2010. https://www.annarbor.com/business-review/buschs-fresh-food-market-celebrates-35-years-in-an-ever-changing-market/.

27 City of Livonia. *Plymouth Road/Ann Arbor Road Intersection*. Accessed March 23, 2025. https://livonia.gov/265/Plymouth-Road-Ann-Arbor-Road-Intersection

28 Michigan Department of Transportation (MDOT), "US-23 Improvement Project Study – Ann Arbor," *Michigan.gov*, accessed March 23, 2025. https://www.michigan.gov/mdot/projects-studies/studies/traffic-and-environmental-linkages-studies/us-23-improvement-project-study-ann-arbor/.

29 See Appendix G for additional information on local zoning designations.

City's goals for the area, including walkability, transit accessibility, and compact growth. The site's previous designation, as Office/Research/ Limited Industrial zoning, differs significantly from current zoning in its restrictions on residential and mixed-use development. While the Office/ Research/Limited Industrial zoning prioritizes office, research, and industrial uses, current area zoning would allow for a more urban, transit-friendly development that includes faculty and staff housing, along with retail and office space designed to integrate seamlessly with the surrounding community.

Transit Corridor 1 (TC1) zoning was officially approved and effective in July 2021 by the City of Ann Arbor as part of a long-term strategy to promote transit-oriented development along major corridors.[30] The designation was created to align land use with existing transit infrastructure, ensuring that development patterns encourage high-density, mixed-use growth that prioritizes walkability, public transit access, and reduced reliance on personal vehicles. The TC1 zoning district is designed for locations with fixed-route transit service, such as Plymouth Road, and mandates development that is compact, key pedestrian-friendly, and efficiently connected to transit. While minimum parking requirements have been eliminated citywide in Ann Arbor, TC1 goes further by establishing parking maximums to limit excessive vehicle accommodation and support walkable, transit-focused environments. These specific limits are outlined in the table below.

Maximum vehicle parking spaces	Minimum bicycle parking spaces				Minimum EV parking spaces	
	Spaces	Class			Facility standards	
		A[31]	B[32]	C[33]	EV-C[34]	EV-I[35]
Number of spaces per ft²		Percent of spaces provided				
1/333 ft²	1/5,000 ft²	50%	25%	25%	90%	10%

Table 1: Parking Requirements (Special Districts, i.e., TC1)[36]

These parking regulations are intended to support transit ridership, cycling, and pedestrian activity rather than car-dependent development. Additionally, under TC1 zoning, the amount of land used for vehicular use area is capped: for lots less than 250 feet in width, the vehicular use area cannot exceed 100% of the building footprint; for lots 250 feet wide or more, it cannot exceed 125% of the building footprint.[37] If more parking is needed beyond these limits, it must be located in a structure or integrated within the building.

30 City of Ann Arbor, Unified Development Code, 9th ed. (Effective May 26, 2024), 3.

31 Class A - Enclosed Bicycle Parking
32 Class B - Covered Bicycle Parking
33 Class C - Fixed Bicycle Parking
34 EV-C - Electric Vehicle Capable (not active yet, but equipped with electric panels)
35 EV-I - Electric Vehicle Installed
36 Unified Development Code (2024), 96.
37 Unified Development Code (2024), 86.

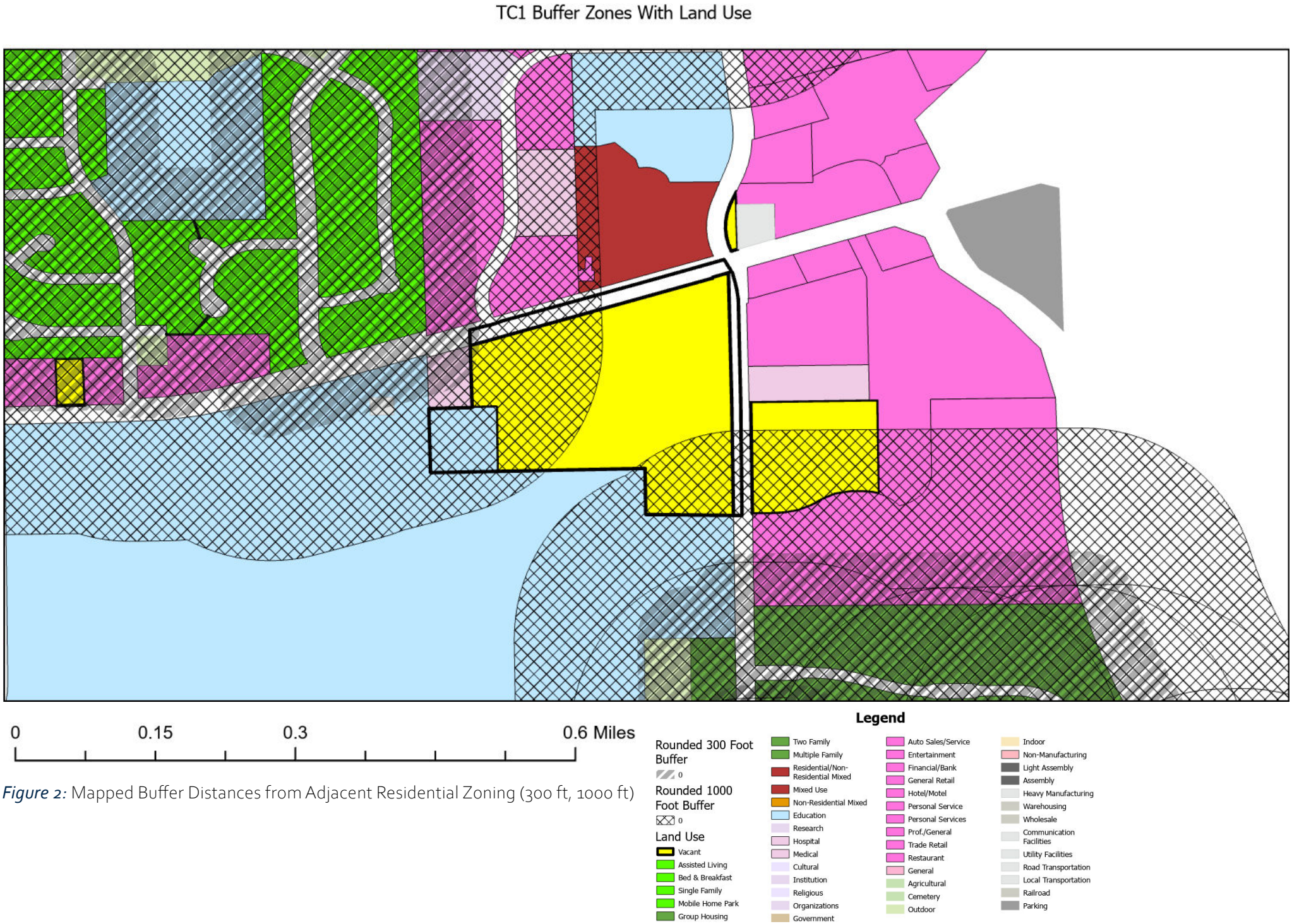


Figure 2: Mapped Buffer Distances from Adjacent Residential Zoning (300 ft, 1000 ft)

To further reflect the goals of TC1 zoning, the development could adhere to specific design requirements that shape building placement, density, parking, and transit integration. Minimum building heights are two stories (second floor being at least 75% of the floor area of the first story), with height variation depending on proximity to residential areas (Table 2). At the Plymouth & Green site, the majority of the parcel lies beyond the 30-foot residential buffer, meaning it can accommodate buildings up to 120 feet in height in the northwestern and southeastern portions, which lie more than 1000 feet away from residential zones, the site could legally support building heights up to 300 feet under TC1 guidelines (Figure 2). The northwest corner, where the 300-foot buffer barely intersects the site, would be limited to a maximum of 75 feet in height (Figure 2). A one-story building is possible with the exception that it is more than 750ft. from a public street. This condition may apply to the southwestern middle portion of the Plymouth & Green site, which lies beyond that threshold and could accommodate such form if desired.

Distance from Residential Zone (R)	Maximum Building Height Allowed
0-80 ft	55 ft
80-300 ft	75 ft
300-1,000 ft	120 ft
Over 1,000 ft	300 ft

Table 2: Maximum Building Heights under the TC1 Zone[38]

The setbacks in table 3 are another important aspect of TC1 guidelines to promote walkability, creating active streetscapes, and ensuring smooth transitions near residential zones. For the Plymouth Road frontage along the northern edge of the site, designated as a transit corridor, TC1 requires a minimum front setback of 18 feet and a maximum of 28 feet, pulling buildings closer to the street and reinforcing a pedestrian-friendly environment. Along the Green Road frontage on the eastern edge, which is not part of a designated transit corridor, the maximum front setback is 15 feet. The southern and western edges of the site do not front a public street, and so front setbacks do not apply there. Instead, side and rear setback rules must be followed, particularly in areas where the parcel lies within 1,000 feet of residential zoning. In these areas, primarily the northwestern and southeastern corners, TC1 mandates a minimum 30-foot setback to buffer the intensity of new development and maintain compatibility with nearby homes. These spatial guidelines contribute to a compact, transit-supportive form that balances access, visibility, and urban design goals.

Edge of Site	Setback Required
Front (on Transit Corridor)	Min: 18ft / Max: 28 ft
Front (non-corridor, mixed-use)	Max: 15 ft
Front (non-corridor, townhouse/apt.)	Max: 20 ft
Side/Rear (abutting R district)	Min: 30 ft
Side/Rear (not abutting R district)	0 ft

Table 3: Setback Requirements Under the TC1 Zone[39]

Landscaping and greenery play a key role in enhancing both the functionality and livability of development in TC1-zoned areas. For the Plymouth & Green site, these guidelines would apply particularly along Plymouth and Green Road frontages, where any surface parking visible from the street should be screened with a 10-foot-wide landscaped buffer that includes trees spaced every 30 feet and a continuous hedge or low wall.[40] These features help soften the site edge, reduce heat, and improve visual appeal for pedestrians and transit riders. Interior parking areas, which may be necessary given the site's scale, are also required to include landscaped islands, and larger lots must incorporate bioretention elements for

38 Unified Development Code (2024), 80.

39 Unified Development Code (2024), 80.

40 Unified Development Code (2024), 12.

stormwater management. These design strategies contribute to a greener, more walkable and comfortable environment for faculty, staff, and the community at large.

In terms of building dimensions and site layout, TC1 zoning encourages a pedestrian-oriented design while limiting bulky or monolithic structures. Buildings located along the transit corridor, specifically Plymouth Road, which defines the northern edge of the site must comply with TC1's dimensional limits: a maximum building width of 250 feet parallel to the street and a maximum diagonal dimension of 360 feet.[41] These requirements do not extend to buildings located further inside the parcel or along Green Road. Regardless of orientation, all development on parcels larger than 62,500 square feet, such as the Plymouth & Green site, must be divided into smaller walkable blocks, separated by sidewalks, internal drives, or open plazas to avoid superblock conditions.[42] Each block is also required to meet a minimum building frontage of 70% of its lot width, provided this still allows for 30 feet of side spacing, or 45 feet if adjacent to residential zoning.[43] This rule ensures active street presence while maintaining appropriate spacing and transitions, particularly near the northwestern and southeastern corners of the site where it falls within a 1,000-foot residential buffer. In addition to these layout and dimensional standards, the site's location (specifically the north-eastern part) at a signalized intersection triggers further TC1 regulations. Within 100 feet of the Plymouth and Green intersection, residential uses are not allowed on the ground floor; instead, the space must be reserved for commercial, institutional, or other public-facing functions.[44] Moreover, at least 60% of the street-level façade facing either road (Plymouth or Green) must consist of transparent glazing to enhance pedestrian visibility and engagement, and the bottom edge of windows may not exceed 2.5 feet above sidewalk grade.[45] Together, these rules are intended to support a human-scaled, walkable development pattern that strengthens the site's connection to transit infrastructure while maintaining compatibility with its surrounding context.

41 Unified Development Code (2024), 87.
42 Unified Development Code (2024), 86.
43 Unified Development Code (2024), 86.
44 Unified Development Code (2024), 87.
45 Unified Development Code (2024), 86.

OVERVIEW OF PROPOSALS

The Campus Connector's Overall Impact

The Campus Connector project is a significant potential strategy for curbing carbon emissions and increasing sustainability at the University of Michigan. Replacing 25 diesel buses with a LRT system would result in an estimated annual reduction of 1,400 metric tons of CO_2, according to the President's Commission on Carbon Neutrality Final Recommendation.[46] While this figure is based on an LRT model, the ATS proposed for the project has the potential to achieve comparable or even greater carbon reductions. Aside from the immediate reduction of greenhouse gas emissions, the ATS is also intended to be in compliance with the University of Michigan's Campus Plan 2050, with a focus on sustainability in the installation of geo-exchange fields and ground-source heat pumps.[47] These new technologies harness underground thermal energy for heating and cooling buildings, thus lessening the use of fossil fuels and increasing efficiency in total campus energy use.

The Campus Connector is also geared at efficiency in commuting and multimodal integration in the North, Central, and South campuses of the University of Michigan. By optimizing commuters' routes and curbing reliance on personal vehicles, the program will support a greener and accessible mobility system in the campus. In addition, the Campus Connector design is envisioned to encourage a seamless connection among pedestrian, bike, and bus modes, consistent with the master goals presented in Campus Plan 2050. The multimodal strategy not only makes the system accessible but also supports the usage of shared and non-motor vehicle modes, consequently developing a cohesive and greener network.

Current Terminus Proposal: Plymouth & Green

The University's plans (as per the RFQ) for the eastern terminus of the Campus Connector locate the final station along Green Rd, just south of Plymouth Rd. The visualization of the Plymouth & Green garage in Figure 3 is an interpretation based on what the team has been told about a possible parking structure. This garage would accommodate 4,000 vehicles and connect to the terminus station. This design conforms the structure's footprint to an existing dirt lot on the site. It would stand at a height of six stories with an internal ramp layout. The entrance and exit driveways would match existing curb cuts. Building the parking structure in this location would not require any changes to the ATS route proposed by the University in its RFQ specifications. The transit system would run along the site's southern edge, ending at the terminus next to Green Road.

A primary benefit of siting the terminus and garage on this property is that the University already owns the land. It is not currently used for anything beyond parking and storage, so the University could readily begin development. The site is also downward sloping from Plymouth Rd. to the south, reducing the visual impact of such a large parking structure from the north. From some angles, the garage looks four to five floors tall, rather than six. The rectangular shape of the lot matches well with a rectangular parking structure, allowing a design with low complexity and, therefore, relatively low cost. Building the parking structure on this site would also permit direct bridge access between the ATS terminus and the garage for straightforward Park & Ride integration.

Drawbacks of the Plymouth and Green terminus site begin with TC1 zoning incompatibility. Given the limitations of Southeast Michigan's regional transit service, parking adjacent to the terminus is a necessity for many potential users. However, we have concerns with how a garage of this scale, in this location, will impact the surrounding area. To accommodate 4,000 cars, the parking structure would need to be two city blocks in length (if built with six parking levels). Any garage, even one designed to be aesthetically pleasing, will create a dead zone for pedestrians along both Plymouth and Green Roads, which counteracts the goals of the TC-1 zone

46 U.-M. President's Commission on Carbon Neutrality, *Final Report and Recommendations* (Michigan Publishing, 2021), https://doi.org/10.3998/mpub.12230588.
47 Campus Plan 2050 (2024)



Figure 3: Anticipated U-M Plymouth and Green ATS terminus/garage

to create a lively, walkable environment. The parking structure far exceeds TC1 parking maximum limits (see Table 1), which are intended to limit excessive vehicle accommodation. Further, the cars entering and exiting the garage would exacerbate potential vehicular conflicts with pedestrians and cyclists, discouraging nearby residents from engaging in activities in their neighborhood. Overall, the proposed parking structure is likely to hamper the City's intent to foster a human-scale Plymouth and Green environment where people can linger and enjoy their surroundings.

Drawbacks of the Plymouth and Green terminus site begin with TC1 zoning incompatibility. Given the limitations of Southeast Michigan's regional transit service, parking adjacent to the terminus is a necessity for many potential users. However, we have concerns with how a garage of this scale, in this location, will impact the surrounding area. To accommodate 4,000 cars, the parking structure would need to be two city blocks in length (if built with six parking levels). Any garage, even one designed to be aesthetically pleasing, will create a dead zone for pedestrians along both Plymouth and

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Additionally, the increase in rush hour traffic turning between Plymouth and Green in both directions will create traffic jams, as the additional trips (up to 8,000 daily) that the garage would generate would significantly degrade that intersection's level of service (See Table 3). The added congestion on Plymouth between US-23 and Green Rd would compound traffic delays already present on the adjacent US-23 corridor. Based on responses to our surveys and presentations (see Appendix F), there is opposition from residents in the area to have a garage on this site due to the anticipated congestion and pedestrian safety impacts at Plymouth and Green. Discussions with neighbors also surfaced concerns that drivers will cut through the Busch's parking lot more than they already do to avoid the intersection.

While multimodal transfers from the parking structure to the Campus Connector would be direct, the length of the structure would create long walks between parking spaces to the north and the terminus to the south. Further challenges would arise around integrating the parking structure and ATS terminus with University or AAATA buses for transit connections. Buses would get stuck in car traffic around the Plymouth-Green intersection, and the site does not interface with the proposed AAATA regional Park & Ride routes on US-23. Stakeholders have also expressed concern regarding using this site as the terminus (see Appendix F for more information).



Figure 4: Anticipated U-M Plymouth and Green garage structure

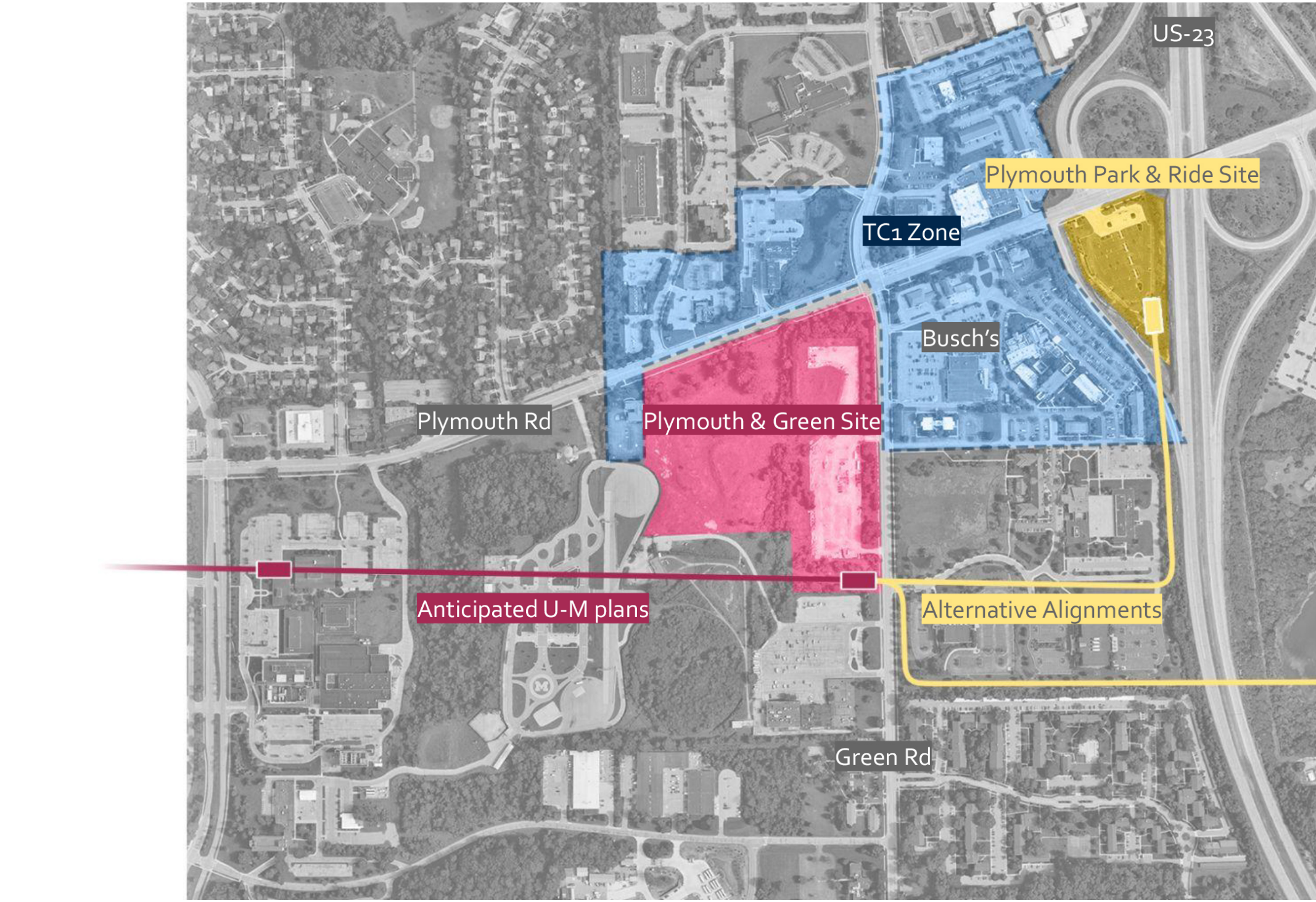

US-23
Plymouth Park & Ride Site
TC1 Zone
Busch's
Plymouth Rd
Plymouth & Green Site
Anticipated U-M plans
Alternative Alignments
Green Rd



Figure 5: Anticipated U-M Plymouth and Green garage structure

Alternative Terminus Locations

Zooming out from the University's proposed ATS terminus site, the team developed alternative terminus scenarios to address the drawbacks of the site at Plymouth & Green. Criteria for alternative development included the following:

- The parking garage needs to move away from residential and commercial areas in the TC1 district.
- The parking garage should be located to prioritize short driving access to and from US-23.
- Elevated ATS track extensions to alternative terminus locations must be limited to avoid ballooning costs.

Plymouth Park & Ride

The first alternative terminus scenario uses the existing Plymouth Park & Ride lot operated by the AAATA, on the southwest corner of the US-23 interchange. The site fits within the Plymouth and US-23 interchange, in an MDOT right-of-way. In this scenario, the garage footprint conforms to the existing Park & Ride lot. Nine levels would accommodate approximately 3,000 parking spaces. The Plymouth Park & Ride garage design includes two sets of spiral ramps, split for up and down traffic. The entrance/exit driveway conforms to the existing Park & Ride curb cut. The garage structure includes a bus hub on the first level next to the entrance/exit driveway.



Figure 6: Plymouth Park & Ride alternative terminus/garage

The Plymouth Park & Ride terminus alternative allows for southbound US-23 traffic exiting at Plymouth to go straight from the ramp, through the intersection, and into the garage. It would also be possible to exit the garage and drive straight through the intersection to reach the southbound US-23 entrance ramp. This scenario also aligns with the AAATA regional Park & Ride bus routes on US-23, with quick in-and-out turnaround for buses. Stakeholders also expressed support for this alternative scenario (see Appendix F for more information).

Any design will need to be consistent with MDOT's plans for the area. Currently,there are no plans to expand US-23 or widen the Plymouth bridge for the foreseeable future. Limiting the garage footprint to the existing Park & Ride lot's extent avoids increasing the site's impervious surface area, which would otherwise be a concern. The elevated ramp entrance to the expansion garage reduces traffic conflicts at the intersection by eliminating left turns into the Park & Ride site.

The uncertainty of MDOT approval for construction within their rights-of-way is a drawback of this option. MDOT has expressed that they will not speculate on the likelihood of passing their design review until the University formally submits a proposal (See Appendix F1). While the intersection design is advantageous for southbound US-23 drivers, there is no direct northbound US-23 access to and from the garage. This design also involves an irregular structure layout, meaning it requires a high design complexity and higher costs than a more straightforward design like the one on Plymouth & Green.

Development of the Plymouth Road Park & Ride Lot

The Plymouth Road Park & Ride Lot is strategically located near US-23, a critical north-south highway owned and maintained by MDOT. The construction of US-23 between Ann Arbor and Whitmore Lake in 1957, with extensions to I-96 in Brighton by 1960, transformed regional transportation patterns, making the area a key corridor for commuters. As traffic increased, efforts to improve public transit connectivity led to the development of park-and-ride facilities along major commuter routes.[48]

The Plymouth Road Park & Ride Lot was established in 2010 as part of a regional initiative to reduce congestion and encourage public transit use.[49] A collaboration between MDOT, the City of Ann Arbor, and the Federal Highway Administration, the facility was designed to support commuter transit while integrating with local and regional bus routes.

The lot features:

- 260 paved parking spaces for commuters.[50]
- Shelters, lighting, and security cameras for passenger safety.
- Carpool/vanpool parking and covered bicycle storage to encourage multimodal transit.
- Direct access to AAATA bus services, linking commuters to downtown Ann Arbor and the University of Michigan.

Key nearby landmarks include:

- Domino's Farms Office Park (established in the 1980s): This massive Frank Lloyd Wright-inspired campus is a regional business hub and home to Domino's Pizza's headquarters.
- Matthaei Botanical Gardens (3 miles east) – A preserved natural space that plays a key role in environmental education and conservation in Ann Arbor.
- Leslie Science & Nature Center (2 miles southwest) – A public nature preserve that contributes to Ann Arbor's green infrastructure.
- Argo Park & Cascades (west along the Huron River) – A recreational space featuring kayaking and hiking trails, linking to the broader Ann Arbor park system.

Located near the Plymouth and US-23 interchange, the Plymouth Park & Ride Lot enhances regional transit connections, particularly for commuters from Brighton, Whitmore Lake, and Ypsilanti. The facility supports Ann Arbor's sustainability goals by encouraging shared mobility options and reducing single-occupancy vehicle trips into the city.

48 Gribblenation, "The Flex Lanes of US Route 23 Between Ann Arbor and Whitmore Lake," *Gribblenation*, December 2024. https://www.gribblenation.org/2024/12/the-flex-lanes-of-us-route-23-between.html.

49 AnnArbor.com, "New Plymouth Road Park-and-Ride Lot Offers Alternative Option for Commuters to Ann Arbor," *AnnArbor.com*, October 21, 2010. https://www.annarbor.com/news/new-plymouth-road-park-and-ride-lot-offers-alternative-option-for-commuters-to-ann-arbor/.

50 Ann Arbor Area Transportation Authority. "Park & Ride Locations." *TheRide.org.*

Alignment

The proposed ATS terminus on Green Rd. would become an intermediate station in this scenario. The track would continue east from the station and cross over Green Rd. The extension then crosses over a University-owned office property at 3520 Green Ct., and then over a privately owned office property at 3550 Green Ct., which would require an easement agreement with Sir Properties Trust (See Appendix C2) along the property's northern edge. After crossing those sites, the ATS track would turn 90 degrees to the north and follow existing utility easements in the US-23 right-of-way buffer. The alignment would then cross over the southbound US-23 entrance ramp from Plymouth, reaching the Plymouth Park & Ride terminus station on the southern edge of the parking structure.



Figure 7: ATS extension alignment from Green Rd. to the Park & Ride terminus alternative

Expansion Opportunity: Plymouth Park & Ride

This scenario offers an expansion option if additional parking capacity is necessary beyond the initial 3,000 spots. An additional parking garage would fit within the northwest US-23 cloverleaf, across Plymouth Rd, opposite the Park & Ride garage. This structure would have four levels and two sets of spiral ramps split for up and down traffic. There are no additional curb cuts necessary for this expansion. The entrance ramp would allow entry from the existing westbound Plymouth left turn lane, and a bridge over Plymouth would connect the two garages. To exit, a driver would have to cross over from the expansion garage to the Park & Ride garage.



Figure 8: Plymouth Park & Ride alternative terminus with expansion garage option

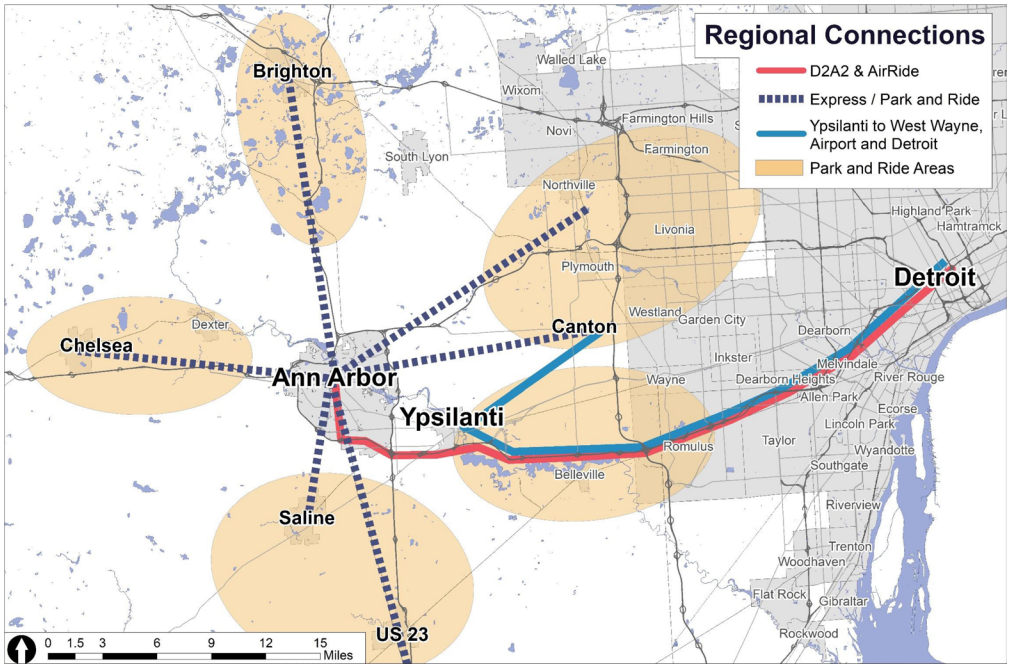


Figure 9: TheRide regional connections in 2045 Long-Range Plan (AAATA, 2022)



Figure 10: MDOT (2024) recommended bus-on-shoulder-operation in US-23 'Safely Connecting Communities' alternatives

While the expansion is possible, it is designed to be implemented only once its necessity is established by the parking volumes regularly exceeding the capacity of the original 3,000-spot garage. This site, in particular, is a piece of an evolving transit landscape. The existing Plymouth Park & Ride lot currently serves TheRide's buses, andt the transit authority would expect any changes to the site to continue their operations. In TheRide's 2045 Long-Range Plan, the AAATA recommends connecting a network of remote Park & Ride lots with express bus services.[51] By offering bus riders a direct connection from any Park & Ride route to the entire University via the Campus Connector, the Plymouth Park & Ride terminus would function as a primary hub within the regional Park & Ride network.

In conjunction with the AAATA's remote Park & Ride objectives, MDOT is developing plans to accommodate buses on the shoulders of US-23 near the Plymouth Park & Ride. This wave of improvements to multimodal operations and infrastructure along regional highways could increase the mode share of bus trips, which would reduce needed parking capacity at the Plymouth Park & Ride garage.

The facility could also become a vehicle for integration of service between the campus transit system and AAATA. For example, AAATA bus service from the facility could focus on downtown Ann Arbor, leaving the ATS to serve North, Medical, and Central Campuses. Passengers arriving via bus from the remote Park & Ride lots that AAATA is currently contemplating could choose to remain on the bus or transfer to the Campus Connector, based on the most convenient access to their destination.

51 TheRide and Left Turn Right Turn, publication, TheRide 2045 Long Range Plan (Ann Arbor Area Transportation Authority, July 2022), www.theride.org/sites/default/files/2022-07/TheRide%202045%20Long-Range%20Plan_Final%20Report_with_Apps-compressed_2.pdf.

US-23 Air Rights

Another terminus alternative scenario is an elevated structure over US-23 on the south side of the Plymouth Rd. bridge. This option shifts the Plymouth Park & Ride garage vertically one level and horizontally over the full width of the highway. The design involves parallel rows of support columns spaced 100 feet apart. A six level structure would accommodate roughly 4,000 parking spaces, accessed through two external spiral entrance/exit ramps and an internal ramp layout. The entrance/exit on the Park & Ride side of the structure would have a bus hub around the ramp perimeter, and the driveway would conform to the existing Park & Ride curb cut. The ramp on the northeast corner of the interchange would bridge over Plymouth Rd. to the garage, and the entrance/exit driveway would add a curb cut to the north side of the existing intersection. The ATS alignment for the US-23 Air Rights terminus alternative would be the same as the route described in the Plymouth Park & Ride scenario.

The US-23 Air Rights alternative has the benefit of allowing for both northbound and southbound US-23 traffic exiting at Plymouth to go straight from the exit ramps, through the intersections, into the garage. It would also be possible to exit the garage and drive straight through the intersections to reach either the northbound or southbound US-23 entrance



Figure 11: US-23 Air Rights alternative terminus/garage

ramps. Interior wayfinding signage in the garage would direct drivers to exit through the corresponding ramp for either US-23 north or south. The US-23 Air Rights design also aligns with the AAATA regional Park & Ride bus routes on US-23, with a quick turnaround for buses and direct elevator access between the bus hub and the ATS terminus station, which is the most advantageous scenario for multi-modal transit connections. When undergoing MDOT design review, this option is notable for theoretically accommodating infrastructure modifications underneath the structure in the future. This design also has reduced impervious surface area compared to both the Plymouth Park & Ride terminus alternative and the existing Park & Ride surface lot. Like the previous alternative, this option also frees up the site at Plymouth & Green for more appropriate uses that align with the City's TC1 zoning.

The drawbacks of this design are similar to the previous option. MDOT will not speculate on the scenario until the University formally submits a proposal. An easement agreement is still required at 3550 Green Ct. This irregular garage structure layout is highly complex, and with the additional challenges of Air Rights construction over a busy highway, the costs would be significantly higher than the Plymouth Park & Ride alternative.



Figure 12: US-23 access to/from Air Rights alternative terminus/garage

Earhart Road

The last terminus alternative to Plymouth & Green is to use undeveloped University property at Old Earhart Road and Earhart Road. A parking structure on this site with six levels would accommodate about 4,000 spaces, accessed via an internal ramp layout. This would require new curb cuts for the entrance driveway on Old Earhart Rd and the exit driveway on Earhart Road.

As with the Plymouth Park & Ride and US-23 Air Rights alternatives, in this scenario, the Green Rd. terminus would become an intermediate station.

The ATS track would continue east, crossing over Green Rd. and turning 90 degrees to the south. The track would cross over the same, aforementioned University-owned property at 3520 Green Ct. along the western edge, turn 90 degrees to the east, and cross along the property's southern edge. Then, the track would cross over the privately-owned office property at 3550 Green Ct. (which would require a property easement), continue over US-23, and then cross over a privately-owned residential property at 2137 Old Earhart Rd. Passing over this large private property would require an easement across the southern side (the property has two houses on the



Figure 13: Earhart Road alternative terminus/garage

north side). The ATS track would also have to cross over a pond on the property. The track then continues over Old Earhart Rd into the University-owned site, and reaches the terminus, which intersects with the northern edge of the parking structure.

The Earhart Road scenario has less uncertainty in terms of gaining MDOT approval compared to the Park & Ride and Air Rights alternatives, though it does require a Campus Connector crossing over US-23. It also has the easiest alignment to extend to the East Medical Campus, should the University decide to pursue that option. As with the other alternative scenarios, this option frees up the Plymouth and Green site for more appropriate uses.

However, the Earhart Road alternative necessitates a longer ATS alignment than the Plymouth Park & Ride and US-23 Air Rights alternatives. This scenario also requires longer driving distances to and from US-23. Additionally, the Earhart Road alternative would be very disruptive to the residential property at 2137 Old Earhart Rd., and the garage would have a significant visual impact on the homes on Marblewood Way.



Figure 14: ATS extension alignment from Green Rd. to the Earhart Road terminus alternative

Expansion Opportunity: East Medical Campus

In the longer term, the East Medical Campus offers a viable alternative endpoint to the Campus Connector project, particularly in situations where the Plymouth Park & Ride location encounters unforeseen challenges to its realization. Strategically situated southeast of the proposed path, the East Medical Campus has several advantages in terms of its accessible land and existing facilities. The location offers a large surface parking lot that is already university property, thus reducing the need to acquire additional land or develop additional impervious surface areas. This results in a lessened environmental impact commonly associated with large-scale building projects, such as increased stormwater runoff.

In addition, the location within the East Medical Campus is supported by current planning projects intended to construct a bridge over US-23, which will enable seamless and efficient upgrading of the ATS in the future. The



Figure 15: ATS East Medical Campus extension alignment through the US-23 Air Rights structure

plan at this location allows for potential construction of ground-level or elevated structures, hence offering options in terms of construction costs, technical possibility, and future system development. While the location requires longer ATS travel time compared to the Park & Ride solution, its ability to be expanded in the future within the university's medical complex makes it a future-looking choice. Despite the potential benefits, the Plymouth Park & Ride location remains the first choice, followed by the East Medical Campus as an alternative.



Figure 16: ATS East Medical Campus extension alignment above Plymouth Rd

ANALYSIS OF PROPOSALS

Commuter and Traffic Flow Impact

Commutershed Analysis

The projected commuter catchment area for the ATS terminus (Figure 5), produced by GIS analysis of likely inbound travel times to the ATS terminus during the Monday morning rush hour, includes nearly all of Wayne County, a small portion of Macomb County, as well as a significant portion of Washtenaw, Livingston, and Oakland counties. Given that Michigan's statewide average commute time is 25 minutes, most commuters will come from the dark- and light-blue shaded areas.

This assumption is reflected in geospatial data analysis for this commutershed. Visualizations of commuter flows based on US Census LEHD Origin-Destination Employment Statistics (LODES) datasets for 2019 and 2021 indicate that most commuters from within the catchment area (Figure 5) who travel to jobs in the census tracts containing the University of Michigan's Central, North, Medical, and East Medical campuses come from the geographically proximate area in the dark- and light-blue shaded areas.

Despite a reduction of over 9,000 commuters during the COVID-19 pandemic, the visualizations show that overall trends for short-distance commuters are largely similar between the two years when considering where those commuters, even with reduced flows, are traveling from geographically close locations. However, there is a visually apparent drop in long-distance commuters — i.e., commuters coming from Wayne, Oakland, and Macomb counties. While this may be an indication of a change in commuting patterns, it is important to note that 2021, which represents the most recent LODES dataset for Michigan, was not a 'normal' year for commuting data nationwide due to the impacts of mandatory remote work and shelter-in-place orders. It is very likely that these figures have changed in the three years since the end of 2021, meaning that 2019 is probably a more accurate reflection of current commuter flows in the ATS catchment area.

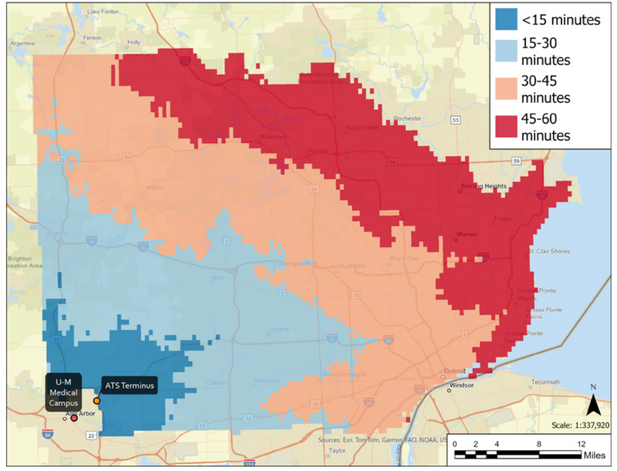


Figure 17: Visualization of ATS catchment area driving timesheds for 7:30 AM, average Monday

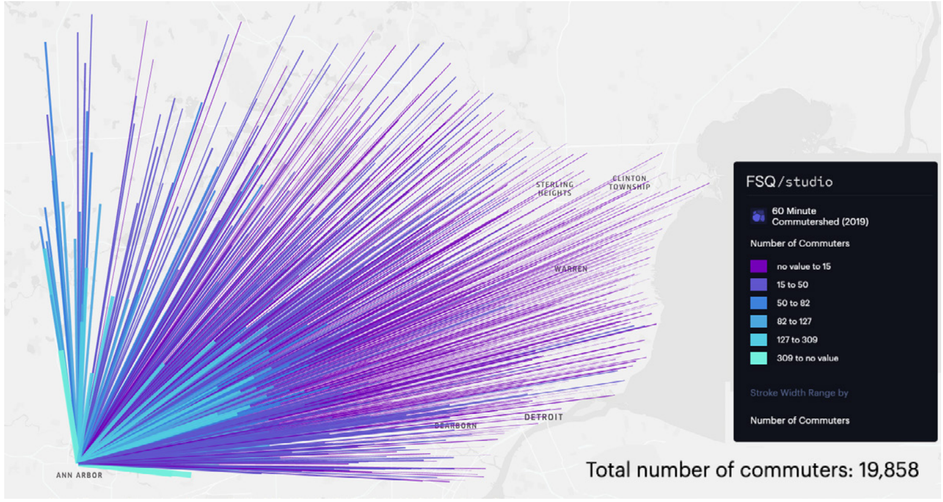


Figure 18: Visualization of 2019 ATS catchment area commuter flows for ≤60 minute commutes

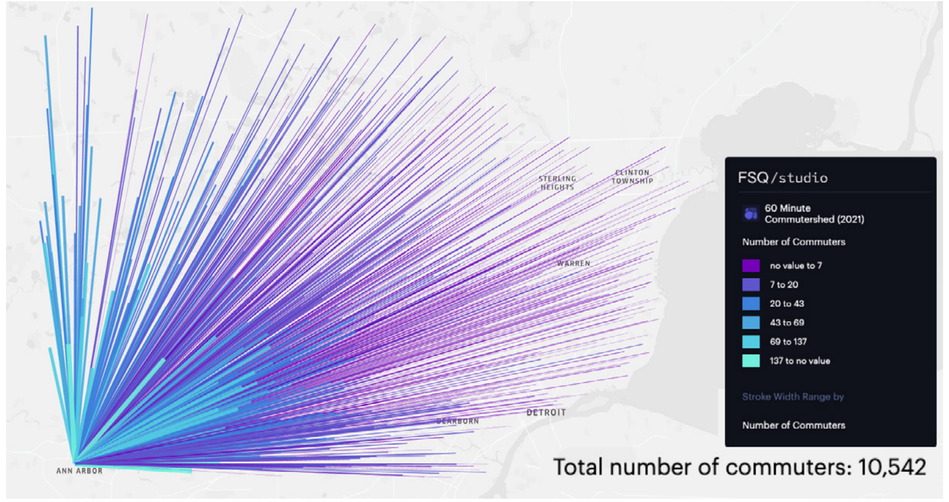


Figure 19: Visualization of 2021 ATS catchment area commuter flows for ≤60 minute commutes

Even with the impact of COVID-19 and remote work, both visualizations clearly show that the bulk of commuters are traveling from close-in areas with commute times around 30-minutes. Given that travelers with longer commute times are less likely to use a park & ride for their commute, the bulk of the likely commuters will probably come from within this travel window.

Plymouth & Green

A projected 4,000-spot parking structure would thus accommodate about 53 percent of the commute from the relevant commutershed, if one takes 2019 to be a "normal" year. (For the pandemic year of 2021, this number decreases to about 28 percent of the commute). However, projected U-M growth will surely increase commuter flows from the area, implying that the planned parking structure could be filled even with lowered shares of the commute.

According to GIS data from the City of Ann Arbor, the Plymouth-Green intersection is a high crash density location. Extended dwell times at traffic signals, high vehicle volumes, and extended distances between crosswalks contribute to risky pedestrian behaviors such as jaywalking. The projected increase in vehicle trips from the terminus and garage will further complicate pedestrian crossings, increasing the risk to pedestrian safety in the area.

Existing conditions at the Plymouth-Green intersection would be significantly worsened with the addition of just half of the projected 4,000 new car trips to the proposed parking garage. Based on data the team collected on April 9, 2025, the Plymouth-Green intersection maintains volume-to-capacity ratios of 0.56 during morning rush hour (7:15-8:15 AM) and 0.70 during evening rush hour (4:30-5:30 PM). These correspond to an "A" and a "C" highway level-of service grade, respectively. The level-of-service scale runs from "A" to "F," with A indicating an intersection that experiences little-to-no congestion, and F indicating an intersection experiencing total gridlock (Appendix B). Existing conditions in the morning qualify for an A grade, while evening conditions qualify for a C grade. When 2,000 new vehicles—only half of the projected 4,000 new car trips generated by the ATS terminus—are added to these assessment tools, conditions

	Morning (7:15 - 8:15 AM)	Evening (4:30 - 5:30 PM)
Existing Volume-to-Capacity Ratio	0.58 (A grade)	(0.70) C grade
With 2,000 Additional Cars	1.06 (F grade)	1.44 (F grade)

Table 4: Existing and projected volume to capacity ratios for Plymouth-Green intersection

at the intersection significantly deteriorate, with respective volume-to-capacity ratios of 1.06 and 1.44 for the morning and evening peak hours.

Based on these capacity and safety analyses, the addition of significant new traffic volumes to this intersection is expected to worsen congestion, degrade commuter experience, and increase potential conflicts between vehicles and pedestrians.

The transportation system at Plymouth & Green is located in a highly utilized corridor with extensive surface parking and congestion-related inefficiencies. The heavy traffic flow increases travel time and fuel consumption, reducing transit reliability. Additionally, the lack of transit-integrated infrastructure and persistent congestion limit opportunities for commercial investments, as businesses may be deterred by accessibility concerns and high infrastructure costs. Without improvements, the area's economic potential may remain underutilized.

Plymouth Park & Ride

The Plymouth Park & Ride is presently a recognized regional transit hub, and AAATA has extended service hours on several routes serving this area—such as Routes 23 and 67—as part of its long-range plan to improve regional connectivity.[52] Its inclusion in the existing transit hub is expected to reduce the frequency of stops at the Plymouth-Green. In doing so, it may improve overall transit performance while promoting pedestrian safety by improving pedestrian crossings through better design and traffic control. Additionally, the relocation of the transit hub is expected to reduce pedestrian–vehicle

52 Jeffrey Pfeifer, "TheRide Announces Expanded Service and Longer Service Hours," August 5, 2024, https://www.theride.org/about/news/theride-announces-expanded-service-and-longer-service-hours.

conflicts through the use of a dedicated Park & Ride complex with enhanced pedestrian infrastructure, such as improved crosswalks and clearer separation from vehicular flow.

Traffic flow analysis at the Plymouth and US-23 interchange indicates that existing conditions would be significantly worsened with the addition of just half of the projected 4,000 new car trips to the proposed parking garage. Based on traffic flow data collected on 19 February 2025 during morning (7:15-8:15 AM) and evening (4:30-5:30 PM) rush hours, the Plymouth and US-23 interchange maintains respective volume-to-capacity ratios of 0.58 and 0.44.

The traffic engineering profession commonly uses volume-to-capacity ratios as a metric to assess level of service by letter grades, with A indicating an intersection that experiences little-to-no congestion, and E indicating an intersection at near or total gridlock (Appendix B). Existing conditions qualify for an A grade, since both volume-to-capacity ratios are below 0.60. However, when 2,000 new vehicles are added—only half of the projected 4,000 new car trips generated by the ATS terminus—conditions at the intersection significantly deteriorate, with projected volume-to-capacity ratios of 0.98 for both the morning and evening hours.

	Morning (7:15 - 8:15 AM)	Evening (4:30 - 5:30 PM)
Existing Volume-to-Capacity Ratio	0.59 (A grade)	(0.44) A grade
With 2,000 Additional Cars	0.98 (E grade)	0.98 (E grade)

Table 5: Existing and projected volume to capacity ratios for Plymouth-US-23 interchange

In addition to the inherent transit access that the site at Plymouth & Green has to the proposed Campus Connector, it also has strong links to the greater Ann Arbor transportation network. The site has immediate access to AAATA bus route 65 which runs along both Plymouth and Green adjacent to the site in question, with direct access to downtown Ann Arbor and the Blake Transit center. The site at Plymouth & Green also provides access to AAATA bus route 23, which runs along Plymouth and Green diagonal to the Plymouth Green site, although it may be rerouted as part of this proposal given that its present terminus is the Plymouth Park & Ride.



Figure 20: Photo of US-23 off-ramp at Plymouth-US-23 interchange during morning rush hour

Land Use and Urban Planning Compatibility

The area around Plymouth & Green is characterized by high levels of vehicular traffic as shown in our earlier analysis, large surface parking lots, and undeveloped land. Indeed, the parcel at the southwest corner of Plymouth & Green is the fourth largest vacant land parcel in the City of Ann Arbor, representing a rare opportunity for large-scale in-fill development in close proximity to Ann Arbor's urban core. The proposed site at Plymouth & Green sits at the northeastern end of a sparsely developed swath that runs through Northeastern Ann Arbor. This swath creates a break in the residential urban fabric, dividing residential neighborhoods in Northeast Ann Arbor north of Plymouth Road such as Orchard Hills from nearby neighborhoods south of Plymouth Road such as the Glacier Highlands area. This example of urban fragmentation hinders travel and connection between the various communities. The zoning classification of TC1 is intended to enable the creation of residential and commercial space that would serve to help link these two parts of Ann Arbor together, creating a more interconnected community.

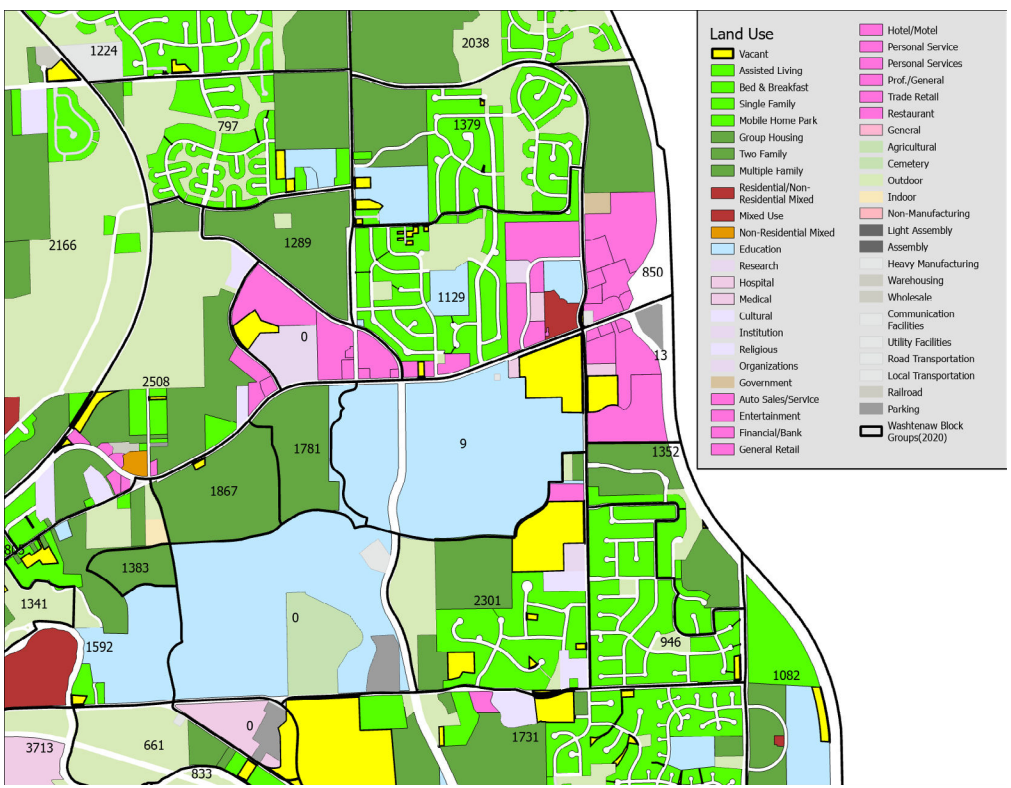


Figure 21: Overview of Land Use and Block Group Population in Northeast Ann Arbor

Plymouth & Green

The purpose of the TC1 district is not to impose uniform design across all sites, but to guide the placement and form of development in ways that prioritize walkability, reduced car dependency, and sustainable urban design. Even outside of TC1-zoned parcels, adherence to these planning values strengthens the overall functionality and visual character of the corridor. The Plymouth and Green site is located at a signalized intersection and is directly adjacent to existing residential neighborhoods, commercial offices, and pedestrian-scaled retail. TC1 principles discourage the placement of large, car-oriented infrastructure at these high-visibility nodes due to its potential to:

- **Disrupt walkability:** A parking structure of this scale would dominate the streetscape, interrupt pedestrian movement, and eliminate opportunities for active ground-floor uses especially important at intersections.
- **Induce vehicle congestion:** With a capacity for thousands of vehicles, the site would generate significant daily traffic, undermining the TC1 objective of minimizing car dependency along transit corridors.
- **Limit future mixed-use potential:** By occupying valuable land at a central corridor intersection, a monolithic parking structure would preclude more context-sensitive development such as townhouses, apartments, or retail-oriented infill.
- **Conflict with street-level design expectations:** TC1 guidance restricts residential use on the first floor within 100 feet of signalized intersections and encourages transparency of building frontages and activation of the street edge—criteria that a structured garage is unlikely to satisfy.

Plymouth Park & Ride

The Plymouth Park & Ride is already established as a designated transit hub, aligning more directly with Ann Arbor's broader sustainability goals. Shifting transit activity to a dedicated Park & Ride links better to future transit on US-23, minimizing the need for surface parking in high-traffic zones while consolidating bus operations in a designated, transit-oriented space. Recent research conducted regarding transit-oriented growth indicates the areas transitioning from automobile-based models toward pedestrian-based transit stops usually experience a 5-10% growth in property value. The long-term impact of the relocation will depend on future planning efforts between U-M and the City of Ann Arbor, particularly regarding mixed-use redevelopment near Plymouth & Green and further expansion of transit infrastructure at the Park & Ride facility.

Carbon Emissions and Environmental Impact

A key strategy for reducing emissions lies not only in shifting commuting behavior away from single-occupancy vehicle trips, but also in supporting the development of dense, walkable, and transit-oriented neighborhoods—particularly near regional transit hubs such as the US-23 corridor. All three alternatives offer opportunities to reduce vehicle dependence and support mode shift, although to varying degrees depending on land use context and design flexibility.

The City of Ann Arbor's A2Zero Carbon Neutrality Plan and the University of Michigan's own carbon neutrality commitments emphasize the importance of shifting away from car-centric infrastructure. Aligning the future terminus with these goals requires minimizing surface-level automobile traffic near pedestrian-dominant zones, optimizing multimodal connectivity, and enabling long-term emissions reductions through electric transit infrastructure and land use strategies.

Plymouth & Green

Transportation-related emissions, including commuting and university-affiliated travel, represent a significant share of U-M's carbon footprint. The University of Michigan Ann Arbor Campus Annual Environmental Metrics Report states that the net greenhouse gas emissions of the university amounted to 515,202 metric tons of CO_2 equivalent for the fiscal year 2021. Although specific transportation emissions data is not provided, the transportation sector accounted for 28.4% of U.S. greenhouse gas emissions in 2022. The current congestion at Plymouth & Green contributes to inefficient fuel consumption due to stop-and-go traffic, which exacerbates emissions. Without significant intervention, continued use of this location as a terminal is unlikely to align with U-M's carbon neutrality goals. Moreover, the associated increase in vehicle activity undermines the potential for a walkable, transit-oriented environment in the area—precisely the kind of sustainable urban form the city aims to encourage through TC1 zoning.

Plymouth Park & Ride

This site enables significant reductions in automobile trips into the walkable core, decreasing fuel use and supporting efficient regional transit. Short-term benefits include improved traffic flow and reduced congestion-related emissions, while long-term advantages include expanded infrastructure for pedestrian and bicyclist access, the introduction of electric buses, and the potential extension of the Campus Connector to East Medical. By concentrating transit activity at an existing and designated transit hub, this location reinforces sustainable travel behavior and facilitates land use patterns that reduce overall vehicle dependence. It stands out for its ability to align well with both city- and university-level carbon neutrality goals.

Fostering compact, transit-accessible development is not only a land use goal but also a key strategy for reducing transportation emissions. The City of Ann Arbor's A2Zero Carbon Neutrality Plan sets ambitious goals for reducing greenhouse gas emissions by shifting away from car-dependent patterns and promoting active and public transportation.[53] Similarly, the University of Michigan has committed to achieving carbon neutrality, with Scope 3 emissions—such as commuting—identified as a major focus area.[54] Locating high-capacity parking and regional transit functions at the Plymouth Park & Ride site helps avoid intensifying auto-dependence at walkable nodes like Plymouth & Green, and instead concentrates vehicle access at a peripheral site already oriented to handle it.

US-23 Air Rights

While similar in location to the Plymouth Park & Ride, the US-23 Air Rights alternative utilizes vertical infrastructure above US-23, preserving surface land for potential future green or transit-oriented uses. Emissions reduction potential is high due to freeway adjacency, which keeps vehicle access separated from pedestrian zones, thus reducing conflict points and emissions from stop-and-go traffic. Moreover, concentrating auto access along the highway corridor avoids burdening local streets, which supports compact development elsewhere. However, the elevated structure may result in higher embodied carbon from construction, which would need to be mitigated through sustainable building methods or material offsets.

Earhart Road

The Earhart Road site is located on university-owned land, offering design flexibility to incorporate sustainable site planning, such as renewable energy, low-impact development, and green mobility infrastructure. However, its relative distance from regional highways may lead to longer access trips, increasing short-term carbon emissions unless well-supported by last-mile solutions such as shuttle services or active transportation improvements. To align with carbon neutrality goals, this site would require intentional mitigation strategies to reduce auto reliance, such as enhanced pedestrian/bicycle infrastructure and integration with broader transit planning toward East Medical and other regional destinations.

Cost Analysis

This section analyzes additional costs of the system associated with relocating the terminus and parking structure from the currently planned site at Plymouth & Green. Plymouth & Green is treated as the base scenario for the terminal station, and alternative termini at the Plymouth Park & Ride and Earhart Road were analyzed to explore impacts on cost, integration, and feasibility.

Methodology

To ensure consistency and credibility in cost estimation across all scenarios, the team used a component-based modeling approach, drawing estimates from comparable projects—most notably, the Chicago O'Hare ATS modernization—and adjusted for inflation and to reflect U-M's context,

53 *Ann Arbor's Living Carbon Neutrality Plan* (Ann Arbor, MI: Office of Sustainability and Innovations, April 2020), 76.

54 *Sustainability & Climate Action at the University of Michigan: Fiscal Year 2024 Report* (Ann Arbor: University of Michigan, 2024), 15.

scale, and system type.[55] Cost categories were itemized across the following components:

- Elevated guideway (costed per mile)
- Station infrastructure (cost per station)
- Fleet of approximately 40 rubber-tired vehicles
- Automated control systems and systems integration
- A new Operations, Maintenance, and Storage Facility
- Project management, engineering, planning, and design
- A 10% contingency
- Land acquisition (included only in alternatives that extend beyond university-owned land)[56]
- Parking Garage (4000 car space approx)

This model ensured that all scenarios were directly comparable and visualized using clear cost breakdown graphics for ease of interpretation.

Base Scenario: Plymouth & Green

The base scenario of a terminus and parking structure at Plymouth & Green covers a 3.5-mile guideway with six stations and no land acquisition requirements, as the entire route remains on university property. It represents the benchmark for cost comparisons, with a total estimated cost of $1,074 million, or approximately $307 million per mile. The elevated guideway is the largest component at $350 million, followed by vehicles, stations, and systems. The bar graph below represents the baseline ATS route as outlined in Campus Plan 2050. No land acquisition is needed, as the terminus is on University-owned land. All six stations are integrated along this guideway.

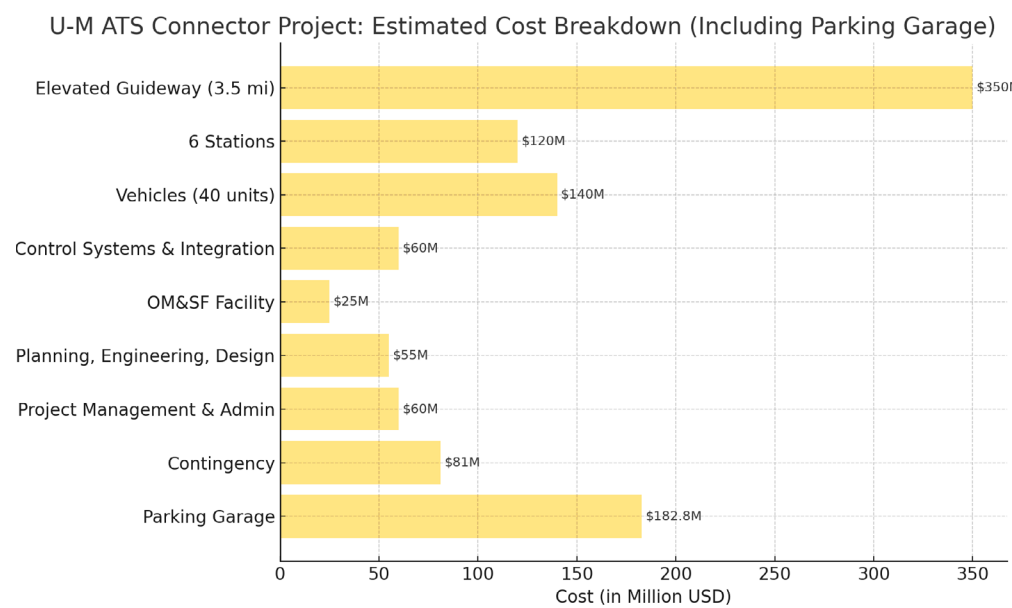


Figure 22: U-M Campus Connector Project: Estimated Cost Breakdown

55 "Chicago O'Hare Airport People Mover Reopens After Disputes, Delays," *Construction Dive*, November 4, 2021, https://www.constructiondive.com/news/chicago-ohare-airport-people-mover-ats-reopens-after-disputes-delays/610700/.

56 In order to estimate land purchase costs, an average easement width of 30 feet was used to fit the guideway's structural envelope and provide for maintenance access. From an assumed average land value of $1.2 million per acre in Ann Arbor (based on Zillow and LoopNet estimates), land requirements and costs were calculated as follows:

- Plymouth Park & Ride (0.5126 mi)
  - » 1.86 acres » ~$2.2 million
- Earhart Road (0.6716 mi)
  - » 2.44 acres » ~$2.9 million

These were incorporated into the total cost models accordingly. LoopNet, "4033 Plymouth Rd, Ann Arbor, MI 48105," *LoopNet.com*, accessed April 14, 2025, https://www.loopnet.com/Listing/4033-Plymouth-Rd-Ann-Arbor-MI/25327835/.

Scenario Comparison: Cost Analysis by Location

The three alternate terminus scenarios extend the system beyond the initial 3.5 miles and require additional land acquisition. Below is a summary of the key differences:

Scenario	Total Guideway Length	ATS[57]	Parking Garage[58]	Total Cost	Cost Increase vs. Base Scenario	% Increase vs. Base Scenario
Plymouth & Green	3.5 mi	$891 million	$182.8 million	$1,073.8 million		
Plymouth Park & Ride	4.0 mi	$969.4 million	$162.3 million	$1,131.7 million	+$57.9 million	+5.4%
Plymouth Park & Ride + Expansion	4.0 mi	$969.4 million	$162.3 million + $97 million = $259.3 million	$1,228.7 million	+$154.9 million	+14.4%
US-23 Air Rights	4.0 mi	$969.4 million	$311.5 million	$1,280.9 million	+$207.1 million	+19.3%
Earhart Road	4.2 mi	$986.8 million	$215.5 million	$1,202.3 million	+$128.5 million	+12%

Table 6: Cost comparison between alternative proposals

Relocating the terminus from Plymouth & Green increases the total system cost across all alternatives, with scenarios ranging from a 5.4% to 19.3% increase over the base case. These cost escalations are driven by a combination of extended guideway lengths, additional stations, and higher-cost parking structures. The Plymouth Park & Ride and Earhart Road scenarios introduce conventional expansions, while the Air Rights scenario constructed above US-23 yields the highest increase due to complex garage construction requirements. Despite variations in parking strategy, the elevated guideway remains the primary cost driver, followed closely by site-specific infrastructure and land acquisition needs.

The elevated guideway remains the largest cost component across all scenarios, increasing proportionally with the length of the route. Station infrastructure costs are held constant at $140 million in all alternatives with seven or more stations. The most significant variation occurs in parking garage costs, which range from $162.3 million (Plymouth Park & Ride) to $311.5 million (US-23 Air Rights), substantially impacting overall project costs.

Meanwhile, additional costs which include vehicles, control systems, planning, and land acquisition are consistent across scenarios, with only slight increases in the Earhart Road scenario due to added land acquisition. These aggregated differences highlight how location-specific factors, such as parking garage type and guideway length, are the most influential in determining the financial feasibility of each alternative.

Cost Validation Using Light Rail Transit Benchmarks

Although the U-M Campus Connector is conceived as an automated, rubber-tired system, LRT projects serve as a helpful comparison point due to common features of infrastructure: elevated tracks, station facilities, vehicle fleets, and operations centers.

Based on the U.S. Government Accountability Office[59] and Transit Cooperative Research Program (TCRP) Report 155,[60] the cost of building

57 Detailed cost breakdown calculations for all scenarios (see Appendix C - C2)

58 Garage cost estimations were done separately from the guideway and terminus estimations (see Appendix C)

59 U.S. Government Accountability Office, *Capital Investment Grants Program: Cost Predictions Have Improved, but Increased Transparency and Longer-Term Evaluation Are Needed*, GAO-23-105479 (Washington, DC: U.S. GAO, 2023), https://www.gao.gov/products/gao-23-105479.

60 National Academies of Sciences, Engineering, and Medicine, *Track Design Handbook for Light Rail Transit, Second Edition* (Washington, DC: The National Academies Press, 2012), https://doi.org/10.17226/22800.

Light Rail Transit in North America usually falls into one of the following categories:

- **$50M–$150M per mile** (typical elevated systems)
- **$200M+/mile** for high-complexity, urban tunneled segments
- **$35M–$80M** per mile for at-grade suburban rail

U-M's approximate base cost of $307M per mile falls on the upper side of LRT systems, justified due to its full elevation, high ridership, automated vehicles, and the inclusion of a 100-ft river-crossing bridge.

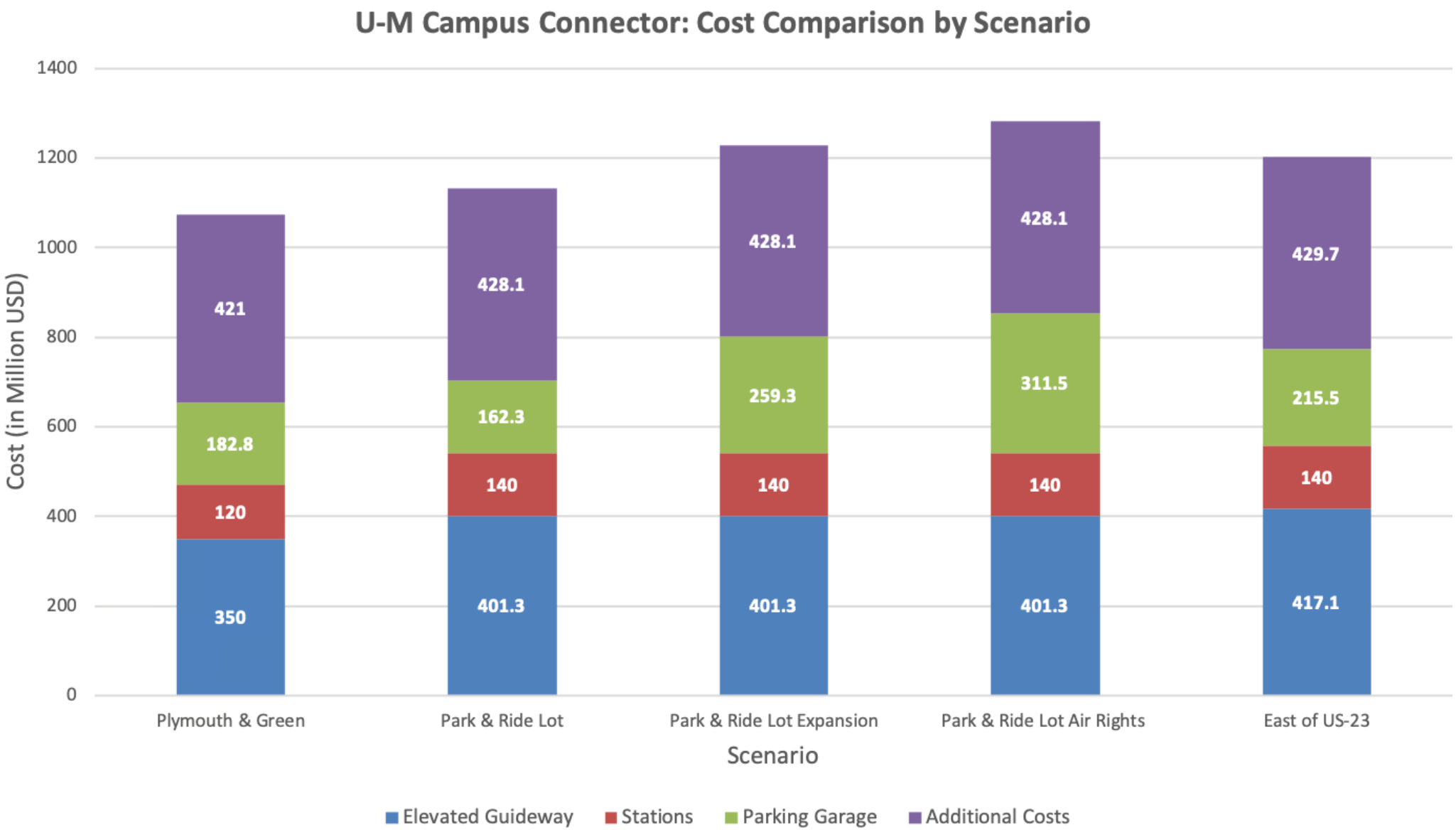


Figure 23: U-M Campus Connector: Cost Comparison by Scenario

Notable U.S. and Canadian Light Rail Transit Examples

Project	Location	Year	Length	Total Cost	Cost per Mile	Key Features
Seattle Link Light Rail (Northgate)[61]	Seattle, WA	2021	4.3 mi	$1.9B	~$442M/mi	Extensive tunneling, deep stations
Charlotte Lynx Blue Line Extension[62]	Charlotte, NC	2018	9.3 mi	$1.16B	~$125M/mi	Elevated + surface segments
Portland MAX Orange Line[63]	Portland, OR	2015	7.3 mi	$1.49B	~$204M/mi	Includes new bridge and mixed-grade structures
Phoenix Valley Metro Light Rail	Phoenix, AZ	Ongoing	Varies	—	~$70M/mi	Mostly at-grade; more cost-effective
Calgary Green Line (Phase 1 projected)	Calgary, AB	Planned	12.3 mi	$4.9B CAD	~$294M/mi (USD)	Mixed grade, includes river crossing infrastructure

Table 7: Cost comparison between representative projects throughout North America

This table presents a range of recent LRT projects across North America, illustrating how project costs vary based on factors such as construction type (elevated, at-grade, or tunneled), geographic constraints, and infrastructure complexity. At the upper end, Seattle's Northgate Extension[64] demonstrates the impact of tunneling and deep stations, reaching ~$442 million per mile. Mid-range examples like Portland's Orange Line and Calgary's Green Line incorporate river crossings and mixed-grade design, resulting in costs between $200M and $300M per mile. In contrast, at-grade systems like Phoenix's Valley Metro remain substantially more economical.

These comparisons validate the estimated capital intensity of the University of Michigan's ATS and support the use of a high-end LRT benchmark in scenario-based cost modeling. The U-M ATS base scenario is estimated at ~$307 million per mile (total: $1,074 million for 3.5 miles), which is consistent with infrastructure-heavy LRT projects like Seattle and Portland. This alignment reinforces the credibility of the cost estimates and reflects the demands of a fully elevated, automated, rubber-tired system with major engineering features like a 100-foot bridge and a 40-vehicle fleet.

61 Sound Transit, "Home," accessed April 7, 2025, https://www.soundtransit.org/.
62 Charlotte Area Transit System, "Home," accessed April 7, 2025, https://www.charlottenc.gov/CATS/Home.
63 TriMet, "Home," accessed April 7, 2025, https://trimet.org/home/.
64 U.S. Department of Transportation, *Northgate Link Extension*, Build America Bureau, accessed April 2, 2025, https://www.transportation.gov/buildamerica/projects/northgate-link-extension.

ALTERNATIVE USE FOR PLYMOUTH & GREEN: STAFF & FACULTY HOUSING

Any of the three alternatives presented would free up the Plymouth & Green site for alternative uses. Along with the alternatives put forth in the rest of this plan concerning the ATS described in the 2050 Campus Plan, we have performed extensive analysis to develop an alternative for the University to consider for the vacant site located at Plymouth & Green as on campus affordable faculty/staff housing.

To support this recommendation, the literature review below begins with our research on the history of faculty/staff housing at the University of Michigan, and a discussion of how faculty/staff housing could be a possible use for the Plymouth and Green lot. Following that background, we reviewed literature five university case studies as current examples of on campus faculty/staff housing. The five universities are University of California Santa Cruz, University of Minnesota, University of California Irvine, Stanford University, and the University of Toronto. These case studies and the possible business models for faculty/staff housing are used to develop alternative business models the University could pursue and the potential physical form faculty/staff housing on the lot.

History of Faculty/Staff Housing at U-M

U-M has long faced challenges regarding housing for faculty and staff. This issue traces back to the post-World War II period when a significant housing shortage adversely affected faculty recruitment and retention. The return of veterans led to increased enrollment, further straining Ann Arbor's already limited housing options. In 1943, the Housing Committee on Plant and Equipment highlighted the struggles of married students and low-income faculty, many of whom struggled to find affordable and suitable housing.[65] By 1945, the Senate Advisory Committee officially addressed these issues, stating that insufficient faculty housing could adversely affect recruitment and retention, especially as the university grew. Faculty faced difficult circumstances, such as living in temporary facilities at Willow Run Village, a World War II-era complex initially built for wartime workers and later adapted for students and staff. Unfortunately, the conditions at Willow Run were subpar, and many faculty members found it hard to make it their permanent home due to a shortage of rental options, escalating construction expenses, and a greater demand for housing in Ann Arbor.

Creation of the Special Senate Committee on Faculty Housing (1947-1950s)

To address these increasing concerns, the University Senate established the Special Committee on Faculty Housing in March 1947 to evaluate the housing crisis and make recommendations. The findings of the committee indicated that:

1. Faculty members were having great difficulty finding housing close to campus, causing some to turn down job offers or resign to other universities with more favorable housing.
2. The construction cost was rising, and the university was struggling to finance huge housing schemes.
3. The Ann Arbor housing market was not doing well in accommodating both students and faculty, and the university had to intervene.

65 University of Michigan. University Housing, *Faculty Housing, 1947, in University Housing (University of Michigan) Records, 1923–2011*, Central Topical Files, 1920–1978, Box 2, Bentley Historical Library, University of Michigan.

To address these problems, U-M explored a number of options, including:

- Repurposing university-owned buildings as faculty residences, such as University Terrace apartments for academic staff.
- Encourage private developers to build on campus, although legal restrictions on corporate holdings prevented the efforts from being successful.
- Proposing university-subsidized rental apartments for professors, although these suggestions failed due to their expense and zoning regulations.

Despite these efforts, the housing crisis continued, particularly for new hires and junior faculty, who regularly had to commute a long way due to the limited and expensive housing in Ann Arbor.

Failed Housing Proposals & Alternative Strategies (1960s-1990s)

Throughout the 1960s-1990s, there were various reports and committees reasserting the need for special faculty housing, but bigger projects never materialized. Budget constraints, zoning restrictions, and the lack of long-term university dedication to faculty housing programs were some of the causes of failure for a number of proposals. The university shifted its strategy instead, focusing on:

- Lobbying policy changes that would allow more faculty-orientated housing development.
- Offering financial support programs to assist faculty members with the purchase of houses in Ann Arbor.
- Investigating public-private partnerships to promote private housing projects that would be accessible to faculty.

By the 1980s, Ann Arbor's housing market had grown, yet affordability remained a concern. Faculty members were increasingly being priced out of the city, while rental properties were in high demand due to the expanding student population.

Summary of the 1989-91 Junior Faculty Housing Survey at the University of Michigan

In 1989–91, three MBA students conducted a survey of 150 U-M[66] assistant professors including 45 non-American faculty[67] aimed at understanding junior faculty housing needs, expectations, and cultural differences. The study, which achieved a 41% response rate, was developed with input from junior faculty across six academic disciplines.

The survey revealed notable disparities between American and non-American faculty. Non-American faculty were twice as likely to expect housing assistance from the university and rented for an average of 34.9 months before purchasing a home compared to 17.1 months for American peers highlighting greater financial and logistical adjustment needs. Non-American faculty also relied more on the U-M Housing Office, whereas American faculty commonly used real estate agents.

Income levels significantly influenced preferences. Faculty earning under $60,000 were more likely to expect university-provided housing and typically rented for longer periods. In contrast, higher-income faculty were more likely to buy larger homes sooner.

Household status also played a key role. Faculty with families prioritized proximity to schools and tended to buy homes after about 15 months, compared to 31 months for single faculty. Temporary furnished housing was appealing to faculty without children but less suitable for families.

Location preferences centered around proximity to Central Campus, North Campus, and Downtown Ann Arbor. Non-American faculty were less willing to live farther from campus, while North Campus faculty preferred nearby housing.
Finally, faculty expressed interest in down payment assistance, rental subsidies, and university-sponsored housing. The survey emphasized

66 University of Michigan. University Housing, *Junior Faculty Housing Survey, undated, in University Housing (University of Michigan) Records, 1923–2011*, Program Director > Topical Files, 1925–1997 > Reports and Surveys (cont.), Box 39, Bentley Historical Library, University of Michigan.
67 The classification of "non-American" faculty refers specifically to international faculty who did not hold U.S. citizenship at the time of the survey.

University Case Studies

University of California Santa Cruz

The University of California, Santa Cruz has been actively developing faculty housing since 1985 and also provides financial assistance programs such as loan counseling and down payment support to further enhance affordability. The university has taken a decentralized approach to faculty housing by developing multiple on-campus housing clusters. This model allows for a variety of housing types that cater to different faculty needs and life stages. To be eligible for the for-sale housing program, faculty must be employed at 100% time and a minimum one-year appointment. The rental housing program is available to employees at 100% employment for up to two years from their hiring date.



Figure 24: Hagar Court at UC Santa Cruz

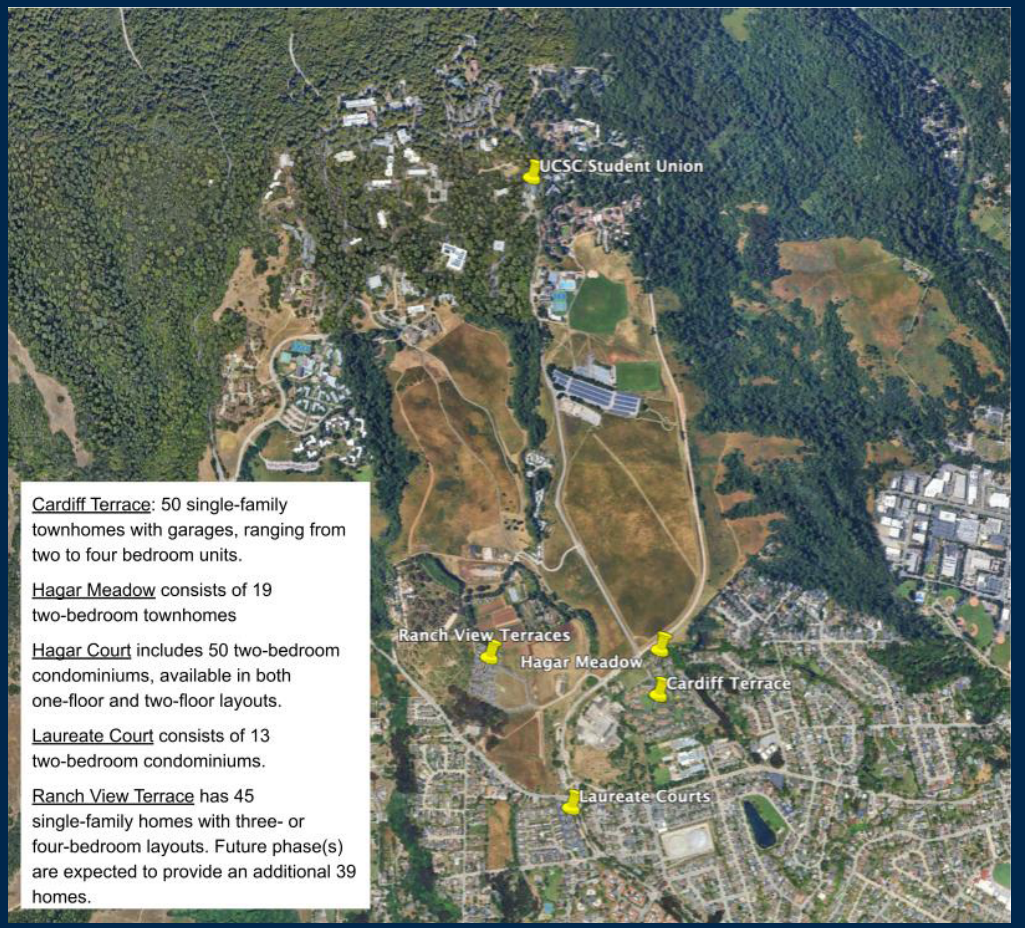


Figure 25: Map of UC Santa Cruz housing examples

The for-sale housing options include five different housing communities in different styles. To live in these housing options, faculty must fill out their living preferences during the Open Enrollment period to join a waiting list. The developments include Cardiff Terrace, Hagar Meadow, Hagar Court, Laureate Court, and Ranch View Terrace.

the need for improved institutional housing support particularly for international hires navigating Ann Arbor's high-cost, competitive housing market.

Current Status of Faculty Housing at U-M

Currently, U-M lacks a centralized faculty housing complex. While there are some scattered university-owned rental properties available for employees and faculty, earlier proposals for subsidized housing did not materialize due to funding and zoning challenges. The situation persists as Ann Arbor's tight housing market has increasingly hindered faculty, especially junior hires, in finding affordable housing within walking distance from campus. Although the university is pursuing partnerships and zoning changes to facilitate housing solutions, there are no large-scale faculty housing projects actively in development at this time.

U-M's journey with faculty housing reflects years of attempts to achieve a balance between housing affordability and institutional growth. Initial attempts to create university-owned housing faced challenges due to budget limitations and regulatory restrictions, hindering large-scale projects. Consequently, U-M shifted focus towards lobbying for policy changes and implementing financial assistance programs, rather than directly engaging in housing development. Currently, faculty housing continues to be a pressing concern, underscoring the necessity for strategic planning and investment in sustainable accommodation for academic staff.

Rationales for Building Faculty/Staff Housing

Under voluntary compliance with TC1 zoning, faculty and staff housing at Plymouth & Green would emphasize multifamily residential development, meaning apartment buildings, townhomes, or mixed-use residential spaces are required rather than single-family homes. The design would activate street-level features, such as stoops, porches, or ground-floor retail spaces, ensuring that the streetscape remains vibrant and pedestrian-friendly. Given that a portion of the site is located within a 100 feet of a signalized intersection at Plymouth & Green, residential uses on that portion of the ground floor are not permitted. Instead, those portions of the building could be designed with active, non-residential street-level uses, such as retail, office, or common amenity space, and would follow specific guidelines. These include a minimum ground-level height of 15 feet, and at least 60% of the street-facing facade consisting of transparent glazing.[68] The windows should allow clear views into the building's interior, with transparency higher than 80% and no more than 15% reflectance.[69] Additionally, the bottom of the windows should be no more than 2.5 feet above the adjacent sidewalk, helping maintain a visually active and engaging streetscape.[70]

By aligning with TC1 zoning, Plymouth & Green can serve as a model for transit-oriented faculty and staff housing, providing high-quality residences for U-M employees while enhancing connectivity, sustainability, and collaboration with the city. While U-M is not required to follow TC1 zoning, adopting these standards would demonstrate a commitment to the city's vision for walkable, transit-friendly development, strengthening ties between the campus and the broader Ann Arbor community and contributing to the development of the Plymouth TC1 district as a whole.

Affordability

Housing affordability has arisen as a concern for the staff and faculty at U-M, particularly those who are in their early or middle years of their careers. As prices on property and rent steadily rose in the area, the supply of housing

68 Unified Development Code (2024), 86.
69 Unified Development Code (2024), 86.
70 Unified Development Code (2024), 86.

University Case Studies

University of Minnesota

The University of Minnesota offers a range of housing options and relocation assistance to support faculty at various stages of their careers. These options include university-owned housing, off-campus search resources, and specialized housing communities that cater to different needs. Through these programs, the university aims to provide accessible, flexible housing solutions to attract and retain faculty and staff.



Figure 26: Pillsbury Court at the University of Minnesota



Figure 27: Map of University of Minnesota housing examples

Pillsbury Court offers family-oriented housing for faculty and staff new to the university looking for some place to settle while looking for a more permanent living situation. University Grove is another housing option owned by faculty. Homeownership is available to all University faculty and staff eligible for the faculty or federal retirement plans, current civil service and union-represented staff working at least 75% time (excluding probationary and temporary employees), and retired employees who qualify for continued coverage under the University's health and dental benefits program. The 1666 Coffman Condominiums offer a slightly different housing model, providing housing for people that have worked at the university at some point in their lifetime and are at least 55 years old.

has not caught up with the increasing demand, leading to increased competition and rising prices. Thus, those in the middle-class income range typically face housing costs that stress their financial stability and limit their ability to live close to their work location.

One of the possible strategies could be the implementation of a tiered rental pricing structure that considers the different levels of income for university staff. This structure allows for cross-subsidization, where tenants with higher incomes subsidize those with lower incomes. In addition, the University of Michigan (U-M) could examine implementing Community Land Trusts (CLTs) that preserve long-term affordability by separating homeownership from land ownership, or introducing limited-equity rental agreements that cap rent escalations and provide stable housing costs over time. Furthermore, expanding the overall housing stock—via high-density, mixed-use developments with minimal parking requirements—can help reduce development costs and market pressure, improving affordability without direct subsidization. These strategies build on the university's unique ability to influence land valuation and guide development schemes. Models from peer universities, including Stanford University and the University of California, Irvine, demonstrate how university-owned rental housing, paired with structured allocation systems, can ensure long-term affordability while meeting the varied needs of employees.

In addition, U-M has the unique benefit of having control over land value, and with this, it is able to decrease development costs through the incorporation of the project in the TC1 zoning scheme that promotes high-density, transit-oriented development and limits the need for expensive parking, thereby allowing the university to increase its resident base without the burden of high infrastructure costs. Subsequently, these savings can be passed on to the residents in the form of below-market rent, lessening the economic burden on the employees who would otherwise be pushed to the more expensive housing market in Ann Arbor.

Sustainability

For three-quarters of U-M staff and faculty, the daily commute begins and ends with the turning of a car key. But from a carbon impact perspective, the effects of a commute are a product of more than a single car trip. The study shows that commuting distance and carbon emissions are almost linearly related, with living closer significantly reducing emissions.

The site at Plymouth & Green is located on a major transit corridor in Ann Arbor and is surrounded by a well-established network of bus routes. Several AAATA bus routes run along Plymouth Road, providing scheduled shuttle service. If faculty and staff live in the area, they can conveniently commute between the main campus and downtown by public transit. The area is also equipped with infrastructure such as sidewalks and bike lanes to facilitate walking and biking trips. Residents can walk to nearby North Campus, grocery stores, and dining options, creating a "15-minute circle"[71] that reduces reliance on automobiles.

On the other hand, the Campus Connector would enable people to move between the Central, Medical and North campuses in minutes. Although the Campus Connector would increase the university's energy demand, it would decrease commuting-related greenhouse gas emissions. As U-M seeks to procure 100% of its purchased electricity from renewable sources, the transit system ultimately would derive its energy entirely from renewables. The terminus of the ATS system is expected to be located near the Plymouth & Green neighborhood. Faculty and staff are just a few minutes' walk away. If faculty housing can be constructed in the area, the faculty community will be well-served by the ATS system, as well as the transit system and bike lanes that are tightly linked to it.

71 Adam Fisher, "Commuting Analysis Team Exploring Options Beyond Driving," *The University Record*, March 30, 2020 , https://record.umich.edu/articles/commuting-analysis-team-exploring-options-beyond-driving/.

University Case Studies

University of California Irvine

The University of California, Irvine (UCI) developed University Hills, a single-site community exclusively for faculty, featuring over 1,200 homes within walking distance of campus. Housing options include rental apartments, townhomes, and for-sale single-family homes. To ensure long-term affordability, UCI employs a ground lease model that reduces purchase prices and includes resale price controls to maintain affordability for future owners. UC Irvine's faculty housing model is also one of the largest on-campus, for-sale workforce housing communities in the nation.



Figure 28: University Hills at UC Irvine

In terms of for-sale housing, 25-35 resale homes become available each year. These homes are offered either through the New Home Drawing system or by joining the resale home waitlist. For the waitlist option, faculty fill out an application with their preferences, and full-time University employees are entered onto the waiting list for homes based on a priority system (Appendix E1). For-rent housing follows the same priority system as for-sale housing but the process does not involve waitlists and works similar to finding an apartment in general for the unfurnished options. While an increasing number of faculty is being recruited to the University, the number of for-sale homes becoming available has declined and housing in University Hills is not guaranteed (Appendix E2). Faculty looking to live in University Hills do not need to have an offer of employment to apply as application submission date does determine your place on the waitlist.

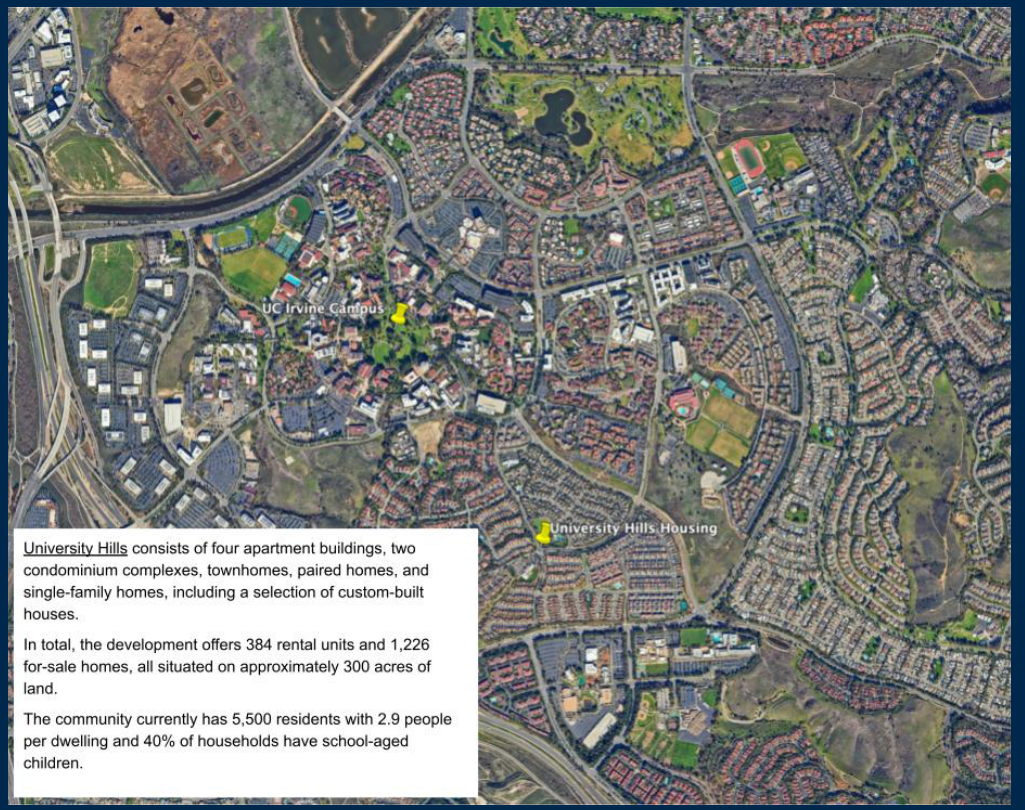


Figure 29: Map of UC Irvine housing examples

Recruitment and Retention

Ann Arbor's current high cost and tight supply of housing puts a heavy strain on middle-income faculty and staff (may exceed commonly used 30% affordability thresholds). In 2024, the average Ann Arbor home is now valued at $520,575, up 5.3% over the last year and the median rent in Ann Arbor for all rental types is $2,300 a month. According to PayScale, the cost of living overall in Ann Arbor is 4% above the national average, but housing is 16% higher and groceries are 9% higher.[72]

High housing prices and rents have forced some U-M faculty and staff to choose to settle outside of Ann Arbor. Reports indicate that it is difficult to purchase a home in downtown Ann Arbor unless one has millions of dollars of net worth; many who can only afford about $500,000 in property are forced to purchase homes nine miles away from campus in surrounding towns such as Dexter or Saline, communities that are a 15-30 minute drive from the center of Ann Arbor. With significantly lower housing and rent prices on the North Campus compared to the Central Campus, the development of affordable faculty and staff housing on university-owned land in the area of the Plymouth and Green could provide these middle-income faculty and staff with affordable on-campus housing options. This would not only alleviate the financial pressure on faculty and staff, but also provide some relief from the housing shortage throughout Ann Arbor.

On the other hand, since long commutes tend to lead to higher turnover intentions and turnover rates, it would be great if the U-M could build faculty housing in the area that would allow employees to walk a few minutes to a bus stop or an ATS station, and thus commute among Central, Medical and North campuses within minutes. This would dramatically reduce faculty and staff commuting fatigue and stress, and increase job satisfaction. The lower cost of living and easier commute will be a great incentive for younger faculty to join the organization and reduce talent loss.

72 Eleanor O'Sullivan, "Don't Mind the Cold? Retire to Ann Arbor, Michigan!" *Rethinking65*, July 25, 2024, https://rethinking65.com/dont-mind-the-cold-retire-to-ann-arbor-michigan/.

On Campus Faculty/Staff Housing

To help inform the type of faculty/staff housing that the University can offer, the team reviewed literature and researched several university case studies and on academic research surrounding affordable housing and workforce housing. The goal of analyzing these sources is to highlight the different financial and affordability models available when constructing a housing project like on-campus faculty/staff housing as well as the different physical structures the University can build and the different tenancy models they might use. Investigating all of these examples and research will allow us to adapt options that have been tried elsewhere to the physical and institutional environment of the area.

Intersection of Housing and Transportation

University communities across the US are facing increasing challenges related to housing affordability and transportation accessibility. Growth in university enrollment and faculty and staff rolls leads to housing demand increases, often driving up home prices and displacing lower-income residents.[73] Furthermore, commuting behaviors and habits for faculty, staff, and students are molded by the availability of affordable housing and efficient transportation options.[74]

Housing Affordability Challenges

The increasing demand for housing near universities exacerbates affordability, especially in high-cost urban regions. Many faculty and staff find it difficult to find housing and this can negatively impact recruitment and retention for universities.[75] This issue can be seen most prominently for teachers and lower-income university employees, as revealed in

73 Arnold, Emily. "Promising Practices for Workforce Housing: Implications for Colleges and Universities." (2020).

74 Baron, Griffin., Maves, Samuel., Shkembi, Abas., Sofka, Gwyndolyn., Wooldridge, James. "Commuting at the University of Michigan: A Report Developed or and Supported by the U-M President's Commission on Carbon Neutrality" (2020).

75 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."

University Case Studies

Stanford University

Stanford University provides a mix of rental, ground-lease ownership, and for-sale options through its faculty housing program. The university has developed multiple university-owned faculty rental housing complexes that are managed by professional property managers. These housing complexes include Stanford West Apartments, Colonnade Apartments, Stanford West, Welch Road Apartments, Middle Plaza, and Oak Creek Apartments.

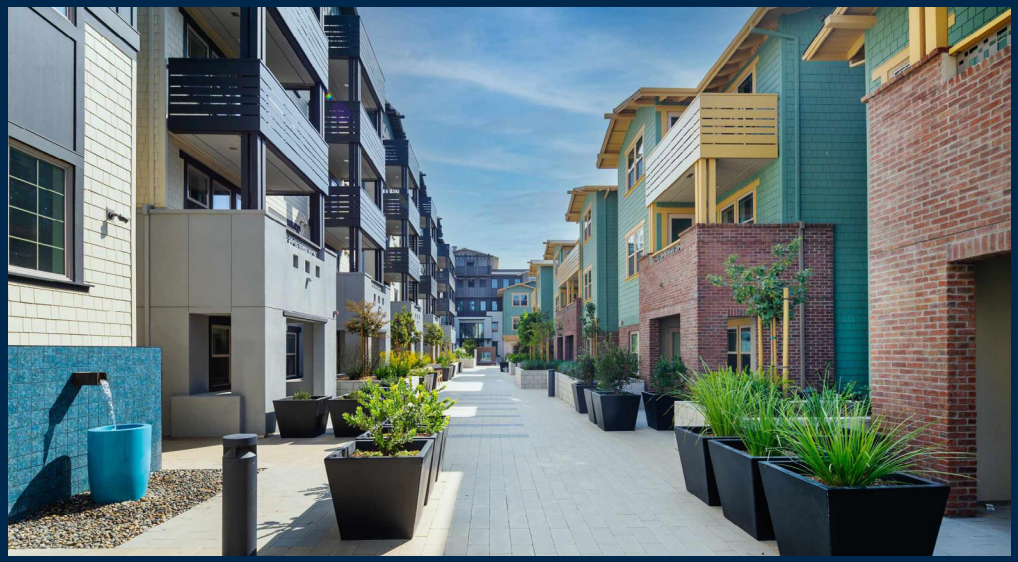


Figure 30: Middle Plaza at Stanford University

The specific rental communities mentioned above have a structured priority system for allocating housing. The highest priority is given to Redwood City campus staff, followed by other Stanford employees, including main campus staff, postdoctoral scholars, retired faculty on recall duty, and public safety officers. Faculty members, including tenure and non-tenure line professors, fall into the third priority category, while additional groups such as medical faculty, researchers, and visiting academics are assigned lower priority tiers. This structured priority system allows Stanford to allocate housing based on institutional needs while ensuring that faculty have access to affordable living options near campus. (Appendix E3) In addition to these rental options, Stanford has a faculty-owned rental home program where faculty can list their properties or rent directly from other faculty members.

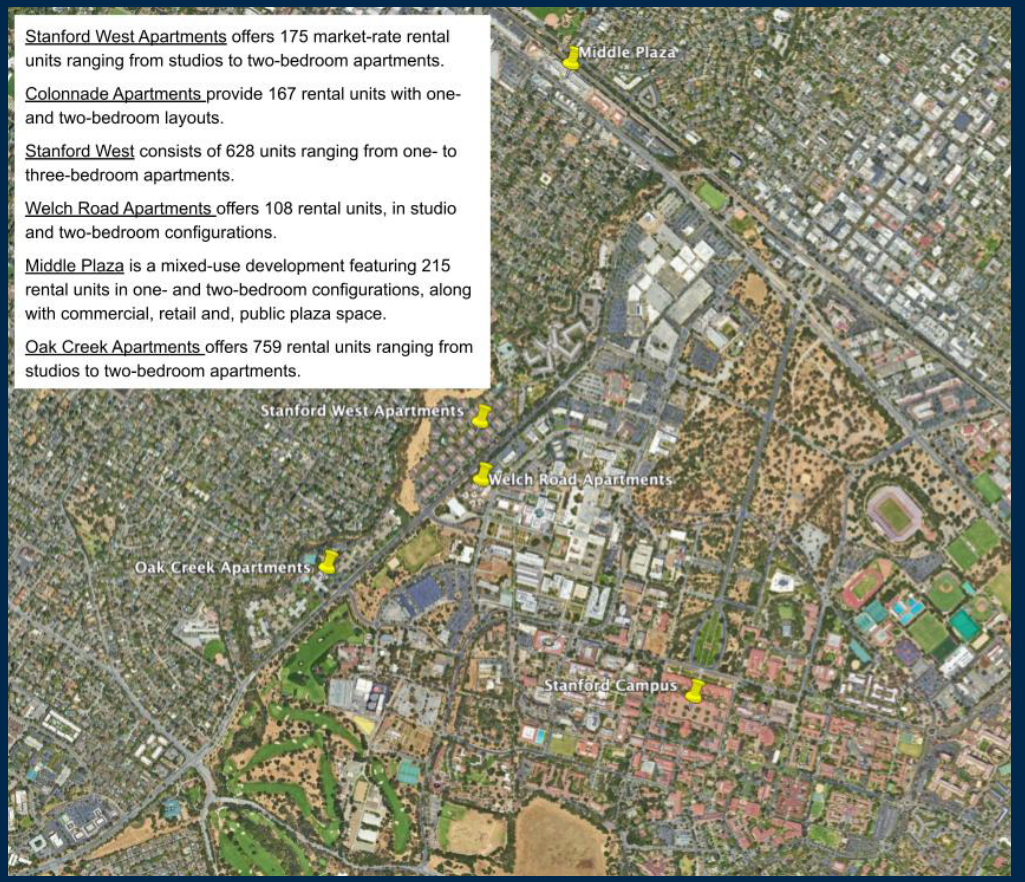


Figure 31: Map of Stanford University housing examples

studies where educator-focused housing initiatives have been developed.[76] Exacerbating the problem, many university towns maintain restrictive zoning regulations that hinder the development of high-density, mixed-use, and affordable housing options.[77] Policies like these contribute to limited housing supply and higher home prices. Some municipalities have reformed zoning codes that permit higher densities through upzoning and bonus schemes and require a percentage of new housing development to include affordable units, but municipal-university tensions often complicate housing policy changes.[78][79]

Models of Affordable Housing

A sustainable model for preserving affordable housing that has emerged is CLTs, which separate land ownership from home ownership, ensuring that property remains affordable even as market rates increase.[80] Some universities have partnered with CLTs to develop faculty and staff housing, managing to maintain both control over the land and long-term affordability.[81] There are barriers to implementation, however, including funding constraints and governance complexities.[82] Another approach to constructing faculty/staff housing is a public-private partnership where universities collaborate with private developers to build mixed-income housing near campuses. In this model, universities can leverage private sector investment while allowing themselves to maintain influence over affordability and accessibility.[83] Case studies like Miller's Court in Baltimore and Teachers Village in Newark demonstrate how public-private partnerships can successfully provide educator-focused housing.[84] There are concerns regarding the long-term affordability and financial commitments in this model.

Financing University Housing Projects

Many cities have adopted inclusionary zoning policies, requiring new developments to include a certain percentage of affordable housing units.[85] Additionally, density bonuses allow developers to build taller structures on the condition that they incorporate affordable housing.[86] Universities have worked with local governments to integrate these kinds of policies into housing models to ensure that new developments align with affordability frameworks.[87] Funding mechanisms such as Low-Income Housing Tax Credits and New Markets Tax Credits can be used to support affordable housing.[88] Furthermore, Tax Increment Financing can be used to reduce infrastructure costs and support development.[89] Construction method choice also impacts affordability. Mid-rise buildings are more cost effective than high rise buildings, and are thus often preferable for university housing projects.[90] When planning developments like this, universities need to make sure they balance land-use efficiency with financial sustainability.[91]

76 Davis, Paula. "Affordable Housing Solutions for Educators." *Donnell-Kay Foundation* (2017).
77 Brett, Deborah L. *Real estate market analysis: Trends, methods, and information sources*. Urban Land Institute, 2019.
78 George, Taz, and Marva Williams. "Maintaining housing affordability: The role of university partnerships in Iowa City and other communities." *Profitwise* 4 (2016): 9-16.
79 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."
80 Meehan, James. "Reinventing real estate: The community land trust as a social invention in affordable housing." *Journal of Applied Social Science 8*, no. 2 (2014): 113-133.
81 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."
82 Meehan, James. "Reinventing real estate: The community land trust as a social invention in affordable housing."
83 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."
84 Davis, Paula. "Affordable Housing Solutions for Educators."
85 George & Williams. "Maintaining housing affordability: The role of university partnerships in Iowa City and other communities."
86 Brett, Deborah L. *Real estate market analysis: Trends, methods, and information sources.*
87 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."
88 Davis, Paula. "Affordable Housing Solutions for Educators."
89 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."
90 Brett, Deborah L. *Real estate market analysis: Trends, methods, and information sources.*
91 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."

University Case Studies

University of Toronto

The University of Toronto provides university-owned housing for new and visiting faculty at the St. George campus through the Huron-Sussex Apartments. This housing option is available exclusively to faculty relocating from outside the Greater Toronto Area who hold a newly appointed full-time tenure-stream or continuing status-stream position at the university. The program aims to support faculty during their transition by offering convenient, on-campus living arrangements.



Figure 32: Huron-Sussex at the University of Toronto



Figure 33: Map of University of Toronto housing examples

Faculty are eligible to live in this housing for up to four years from the date of their appointment by the university. On average, 25% of the units in the neighborhood become available in any given year, so the University states they are unable to accommodate the demand for housing in this program and housing is not guaranteed if you fill out an application. To get an offer for housing in Huron-Sussex, faculty must fill out an application and how quickly they are offered housing depends on factors such as their position on the applicant list, the date of the application, and appointment date.

Transportation and Sustainability in Housing

Transportation and accessibility are critical pieces to housing affordability at universities. Reducing parking requirements in university housing development can significantly reduce construction costs while promoting sustainable commuting.[92] Universities can also expand transit subsidies to improve bike and pedestrian infrastructure to encourage non-car commutes.[93] Integrating housing models with sustainable practices and designs like energy efficiency can enhance long-term affordability by reducing utility costs and features like solar panels, passive heating and high-efficiency insulation can contribute to lower operational costs over time.[94]

92 Baron et al. "Commuting at the University of Michigan: A Report Developed or and Supported by the U-M President's Commission on Carbon Neutrality"

93 Arnold. "Promising Practices for Workforce Housing: Implications for Colleges and Universities."

94 George & Williams. "Maintaining housing affordability: The role of university partnerships in Iowa City and other communities."

Business & Tenancy Models

Models of faculty/staff housing can be characterized by their tenancy models, physical forms, and qualification requirements and allocation systems.

For-Sale Housing with Resale Restrictions

Several of the universities researched, including the University of California Irvine, the University of Minnesota, and the University of California Santa Cruz, offer for-sale housing options. This business model ensures that homes remain accessible to future faculty by capping resale prices. This is often done through university-controlled formulas or ground lease agreements. This approach enables universities to offer homeownership opportunities in high-cost real estate markets while ensuring that their housing stock remains affordable for faculty. However, resale restrictions may limit faculty members' ability to accumulate equity, making this process less attractive than traditional homeownership in the open market. This approach is nonetheless popular with faculty struggling to enter high-priced markets, and waitlists and availability constraints can make it difficult for all interested faculty members to secure housing.

Community Land Trust

A Community Land Trust is a nonprofit organization that acquires and holds land on behalf of a community to ensure long-term affordability and sustainable land use. By retaining ownership of the land and providing long-term leases to homeowners or businesses, CLTs maintain affordability and prevent displacement. This model supports affordable housing, community gardens, civic buildings, and commercial spaces, fostering community development and stability. UC Irvine does not operate under a land trust model but its system of leasing land to the Irvine Campus Housing Authority functions similarly by ensuring affordability through controlled resale mechanisms.

University-Owned Rental Housing

Many institutions, such as Stanford, the University of Minnesota, and the University of Toronto, provide university-owned rental housing. At Stanford they are managed by professional property managers. This model offers affordable living options without requiring long-term financial commitments from faculty. Rental options range from small-scale faculty apartments, such as those at the University of Toronto's Huron-Sussex Apartments, to large-scale rental communities like Stanford West Apartments, which offer hundreds of units. Some universities impose time limits on rental housing so that this housing acts as assistance to faculty as they transition to working for the university. University-owned rentals offer flexibility, allowing faculty to transition into the housing market without the immediate pressure of homeownership. These rentals often come at below-market rates, helping faculty manage housing costs in expensive urban areas. However, these housing options are usually in high demand, meaning that rental units have long wait lists and often an uncertain option for incoming faculty. Furthermore, because rental housing is often designed to be a transitional solution, faculty who plan to stay long-term often have to eventually seek housing elsewhere.

Physical forms

Housing Types

Housing in these developments can come in different forms. The main form used for home ownership is single-family homes which can be seen in the case of the University of California Irvine, the University of Minnesota, and the University of California Santa Cruz. Other models that are used include townhomes and condominiums and age restricted housing. For rental housing, the dominant housing form in apartments, which can be seen at Stanford's Stanford West Apartments and sections of the University of California Irvine's University Hills. Some of the other types employed include townhomes, historic homes, and faculty-owned homes they rent out to other faculty.

Use Mix

Some universities, like the University of California Irvine and Stanford, have developed large-scale faculty housing communities that integrate residential, commercial, and recreational spaces. UC Irvine's University Hills offers a mix of rental apartments, townhomes, and single-family homes within walking distance of campus. Similarly, Stanford's Middle Plaza incorporates retail and public spaces into its housing development. This proximity can enhance collaboration, social interaction, and campus engagement. This model offers convenience, accessibility, and a sense of belonging, particularly for faculty with families. Including mixed-use spaces also benefits the broader university and local communities by integrating amenities like shops and public plazas. It is important to note, however, that large-scale housing developments require significant upfront investment and long-term management. In residential-only communities, the developments focus solely on housing, offering a mix of housing types to cater to diverse faculty needs. The University of California Santa Cruz's faculty housing communities, such as Hagar Meadow and Hagar Court, provide townhomes and condominiums without integrating commercial spaces.

Qualification Requirements/Allocation Systems

Given the high demand for faculty housing, many universities use structured allocation systems to determine eligibility and access. These systems provide an organized and transparent method for distributing limited housing resources, ensuring priority is given to those who need it most. Faculty with lower priority rankings may struggle to access housing, and the lottery system can introduce uncertainty. Furthermore, rigid priority systems may not always align with the evolving needs of faculty as they progress in their careers.

Priority-Based Allocation Systems

Many institutions assign housing based on factors such as employment status, tenure, and departmental needs. For example, Stanford University employs a structured priority system for its rental communities, prioritizing Redwood City campus staff, followed by other Stanford employees, including main campus staff, postdoctoral scholars, and retired faculty on recall duty. Faculty members, including tenure and non-tenure line professors, fall into the third priority category.

Lottery-Based Allocation Systems

The University of California Irvine and the University of Minnesota use lottery systems to allocate limited housing resources. The University of California Irvine uses a waitlist for rental and for-sale units, with faculty entering based on priority systems. The University of Minnesota and the University of Toronto prioritize housing based on tenure status, faculty rank, and department needs. The University of California Irvine also has a Provost's Priority List for those with high-priority needs.

Faculty/Staff Housing at Plymouth & Green Site

Land Leasing to a Community Land Trust

Under this model, U-M could lease the roughly 27-acre site to a CLT, allowing the CLT to develop and manage an affordable, mixed-use housing development. This model is particularly effective in addressing housing affordability while maintaining long-term land control. The University would retain land ownership while enabling the CLT to offer affordable housing through long-term stewardship and reduced housing costs.

This option prioritizes affordable housing, with a CLT possibly planning for about 80% of the units to be designated for homeownership and 20% as rental units. The University can lease the land for a nominal fee to lower development costs, making the project financially viable. According to local real estate professionals, leveraging public subsidies, grants, and tax incentives—such as Michigan's 2023 Tax Increment Financing law—could further reduce costs and enhance affordability. Tax Increment Financing could be used to fund infrastructure improvements and offset costs, reducing the initial financial burden and allowing the CLT to focus on delivering affordable units.

This approach directly addresses affordability through reduced land costs and public subsidies. It aligns with community-focused development goals while leveraging external financing to reduce the University's financial risk. Working with a CLT also fosters long-term housing stability and affordability. The primary challenges include the complexity of securing public funding and regulatory approvals. Establishing and maintaining a long-term partnership with a CLT also requires consistent oversight and collaboration.

University-Owned Rental Faculty/Staff Housing

The University can own and rent apartments out to faculty and staff, possibly in collaboration with a private contractor. To determine which faculty/staff can live on the property, the University would need to devise a housing property scheme similar to the ones used by Stanford and the University of California Irvine that can prioritize faculty and staff based on criteria such as household income, current proximity to campus, or application submission timing.

In this model, U-M could directly develop, own, and operate faculty and staff housing on the site. Real estate experts believe this option gives the University great control over property management and future planning while addressing the affordable housing needs of faculty and staff. The University would be able to manage all aspects of construction and leasing and insights from industry professionals suggest that leveraging the University's tax-exempt status and public subsidies would reduce construction and operational costs.

In terms of building construction, for buildings above five stories, cold-form steel would be the most common and economical option for construction. For buildings 5 stories or lower, wood framing over a steel or concrete first floor would be the most effective. The University could generate revenue through below-market-rate rents targeted at faculty and staff while reducing costs through tax exemptions and limited parking provision.

Possible developments to reference include the Arbor South development being constructed by Oxford Companies, which is planned to include 2 office buildings, a hotel, 7 apartment buildings (including an affordable housing building), and three parking structures. Another example development the University can reference is The Standard on Main St. or the Packard Row development currently under construction.

This model enables the University to maintain full ownership and control while generating long-term revenue. It also allows for collaborative planning by ensuring the development follows the City's TC1 zoning criteria. The primary drawbacks are the high upfront capital investment and the ongoing responsibilities of property management. The University would need to carefully manage the development and its operational costs to maintain long-term affordability.

Considerations for Both Options

The development constructed on the site through either model would ideally consist of a mix of mid-rise structures consistent with TC1 zoning and balancing open space with vertical density. Based on conversations with local real estate professionals and comparable projects, on a lot of Plymouth & Green's size, the University should aim to build about 2500 to 3000 units, ranging from studio to two-bedroom apartments with an average unit size of 800-850 square feet across multiple different buildings. Based on comparable projects like Packard Row, construction costs are estimated at approximately $380,000 per unit, with unit sizes averaging about 840 sq. ft. Conversations with developers indicate that operating expenses would be lower than private developments because of the University's tax-exempt status.

There is the possibility of building in four to five phases with each phase needing to be sufficiently leased before going on to the next phase. The first phase should be the largest so that the majority of construction is finished once people start to live in the development. This also creates a critical mass of people already on the site to support ground floor retail.[95]

For both development options described above, there are some design principles the University should consider. Parking solutions should prioritize minimizing parking ratios in line with TC1 guidelines to reduce costs, emphasizing external or structured parking rather than expensive underground options. The University could also choose not to provide on-site parking and recommend parking at the ATS terminus parking structure.

To foster placemaking, the development should incorporate large green spaces for community use and ground-floor retail units. This provides the opportunity for economic and social development in the area and creates a positive living experience for faculty/staff and the surrounding community. Integrating the development with the existing bus systems provided by the City and the University is also critical to reduce parking demand and enhance mobility. Additionally, we recommend that the site at Plymouth & Green house e-bikes and e-scooters to further enhance the site for multi-modal use and foster TC1 zoning and City and University carbon neutrality goals.

95 Discussion with Andy Andre, Vice President of Real Estate Development, Oxford Companies, March 19, 2025.

Our team has designed an example of what a potential development on this site could look like. Our concept shows a 27-acre mixed-use development with faculty/staff apartments and commercial space.



This is just one possible design that this space could hold but it highlights the potential of the site for a highly mixed-use development.

Figure 34: Aerial perspective from the south of Plymouth & Green mixed-use development concept

We were able to fit about 2.3 million square feet of residential space across roughly 2,700 units at 850 square feet per unit.

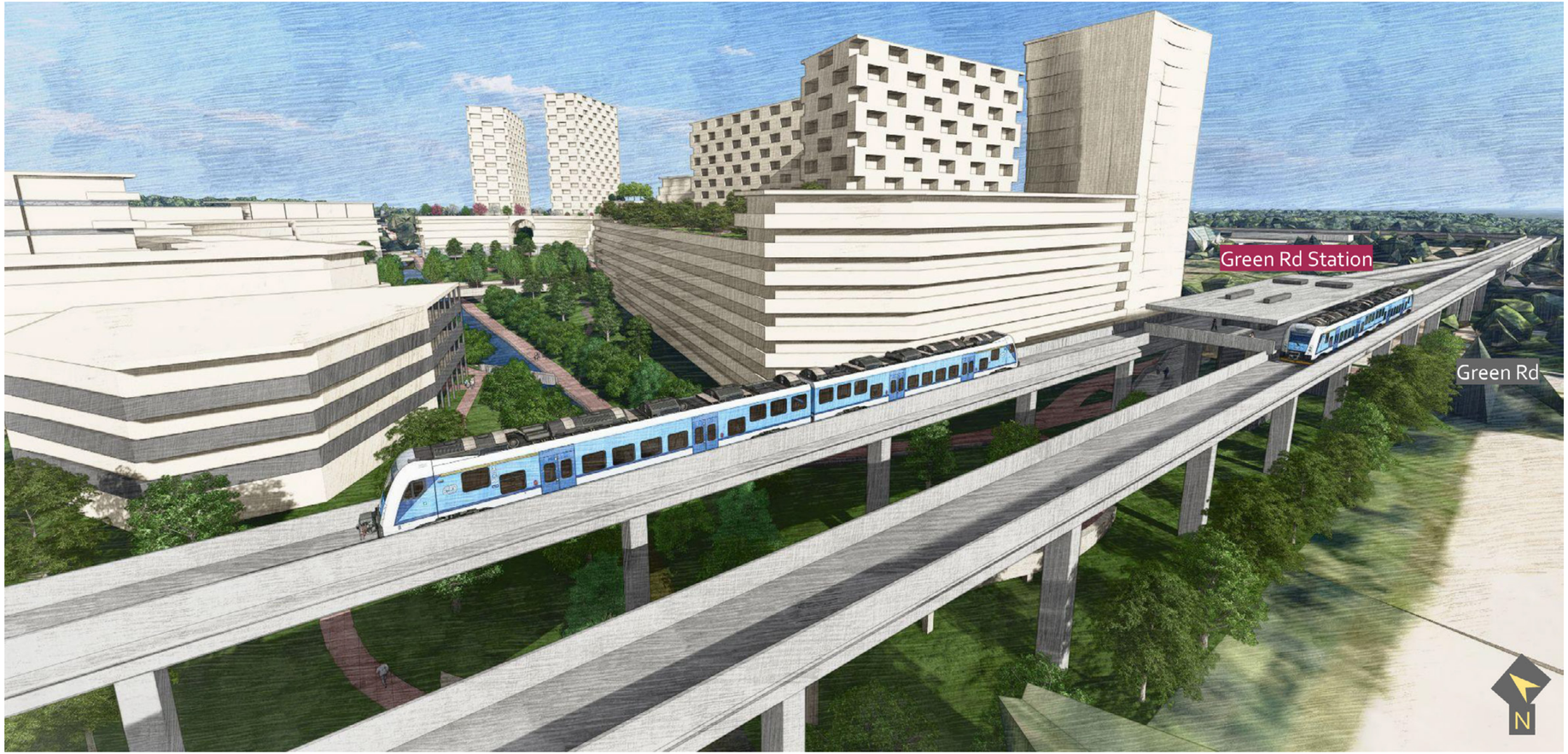


Figure 35: Aerial perspective from the southwest of Plymouth & Green mixed-use development concept



Figure 36: Perspective from the northeast of Plymouth & Green of mixed-use development concept

There is also room for about 200,000 square feet of retail space and 300,000 square feet of parking with around 1,800 parking spaces across five garages.

Our design also shows an interior public park covering about seven acres.



Figure 37: Interior perspective from the west of Plymouth & Green mixed-use development concept

CONCLUSION & RECOMMENDED NEXT STEPS

Of the report's proposed alternatives, the Park & Ride lot on Plymouth Rd., adjacent to the southwest US-23 entrance ramp offers notable advantages. Commuters using US-23 and Plymouth Rd. can easily enter and exit the various garage alternatives, keeping them and their vehicles immediately connected to their respective routes. This follows best practice considerations of tying different forms of transportation together by alleviating gaps, such as needing to drive further into Ann Arbor to access buses or the future ATS system. With the potential for expansion, the Plymouth Park & Ride lot is also best for staged garage construction, should the first 3,000 spot garage be able to handle the near-mid term flow of vehicle traffic.

For the University to succeed in building the Plymouth Park & Ride terminus and garage, our team and report suggest that U-M incorporate evaluation of alternative sites into the ongoing development and stakeholder engagement process.

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APPENDIX B: TRAFFIC LEVEL OF SERVICE STANDARDS

Appendix B1: Intersection of Service Table

This table pairs an intersection's volume-to-capacity ratio to a level of service letter grade with a brief description of what that grade means in normative terms. (Source)

Signalized Intersections

The TRB *Circular 212* Planning method is the selected level of service calculation method for the designated intersections in the San Mateo County's CMP Roadway System. A signalized intersection's level of service, according to the method described in TRB *Circular 212*, is based on dividing the sum of the critical volumes by the intersection's capacity. This calculation yields the volume-to-capacity ratio (V/C). The critical movements are the combinations of through movements plus right-turn movements if there is no exclusive right-turn lane, and opposing left-turn movements that represent the highest per-lane volumes. Descriptions of levels of service for signalized intersections, together with their corresponding V/Cs, are presented in Table B-6.

Table B-6
Intersection Level of Service Definitions

Level of Service	Interpretation	V/C Ratio
A	Uncongested operations; all queues clear in a single signal cycle.	Less Than 0.60
B	Very light congestion; an occasional approach phase is fully utilized.	0.60 to 0.69
C	Light congestion; occasional backups on critical approaches.	0.70 to 0.79
D	Significant congestion on critical approaches, but intersection functional. Cars required to wait through more than one cycle during short peaks. No long-standing queues formed.	0.80 to 0.89
E	Severe congestion with some long-standing queues on critical approaches. Blockage of intersection may occur if traffic signal does not provide for protected turning movements. Traffic queue may block nearby intersections(s) upstream of critical approach(es).	0.90 to 0.99
F	Total breakdown, stop-and-go operation.	1.00 and Greater

Appendix B2: Plymouth/Green Traffic Analysis Table (Morning)

Baseline Statistics - Plymouth/Green (Morning)

Movement	WB L	EB L	WB TR	EB TR	NB L	SB L	NB TR	SB TR
Movement Volume	105	20	1418	494	69	361	121	176
Left Turn Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Lane Factor	1	1	1.1	1.1	1	1.13	1.05	1.05
Heavy Vehicle Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjusted Volume	104	20	1552	541	69	406	126	184
Number of Lanes	1	1	3	3	1	2	2	2
Critical Group Lanes	-	-	-	**8**	-	-	-	**7**
Per Lane Flow Rate	104	20	517	180	69	203	63	92
Critical Lane Flow Rate	-	-	-	**537**	-	-	-	**266**
Lane Group Cycle Length	24	20	55	50	20	20	30	35
Critical Cycle Length	-	-	-	**79**	-	-	-	**55**
Effective Green Time	-	-	-	**68.21**	-	-	-	**33.79**
Critical Group Capacity	-	-	-	**7737**	-	-	-	**3354**
Critical Group V/C Ratio	-	-	-	**0.56**	-	-	-	**0.56**

Formula Variables	
8	Number of Phases
4	Time Lost per Phase
1	Peak Hour Factor
0.97	Desired V/C Ratio
1900	Saturation Flow Rate

15	**--- Total Lanes**
803	**--- Sum of Critical Flow Rates**
134	**--- Total Cycle Length**
102	**--- Total Effective Green Time**
1446	**--- Intersection Capacity**
0.56	**--- Intersection V/C Ratio**

With 2,000 Vehicle Increase (Westbound)

Movement	WB L	EB L	WB TR	EB TR	NB L	SB L	NB TR	SB TR
Movement Volume	105	20	3418	494	69	361	121	176
Left Turn Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Lane Factor	1	1	1.1	1.1	1	1.13	1.05	1.05
Heavy Vehicle Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjusted Volume	104	20	3741	541	69	406	126	184
Number of Lanes	1	1	3	3	1	2	2	2
Critical Group Lanes	-	-	-	**8**	-	-	-	**7**
Per Lane Flow Rate	104	20	1247	180	69	203	63	92
Critical Lane Flow Rate	-	-	-	**1267**	-	-	-	**266**
Lane Group Cycle Length	24	20	55	50	20	20	30	35
Critical Cycle Length	-	-	-	**79**	-	-	-	**55**
Effective Green Time	-	-	-	**84.29**	-	-	-	**17.71**
Critical Group Capacity	-	-	-	**9561**	-	-	-	**1758**
Critical Group V/C Ratio	-	-	-	**1.06**	-	-	-	**1.06**

15	**--- Total Lanes**
1533	**--- Sum of Critical Flow Rates**
134	**--- Total Cycle Length**
102	**--- Total Effective Green Time**
1446	**--- Intersection Capacity**
1.06	**--- Intersection V/C Ratio**

Appendix B3: Plymouth/Green Traffic Analysis Table (Evening)

Baseline Statistics - Plymouth/Green (Evening)

Movement	WB L	EB L	WB TR	EB TR	NB L	SB L	NB TR	SB TR
Movement Volume	94	78	965	1224	119	437	385	209
Left Turn Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Lane Factor	1	1	1.1	1.1	1	1.13	1.05	1.05
Heavy Vehicle Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjusted Volume	94	78	1056	1340	118	491	402	218
Number of Lanes	1	1	3	3	1	2	2	2
Critical Group Lanes	-	-	-	**8**	-	-	-	**7**
Per Lane Flow Rate	94	78	352	447	118	246	201	109
Critical Lane Flow Rate	-	-	-	**540**	-	-	-	**447**
Lane Group Cycle Length	15	15	60	60	20	20	30	30
Critical Cycle Length	-	-	-	**75**	-	-	-	**50**
Effective Green Time	-	-	-	**50.90**	-	-	-	**42.10**
Critical Group Capacity	-	-	-	**6189**	-	-	-	**4480**
Critical Group V/C Ratio	-	-	-	**0.70**	-	-	-	**0.70**

Formula Variables	
8	Number of Phases
4	Time Lost per Phase
1	Peak Hour Factor
0.97	Desired V/C Ratio
1900	Saturation Flow Rate

15	**--- Total Lanes**
987	**--- Sum of Critical Flow Rates**
125	**--- Total Cycle Length**
93	**--- Total Effective Green Time**
1414	**--- Intersection Capacity**
0.70	**--- Intersection V/C Ratio**

With 2,000 Vehicle Increase (Northbound)

Movement	WB L	EB L	WB TR	EB TR	NB L	SB L	NB TR	SB TR
Movement Volume	94	78	965	1224	119	437	2385	209
Left Turn Factor	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
Lane Factor	1	1	1.1	1.1	1	1.13	1.05	1.05
Heavy Vehicle Factor	1.03	1.03	1.03	1.03	1.03	1.03	1.03	1.03
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adjusted Volume	94	78	1056	1340	118	491	2492	218
Number of Lanes	1	1	3	3	1	2	2	2
Critical Group Lanes	-	-	-	**8**	-	-	-	**7**
Per Lane Flow Rate	94	78	352	447	118	246	1246	109
Critical Lane Flow Rate	-	-	-	**540**	-	-	-	**1492**
Lane Group Cycle Length	15	15	60	60	20	20	30	30
Critical Cycle Length	-	-	-	**75**	-	-	-	**50**
Effective Green Time	-	-	-	**24.72**	-	-	-	**68.28**
Critical Group Capacity	-	-	-	**3006**	-	-	-	**7265**
Critical Group V/C Ratio	-	-	-	**1.44**	-	-	-	**1.44**

15	**--- Total Lanes**
2032	**--- Sum of Critical Flow Rates**
125	**--- Total Cycle Length**
93	**--- Total Effective Green Time**
1414	**--- Intersection Capacity**
1.44	**--- Intersection V/C Ratio**

Appendix B4: Plymouth/US-23 Traffic Analysis Table (Morning)

Baseline Statistics - Plymouth/US-23 (Morning)

Movement	WB	EB	NB	SB	
Movement Volume		1322	644	18	1612
Through Lane Factor		1.05	1.05	1	1
Left Lane Factor		1	1	1	1
Right Lane Factor		1	1	1	1
Heavy Vehicle Factor		1.03	1.03	1.03	1.03
Peak Hour Factor		0.92	0.92	0.92	0.92
Adjusted Volume		1315	641	17	1528
Number of Lanes		4	3	2	3
Critical Group Lanes	-		7	-	5
Per Lane Flow Rate		329	214	9	509
Critical Lane Flow Rate	-		329	-	509
Lane Group Cycle Length		30	30	25	25
Critical Cycle Length	-		**35**	-	**20**
Effective Green Time	-		**19.23**	-	**29.77**
Critical Group Capacity	-		**3934**	-	**4351**
Critical Group V/C Ratio	-		**0.59**	-	**0.59**

Formula Variables	
4	Number of Phases
4	Time Lost per Phase
1	Peak Hour Factor
0.97	Desired V/C Ratio
1900	Saturation Flow Rate

12	--- Total Lanes
838	--- Sum of Critical Flow Rates
65	--- Total Cycle Length
49	--- Total Effective Green Time
1432	--- Intersection Capacity
0.59	--- Intersection V/C Ratio

With 2,000 Vehicle Increase (West/Southbound)

Movement	WB	EB	NB	SB	
Movement Volume		2322	644	18	2612
Through Lane Factor		1.05	1.05	1	1
Left Lane Factor		1	1	1	1
Right Lane Factor		1	1	1	1
Heavy Vehicle Factor		1.03	1.03	1.03	1.03
Peak Hour Factor		0.92	0.92	0.92	0.92
Adjusted Volume		2310	641	17	2475
Number of Lanes		4	3	2	3
Critical Group Lanes	-		7	-	3
Per Lane Flow Rate		578	214	9	825
Critical Lane Flow Rate	-		578	-	825
Lane Group Cycle Length		30	30	25	25
Critical Cycle Length	-		**35**	-	**20**
Effective Green Time	-		**20.18**	-	**28.82**
Critical Group Capacity	-		**4129**	-	**2528**
Critical Group V/C Ratio	-		**0.98**	-	**0.98**

10	--- Total Lanes
1403	--- Sum of Critical Flow Rates
65	--- Total Cycle Length
49	--- Total Effective Green Time
1432	--- Intersection Capacity
0.98	--- Intersection V/C Ratio

Appendix B5: Plymouth/US-23 Traffic Analysis Table (Evening)

Baseline Statistics - Plymouth/US-23 (Evening)

Movement	WB	EB	NB	SB	
Movement Volume		1162	1172	34	468
Through Lane Factor		1.05	1.05	1	1
Left Lane Factor		1	1	1	1
Right Lane Factor		1	1	1	1
Heavy Vehicle Factor		1.03	1.03	1.03	1.03
Peak Hour Factor		0.92	0.92	0.92	0.92
Adjusted Volume		1156	1166	32	443
Number of Lanes		4	3	2	3
Critical Group Lanes	-		7	-	5
Per Lane Flow Rate		289	389	16	148
Critical Lane Flow Rate	-		**389**	-	**148**
Lane Group Cycle Length		30	30	15	15
Critical Cycle Length	-		**30**	-	**15**
Effective Green Time	-		**21.01**	-	**7.99**
Critical Group Capacity	-		**6210**	-	**1687**
Critical Group V/C Ratio	-		**0.44**	-	**0.44**

Formula Variables	
4	Number of Phases
4	Time Lost per Phase
1	Peak Hour Factor
0.97	Desired V/C Ratio
1900	Saturation Flow Rate

12	--- Total Lanes
537	--- Sum of Critical Flow Rates
45	--- Total Cycle Length
29	--- Total Effective Green Time
1224	--- Intersection Capacity
0.44	--- Intersection V/C Ratio

With 2,000 Vehicle Increase (Eastbound)

Movement	WB	EB	NB	SB	
Movement Volume		1162	3172	34	468
Through Lane Factor		1.05	1.05	1	1
Left Lane Factor		1	1	1	1
Right Lane Factor		1	1	1	1
Heavy Vehicle Factor		1.03	1.03	1.03	1.03
Peak Hour Factor		0.92	0.92	0.92	0.92
Adjusted Volume		1156	3156	32	443
Number of Lanes		4	3	2	3
Critical Group Lanes	-		7	-	5
Per Lane Flow Rate		289	1052	16	148
Critical Lane Flow Rate	-		**1052**	-	**148**
Lane Group Cycle Length		30	30	15	15
Critical Cycle Length	-		**30**	-	**15**
Effective Green Time	-		**25.43**	-	**3.57**
Critical Group Capacity	-		**7515**	-	**754**
Critical Group V/C Ratio	-		**0.98**	-	**0.98**

12	--- Total Lanes
1200	--- Sum of Critical Flow Rates
45	--- Total Cycle Length
29	--- Total Effective Green Time
1224	--- Intersection Capacity
0.98	--- Intersection V/C Ratio

APPENDIX C: COST ANALYSIS METHODOLOGY

Appendix C1: Plymouth Park & Ride and East Medical Campus Scenario

In addition to the two primary scenarios that were considered for the U-M Campus Connector project, a third extended scenario was under consideration that would extend the guideway to the East Medical Campus. This option adds an eighth station and approximately 1.5 miles to the system length, making the entire guideway 5.0 miles.

The overall cost for this scenario is estimated at $1.1 billion, the largest of the scenarios being considered. It is up from the baseline Plymouth & Green scenario by some $209 million, or 23.5% higher overall project cost. The majority of this increase comes from the additional length of elevated guideway, the inclusion of a new station, and associated systems and infrastructure scaling corresponding to the growth.

Most significantly, this project also constitutes a significant land acquisition requirement of approximately 5.3 acres worth $6.4 million based on Ann Arbor's average land values and assuming a 30-foot right-of-way easement. Because of its high cost impacts and relatively few additional connectivity benefits over other options, this alternative was not recommended for further development. Nevertheless, it is included here for the record to provide a sense of the upper limit of possible system expansion and to assist in future decision-making if corridor priorities were to change or funding conditions differ.

Appendix C2: Detailed Cost and Land Acquisition Analysis for Campus Connector Extension Scenarios without Parking Garage

This appendix presents a comprehensive breakdown of cost estimates and land acquisition requirements for three proposed extensions to the Campus Connector. Each scenario explores a different terminus location beyond the baseline Plymouth & Green site.

Scenario 1: Plymouth Park & Ride
- Additional Guideway Length: 2,707 ft (~0.5 miles)
- Total Guideway Length: ~4.01 miles
- Estimated Costs:
  - Elevated Guideway: $401.3 million
  - 7 Stations: $140.0 million
  - Vehicles (40 units): $140.0 million
  - Control Systems & Integration: $60.0 million
  - Operations, Maintenance & Storage Facility: $25.0 million
  - Planning, Engineering, Design: $55.0 million
  - Project Management & Admin: $60.0 million
  - Contingency (10%): $88.1 million
  - **Total Estimated Cost: $969.4 million**

Scenario 2: Earhart Road
- Additional Guideway Length: 3,542 ft (~0.7 miles)
- Total Guideway Length: ~4.17 miles
- Estimated Costs:
  - Elevated Guideway: $417.1 million
  - 7 Stations: $140.0 million
  - Vehicles (40 units): $140.0 million
  - Control Systems & Integration: $60.0 million
  - Operations, Maintenance & Storage Facility: $25.0 million
  - Planning, Engineering, Design: $55.0 million
  - Project Management & Admin: $60.0 million
  - Contingency (10%): $89.7 million
  - **Total Estimated Cost: $986.8 million**

Scenario 3: Plymouth Park & Ride + East Medical Campus
- Additional Guideway Length: 7,699 ft (~1.5 miles)
- Total Guideway Length: ~4.96 miles
- Estimated Costs:
  - Elevated Guideway: $495.8 million
  - 8 Stations: $160.0 million
  - Vehicles (40 units): $140.0 million
  - Control Systems & Integration: $60.0 million
  - Operations, Maintenance & Storage Facility: $25.0 million
  - Planning, Engineering, Design: $55.0 million
  - Project Management & Admin: $60.0 million
  - Contingency (10%): $97.6 million
  - **Total Estimated Cost: $1.1 billion**

Land Acquisition Estimates

For each extension, land acquisition was estimated using a 30-foot-wide easement for the elevated guideway. Based on an average 2024 land value of $1.2 million per acre in Ann Arbor (sources: Zillow, LoopNet), the following calculations were used:[96]

Conversion Method:
- Area (sq ft) = Length (ft) × 30 ft (easement width)
- 1 acre = 43,560 sq ft

Scenario 1: Plymouth Park & Ride
- Area Required: 2,707 × 30 = **81,210 sq ft**
- In Acres: 81,210 ÷ 43,560 ≈ **1.86 acres**
- **Estimated Land Cost**: 1.86 × $1.2M = **~$2.2 million**

96 LoopNet, "4033 Plymouth Rd, Ann Arbor, MI 48105," *LoopNet.com*, accessed April 14, 2025, https://www.loopnet.com/Listing/4033-Plymouth-Rd-Ann-Arbor-MI/25327835/.

Scenario 2: Earhart Road

- Area Required: 3,542 × 30 = **106,260 sq ft**
- In Acres: 106,260 ÷ 43,560 ≈ **2.44 acres**
- **Estimated Land Cost**: 2.44 × $1.2M = **~$2.9 million**

Scenario 3: Plymouth Park & Ride + East Medical Campus

- Area Required: 7,699 × 30 = **230,970 sq ft**
- In Acres: 230,970 ÷ 43,560 ≈ **5.3 acres**
- **Estimated Land Cost**: 5.3 × $1.2M = **~$6.4 million**

These values are integrated into the overall project cost under the "Additional Costs" category in the scenario comparison visualizations. While land acquisition represents a relatively small portion of the total budget, it becomes a critical factor when evaluating extensions that go beyond university-owned property boundaries.

Appendix C3: Garage Cost Estimates

In calculating garage estimates, two sets of projections were created, each using similar sources with different methods of calculation and considering differing factors. The average cost of each proposal was averaged between its high and low estimates, and again averaged with its partner calculation from the other set.

The first set of garage estimates incorporate calculations based on cost per square foot, complexity of irregular shaped construction and related irregularities (internal ramps, external spiral ramps, bridges), and number of levels to calculate a rough cost for each proposal. The team added contingency buffers based on uncertainty about the estimated components ranging from 10 percent for internal ramps to 25 percent for external ramps, among others. These were applied directly to the structures' cost per square footage.

The second set of calculations includes a split between structural and soft costs, added together from high and low estimated cost points. Structural costs emphasize the materials needed to construct the garage itself, while soft costs cover everything from design and construction fees to signage and equipment costs.

Various sources were used to construct these estimates, including the cost ranges listed in Appendix C4.

Appendix C4: How Much Does it Cost to Build a Parking Garage?[97]

National Average Cost

"The average precast parking garage cost per space is between $19,500 and $26,000 and $31,500 to $42,000 for a traditional garage. The car space can be anywhere between 300 and 400 sq.ft. The most common size is 340 sq.ft."

National average cost	**$9.75M**
Average range	**$7.5M-$12M**
Low-end	**$150,000**
High-end	**$20M**

Size of Garage

Size	Precast Cost (Labor Included)
50,000 sq.ft.	**$2.5M - $4M**
100,000 sq.ft.	**$5M - $8M**
150,000 sq.ft.	**$7.5M - $12M**
200,000 sq.ft.	**$10M - $16M**
250,000 sq.ft.	**$12.5M - $20M**

Number of Levels

Number of Levels	Cost per Space (Labor Included)
Single-Level	**$14,000 - $20,000**
Multi-Level	**$19,000 - $30,000**

Location of Parking Space

Location	Cost per Space (Labor Included)
Surface Lot	**$14,000 - $20,000**
Underground Lot	**$19,000 - $30,000**

Construction Material Cost

Material	Cost per Sq.Ft. (Labor Included)
Chip Seal	**$2 - $5**
Permeable Pavers	**$2 - $8**
Gravel	**$3 - $5**
Concrete	**$4 - $7**
Asphalt	**$7 - $13**

Breakdown of Project Costs

Part of Project	Percentage of Total Cost
Structural Engineer Fees	**1% - 20%**
Finishing	**5% - 10%**
Soft Costs	**5% - 10%**
Architect	**8.9% - 10%**
Equipment	**10% - 15%**
General Contractor	**15% - 20%**
Labor	**20.1% - 25%**
Material	**35% - 40%**

97 Adam Graham, "How Much Does it Cost to Build a Parking Garage?" Fixr, Last Updated August 17, 2022. https://www.fixr.com/costs/build-parking-garage.

Signage and Finishing Costs

Type of Sign	Cost (Labor Included)
Lines	$0.20 - $0.65/linear foot
Curb Painting	$0.50 - $1.50/linear foot
Stenciled Numbers	$1.50 - $3.50/number
Letters	$2 - $4/letter
Directional Arrows	$10 - $30/each
Stop Signs	$15 - $25/each
Handicapped Logos	$25 - $30/each
Pedestrian Crosswalks	$50 - $75/each

- "Building an automated garage lowers the price per car to around $16,000 to $24,000 per space."
- "A budget for total operating and maintenance costs for a garage is around $400 to $600 per space per year, depending on if you have a surface lot or a garage."
- "Parking lot paving cost per square foot averages $1 to $7 depending on the material."
- "The average price for a four-person elevator is around $40,000. However, prices can go from $18,000 for one person to $65,000 for elevators holding six people."
- "Photovoltaic systems have starting costs of $100,000 for canopy systems and can get more expensive for larger garages."
- "Most car park sensor systems come at the price of $20 to $200 per sensor./ Some smart systems can have costs going up to $400 per installed sensor."
- "A garage bumper is priced between $23 and $75, depending on the materials onto which they are installed."
- "Parking lot pay machines cost from $5,000 to $20,000 depending on the features you want to include."
- "Automated license plate readers (ALPRs) typically cost between $10,000 and $25,000, depending on the quality of the system and any additional features."

Appendix C5: Parking Garage Alternatives Comparison Table 1[98]

Location	Plymouth & Green	Plymouth Park & Ride	Plymouth Park & Ride Expansion	US-23 Air Rights (Garage only)	US-23 Air Rights (Full structure)	Earhart Road
Size of Deck	246,225 sq. ft. (245'x1,005')	133,140 sq. ft.	74,964 sq. ft.	323,337 sq. ft.	323,337 sq. ft.	269,270 sq. ft.
Number of Decks	6	9	4	5	5	6
Total Area	1,477,350 sq. ft.	1,198,260 sq. ft.	299,856 sq. ft.	1,616,685 sq. ft.	1,616,685 sq. ft.	1,615,620 sq. ft.
Complexity Adjustments	Internal Ramp Layout: **+10%**	Irregular Shape (+10%) 18 External Spiral Ramp Segments (+20%) = **+30%**	Irregular Shape (+10%) 7 external spiral ramp segments (+15%) = **+35%**	5 External Spiral Ramp Segments (+15%) Internal Ramps (+10%) 74'x287' bridge (+10%) Structural Support Columns (+25%) = **+70%**	Foundation/ Structural Enhancements (+20%) Construction Logistics (+10%) Bridge Integration (+10%) Utilities & Drainage (+5%) Regulatory & Environmental Costs (+5%) = **+50%** (on top of Air Rights Scenario)	Irregular Shape (+10%), Internal Ramp Layout (+10%) = **+20%**
Cost per Square Foot	$85-$110, average $97.50[99]	$110.50-$143, average $126.75	$114.75-$148.50, average $131.63	$144.50-$187, average $165.75	$187-$264, average $225.50	$102-$132, average $117
High-end Cost	$150 million	$170 million	$45.1 million	$310 million	$430 million	$215 million
Low-end Cost	$140 million	$130 million	$34.8 million	$235 million	$300 million	$165 million
Average Cost	~$145 million	~$150 million	~$40 million	~$270 million	~$370 million	~$190 million
Rank	5	4 (2 if combined)	6 (2 if combined)	2	1	3

98 This table includes all the applicable information from the first set of calculations, with no additional tables required.
99 Adjusted from the initial estimate of $80-$100 considering the complexity of the internal ramp layout.

Appendix C6: Parking Garage Alternatives Comparison Table 2

Category; Details/ Assumptions	Plymouth & Green	Plymouth Park & Ride	Plymouth Park & Ride Expansion	US-23 Air Rights (Garage only)	US-23 Air Rights (Full structure)	Earhart Road
Core Construction	1477350 ft² × $80-$110/ft²	1,198,260 ft² × $80–$110/ft²	299,856 ft² × $80–$110/ft²	1477350 ft² × $80-$110/ft²	1477350 ft² × $80-$110/ft²	269,270 ft² × 6 levels × $80–$110/ft²
High Estimate	$163,000,000	$137,000,000	$32,984,160	$163,000,000	$242,500,000	$178,000,000
Low Estimate	$118,000,000	$99,910,800	$23,988,480	$118,000,000	$194,000,000	$129,000,000
Other Structural Components	Internal Ramps 10000 ft² × $90-$125/ ft²	Internal Ramps 45,000 ft² × $90–$125/ft²	External Ramps (7 total) 17,500 ft² × $90–$125/ft² Bridge	Internal Ramps 10000 ft² × $90-$125/ ft²	Internal Ramps (10000 ft² × $90-$125/ft²)	Internal Ramp layout (10,000 ft² × $90–$125/ft²)
High Estimate	$1,250,000	$5,625,000	$3,581,100	$1,250,000	$1,250,000	$1,250,000
Low Estimate	$900,000	$4,050,000	$2,271,800	$900,000	$900,000	$900,000
Subtotal (Structure)	Decks + Ramps	Decks + Ramps	Structure + Ramps + Bridge	Decks + Ramps	Structure + Foundation + Ramps + Bridge	Structure + Internal Ramps
High Estimate	$164,000,000	$137,000,000	$36,565,260	$164,000,000	$281,440,000	$179,000,000
Low Estimate	$119,000,000	$99,910,800	$26,260,280	$119,000,000	$218,070,000	$130,000,000
Total Soft Costs						
High Estimate	$91,704,760	$76,961,000	$20,426,545	$91,704,760	$112,580,000	$100,000,000
Low Estimate	$66,689,280	$55,950,000	$14,765,750	$66,689,280	$65,420,000	$72,883,776
Total Projected Costs (Structure + Soft)						
High Estimate	$255,000,000	$193,000,000	$56,991,805	$255,000,000	$281,850,000	$279,000,000
Low Estimate	$186,000,000	$156,000,000	$41,026,030	$186,000,000	$224,270,000	$203,000,000
Rank	3	4 (4 if combined)	5 (4 if combined)	3	1	2

Appendix C7: Line Item Estimates

The following are line item estimates from the second set of calculations. Bolded are subtotals for structures, soft costs, and total project costs. Estimate tables also include optional features and total project costs with those elements.[100]

Scenario 1: Plymouth & Green Estimates

Category	Details/ Assumptions	Low Estimate	High Estimate
Core Construction	1477350 ft² × $80-$110/ft²	$118,000,000	$163,000,000
Internal Ramps	10000 ft² × $90-$125/ft²	$900,000	$1,250,000
Subtotal (Structure)	Decks + Ramps	**$119,000,000**	**$164,000,000**
Architect Fees	9% of structure	$10,717,920	$14,738,265
Structural Engineering	5% of structure	$5,954,400	$8,187,925
General Contractor Fee	18% of structure	$21,435,840	$29,476,530
Soft/Admin/ Legal Costs	7% of structure	$8,336,160	$11,463,095
Finishing & Signage	5% of structure	$5,954,400	$8,187,925
Equipment (elevators, access, pay systems)	12% of structure	$14,290,560	$19,651,020
Total Soft Costs	Sum of soft costs	**$66,689,280**	**$91,704,760**
Total Garage Cost	Structure + Soft	**$186,000,000**	**$255,000,000**

Category	Details/ Assumptions	Low Estimate	High Estimate
EV Charging Infrastructure	Lump sum estimate	$750,000	$750,000
Photovoltaic System (Solar Canopy)	Lump sum estimate	$1,200,000	$1,200,000
Parking Sensors System	Lump sum estimate	$800,000	$800,000
License Plate Readers (ALPR)	Lump sum estimate	$200,000	$200,000
Parking Pay Machines	Lump sum estimate	$150,000	$150,000
Elevators (3 @ $45,000 each)	Lump sum estimate	$135,000	$135,000
Bumpers, Signs, Markings	Lump sum estimate	$250,000	$250,000
Total w/ Features	Final total including all features	**$189,000,000**	**$259,000,000**

100 The Earhart Road garage estimate table does not include optional features.

Scenario 2: Plymouth Park & Ride Estimates

Category	Details/ Assumptions	Low Estimate	High Estimate
Core Construction	1,198,260 ft² × $80–$110/sq.ft.	$95,860,800	$132,000,000
Spiral Ramps (18 total)	45,000 ft² × $90–$125/sq.ft.	$4,050,000	$5,625,000
Subtotal (Structure + Ramps)	Structure + Ramps Total	**$99,910,800**	**$137,000,000**
Architect Fees	9% of subtotal	$8,992,000	$12,369,000
Structural Engineering	5% of subtotal	$4,996,000	$6,871,000
General Contractor Fee	18% of subtotal	$17,984,000	$24,738,000
Soft/Admin/ Legal Costs	7% of subtotal	$6,993,000	$9,620,000
Finishing & Signage	5% of subtotal	$4,996,000	$6,871,000
Equipment (elevators, access, pay systems)	12% of subtotal	$11,989,000	$16,492,000
Total Soft Costs	Sum of soft costs	**$55,950,000**	**$76,961,000**
Total Garage Cost	Structure + Soft Costs	**$156,000,000**	**$193,000,000**
EV Chargers (100 stations)	$10K–$20K each	$1,000,000	$2,000,000

Category	Details/ Assumptions	Low Estimate	High Estimate
Photovoltaic System (Solar Canopy)	Basic to mid-size	$500,000	$1,500,000
Smart Sensors (4,000)	$100–$400/ sensor	$400,000	$1,600,000
Pay Stations + ALPR	10 stations + camera system	$200,000	$400,000
Elevators (4-6)	$40K–$65K each	$160,000	$260,000
Bumpers	$23–$75 each	$92,000	$300,000
Optional Add-ons Total	Sum of all add-ons	**$2,352,000**	**$6,060,000**
Total w/ Features	Garage + Optional Systems	**$158,000,000**	**$199,000,000**

Plymouth Park & Ride Expansion

Category	Details/ Assumptions	Low Estimate	High Estimate
Core Construction	299,856 ft² × $80–$110/sq.ft.	$23,988,480	$32,984,160
Spiral Ramps (7 total)	17,500 ft² × $90–$125/sq.ft.	$1,575,000	$2,187,500
Bridge (26'x134')	3,484 ft² × $200–$400/sq.ft.	$696,800	$1,393,600
Subtotal (Structure + Ramps + Bridge)	Structure + Ramps + Bridge Total	**$26,260,280**	**$36,565,260**
Architect Fees	9% of subtotal	$2,363,425	$3,290,873
Structural Engineering	5% of subtotal	$1,313,014	$1,828,263
General Contractor Fee	18% of subtotal	$4,726,849	$6,581,747
Soft/Admin/ Legal Costs	7% of subtotal	$1,838,220	$2,559,568
Finishing & Signage	5% of subtotal	$1,313,014	$1,828,263
Equipment (elevators, access, pay systems)	12% of subtotal	$3,151,229	$4,387,831
Total Soft Costs	Sum of soft costs	**$14,765,750**	**$20,426,545**
Total Garage Cost	Structure + Soft Costs	**$41,026,030**	**$56,991,805**
EV Chargers (40 stations)	$10K–$20K each	$400,000	$800,000
Smart Sensors (1,200)	$100–$400/ sensor	$120,000	$480,000
Photovoltaic Canopy	$300K–$600K system	$300,000	$600,000

Category	Details/ Assumptions	Low Estimate	High Estimate
Pay Stations + ALPR	System estimate	$100,000	$200,000
Elevators (2–3)	$40K–$65K each	$80,000	$180,000
Bumpers	$23–$75 each	$27,000	$90,000
Optional Add-ons Total	Sum of all add-ons	**$1,027,000**	**$2,350,000**
Grand Total w/ Add-ons	Garage + Optional Systems	**$42,053,030**	**$59,341,805**

US-23 Air Rights (Garage only)

Category	Details/ Assumptions	Low Estimate	High Estimate
Core Construction	1477350 ft² × $80-$110/ft²	$118,000,000	$163,000,000
Internal Ramps	10000 ft² × $90-$125/ft²	$900,000	$1,250,000
Subtotal (Structure + Ramps + Bridge)	Decks + Ramps	**$119,000,000**	**$164,000,000**
Architect Fees	9% of subtotal	$10,717,920	$14,738,265
Structural Engineering	5% of subtotal	$5,954,400	$8,187,925
General Contractor Fee	18% of subtotal	$21,435,840	$29,476,530
Soft/Admin/ Legal Costs	7% of subtotal	$8,336,160	$11,463,095
Finishing & Signage	5% of subtotal	$5,954,400	$8,187,925
Equipment (elevators, access, pay systems)	12% of subtotal	$14,290,560	$19,651,020
Total Soft Costs	Sum of soft costs	**$66,689,280**	**$91,704,760**
Total Garage Cost	Structure + Soft Costs	**$186,000,000**	**$255,000,000**
EV Charging Infrastructure	Lump sum estimate	$750,000	$750,000
Photovoltaic System (Solar Canopy)	Lump sum estimate	$1,200,000	$1,200,000
Parking Sensors System	Lump sum estimate	$800,000	$800,000
License Plate Readers (ALPR)	Lump sum estimate	$200,000	$200,000
Parking Pay Machines	Lump sum estimate	$150,000	$150,000
Elevators (3 @ $45,000 each)	Lump sum estimate	$135,000	$135,000
Bumpers, Signs, Markings	Lump sum estimate	$250,000	$250,000
Grand Total w/ Add-ons	Garage + Optional Systems	**$189,000,000**	**$259,000,000**

US-23 Air Rights (Full structure)

Category	Low Estimate	High Estimate
Core Structure (1,616,685 ft² × $120–$150)	$194,000,000	$242,500,000
Foundation & Support (Deep Piles)	$15,000,000	$25,000,000
Bridge (21,228 ft² × $300–$500)	$6,370,000	$10,610,000
External Ramps (12,500 ft² × $120–$150)	$1,500,000	$1,875,000
Internal Ramps (10,000 ft² × $120–$150)	$1,200,000	$1,500,000
Subtotal (Structure + Foundation + Ramps + Bridge)	**$218,070,000**	**$281,440,000**
Soft & Professional Costs (30-40% of subtotal)	**$65,420,000**	**$112,580,000**
Total Estimate	**$224,270,000**	**$281,850,000**

Scenario 3: Earhart Road Estimates

Category	Details/ Assumptions	Low Estimate	High Estimate
Core Construction	269,270 ft² × 6 levels × $80–$110/ sq.ft.	$129,000,000	$178,000,000
Internal Ramps	Internal Ramp layout (10,000 ft² × $90–$125/sq.ft.)	$900,000	$1,250,000
Subtotal (Structure + Ramps)	Structure + Ramps Total	**$130,000,000**	**$179,000,000**
Architect Fees	9% of subtotal	$11,713,464	$16,107,138
Structural Engineering	5% of subtotal	$6,507,480	$8,948,410
General Contractor Fee	18% of subtotal	$23,426,928	$32,214,276
Soft/Admin/ Legal Costs	7% of subtotal	$9,110,472	$12,527,774
Finishing & Signage	5% of subtotal	$6,507,480	$8,948,410
Equipment (elevators, access)	12% of subtotal	$15,617,952	$21,476,184
Total Soft Costs	Sum of soft costs	**$72,883,776**	**$100,000,000**
Total Garage Cost	Structure + Soft Costs	**$203,000,000**	**$279,000,000**

APPENDIX D: MODELS OF UNIVERSITY-CITY TRANSIT PARTNERSHIPS

The relocation of the terminus and parking requires initial capital for transit facility upgrades and pedestrian improvements. However, an extension to US23 would mean that the Campus Connector is offering broader community benefits beyond U-M, and as such might be conceived of as a joint university-city effort. Ann Arbor's broader transportation funding landscape has offered multiple avenues to support such investments. AAATA has recently secured a $25 million federal grant to support zero-emission hydrogen fuel cell buses and infrastructure, part of an ongoing effort to modernize transit operations and reduce carbon emissions.[101] In addition, $400,000 has been granted for the improvement of transit and pedestrian infrastructure on Fourth Avenue, reflective of broader initiatives to enhance transit access and maximize land use efficiency.[102]

The relocation improves transit effectiveness as well as promotes multimodal integration, thus being compatible with the financing schemes supporting sustainable transportation measures. Provisions for grants supporting carbon reduction measures, transit-based development, as well as infrastructure upgrades, makes the project economically viable, thereby guaranteeing long-lasting economic benefits commensurate with the local area's area plan. In addition, the relocation is compatible with the long-term vision of the University of Michigan with regard to the reduction of single-occupancy vehicles, thereby being eligible for more sustainability grants as well as carbon reduction incentives as per the President's Commission on Carbon Neutrality Report.

The University-run nature of the Campus Connector leaves limited direct comparisons available to study; typical case studies of transit projects undertaken by a municipality and a university working collaboratively involve a municipal transit system being expanded through subsidization by the university. Given the higher level of coordination with AAATA and the City of Ann Arbor that either of the alternative proposals leveraging the Plymouth Park & Ride would require, the following case studies can be viewed as example models of cooperation other Universities throughout the country have built.

Appendix D1: University-Municipal Collaborative Projects

The Laker Line

The Laker Line is a bus service in the Grand Rapids metropolitan area of Michigan, operated by The Rapid, which is the public transit provider for the area. The Laker Line connects three campuses of Grand Valley State University: the main campus in Allendale and two satellite campuses in Downtown Grand Rapids. The service is named after the GVSU athletic teams, and funded primarily by the university. The Laker Line is free to ride for GVSU students and employees, and is open to the general public with the payment of regular The Rapid bus fares.[103]

The Rapid began operating bus service between Downtown Grand Rapids and Grand Valley State University in Allendale in 2000, funded by the university. The Route 50 "Campus Connector" (the Laker Line's predecessor) grew into a popular service, with ridership increasing from 179,000 trips per year in 2002 to 1.4 million in 2012. This rapid ridership growth occurred in

101 Jeffrey Pfeifer, "TheRide Receives $25 Million Federal Grant to Reduce Carbon Emissions" July 9, 2024, https://www.theride.org/about/news/theride-receives-25-million-federal-grant-reduce-carbon-emissions.

102 Jaishree Drepaul, "Transit and Pedestrian Improvements in Ann Arbor Receive $400,000 in State Grants," Concentrate, June 11, 2024, https://www.secondwavemedia.com/concentrate/devnews/fourthavenue0747.aspx.

103 Mischa Wanek-Libman, "The Rapid Begins Service on the Laker Line," *Mass Transit*, August 25, 2020, https://www.masstransitmag.com/bus/article/21151659/the-rapid-begins-service-on-the-laker-line.



tandem with the growth of the GVSU campuses in Downtown Grand Rapids.

The Rapid released a long-range plan in 2010, which included a number of proposed improvements to its services by 2030. Detailed planning for the project began in 2012, when the Federal Transit Administration awarded The Rapid a $600,000 grant to study options for enhanced transit service along Lake Michigan Drive. The alternatives analysis for the Lake Michigan Drive project was completed in 2014, the same year as The Rapid's first bus rapid transit line opened. The Silver Line is a limited-stop service with enhanced bus stations along the route, transit signal priority, and bus-only lanes in select locations along the route. The Laker Line proposal was a similar service, serving enhanced stations, but running on city streets in mixed traffic with only short segments of bus-only lanes. In February 2018, the Laker Line project was approved for $56.2 million in federal funding under the Federal Transit Administration's Small Starts program. The federal grant covered 80% of the capital cost of the Laker Line system, including the buses and the construction of the stations. The remaining 20% of the capital cost was paid for by the State of Michigan's Comprehensive Transit Fund. Construction of the Laker Line began in April 2019 and operations began in August 2020. The final cost of the line, including buses, stations, and road work, was $72.8 million.[104]

The Laker Line is integrated with The Rapid's fare system, and charges standard bus fares. Ticket machines are located at all stations, and tickets must be purchased before boarding the bus. Grand Valley State University students and employees ride for free on the Laker Line and all other The Rapid bus routes, as part of a partnership between GVSU and The Rapid that began the Route 50 service in 2000, and continues to the present with the Laker Line.

Tompkins Consolidated Area Transit

Tompkins Consolidated Area Transit, Inc., usually referred to as TCAT, is a private, non-profit public transportation operator, created by Cornell University, Tompkins County, and the City of Ithaca to serve Tompkins County, New York. The vast majority of TCAT bus routes are based in the City of Ithaca and surrounding urban areas. These routes serve Ithaca College, Cornell University, and Tompkins Cortland Community College. In 2024, the system had a ridership of 2,488,000, or about 8,000 per weekday as of the fourth quarter of 2024. As of 2019, TCAT operates 34 bus routes.[105]



104 Andrew Krietz, "The Rapid's 'Laker Line' Solicits Feedback for Bus Rapid Transit System between GVSU, Grand Rapids," MLive, November 22, 2013, https://www.mlive.com/news/grand-rapids/2013/11/the_rapids_laker_line_solicits.html.

105 Tompkins Consolidated Area Transit, "TCAT's History," accessed March 31, 2025, https://tcatbus.com/history.

In 1996, the New York State Legislature adopted a state law authorizing that "the county of Tompkins, the city of Ithaca and Cornell University may jointly provide for mass transportation services in the county of Tompkins", and on April 1, 1998, the City of Ithaca, Cornell University and Tompkins County established TCAT as a joint venture (public entity) to operate public transit service in Tompkins County, service began in 1999, establishing a unified route and fare system. TCAT re-organized itself as a nonprofit corporation, TCAT. Inc. in 2005 with representatives of City of Ithaca, Cornell University, and Tompkins County serving on its board of directors.

Based on 2023 data, TCAT's full-year operating expenses are $19 million. The largest share, $10.39 million, is provided by funding from both New York state and the federal government. The next-largest share, $4.075 million, comes from local fares and revenue — over 80 percent of which, $3.33 million, comes from Cornell's annual service payment. Cornell, the City of Ithaca and Tompkins County — TCAT's three underwriters — each pay an annual, equal share of $994,574, for a total of $2.98 million. TCAT also receives $1.55 million in additional revenue from miscellaneous sources including advertising revenue and proceeds from the county's mortgage recording tax.

In the past, Cornell made an annual payment under the terms of a multi-year Memorandum of Understanding signed in 2017. This funding was directly tied to annual projections of TCAT ridership, which have not been realized since the onset of the COVID-19 pandemic in early 2020. To better align TCAT's service levels with the evolving needs of the Cornell community, the university and TCAT, with this new agreement, have shifted to a service-level agreement that establishes target service levels and incentivizes TCAT to meet and exceed those service levels. Under this four-year agreement — which covers the period from July 1, 2023, to June 30, 2027 — Cornell will pay the same base annual amount to TCAT that it has paid since before the pandemic, when TCAT ridership levels were much higher. After the first year, that base amount of $3,332,551 will increase each year by 3%. And if, on the five selected routes that serve Cornell, TCAT's total hours of bus service exceed a target number of service hours during the year, Cornell's annual payment will increase by 3.75 percent the following year. There is an additional incentive built into the service agreement that is completely separate from the base payment incentive. If actual service levels exceed the target level of service by more than 2.5 percent, Cornell will make a corresponding increase in its payment (if the university has agreed in advance to an increased level of service). If actual service levels are within 2.5 percent above or below the target service level, there will be no adjustment to the payment. If actual service levels are more than 2.5 percent below the target service level, TCAT will provide Cornell a credit or refund that corresponds to the percentage decrease. The new service agreement, approved by the TCAT Board of Directors on Sept. 28, 2023, incentivizes TCAT to meet and exceed target service levels. If the level of service improves, more riders are accommodated, and thus more Cornell- and system-wide revenue is generated for TCAT — funds that can then be used to hire additional drivers and crew.[106]

Cornell staff and faculty ride for free at all times on all TCAT routes and have the option to purchase discounted passes for transit services in adjacent counties that connect with TCAT routes. The Cornell community accounts for approximately 70 percent of all TCAT riders.

The Mid-Coast Trolley

The Mid-Coast Trolley project is a 17.7km-long extension to the existing Blue Line, which is a light rail line in the San Diego Trolley system in California, US. Built by the San Diego Association of Governments (SANDAG), the new extension connects Old Town, the University of California, San Diego (UCSD), and Westfield UTC. The light rail extension project was developed with an estimated investment of $2.1bn. The full funding grant agreement (FFGA) of the Federal Transit Administration's (FTA's) New Starts program was expected to generate 50% of funds for the project. The remaining funds were to be generated from the region's TransNet half-cent sales tax for transportation. TransNet will also provide operating funds for the extension until 2048. The new Trolley extension increased the San Diego Blue Line's capacity by 20%. The expansion project was completed in the fall of 2021 and is being led by the San Diego Association of Governments (SANDAG) and operated by MTS.[107]

106 Tompkins Consolidated Area Transit, "Cornell-TCAT Agreement," accessed March 31, 2025, https://tcatbus.com/cornell-tcat-agreement.

107 "Mid-Coast Trolley Project, San Diego, California," *Railway Technology*, accessed March 31, 2025, https://www.railway-technology.com/projects/mid-coast-trolley-project-san-diego-california/.

The University of California, San Diego is one of the primary beneficiaries. The UCSD entered into a $30 million deal with the Metropolitan Transit System to dub the Mid-Coast Trolley Line the "UC San Diego Blue Line." The name change is a nod to the school's campuses, medical center and facilities that all sit alongside the proposed mass transit route. Along with naming the line, the school named two new stations on its campus in La Jolla and one station in Old Town. UC San Diego paid MTS $675,000 for naming rights while the line is under construction. In the first year of trolley service, the fee increased to $945,000. After that, the annual cost will increase with the local inflation rate with UC San Diego paying a total of $30 million over a 30-year period.[108] In anticipation of this transportation upgrade brought by the extension project, UCSD made several service changes and upgrades to public transit around campus. Triton Transit replaced the Hillcrest Shuttle between the La Jolla campus and Hillcrest via Old Town with the new Hillcrest Express service, removing duplication with the UC San Diego Blue Line and doubling the frequency of service between the Old Town Transit Center and the Hillcrest Medical Center. The University also partnered with Spin to add 600 rentable electric bikes and scooters to campus, and has worked on improvements to major pedestrian areas such as Ridge Walk to boost capacity and accommodate traffic from bikes, scooters, and skateboards. These efforts aim to create a green transportation network that covers the entire campus. In addition, UCSD actively promoted and funded the U-Pass (Triton U-Pass) program, which grants all enrolled students free access to MTS light rail and bus services, significantly increasing the usage of these public transportation systems. In 2018, UCSD students voted to continue the program, with 72% in favor, making UCSD the only university in San Diego where all students can ride public transit for free.



108 SDBJ Staff, "UC San Diego to Pay MTS $30 Million for Naming Rights on Trolley Line," *NBC 7 San Diego*, July 17, 2015, https://www.nbcsandiego.com/news/local/uc-san-diego-to-pay-mts-30-million-for-naming-rights-on-trolley-line/1980971/.

Appendix D2: University-run Transit Systems

Shuttle–UM

Shuttle–UM is a transit system for the University of Maryland, College Park (UMD), which constitutes the UM acronym of the company, that operates as a unit of the university's Department of Transportation Services. The system is student-run and is supported by student fees and the university's Student Affairs department. Its fleet consists of over 60 vehicles and transports approximately three million rides a year. The system provides four different services: commuter, evening, charter, and demand response. The bus service routes "shuttle" passengers to and from the university with over 20 different routes. Paid upon admission by students to the university, the services are complementary and only certain services require university identification badges. In 2012, the company expanded to provide service to the University of Maryland, Baltimore (UMB) campus under the name, UM Shuttle.[109]



Shuttle–UM was established in November 1972 by the University of Maryland, College Park's (UMD) Black Student Union as an initiative to promote security for students walking through campus during the evening hours. Operations began with the use of two vans to circulate campus, which were purchased by UMD's Student Government Association (SGA), the campus' student governing body, through approval by the Office of Commuter Student Affairs, a campus organization supporting students' commuters. The operations were run in the basement of a residence hall on campus and consisted of running the vans on two fixed routes. Upon 1979, the project that started as a security service expanded to a transit system consisting of 10 routes with over 20 vehicles. By 1986, Shuttle–UM became a member of the American Public Transportation Association and the Transit Association of Maryland.

Shuttle–UM and UM Shuttle are complimentary services via paid student fees and UMD's Student Affairs' funds. Additionally, living complexes and businesses pay the organization to run the service in their area, which allows riders to ride by just showing drivers a university ID, not limited to University of Maryland System schools. Residents of College Park were granted access to Shuttle–UM's services via a program approved by city council in 2010, which granted residents passes to show drivers. In September 2012, the city of Greenbelt passed a similar program to that of College Park allowing passes for its residents to use Shuttle–UM's services.

Beginning with simply two routes in 1972, the company has expanded its bus service by currently having 27 routes (23 that serve UMD, 3 that serve UMB, and 1 that serves BSU).

109 University of Maryland Department of Transportation Services, *Annual Report 2016* (College Park, MD: University of Maryland, 2016), https://transportation.umd.edu/sites/default/files/2023-10/Annual%20Report_2016.pdf.

Unitrans

Unitrans is the transit system which operates in and around the campus of the University of California, Davis. It takes its name from an abbreviation of the words "University Transport". Unitrans was formed by the Associated Students of UC Davis and began operation on February 28, 1968 with two RT doubledecker buses that had been retired from service in London. It is since grown into one of the largest student-run transit systems in the world. Opened to the general public as the transit service for the City of Davis in 1972. Undergraduate students passed an initiative in 1990 to increase registration fees to provide unlimited access to Unitrans service to undergrads at no fare. Subsequent increases in this fee were passed in 1999, 2004, 2007, and 2019. Except for several managerial and maintenance positions, Unitrans is managed and operated entirely by students of the University of California, Davis who usually work part-time while attending school. The system is well known throughout the area for its use of several distinctive ex-Transport for London double-decker buses, as well as its fleet of modern natural gas single-decks. Unitrans has one of the best safety records of any public transit system in the US. In 2024, the system had a ridership of 3,656,900, or about 15,600 per weekday as of the fourth quarter of 2024. According to the 2019 financial report, Unitrans has 4 million annual boardings or approximately 22,000 on a typical day with UCD in session. 90% are UCD undergraduates, 5% are grad students/staff/faculty, and 5% are general public. A third of UC Davis undergraduates who live off-campus use Unitrans to get to campus each day. During regular service, buses make about 650 trips, running for 500 hours, covering almost 4,000 miles per day.[110]

In terms of staff, there are over 225 student employees, who work in all areas of the operation, maintenance, administration, and support functions, along with 20 career staff. Students make up over 90% of all staff and in FY19 provided 180,000 labor hours. All 150 drivers and operations supervisors are UCD students working part-time. Approximately $5,000 of training is invested in every driver trainee. In terms of funding, the annual operating budget is $6.7 million. $3.5M from student fees ($39/student/ quarter), $2.5M from City of Davis Transit funds, $0.25M from fares/passes, and $0.45M in other income. Total annual student wages are approximately $3.3M. While a new funding measure was passed in February 2019, Unitrans will remain in an operational deficit for the current year and projects to be operating budget neutral in FY2021. In addition to the approximately $380,000 in annual CEI capital funding, the City of Davis provides approximately $1.3 million annually for capital budget support.[111]



110 "Student Jobs at Unitrans & Equal Employment Opportunity," Unitrans, accessed March 31, 2025, https://unitrans.ucdavis.edu/employment.

111 Unitrans, "Unitrans Fact Sheet FY2019-2020," Council on Student Affairs and Fees, accessed March 31, 2025, https://cosaf.ucdavis.edu/sites/g/files/dgvnsk1561/files/inline-files/Handout%20-%20Unitrans.pdf.

APPENDIX E:
STAFF & FACULTY HOUSING

Appendix E1: University of California Irvine Faculty Housing Priority Scheme

- Newly recruited members of the Academic Senate and the Senior Management Group
- Current members of the Academic Senate and the Senior Management Group
- Newly recruited members of the University's non-Senate Academic Staff and Management and Senior Professional Group
- (Examples of these include clinical and adjunct professors, lecturers, post doctoral and professional researchers, specialists and librarians.)
- Current Academic Staff and Management and Senior Professionals
- Other University staff

Appendix E2: Housing Availability at University Hills

Housing Available Since 2017

Year	Resales	New Homes	Total
July 2022 - July 2023	21	0	21
July 2021 - July 2022	25	0	25
July 2020 - July 2022	30	28	58
July 2019 - July 2020	18	34	52
July 2018 - July 2019	27	42	69
July 2017 - July 2018	29	56	85

Appendix E3: Stanford University Faculty Housing Priority Scheme

- 1st Priority – Redwood City Campus Staff employed by Stanford University
- 2nd Priority – Other Staff employed by Stanford University including the following:
  - Main Campus Staff employed by Stanford University
  - Staff employed by SLAC
  - Academic Postdoctoral Scholars employed by Stanford University
  - Retired Faculty on Recalled Duty
  - Public Safety Officers employed by Stanford University
  - N11 and N99 Staff
- 3rd Priority – Faculty including the following:
  - Tenure and Non-Tenure Line Professors
  - Senior Fellow Members of the Academic Council at Special Policy Centers and Institutes
  - Senior Fellows at the Hoover Institution
  - University Medical Line (UML) Professors
  - Szego Professors
  - Acting, Adjunct, Consulting, and Visiting Professors
- 4th Priority – Clinician Educator (CE) Professors
- 5th Priority – Stanford Health Care Employees, Medical Residents, and Fellows
- 6th Priority – Other Visiting Academics (includes Fellow, Researcher, Scholar, as well as visitor to the Center of Advanced Study in the Behavioral Sciences – CASBS)

APPENDIX F: STAKEHOLDER ENGAGEMENT

Appendix F1: Institutional Stakeholders

Key institutional stakeholders that are relevant to our proposal include AAATA, MDOT, and City of Ann Arbor. Each entity's relevance to our proposal is described below.

Ann Arbor Area Transportation Authority

The alternative terminus site at the Plymouth/US-23 interchange currently houses a Park & Ride operated by AAATA, the public transit system serving the greater Ann Arbor –Ypsilanti area in Michigan. Its services consist of regular bus services along established routes, paratransit services, vanpools, and demand-responsive services such as FlexRide, NightRide, and HolidayRide. It also provides dedicated transportation for events like FootballRide and connections to Detroit Metropolitan Airport. It recorded a ridership of 4,350,470 fixed-route rides in fiscal year 2023.[112] It is governed by an Executive Staff and Board of Directors and supported by a Local Advisory Council. The Local Advisory Council Executive Committee Officers are appointed by the AAATA board and comprise six to ten people. It also operates major transit hubs, such as the Blake Transit Center in downtown Ann Arbor and the Ypsilanti Transit Center.

The team engaged with the Manager of Public Affairs and Community Engagement, Jeffrey Pfeifer, and learned the following regarding the alternative Plymouth Park & Ride terminus site:

The Plymouth Park & Ride lot is owned by MDOT, with AAATA responsible for all site improvements. While AAATA manages the transit operations and enhancements, MDOT retains full oversight authority, and any proposed changes or upgrades to the property must receive its approval. AAATA currently operates transit services at the Park & Ride under a formal agreement that grants use of the MDOT-owned land. This partnership allows AAATA to provide commuter options without assuming ownership of the site.

AAATA is open to the idea of the Plymouth Park & Ride serving as a terminus for the Campus Connector. However, this is contingent on the construction, operations, and maintenance costs associated with structured parking or Campus Connector-specific infrastructure being funded by other parties. In this scenario, no significant operational changes are anticipated for AAATA. If demand increases, AAATA would adjust service frequency on routes serving the lot to accommodate growing ridership.

AAATA is supportive of initiatives that expand regional connectivity and encourage transit ridership. As part of its broader remote Park & Ride strategy, AAATA remains committed to enhancing transit access between surrounding communities and Ann Arbor, while working within the limits of available resources.

AAATA's long-range vision, outlined in TheRide 2045, identifies Plymouth Road as a future BRT corridor. As such, any proposed modifications to the Plymouth Road or US-23 corridors, such as lane reductions to accommodate rail infrastructure, should be evaluated in the context of these long-term transit goals. AAATA's preference is for such changes to support or enhance the potential for future high-frequency bus service along this key corridor.

112 Ann Arbor Area Transportation Authority, *Citizen Report: Fiscal Year 2023*, October 1, 2022 – September 30, 2023, https://theridecitizenreport.org/.

Michigan Department of Transportation

MDOT manages the state's transportation infrastructure, including nearly 10,000 miles of highways and over 4,700 bridges. It also oversees 665 miles of rail, 2,700 miles of non-motorized trails, and four state-owned airports. In addition to maintaining roads and transit assets, MDOT administers state and federal programs for aviation, rail, and local public transit, supporting a multimodal system that connects communities across Michigan.

The alternative Plymouth Park & Ride terminus site currently operates as a Park & Ride lot owned by MDOT and managed in partnership with the AAATA. While surface-level transit infrastructure exists on MDOT rights-of-way, the introduction of vertical infrastructure such as a parking garage or elevated automated transit system tracks is unprecedented within the state. As such, our proposal raises questions about regulatory constraints, environmental limitations, and procedural requirements.

The team engaged with the Senior Regional Transportation Planner, Mike Davis Jr., and learned the following regarding the alternative Plymouth Park & Ride terminus site.

MDOT generally does not permit permanent structures within highway right of way, especially within interchange loops such as cloverleaf configurations. Notably, while non-motorized structures (such as trails or pedestrian bridges) are occasionally permitted, structured parking has not been approved within the interior of highway interchanges in Michigan. The department could not identify a precedent for such development.

For MDOT to consider a proposal involving a parking garage or elevated infrastructure, the following would be required:

- Formal Proposal Submission – Hypothetical inquiries are not accepted. An actual design proposal must be submitted for consideration.
- Regional Design Review – Conducted by the Brighton Transportation Service Center.
- Engineering Documentation – Including structural drawings, impact analyses, utility plans, Americans with Disabilities Act compliance, and environmental assessments.
- Airspace Agreement – For vertical development over MDOT-owned land.
- Traffic and Signal Modernization Review – Required at the Plymouth intersection to accommodate increased volume and circulation.

Environmental and right-of-way constraints play a significant role in shaping the feasibility of any Park & Ride improvements along the US-23 corridor. MDOT has previously encountered challenges with protected plant species near interchanges, such as at I-94/Exit 183, which underscores the importance of minimizing environmental impacts. Staying within the existing Park & Ride parcel would streamline the approval process, whereas expanding beyond that footprint could trigger more complex environmental and jurisdictional reviews.

Currently, MDOT's environmental assessments along US-23 have been narrowed in scope to focus primarily on the segment between I-94 and Washtenaw Avenue. No significant changes are expected in the Plymouth segment of US-23 in the near future.MDOT is generally supportive of efforts to enhance transit connectivity and recognizes AAATA's long-term vision for expanding Park & Ride services. However, AAATA currently lacks the funding and ridership demand to justify frequent service along the US-23

corridor and has no immediate plans to operate bus routes between Plymouth Road and I-94. While bus-on-shoulder infrastructure is under consideration, existing bridge widths remain a key constraint. New bridge designs are incorporating wider shoulders to accommodate both emergency vehicles and potential future transit operations, providing greater long-term flexibility.

City of Ann Arbor

The team engaged with City Transportation Program Managers Suzann Flowers and Trevor Brydon to explore potential implications of using the Plymouth Park & Ride as an alternative terminus. Specific questions addressed the City's perspective on such a proposal and the City's broader interest in shaping the project to align with community mobility goals.

Suzann Flowers acknowledged that many of these decisions are made at higher policy levels, including City Council and senior University leadership, but offered several observations. She expressed concern that adding a 4,000-space parking deck could encourage increased car travel, in conflict with the City's goals around reducing vehicle miles traveled, shifting to non-single-occupancy modes, and supporting affordable housing. She noted that downtown Ann Arbor parking structures are only at 60% capacity, raising questions about the necessity of such a large facility at Plymouth & Green. She also encouraged the exploration of upstream Park & Ride solutions outside city limits, in collaboration with adjacent communities and regional transit providers.

Flowers expressed support for collaboration and acknowledged the potential for the Campus Connector to become a transformative regional asset if developed with broader community goals in mind.

Trevor Brydon offered additional perspective, outlining four general terminus locations:

- The University's proposed site at Plymouth & Green.
- A mixed-use site within the TC1 district (requiring non-University partnerships and off-site maintenance space).
- The Plymouth Road/US-23 Park & Ride (limited in space, owned by MDOT, with pedestrian and interchange access challenges).
- The East Medical campus (further extension, requiring crossing the freeway, but potentially feasible with future development).

Brydon emphasized that site selection should depend on project goals. If the University's priorities are internally focused, there may be little incentive to incorporate broader community needs, especially given the institutional preference to remain on University-owned land. He also pointed out that past efforts to coordinate transit projects between the City and University have been limited, referencing the Ann Arbor Connector project as a case study.

Ann Arbor Charter Township

Regarding the development potential of the proposed site at Earhart Road, Kristine Bolhuis, Deputy Clerk of Ann Arbor Charter Township, pointed out that the parcel is adjacent to residential neighborhoods, which could complicate efforts to introduce a major transit facility. By contrast, she suggested that the University-owned parcels at Plymouth and Green, which are surrounded by commercial and industrial properties, might be more acceptable from a community standpoint.

Appendix F2: Individual Stakeholders

The team interacted with two residential neighborhoods near the Plymouth and Green Site:

- The Orchard Hills/Maplewood Homeowners' Association (including the Bromley neighborhood). This area is north of Plymouth Road between Nixon and Green Roads.
- The Glacier Highlands neighborhood, roughly bordered by Green Road, Glazier Road, Bardstown Trail, and Chatham Way.

Orchard Hills/Maplewood Neighborhood Association Zoom Poll

The team hosted a Zoom meeting with residents of the Orchard Hills/ Maplewood Neighborhood Association, during which a poll was conducted. The results are shown below.

Question	**Responses Options & Results** Bold indicates the most common response.
Before today, how familiar were you with the University of Michigan's Campus Connector proposal? (n=15)	**Not familiar (27%)** Slightly (13%) **Somewhat (27%)** **Moderately (27%)** Very familiar (7%)
If the Campus Connector is built according to the current University proposal, how much of an impact do you think it will have on your daily life? (n=14)	No impact (0%) Minimally (21%) **Somewhat (43%)** Moderately (29%) Very impactful (7%)
Do you foresee the impact being positive or negative? (n=10)	Entirely negative (0%) Mostly negative, some positive (20%) Equal amounts positive and negative (30%) **Mostly positive, some negative (50%)** Entirely positive (0%)
Would you prefer the originally planned terminus at Plymouth & Green, or an alternative terminus site presented today? (n=10)	Plymouth & Green (0%) **Plymouth Park & Ride (70%)** Earhart Road (20%) No preference (10%)
Themes from open-ended responses (n=6)	Traffic concerns Gallup Park/Arboretum route BRT planning Connectivity suggestions

The results of the Zoom poll indicate most respondents had limited prior familiarity with the Campus Connector proposal, yet many anticipate it will have at least a somewhat to moderately meaningful impact on their daily lives. Responses to expected impact were largely positive, with no one anticipating an entirely negative outcome. Notably, half viewed the project as largely positive, albeit with some caveats.

A strong majority favored the alternative terminus at Plymouth/US-23 over the originally proposed location at Plymouth & Green, which received no support. Open-ended comments reinforced practical concerns, including traffic impacts on Plymouth Road, preservation of natural areas like Gallup Park and the Arboretum, and calls for clearer integration with broader transit and infrastructure planning (e.g., BRT, hospital access).

The feedback highlights cautious optimism, interest in improving connectivity, and a strong preference for aligning the terminus with existing transportation infrastructure to avoid unnecessary disruption.

Several themes emerged from neighborhood association feedback from residents of the Orchard Hills–Maplewood neighborhood. One concern was the potential impact of dedicating a lane on Plymouth Road for BRT, which drew more attention and concern than the proposed parking garage. The housing component of the plan received no notable objections.

A recurring topic of interest was the proposed location of the Campus Connector terminus. Many residents expressed a preference for extending the route to the East Medical campus, viewing it as a way to shift traffic and transit activity eastward. They noted that this extension could improve access for hospital staff and students, reduce traffic near central campus, and help relieve housing pressures. Questions were also raised about how this new transit infrastructure would interact with the existing East Medical shuttle, which is currently operated under contract with Golden Limo.

Pedestrian safety was another theme. Residents highlighted the lack of crosswalks near Plymouth and Green and referenced a recent traffic fatality in the area. Suggestions included adding additional crossings and exploring the feasibility of an elevated pedestrian bridge to improve safety and connectivity. Sustainability was also a topic of interest. One suggestion was to install solar panels on the roof of the proposed parking structure to generate power for the site.

Extended Survey to Residents

The team also sent out an extended survey to residents of the Orchard Hills/ Maplewood Homeowners Association and Glacier Highlands Neighborhood Association and the results are below.

Question Some questions were shown to a subset of respondents	**Response Options and Results** Bold indicates the most common response
Before today, how familiar were you with the University of Michigan's Campus Connector proposal? (n=124)	Not familiar (27%) **Slightly familiar (35%)** Somewhat familiar (19%) Moderately familiar (13%) Very familiar (6%)
If the Campus Connector is built according to the current University proposal, how much of an impact do you think it will have on your daily life? (n=124)	No impact (1%) Minimal impact (10%) Somewhat impactful (23%) Moderately impactful (19%) **Significant impact (48%)**
One notable disadvantage of using the original Plymouth & Green site proposed by the University is increased traffic congestion at the site. How concerned are you about this? (n=124)	Not at all concerned (3%) Slightly concerned (4%) Somewhat concerned (7%) Moderately concerned (15%) **Extremely concerned (71%)**
Do you foresee the impact being positive or negative? (n=124)	Entirely negative (23%) **Largely negative, some positive (38%)** Equal positive and negative (21%) Largely positive, some negative (15%) Entirely positive (3%)

Would you prefer the originally planned terminus at Plymouth & Green, or an alternative terminus site presented today? (n=124)	Plymouth & Green (9%) Plymouth Park & Ride (25%) **Earhart Road (65%)** No preference (1%)
Do you foresee the alternative sites as having a lesser or more positive impact on your daily life when compared to the current University proposal? (n=112)	**Lesser impact (44%)** More positive impact (26%) Both lesser and more positive impact (29%) No impact (1%)
Please rate your agreement with the following: The proposed alternative terminus location at the AAATA Park & Ride better serves community needs when compared to the Plymouth & Green site. (n=124)	Strongly disagree (6%) Somewhat disagree (7%) Neither agree nor disagree (9%) **Somewhat agree (44%)** Strongly agree (34%)
Please rate your agreement with the following: The proposed alternative terminus location to the east of US-23 on Earhart Rd better serves community needs when compared to the Plymouth & Green site. (n=124)	Strongly disagree (12%) Somewhat disagree (6%) Neither agree nor disagree (6%) Somewhat agree (17%) **Strongly agree (60%)**

A majority of respondents had limited awareness of the Campus Connector proposal before the session, with 35% identifying as "Slightly familiar" and 27% as "Not familiar". Only 6% indicated being "Very familiar". This suggests a general lack of exposure to the proposal among residents prior to the survey.

The Campus Connector, if implemented as proposed, is expected to significantly affect daily life for many. 48% of respondents anticipate a "Significant impact", with an additional 23% labeling it "Somewhat impactful". This underscores the importance of community involvement and further engagement as the proposal evolves.

When prompted about potential disadvantages, particularly traffic congestion at the Plymouth & Green site, an overwhelming 71% were "Extremely concerned". This highlights a critical pain point for residents and may explain shifting site preferences.

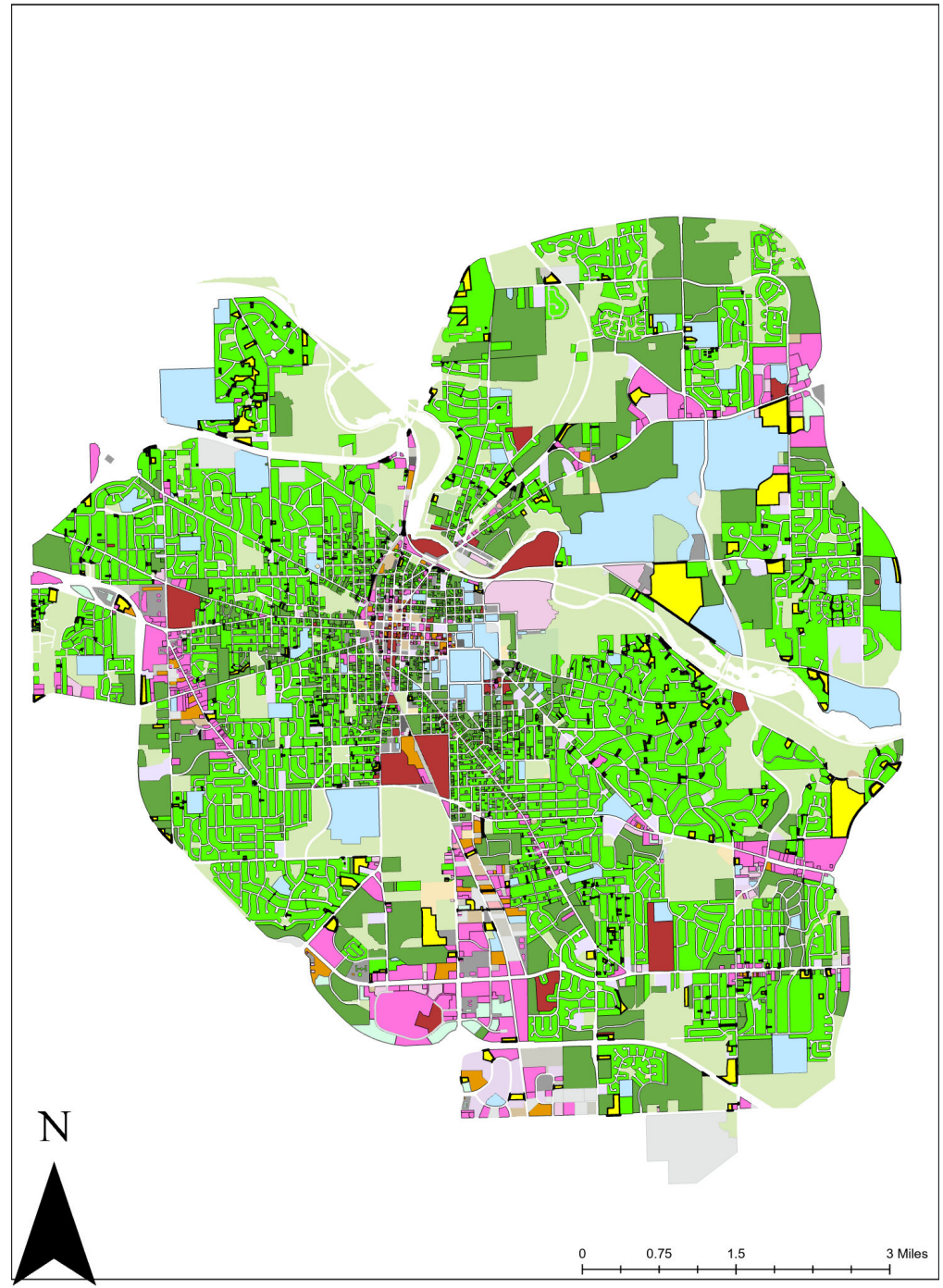
The majority of participants view the project's potential impact in a negative light: 38% selected "Largely negative, some positive" and 23% chose "Entirely negative". Only 3% foresaw the impact as "Entirely positive". This suggests deep skepticism and possibly unmet concerns about how the Connector fits within the community's daily life and needs.

There is a clear community preference for alternative terminus sites over the original Plymouth & Green location. Within the surveyed neighborhoods, all of which are west of US-23, 65% favored the site east of US-23 on Earhart Rd, while the AAATA Park & Ride received 25% support. Only 9% of respondents preferred the original site.

Not only are the alternative sites more favored, but they are also seen as less disruptive or more beneficial. Among those asked, 44% believe these alternatives will have a "lesser impact", and 26% believe they would result in a "more positive impact", with an additional 29% seeing both benefits.

APPENDIX G:
LAND USE & ZONING MAPS

Land Use Map of Ann Arbor Highlighting Vacant Parcels

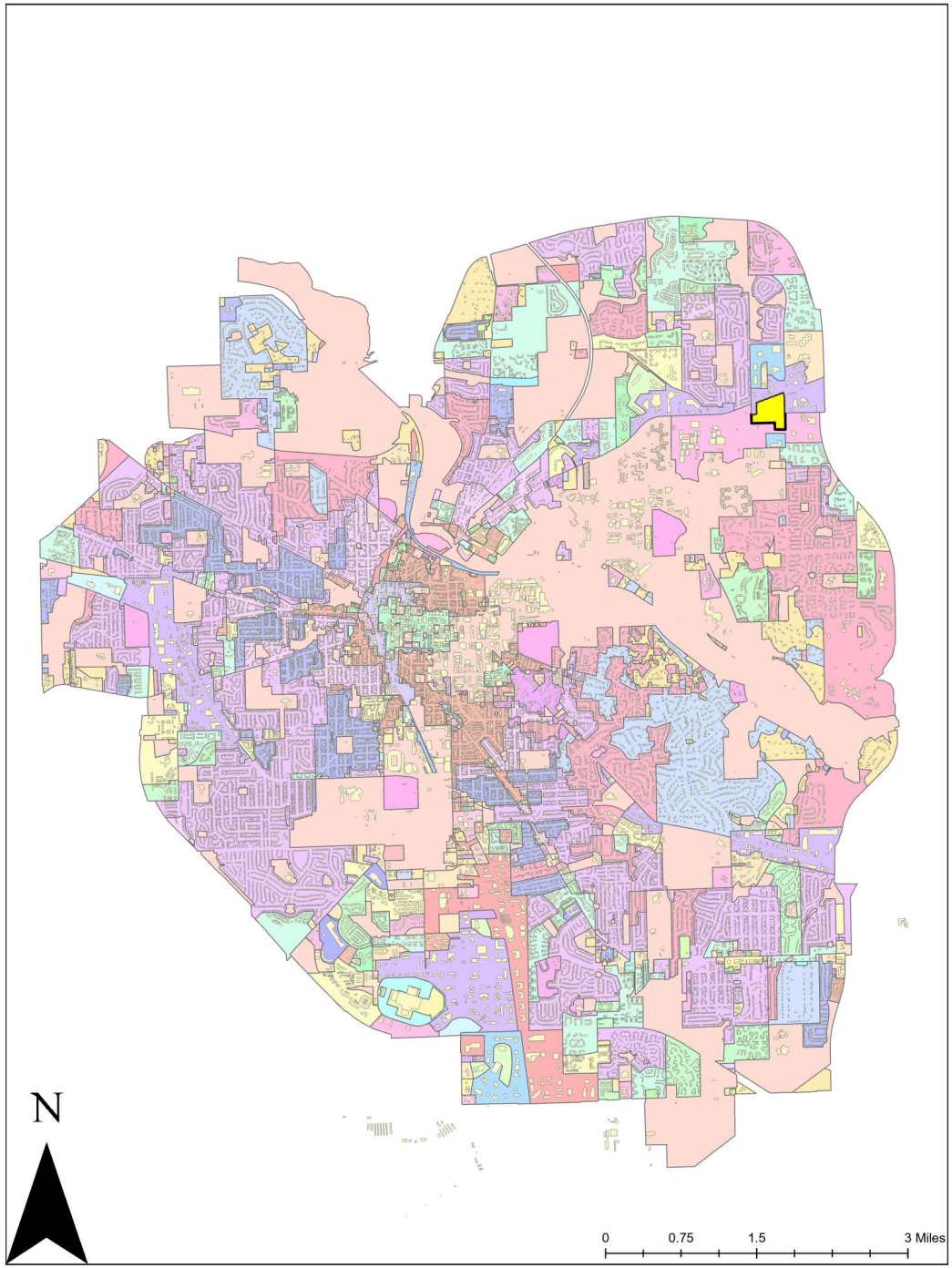


Legend

Land Use

- Vacant
- Assisted Living
- Bed & Breakfast
- Single Family
- Mobile Home Park
- Group Housing
- Two Family
- Multiple Family
- Residential/Non-Residential Mixed
- Mixed Use
- Non-Residential Mixed
- Education
- Research
- Hospital
- Medical
- Cultural
- Institution
- Religious
- Organizations
- Government
- Auto Sales/Service
- Entertainment
- Financial/Bank
- General Retail
- Hotel/Motel
- Personal Service
- Personal Services
- Prof./General
- Trade Retail
- Restaurant
- General
- Agricultural
- Cemetery
- Outdoor
- Indoor
- Non-Manufacturing
- Light Assembly
- Assembly
- Heavy Manufacturing
- Warehousing
- Wholesale
- Communication Facilities
- Utility Facilities
- Road Transportation
- Local Transportation
- Railroad
- Parking

Zoning Map of Ann Arbor Highlighting Plymouth/Green Site



Legend

Building Footprints
- Building

Zoning
Name
- AG
- C1
- C1A
- C1A/R
- C1B
- C2B
- C3
- D1
- D2
- M1
- M1A
- M2
- O
- ORL
- P
- PL
- PUD
- R1A
- R1B
- R1C
- R1D
- R1E
- R2A
- R2B
- R3
- R4A
- R4B
- R4C
- R4D
- R4E
- R5
- R6
- RE
- Selected Site
- TC1
- TWP
- UNZONED

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