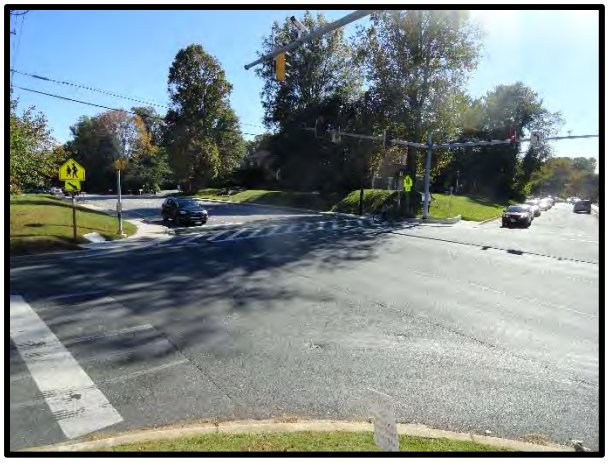
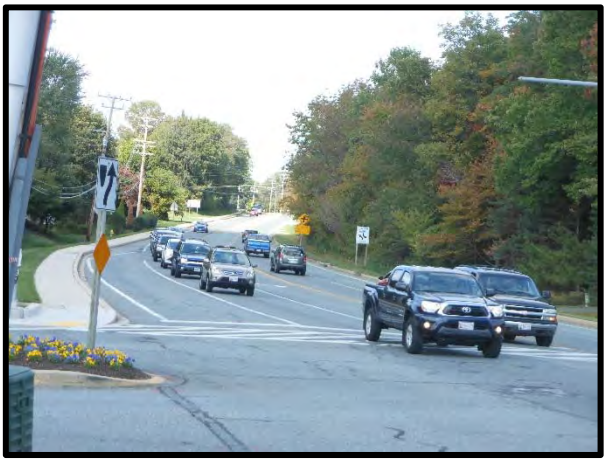
MD 924 Multi-Modal Corridor Study

Plan for the Corridor




WBCM JACOBS
A Joint Venture

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I. INTRODUCTION

A. Overview

The MD 924 Multi-Modal Study focuses on MD 924 from Woodsdale Road to MacPhail Road and the portion of Harford Transit Route 2/2A that serves the corridor. Through the improvements proposed in the study, MD 924 will become a complete street that will support the County's vision for a livable, resilient community. While MD 924 is not a traditional main street, it is an important connector between the residents, businesses, jobs, services and medical facilities along the corridor and is the main access that feeds the many neighborhoods and shopping areas. The study corridor is illustrated in Figure I.1.

The proposed improvements enable a more active, livable vision for the corridor through greater bicycle and pedestrian connectivity. The plan provides a street design that is more compatible with sustainable, pedestrian- and transit-friendly development. Residents of the communities surrounding MD 924 will enjoy access to a shared use path and accessible, continuous sidewalks through the length of the corridor. The improvements will expand access to and improve the experience of active and alternative transportation, enabling people of all ages and abilities to walk, bicycle, and take transit in their community's principal street.

The character of the MD 924 corridor should be less suburban and more characteristic of a livable and complete street that is inviting to multi-modal transportation, including non-motorized methods of travel, with joint use trails and transit. The following corridor vision for MD 924 will improve pedestrian, bicycle, and transit users. Rather than widening MD 924 to meet projected traffic demand, the study proposes shifting much of the future traffic growth to MD 24, which would accommodate the major traffic flows to and from I-95. Therefore, the study also includes recommendations that improve connections to and mobility along MD 24.

The design intent for the future of MD 924 prioritized the following goals:

- Construct continuous sidewalks and pedestrian/bicycle paths with buffers from vehicle travel lanes.
- Improve safety and accessibility for pedestrians and bicyclists.
- Accommodate more reliable and frequent bus traffic along the corridor.
- Provide inviting amenities for bus patrons along with improved and safe pedestrian access.
- Provide planted medians and landscaping opportunities along the road.
- Maintain the two-lane section along MD 924 wherever possible.
- Minimize right-of-way impacts.

Figure I.1. Study Area Map

In order to avoid severe congestion, some vehicle capacity upgrades along MD 924 will be necessary. Consistent with the vision for the corridor, the capacity increases focus on facilitating access to MD 24. Two design-years were selected for the future plans along the corridor: 2025 for medium-term improvements, and 2040 for major, long-range improvements. Implementation tables are located at the end of the report that summarize the recommendations and highlight some short-term improvements. The tables also provide conceptual design, right-of-way requirements and construction durations, in addition to estimated construction costs.

B. Study Background

The recommendations in the report are the result of extensive field reviews, traffic analyses, and coordination with Harford County staff. Supporting materials can be found in the two reports that contain more details on the options considered. ***Volume I – Existing Conditions*** summarizes the existing roadway configurations, traffic volumes and operations, pedestrian facilities, and transit network, as well as existing challenges and deficiencies for multi-modal travel in the corridor. ***Volume II – Operational Analysis*** includes 2025 and 2040 design-year traffic volume projections and an assessment of operations. Background growth and local development assumptions are included in support of the traffic projections. ***Volume II – Operational Analysis*** also includes measures that were considered to accommodate future vehicular traffic needs. The ***Plan for the Corridor*** report includes measures to address future mobility needs and outlines short, medium (2025), and long term (2040) bicycle, pedestrian and transit recommendations.

II. VISION 2025

A. Pedestrian and Bicycle Improvements

To make the most efficient use of capital expenditures, the construction of sidewalks and the joint use path are proposed in the corridor design for 2040, when the entire road would be reconfigured. However, in proposing to divert commuter traffic from MD 924 to MD 24 in the near-term, several connecting roads would be upgraded. As part of these upgrades, sidewalks would be made continuous on Plumtree Road and Bel Air South Parkway. In addition, if new development occurs in the corridor, developers/property owners should either build the planned sidewalks or trail in the ultimate location or set-aside right-of-way and contribute towards the future improvements.

B. Transit Improvements

1. General Improvements

Effectively implemented, public transit can expand access to employment, education, healthcare, and places of commerce; reinforce productive land uses; increase community cohesion; and improve air quality. Ideally, a public transit system will cover a broad geographical area, serving customers for most of the day and evening with an increased frequency during high-demand periods. Public transit systems should not only be accessible to all, but also visible and inviting to the community.

The MD 924 corridor is served by two transit routes. The Harford Transit Route 2/2A, a local fixed-route bus, travels between Joppatowne, Abingdon, Edgewood, and Bel Air. The MTA

Commuter Bus 410 service stops on the MD 924 corridor and then travels as an express commuter service to Downtown Baltimore. With the improvement of MD 924, opportunities will exist to increase the safety and comfort of transit riders by providing greater accessibility for people with disabilities, pedestrian crossings and more bus stop amenities. Also, opportunities are available to increase ridership on Route 2/2A through minor route alignment changes that will better serve recently constructed and planned destinations.

2. Accessibility

Accessibility is crucial to the success of public transit, and is of special concern in the MD 924 corridor since Route 2/2A serves several residential facilities for older adults and several medical facilities. Universal design solutions should be utilized so that those with the broadest age range and ability can have equal access to transit and bus stop amenities. Bus stops should include: stop posts and blades (signs), bus shelters with seating, maps and schedules, security lighting, a concrete landing pad with adequate waiting area and room for a mobility device to maneuver, a curb at a height that can be used by a ramp or lift and connectivity to accessible sidewalks and crosswalks. The improvements benefit a broad range of disabilities, as well as those traveling with children in strollers and riders carrying groceries or luggage. Specific recommendations are outlined below.

3. Span of Service

To attract riders who have access to a vehicle, and to give people equitable access to their community, it is important that transit be available for as many hours per day as possible. Currently Route 2/2A operates between 6:30 A.M. and 6:30 P.M., only 12 hours per day. Increasing the span of service to 15 hours or more per day, as proposed in the 2008 Transit Development Plan, would accommodate additional riders who work in retail, logistics, and in other shift work.

4. Frequency of Service

In addition to span of service, frequency is also crucial in attracting people to ride transit. Long headways on Route 2/2A ranging from 53 to 90 minutes discourage people from choosing to use transit as often as they might with more frequent service, or from using it at all. Improving headways to 30 or 45 minutes would encourage additional residents and workers in the MD 924 corridor to take transit. Among successful transit agencies elsewhere in the country, a roughly 1:1 increase in ridership has been achieved with an equal increase, as a percentage, in service frequency.[1] Route 2/2A ridership currently averages an estimated 369 persons per day. Harford Transit should consider implementing 30 to 45 minute headways on Route 2/2A as a pilot project, with a goal to achieve a ridership of more than 600 persons per day.

[1] Taylor, Haas, et al. "Increasing Transit Ridership: Lessons from the Most Successful Transit Systems in the 1990s," The Mineta Transportation Institute, June 2002.

5. Bus Stop and Route Alignment Improvements – Harford Transit LINK

The proposed transit map is provided as Exhibit 1, which is in the back of the report. With the goals of increasing safety and improving the transit riding experience, the following recommendations concerning bus stops and bus route alignments are proposed.

Lorien at Bel Air

Consider relocating the Harford Transit bus stops from the current locations on MD 924 to the service drive between the newly-constructed MedStar Health Bel Air Campus and Walgreens as illustrated in Figure II.1. MedStar has the potential to generate a significant number of trips on Harford Transit, but the current stop locations on MD 924 are far from the medical facility entrance.

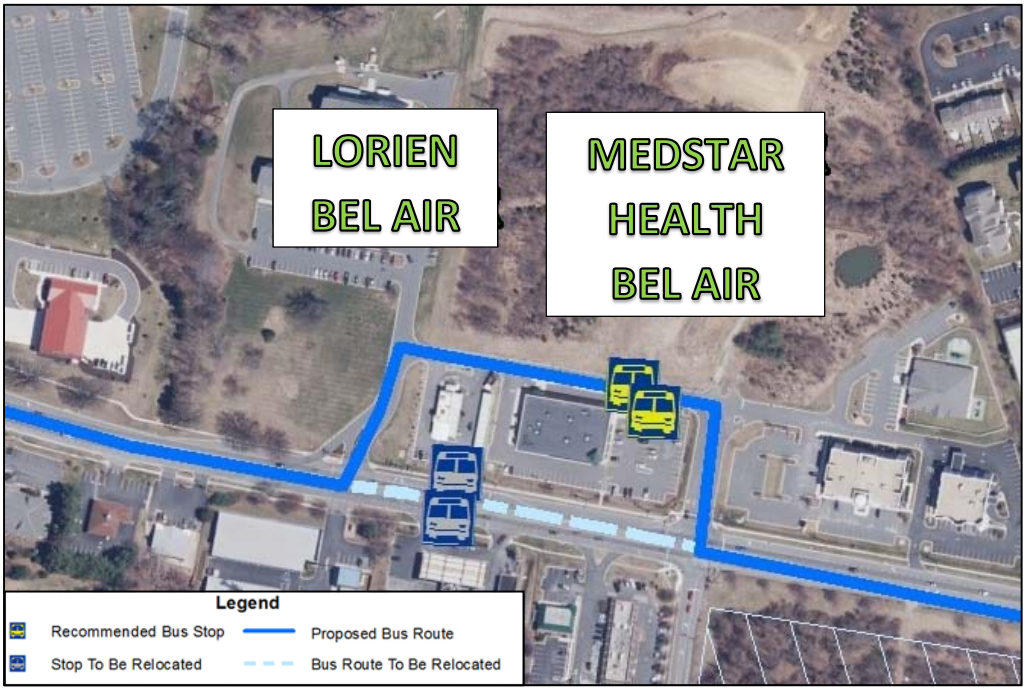


Figure II.1. Proposed Bus Route Relocation - Lorien at Bel Air / MedStar Health

Create sidewalks for safe pedestrian access routes to the bus stop from both MedStar and Lorien at Bel Air. If the bus stops remain on MD 924, relocate the stops to the intersection of MD 924 and Plumtree Road and install a pedestrian crosswalk across MD 924.

Construct landing pads and install seating at the new stop location.

Festival at Bel Air

Install a bus shelter with seating. The Festival at Bel Air stop has the highest ridership of Route 2/2A in the corridor. Include printed schedule information.

Provide better wayfinding to and from the Harford Transit bus stop location inside the Festival at Bel Air complex. Festival at Bel Air is a large retail center that takes pedestrians a significant amount of time to traverse, making it important to instruct transit riders in how to reach the bus stop.

Plan for a route realignment from the Festival at Bel Air across Bel Air South Parkway to Plumtree Road. If the site between Plumtree Road, MD 24, and MD 924 is developed, Route 2/2A should travel through the center of the new development for the greatest access as illustrated in Figure II.2. An appropriately well-linked street grid should be encouraged in a development plan for the site to facilitate transit access, and new stops should be sited to maximize transit ridership on the site. Until the site is developed, Route 2/2A should continue to use the existing alignment through Bel Air South Parkway and Emmorton Road.

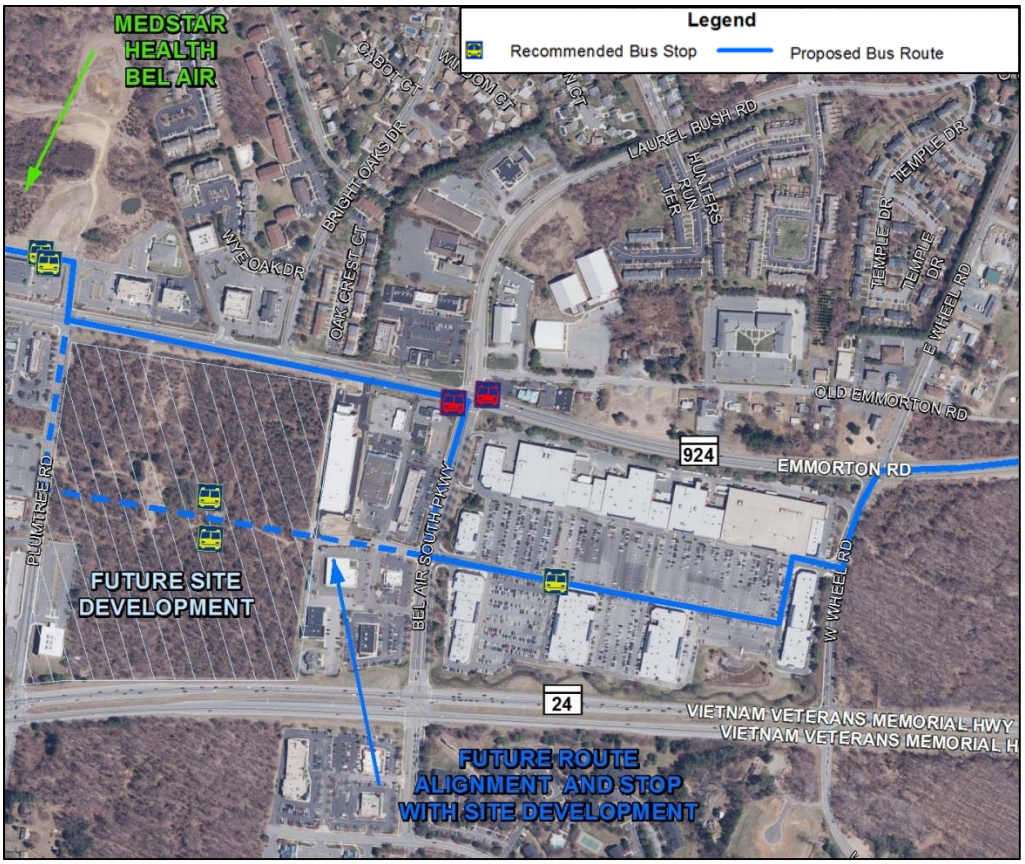


Figure II.2. Proposed Bus Route Relocation - Festival at Bel Air

Abingdon Catholic Charities

Construct landing pads and add seating. Transit riders will be able to reach the stops by existing concrete sidewalks. Add curb ramps where missing and install a pedestrian crossing. Transit maps (Exhibit 1) provided in the back of the report show the existing stop locations.

Boulevard at Box Hill

The Boulevard at Box Hill is a large, recently constructed retail center that is not well-served by the current Harford Transit Route 2/2A. The grade change around the perimeter of the site discourages transit users from accessing the retail stores. Nearby residents without access to a vehicle could visit the shopping center more easily if Route 2/2A is realigned to enter and exit at Wegmans Boulevard and Box Hill South Parkway.

Construct a bus stop on Merchant Boulevard, where crosswalks and curb ramps exist to serve nearby retail buildings as illustrated in Figure II.3. Because the stop is likely to have relatively high ridership due to the number of nearby destinations, install a shelter with seating and printed schedule information.

Figure II.3. Proposed Bus Route Relocation - Boulevard at Box Hill / Park View

Park View

Relocate the northbound Harford Transit bus stop to the west side of the Park View senior housing complex entrance on Box Hill South Parkway, across from the southbound stop, as shown in Figure II.3. Extend the existing sidewalk to the Harford Transit bus stop, construct a landing pad, and install seating. The existing ADA-compliant crossing, pedestrian refuge island, and sidewalk to the housing complex make it a safer, more accessible location to board the bus.

Construct a landing pad and install seating at the southbound stop for accessibility by older adults using mobility devices.

Social Security Office

Construct a sidewalk from the Harford Transit bus stop to the entrance to the Social Security office complex, with a curb ramp and landing pad. Install seating at the bus stop. Transit maps (Exhibit 1) provided in the back of the report show the existing stop locations.

Install a crosswalk on Box Hill Corporate Center Drive across from the entrance to the office complex, with a curb ramp connecting to the existing sidewalk.

YMCA

Relocate the stop closer to Walter Ward Boulevard, which serves as the entrance drive to the YMCA. The current location is on Box Hill Corporate Center Drive, near the YMCA building; however, due to the difference in grade between Box Hill Corporate Center Drive and the YMCA parking lot, transit riders must walk on or adjacent to the grass embankment to access Walter Ward Boulevard and ultimately enter the YMCA parking lot and building. Transit maps (Exhibit 1) provided in the back of the report show the approximate stop locations.

Construct a landing pad and install seating at the bus stop.

Install pedestrian crosswalks on Box Hill Corporate Center Drive and Walter Ward Boulevard so that transit riders can more safely access the southbound bus stop. Construct ADA-compliant curb ramps adjacent to the crosswalks to connect with existing sidewalks.

Wawa Convenience Store w/Fueling Stations

Discontinue the stop. With the recent construction of the Boulevard at Box Hill, the area would be better served with a stop closer to the major retail stores, as mentioned previously.

Woodsdale Apartments

Construct sidewalks on Woodsdale Road between Waldon Road and the Harford Transit bus stop at the north end of the Woodsdale Apartments. The existing bus stop location is provided in Exhibit 1. Currently, Woodsdale Apartments residents at the south end of the complex must access the Harford Transit bus stop using indirect, internal pedestrian paths.

Construct a landing pad and install seating at the bus stop.

Install pedestrian crosswalks on Woodsdale Road at Waldon Road. Residents of the townhouses along Marpat Drive and Torey Lane may be more likely to take transit if a safe pedestrian access to the bus stop is provided on Woodsdale Road.

Woodsdale Senior Housing

Construct a landing pad on Woodsdale Road adjacent to the Harford Transit bus stop. The existing bus stop location is provided in Exhibit 1. A pedestrian walkway is present between Woodside Road and the Woodsdale Senior Housing complex, but a level pad is not available on which to operate a bus ramp or lift for riders who use mobility devices.

A gazebo/covered sitting area close to and with good view of the roadway is present so a bus shelter with seating is not currently needed at this location. The stop has the second highest ridership of Route 2/2A, many of them older adults.

6. Bus Stop Improvements – MTA Commuter Bus

The proposed transit map is provided as Exhibit 1, which is in the back of the report. The proposed MTA Commuter Bus 410 stops and those to be maintained are illustrated on the transit maps. With the goals of increasing safety and improving the transit riding experience, the following recommendations concerning 410 MTA Commuter bus stops are proposed.

MD 924 at Crafton Road

Relocate the MTA Commuter Bus 410 stop to the intersection of MD 924 and West Ring Factory Road, which is a signalized intersection with pedestrian crossings. Riders will be able to cross MD 924 more safely in the evening on the return trip from Baltimore at the signalized intersection.

MD 924 at Glenwood Road and West Riding Drive

Relocate the MTA Commuter Bus 410 stop to the intersection of MD 924 and West Riding Drive since an existing landing pad is not present. Install pedestrian crossings on MD 924; construct curb ramps and a landing pad.

MD 924 at Bel Air South Parkway and Laurel Bush Road

Relocate the MTA Commuter Bus 410 stop so that it is closer to the intersection of MD 924 and Bel Air South Parkway. The current stop location does not contain a landing pad and cannot be accessed safely since it is located adjacent to an embankment with no access provided by existing sidewalks. Construct sidewalks and landing pads that connect to existing pedestrian crossings at the intersection.

MD 924 at Holly Wreath Drive

Install pedestrian crosswalks on Holly Wreath Drive. Use of the stop, which is the only one in the MD 924 corridor with a shelter, can be reinforced with better crossings.

MD 924 at St. Clair Drive

Install a shelter with seating. The stop has the highest ridership of MTA Commuter Bus 410 in the corridor. Many riders park on St. Clair Drive near the stop location. St. Clair Drive has sufficient width for parking on both sides of the street, which is convenient for riders.

MD 924 at Woodsdale Road

If a new Park-and-Ride lot is established, relocate the MTA Commuter Bus 410 stop from the curb in front of the Constant Friendship Shopping Center to the new Park-and-Ride location. The MTA Commuter Bus may need to pull into the Park-and-Ride lot to pick up and drop off passengers to ensure pedestrian safety.

7. Queue Jump Lanes

Queue jumps are proposed at selected intersections to improve running time and schedule adherence. A queue jump allows for a bus to approach an intersection in the right turn lane and proceed before other vehicle traffic in a dedicated phase of the traffic signal. The queue jump can also allow a bus to merge back into the flow of traffic after making a stop. A transit vehicle

thereby receives a "head start" in traffic. Based on traffic projections and the Route 2/2A alignment in the corridor, queue jumps are recommended in both directions for the intersections of MD 924 at MacPhail Road, Ring Factory Road, Patterson Mill Road, and Holly Wreath Drive.

8. Park & Ride Facility

Opportunity may exist to create a new park and ride lot at the southern end of the corridor, where some underutilized parking areas within view and accessible to MD 924 are available. Although establishing a park and ride lot at the location may not decrease congestion on MD 924 because it is located at the southern end of the corridor, the park and ride lot would have the potential to reduce single occupancy vehicle trips on Interstate 95. Sited approximately one mile from Interstate 95, the location is also a logical meeting point for carpools and vanpools. Another potential location for a park and ride lot would be within new and/or redeveloped properties adjacent to the Plumtree Road area. New park and ride lots, if constructed, should include a landing pad, shelter, and seating.

9. Initiatives to Increase Transit Ridership

Transit Visibility

Making transit more visible in the MD 924 corridor would increase awareness of the transportation options available to residents, workers, and shoppers. The current Harford LINK bus blades (signs) are difficult to identify at a distance, both because of their size and colors. Larger blades would be more identifiable by both transit riders approaching a stop location on foot and by motorists passing a stop location. Very clearly marking the location of bus stops can reduce the apprehension sometimes felt by people not accustomed to taking transit in an area. Enlarging the blades would also create opportunities to incorporate additional information useful to transit riders such as route numbers and destination locations on the signs. For people with disabilities and people new to riding a transit route, it is vital that every blade provide information about which buses stop at a location and in which direction those buses travel. The visibility and legibility of the blades can be improved by revising the color scheme such that the brightness differential of the light reflectance value of adjacent colors is 70 percent or greater. Double-sided signs with reflective text can further increase visibility, along with placement at a proper height of at least seven and a half feet.

Employer-Based Strategies

Employer-based transportation demand management (TDM) strategies typically aim to reduce the number of trips taken by single-occupancy vehicles. The Harford Commuter Assistance program works with employers to share information about transit options, "ride match" commuters into carpools and vanpools, and promote the use of flexible schedules and telecommuting. The following employer-based strategies have the potential to reduce vehicle miles traveled and vehicle trips for commute-to-work trips in the MD 924 corridor.

- Promote the Guaranteed Ride Home program, which offers taxi rides home in the event of an emergency. The service is available to a very broad population so long as they take an alternative mode of transportation to work at least two days per week. Residents of Harford County are eligible if they work in the Baltimore-Washington Metropolitan Region or in Cecil County. People who work in Harford County are eligible if they live in

the Baltimore-Washington Metropolitan Region or in Cecil or York Counties. Providing Guaranteed Ride Home along with ride matching services can reduce vehicle trips to and from a single employer by 8.5 percent.[2]

- Encourage employers to provide financial incentives to employees who take alternative forms of transportation. Providing subsidies for carpooling, vanpooling, or riding transit can increase transit ridership by employees of a single employer by as much as 17 percent.[3]
- Hold events to promote the use of transit such as Car Free Day and Try Transit Week. Allowing people to ride transit for free during promotional events can help to introduce people to the experience of using transit. Events cannot sustain long-term travel behavior change on their own, and should be supplemented with other strategies.
- Promote the availability of real-time arrival information now available for Harford Transit through RouteShout. Transit riders can now download the RouteShout application to their smartphones and receive to-the-minute updates of when the next bus will arrive at the nearest stop. Real-time arrival information can help to mitigate the discouraging effects of long headways by better informing riders of when buses will arrive, whether service is running on-time, early, or late.

Employer-based TDM strategies are applied most efficiently to large employers, where hundreds of employees can be reached and organized through a single point of contact. Although the MD 924 corridor does not have many large corporate office tenants, opportunities exist for employer-based TDM programs at Box Hill Corporate Center and at the several medical and assisted living facilities in the corridor.

C. Transportation Systems Management (TSM)/Travel Demand Management (TDM)

TSM is a means by which traffic demand is accommodated without major roadway widening or construction of new roadways. Several TDM measures related to behavior modification of the driver are available to reduce peak period traffic demands such as switching to an alternate mode (walking, bike or transit), flexible work hours, telecommuting, etc. Intelligent Transportation Systems (ITS) can be employed to maximize use of the available roadway network. Several ITS measures were reviewed for the MD 924 study area as noted below:

- Traffic Signal Optimization: New technologies for adaptive real time signal control would allow the signal system along MD 924 and MD 24 to adapt and adjust in real time to existing traffic demand. New systems use the cell phones and Bluetooth devices in vehicles to act as real time traffic reporters providing information on travel times and congestion. The data is used by the signal software to adjust timing to optimize traffic flow.

[2] Schreffler, Eric. "TDM Without the Tedium," Presentation to the Northern California Chapter of the Association for Commuter Transportation, March 20, 1996.
[3] FHWA. "Reference Sourcebook for Reducing Greenhouse Gas Emissions from Transportation Sources," October 20, 2015.

- Dynamic Message Sign (DMS) Travel Times: Software has been developed to provide travel time information based on traffic speeds and volumes. As noted in previous sections, the design philosophy is to prioritize the MD 24 corridor for through traffic while the MD 924 corridor would serve local traffic. DMS signs could be installed along I-95 northbound, prior to the MD 24/MD 924 ramp decision point, to indicate travel times along MD 24 versus MD 924 to US 1 Business or MacPhail Road. It is anticipated the MD 24 route would provide faster travel times and facilitate the driver's decision to utilize MD 24 rather than MD 924.
- Peak Period Shoulder Use: Shoulders on MD 24 could be employed during peak hours to provide an additional lane of capacity. Signing or changeable lane use signs would be required to designate the time periods for use. The shoulder would need to be upgraded to be traffic bearing if not already. In addition, modification of the right turn lanes would be required.

D. Signal and Lane Modifications – Design-Year 2025

The signal and lane modifications for Design-Year 2025 discussed below have also been described in more technical detail in ***Volume II – Operational Analysis***. For ease of analysis, the corridor was split into three zones: Zone 1 from Woodsdale Road to Holly Wreath Road, Zone 2 from Holly Wreath Road to Patterson Mill Road, and Zone 3 from Patterson Mill Road to MacPhail Road. The 2025 modifications are provided by zone and the conceptual roadway design plans for MD 924 improvements are provided as Exhibit 2 and located in the back of the report. Analysis results in ***Volume II – Operational Analysis*** note that even with the upgrades noted below, not all intersections will operate acceptably.

Zone 1 - Woodsdale Road to Holly Wreath Road

MD 924 at Constant Friendship Shopping Center/Woodsdale Road

Optimize the signal cycle length during the AM and PM peak periods. Because the signal is interconnected to the MD 24/MD 924 interchange signals, further analysis should be completed before timing changes are performed.

MD 924 at Porter Drive/Box Hill South Parkway

Add an additional northbound through lane and southbound left turn lane. Install protected southbound left turn phasing and associated signals. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Singer Road/Abingdon Road

Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Holly Wreath Court/Road

Modify eastbound and westbound right turn and shared through-left lanes to through-right and left turn lanes. Install a northbound and southbound right turn lane (to accommodate queue jump). Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at Singer Road and Singer Road Connection:

As part of SHA scheduled improvements, MD 24 will be widened to a six-lane section prior to the 2025 Design-Year, with additional through lanes and turn lanes. Install a second eastbound right turn lane and right turn overlap phase and a second southbound left turn lane. The signal cycle length would be optimized during the AM and PM peak periods. To divert significant traffic away from MD 924 and improve the intersection at MD 924 and Singer Road for pedestrians and bicyclists, widen Singer Road to a five-lane section with sidewalks between MD 924 and MD 24.

Zone 2 - Holly Wreath Road to Patterson Mill Road

MD 924 at Wheel Road

Install a dedicated eastbound right turn lane. Convert the existing shared through-right lane to through lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Bel Air South Parkway/Laurel Bush Road

Increase intersection capacity by adding: an additional eastbound left turn lane, an additional eastbound through lane, an additional westbound right turn lane, an additional westbound left turn lane, an additional southbound left turn lane, and an additional northbound through lane. Convert the westbound shared left-through lane to through. Install westbound right turn overlap signal phase and convert southbound left turn phasing to protected. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Bright Oaks Drive

Additional northbound and southbound through lanes are proposed at the intersection.

MD 924 at Plumtree Road/Medstar Boulevard

Add an additional eastbound and westbound left turn lane and eastbound right turn lane (convert the existing eastbound shared through-right lane to through) to serve new development around the intersection. Add an additional northbound left turn lane and convert the existing northbound right turn lane to a shared through and right turn lane. Convert northbound left turn phasing to protected and split phase the eastbound and westbound approaches. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Barrington Place/Patterson Mill Road

Install a second westbound left turn lane and install a protected left turn phase. Construct a southbound right turn lane (to accommodate queue jump); convert southbound through-right lane to through. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at Wheel Road

Add one additional through lane to all approaches. Create left turn lanes in both eastbound and westbound directions and a right turn lane in the westbound direction. Convert the existing eastbound shared left-through and westbound shared through-right lanes to through. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at Bel Air South Parkway

Use of MD 24 for commuting traffic would be better incentivized by constructing additional eastbound and westbound left turn lanes and additional northbound and southbound through lanes. Convert the existing eastbound left-through lane to a through lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at Plumtree Road

Add an additional through lane in the northbound and southbound direction. Optimize the signal cycle length during the AM and PM peak periods.

W. Wheel Road Connection

Maintain right and left turn lanes at the shopping center entrance, and add a right turn lane at MD 924. Because the parcel across W. Wheel Road from the shopping center will be developed as a park by the County, the necessary right-of-way to accommodate a minimum five lane section along with sidewalks would be available.

Bel Air South Parkway Connection

To better serve the Festival at Bel Air from MD 24, widen Bel Air South Parkway to five lanes including a center turn lane. The five-lane section would require right-of-way acquisition from the retail property bordering Bel Air South Parkway.

Plumtree Road Connection

Widen the road to three lanes including a center turn lane, with new left and right turn lanes at the intersection with MD 924 to serve commercial development on Plumtree Road. Dedicate right-of-way as part of the development of the commercial parcel on the southwest side of Plumtree Road for widening. Right-of-way is available at the MD 24 intersection to accommodate widening for turn lanes.

Zone 3 - Patterson Mill Road to MacPhail Road

MD 924 at W./E. Ring Factory Road

Create an eastbound right turn lane and a westbound left turn lane. Convert the eastbound shared through-right and westbound shared left-through lanes to through. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at W./E. MacPhail Road

Separate the currently-combined northbound through and right turn movements into one through lane and one right turn lane and reconfigure the eastbound left-through-right lane into a left turn and shared through/right lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at W. Ring Factory Road

Add an additional through lane in both the northbound and southbound directions. Split the currently-combined westbound through and left turn movements into one through lane and one left turn lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at W. MacPhail Road

Add an additional through lane in the northbound direction. Add an additional westbound left turn lane. Optimize the signal cycle length during the AM and PM peak periods.

W. Ring Factory Road Connection

To better connect MD 24 and MD 924, but maintain adequate access to the single-family detached houses on W. Ring Factory Road, build a three-lane section with a center turn lane. Because right-of-way is limited to only 40 feet, property frontage would be required to accommodate sidewalks with a buffer from the roadway along both sides.

W. MacPhail Road Connection

A new section of street has been proposed to connect W. MacPhail Road between MD 924 and MD 24 through the Bel Air Schools Complex site. The new street will include a shared use path.

III. VISION 2040

A. Design Intent

The lane geometry required to provide acceptable operations along MD 924 for the 2040 Design-Year was applied to the MD 924 corridor aerial base plans, to determine potential constructability impacts. The proposed typical section varies along the corridor and includes two, three and four lane roadways. Exhibit 2 (Sheets 924.1 to 924.17) at the end of the report illustrates the proposed 2040 lane geometry along MD 924. When Design-Year 2025 geometry differs from the proposed 2040 lane geometry, the interim 2025 improvements are shown as insets on the maps. The exhibits illustrate the right-of-way impacts associated with implementing the typical section and the required lane geometry. Specific areas that might require retaining walls or right-of-way dedication from new developments are noted. Also, noted on the drawings are locations of potential common service lanes that would eliminate direct access to MD 924 by residential sites. The access drives could be included as part of a redevelopment plan for parcels along MD 924. The access lanes would intersect a local roadway servicing MD 924. Reducing the number of access points along MD 924 will improve safety by reducing conflict points and provide opportunities for landscaped medians.

The proposed geometry responds to existing conditions along the corridor. As the corridor continues to develop/re-develop, opportunities to further implement the corridor vision will be provided. Opportunities should be identified for better access management with fewer driveways and more interparcel connections. In addition, opportunities may be available to obtain setbacks for the full desired typical section. For example, areas exist where less than a 5-foot buffer is available between the trail and the roadway; however, as parcels redevelop, there may be opportunities to gain the additional right-of-way needed for the full 5-foot buffer.

B. Typical Section

A closed section, with curb and gutter, is proposed along MD 924 with a planted median in areas without intersections or driveways. As shown in Figures III.1 to III.4, joint use trails with a buffer to MD 924 are proposed and bike lanes would not be included along MD 924. It is understood that SHA's typical roadway section includes wider lanes for bicycle compatibility. However, with the SHA embracing "Practical Design" - meeting the needs not the wants along a roadway, it is anticipated that bike lanes, in addition to shared use paths, will not be required. A 6-foot wide median at major intersections provides pedestrian refuge. A 16-foot wide planted median (10-foot if right-of-way is limited) in areas without intersections or driveways enhances the aesthetics of the roadway, which helps provide the desired main street character. Typical lane widths are 13 feet (maximum), with 11 feet (minimum) employed in areas of limited right-of-way. The renderings shown are for illustrative purposes. Medians, turn lanes, buffers and landscaping will vary and will not be provided along the entire corridor.

In areas with closely spaced intersections or driveways, a two-way left-turn lane would be provided instead of the planted median. The illustration shows the two-way left turn lane as part of a two-lane roadway; however, the same layout would apply in the three or four lane segments of the roadway, as appropriate.

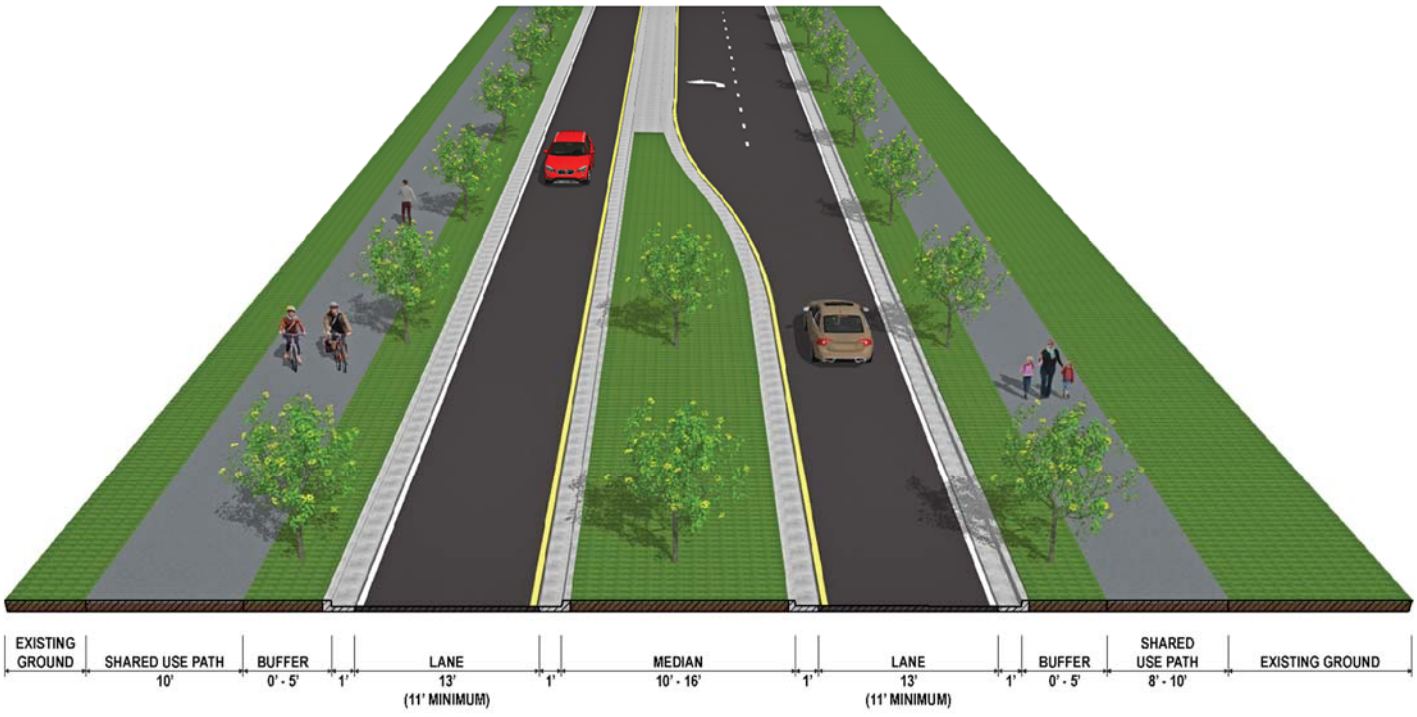


Figure III.1. MD 924 Two Lane Typical Section with Median (looking north) – N.T.S.

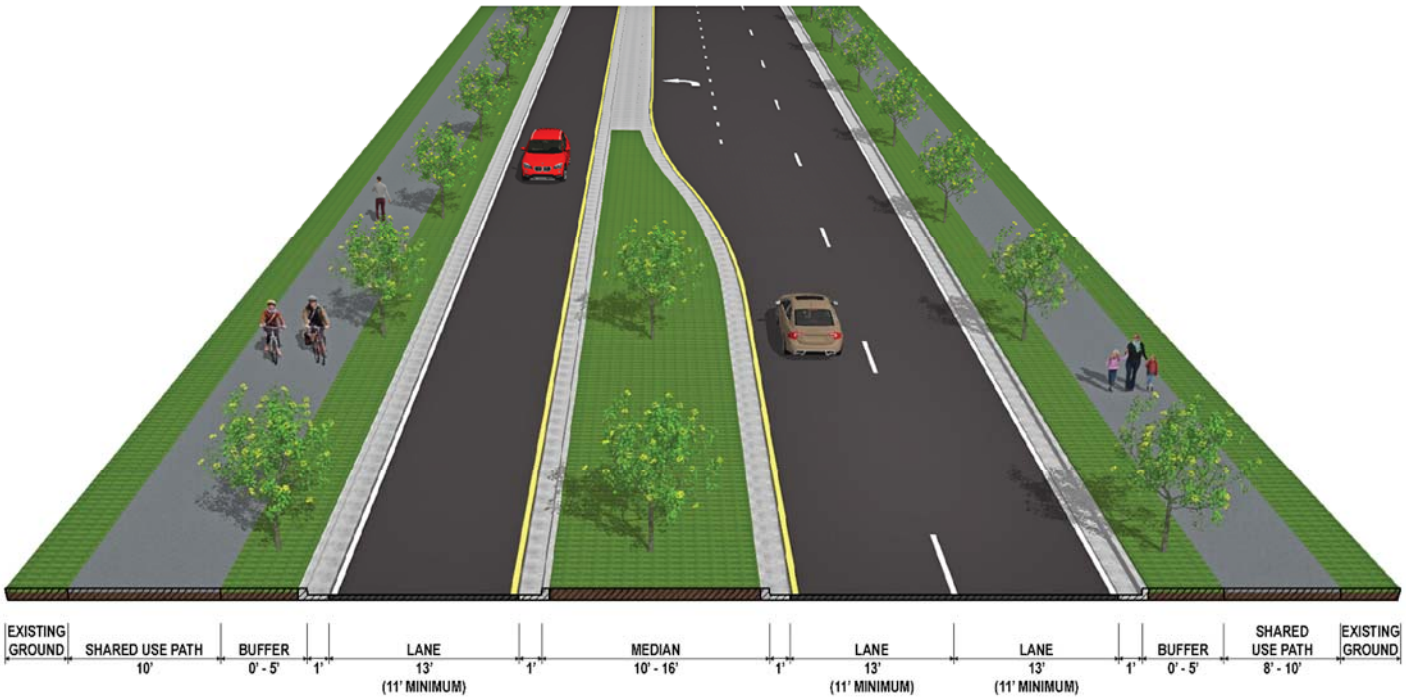


Figure III.2. MD 924 Three Lane Typical Section with Median (looking north) – N.T.S.

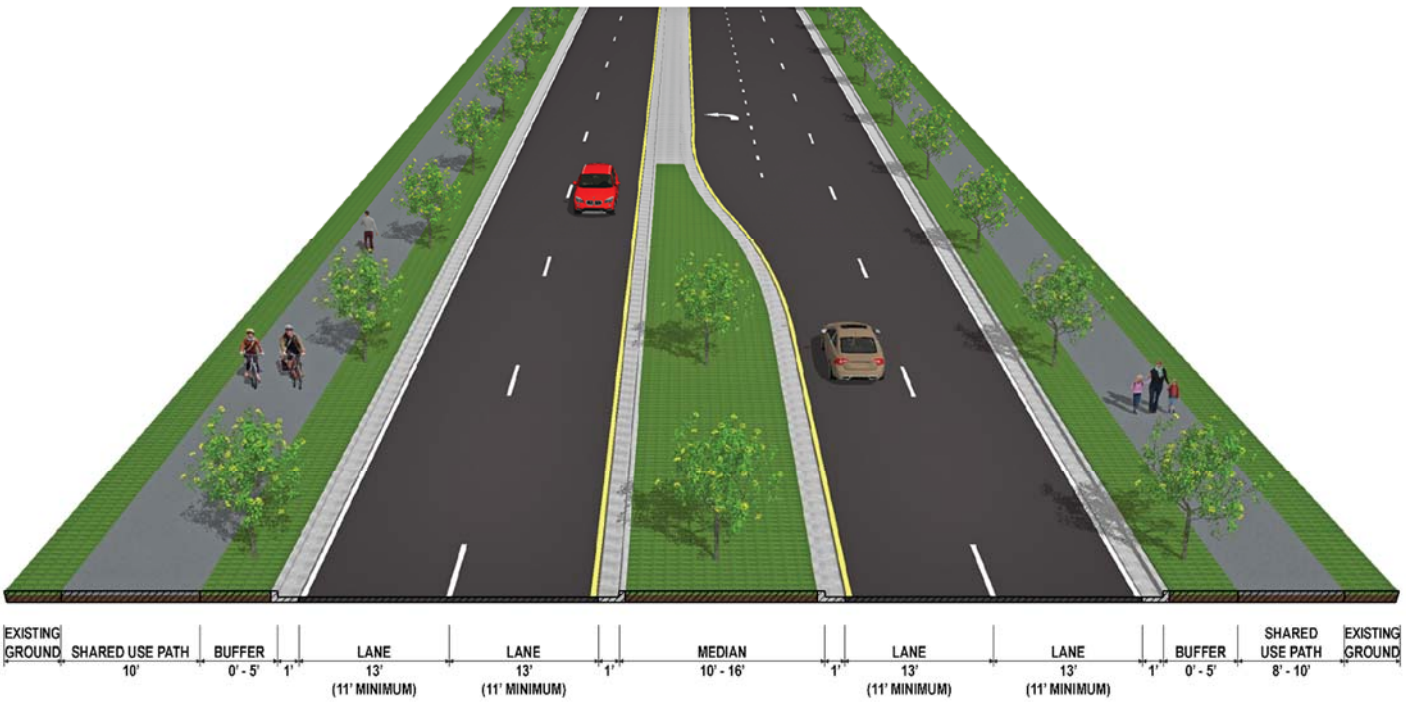


Figure III.3. MD 924 Four Lane Typical Section with Median (looking north) – N.T.S.

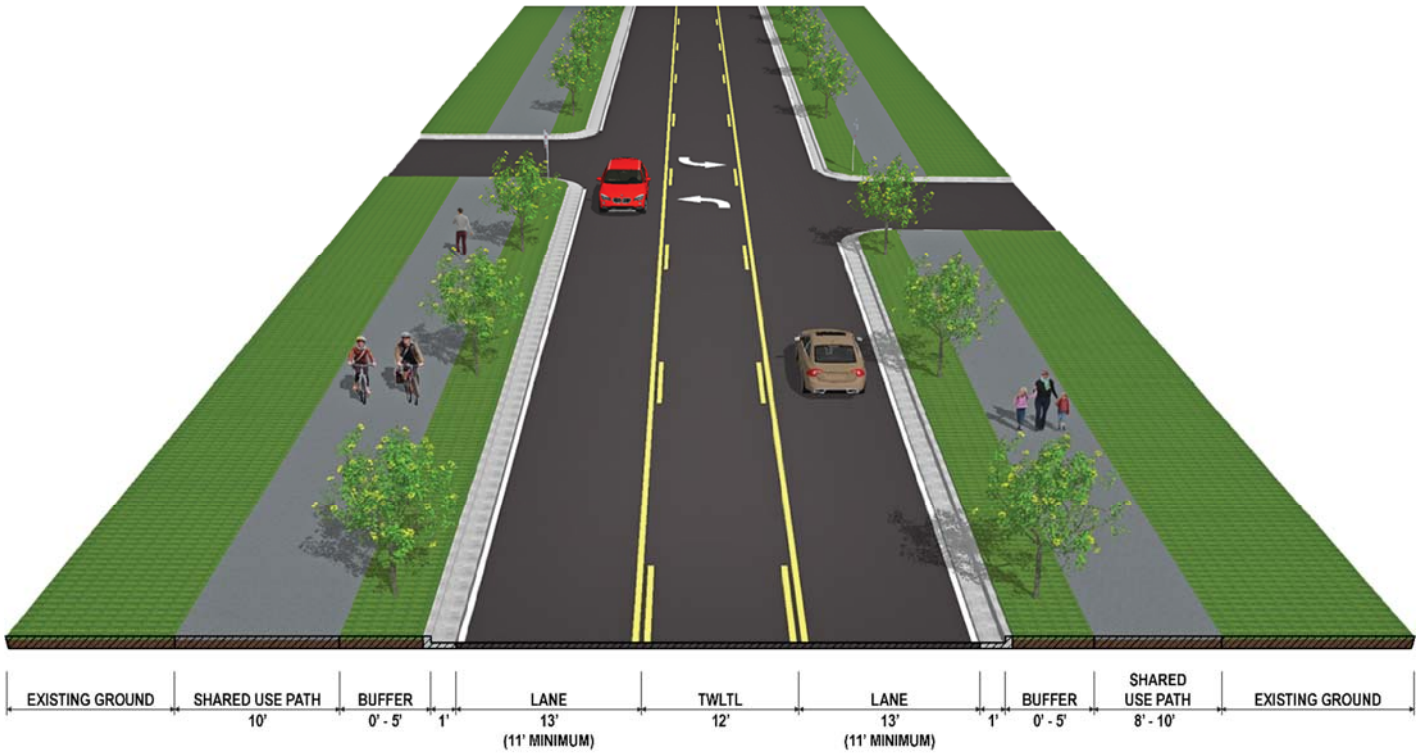


Figure III.4. MD 924 Two Lane Typical Section with Two Way Left Turn Lane (looking north) – N.T.S.

C. Pedestrian Improvements

In transforming MD 924 from a conventional arterial road into a complete street that connects residents with businesses and services, it is essential to address the poor pedestrian conditions that exist today. In some areas along MD 924, pedestrians are currently forced to walk alongside the grass shoulder, or must cross unnecessarily because the sidewalk continues only on one side of the road.

New, continuous shared use paths through the entire length of the corridor will ensure that pedestrians, joggers, bicyclists, people with strollers, etc., are safer, more comfortable, and trips are more convenient than they are today. In the typical section, the west side of MD 924 will contain a standard 10-foot shared use path, which will be both ADA-compliant and comfortable for substantial pedestrian and bicycle traffic. A trail with a 10-foot width will provide bicyclists, joggers, and pedestrians with ample room to travel the path in both directions. The shared use path will be buffered from vehicular traffic. The opposite side of MD 924 will have a secondary shared use path ranging from 8 to 10 feet in width and buffered from vehicular traffic. As part of the pedestrian infrastructure improvements, ADA-compliant curb ramps will be installed at all intersections and all pedestrian signals will be issued ADA-compliant audible instructions so that people with visual impairments can travel safely and independently.

The designs for MD 924 build upon the 2013 Bicycle and Pedestrian Master Plan, which includes specific recommendations for MD 924. Crosswalk improvements will be made at Wheel Road, Bel Air South Parkway, and Box Hill Center, which were locations specifically identified

as most in need of improvements. Also in accordance with the plan, pedestrian improvements will be made at Singer Road to ensure that the intersection is ADA compliant.

Because every trip made by public transit starts and ends with a segment as a pedestrian, the improvements to sidewalks, crosswalks, curb ramps, and pedestrian signals will also benefit transit users in the corridor. It is likely that more people of a greater diversity of ages and abilities will feel comfortable using transit with the substantial upgrades to address pedestrian safety and accessibility. The pedestrian improvements will also help to facilitate more pedestrian- and transit-oriented development in the future by creating the basic infrastructure by which street-facing development succeeds.

A few potential opportunities exist to increase the connectivity of the pedestrian network in the corridor. Pedestrian-only connections could be made to MD 924 from Woodspring Drive, St. Clair Drive (at Benefit Court), Mitchell Drive, and Oak Crest Court, reducing unnecessarily long distances to reach MD 924 on foot. To implement these pedestrian shortcuts, the County would need to establish right-of-way agreements with the appropriate property owners. Should nearby parcels be redeveloped with a more walkable, traditional main street character, it would be beneficial to better connect residents to the new amenities. While these improvements have not been incorporated into the designs as part of the study, they may deserve further consideration in the future.

D. Bicycle Improvements

The 2010 Bicycle Survey of cyclists in Harford County, documented in the 2013 Bicycle and Pedestrian Master Plan, identified several opportunities for increasing bicycle ridership. Among the findings most relevant to the MD 924 corridor are that 60 percent of respondents would consider allowing their children to walk or ride their bike to school if there were adequate facilities, and that 90 percent of respondents think that building more bikeways would encourage more cycling countywide.

Best practices for attracting the greatest number and diversity of people to bicycling employs a method called low-stress connectivity, which seeks to connect streets of low traffic stress through strategic deployment of dedicated bicycle infrastructure. Currently, neighborhood street networks make bicycling a low-stress activity in the communities in the MD 924 corridor; however, because MD 924 serves as the primary connector between destinations and has a high level of traffic stress, few destinations can be reached by residents using only low-stress cycling environments. While MD 924 is currently a barrier to bicycling, it can be transformed through appropriate infrastructure into a connector between low traffic stress residential streets and schools, businesses and services.

A shared use path is the most essential element of a vision for MD 924 as a complete street. Because MD 924 has both high traffic volumes and operating speeds more than 40 MPH, it is crucial that bicyclists have a facility to use that is separated from vehicular traffic. The shared use path, which is buffered from vehicular traffic where feasible, will be safe, comfortable, and inviting for all users. Having a width of 8 to 10 feet, bicyclists, joggers, and pedestrians will have ample room to travel the path in both directions on both sides of MD 924. The shared use path will enable families to exercise together, children to bicycle to school, and people of all ages to access important destinations by bicycle.

The shared use path will connect to a shared used path planned for MacPhail Road, which will expand and enhance a growing comprehensive bicycle network in the well-developed area of Harford County. Should future improvements to Tollgate Road incorporate cycling infrastructure, MacPhail Road will serve as an important connector for traveling by bicycle across MD 24.

E. Transit Improvements – Transportation-Efficient Land Use

One of the most effective transportation strategies is to guide land use in a corridor toward transportation-efficient development characterized by higher densities of housing, employment, and services in a mix of uses. In areas that are sufficiently dense and mixed in uses, people feel comfortable traveling by foot and by bicycle, which also makes them more likely to use transit. When multiple nodes of sufficiently dense and mixed development are located along a corridor, it is cost effective to establish high-frequency transit services that give people much greater freedom in travel than typical suburban transit services that arrive every hour. To reduce vehicle miles traveled in the MD 924 corridor, it will be necessary to infill existing commercial centers with development more characteristic of traditional town centers. New development should connect to existing residential areas as much as possible to reduce trip length by foot or bicycle. With good design, it is possible to increase the number of housing units and area of retail and office space without increasing the number of vehicle trips.

F. Signal and Lane Modifications – Design-Year 2040

The signal and lane alterations for Design-Year 2040 discussed below have also been described with more technical detail in ***Volume II – Operational Analysis***. The descriptions are for the 2040 improvements required beyond those included under Design-Year 2025 conditions. The 2040 modifications are provided by zone and the conceptual roadway design plans for MD 924 improvements are provided as Exhibit 2.

Zone 1 - Woodsdale Road to Holly Wreath Road

MD 924 at Constant Friendship Shopping Center/Woodsdale Road

Optimize the signal cycle length during the AM and PM peak periods. Because the signal is interconnected to the MD 24/MD 924 interchange signals, further analysis should be completed before changes are made.

MD 924 at Porter Drive/Box Hill South Parkway

Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Singer Road/Abingdon Road

Install a second northbound through lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Holly Wreath Court/Road

Install a second northbound through lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at Singer Road

Major upgrades would be required to accommodate the increased traffic volumes along the mainline and side streets. An eight-lane section with double turn lanes southbound would be required to move projected traffic on MD 24. Substantial widening of Singer Road to an eight-lane section on the west leg would also be required. As an alternate to the very large at-grade intersection, a grade-separated intersection with median ramps could be constructed to accommodate left turns and Singer Road through traffic. The interchange would enable MD 24 through traffic and right turns to/from MD 24 to move through the intersection without a signal. The design elements of the interchange are discussed further in a following section.

Zone 2 - Holly Wreath Road to Patterson Mill Road

MD 924 at Wheel Road

Install a westbound right turn lane and convert the existing westbound shared through/right turn lane to a through lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Bel Air South Parkway/Laurel Bush Road

Extend the southbound double left turn lane storage length. Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Bright Oaks Drive

No additional upgrades beyond 205 mitigation measures.

MD 924 at Plumtree Road/Medstar Boulevard

Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at Barrington Place/Patterson Mill Road

Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at E. Wheel Road

Given the high volume of both through traffic and opposing turns at the very busy intersection, major roadway widening would be required to accommodate projected traffic. An eight-lane section would be required to move projected traffic on MD 24, and a seven-lane section with double left turn lanes would be required along E. Wheel Road.

As an alternate to the very large at-grade intersection, a grade-separated intersection with median ramps could be constructed to accommodate left turns, E. Wheel Road through traffic, and eastbound right turns. The interchange would enable MD 24 through traffic and right turns (excluding eastbound right turns) to/from MD 24 to move through the intersection without a signal. The grade-separated intersection at E. Wheel Road would also provide a link to the proposed grade-separated access to and from the Festival at Bel Air. The design elements of the interchange are discussed further in a following section.

MD 24 at Bel Air South Parkway

Install additional lanes related to the Festival at Bel Air and Plumtree development ramps along the northbound and southbound approaches. Achieving acceptable levels of service at the intersection depends on grade-separated access to the Festival at Bel Air, which is discussed further in a following section. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at Plumtree Road

Adjust the northbound and southbound lane alignment to accommodate the Plumtree Road directional ramps and Festival at Bel Air grade-separated access. Optimize the signal cycle length during the AM and PM peak periods.

Zone 3 - Patterson Mill Road to MacPhail Road

MD 924 at W./E. Ring Factory Road

Optimize the signal cycle length during the AM and PM peak periods.

MD 924 at W./E. MacPhail Road

Eastbound and westbound left turns would gain exclusive/permissive phasing. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at W. Ring Factory Road

Install an additional westbound left turn lane. Optimize the signal cycle length during the AM and PM peak periods.

MD 24 at W. MacPhail Road

Add an additional northbound left turn lane and provide a second receiving lane on the west leg. Optimize the signal cycle length during the AM and PM peak periods.

G. Major Roadway Upgrades

1. Overview

As illustrated in the previous sections and summarized in Table III.1, simple geometric upgrades will not be sufficient to accommodate the projected traffic demand along the MD 24 and MD 924 corridors. A review of major traffic travel patterns was performed to identify system upgrades that could address the traffic demand. Measures identified include:

2. Upgrade MD 543 and MD 136

The majority of the study area traffic accesses I-95 and MD 24 south via MD 924. As development progresses, upgrades to MD 543, and improved links to MD 136 and MD 543 from the roadways serving development east of MD 924, should be considered. The links to alternate routes would alleviate some of the demand on the MD 924 corridor.

Table III.1

MD 924 Multi-Modal Corridor Study
Performance Summary and Mitigation Measures

Zone	Intersection ID No.	Intersection	2015 Synchro LOS				2015 Mitigation Measures	2025 Synchro LOS				2025 Mitigation Measures**	2040 Synchro LOS				2040 Mitigation Measures**
			No-Build		Improved			No-Build		Improved			No-Build		Improved		
			AM	PM	AM	AM		AM	PM	AM	PM		AM	PM	AM	PM	
1	01	MD 924 at Constant Friendship S. C/ Woodsdale Rd	C	C	C	C	Cycle length optimized to 110 seconds.	C	C	C	C		B	C	C	C	
	02	MD 924 at Porter Dr/Box Hill S. Pkwy	B	D	B	D	Cycle length optimized to 120 sec. in the PM peak period.	B	F	C	C	Add a second NB TH lane and a second SB LT lane.	B	F	C	D	
	03	MD 924 at Singer Rd/Abingdon Rd	C	D	C	D	Cycle length optimized to 120 sec. in the PM peak period.	C	E	C	E*		C	F	C	C	Add a second NB TH lane.
	04	MD 924 at Holly Wreath Ct/ Holly Wreath Rd	B	C	B	C		C	C	B	C	Modify EB and WB RT and TH-LT lanes to TH-RT and LT lanes. Install a NB and SB RT lane (to accommodate queue jump); convert TH-RT lanes to TH.	C	D	B	B	Add a second NB TH lane.
	05	MD 24 at Singer Rd	F	E				F	F	C	D	MD 24 will be widened to a six-lane section. Add a second EB RT lane and RT overlap phase. Add a second SB LT lane.	F	F			Construct grade separated intersection. Mainline TH and all RT free flow at grade; mainline LT and side street TH and LT grade-separated.
2	06	MD 924 at Wheel Road	C	C	C	D	Modify signal splits for the EB approach during the PM peak.	D	E*	C	D	Add EB RT lane.	D	E	C	D	Modify the WB TH-RT lane to TH. Install WB RT lane. Add a second NB TH lane.
	07	MD 924 at Bel Air S. Parkway/ Laurel Bush Road	C	D	C	D	Modify the existing WB LT lane to a LT-TH lane. Add an EB LT lane. The NB leg of MD 924 requires an additional receiving lane as a LT-TH lane.	D	F	C	D	Add a second EB LT and TH lane. Add a second WB RT and LT lane. Convert WB TH-LT lane to a TH lane. Add a second SB LT and NB TH lane.	D	F	C	D	Extend the southbound double left turn lane from 200' to 400'.
	08	MD 924 at Bright Oaks Drive	B	D	A	A	Modify NB approach to TH, TH-RT.	D	E	A	B	Add additional NB and SB TH lanes.	D	F	A	B	
	09	MD 924 at Plumtree Road/ Medstar Boulevard	B	C	B	C	Install WB and EB exclusive/permissive LT.	E	F	D	E*	Add EB LT and RT lanes, and add a WB LT lane and NB LT lane. Split phase side streets. Convert NB RT lane to a Shared TH-RT lane. Modify NB LT Phase to protected.	F	F	D	D	Add SB TH lane.
	10	MD 924 at Barr. Pl/ Patterson Mill Rd	C	B	C	B		C	C	C	C	Add a second WB LT lane. Modify WB LT phase to protected. Install a SB RT lane (to accommodate queue jump); convert TH-RT lane to TH.	C	D	C	D	
	11	MD 24 at Wheel Road	B	D				D	F	C	D	Add EB, NB, and SB TH lanes and add a second LT, TH and RT lane to the WB approach.	F	F			Construct grade separated intersection. Mainline TH and all RT free flow at grade (excluding EB RT); mainline LT, side street TH and LT and EB RT grade-separated.
	12	MD 24 at Bel Air S. Parkway	D	D				F	F	D	D	Add additional WB and EB LT lanes and NB and SB TH lanes. Convert the existing EB LT-TH lane to a TH lane.	F	F	E*	E***	Widen MD 24 at the intersection to accommodate the Plumtree fly-over ramp and grade separated roadway merge/diverge areas
	13	MD 24 at Plumtree Road	B	C				D	E	C	C	Add additional NB and SB TH lanes.	C	F	C	D	Adjust northbound and southbound lane alignment to accommodate the Plumtree Road directional ramps.
3	14	MD 924 at Ring Factory Rd	C	D	C	C	Remove EB and WB split phase. Modify WB LT-TH and RT lanes to LT and TH-RT.	D	F	C	D	Modify the EB TH-RT lane to a TH lane and add a RT lane. Install a WB LT lane and modify the WB LT-TH to a TH lane.	C	F	D	E*	
	15	MD 924 at W. MacPhail Rd/ E. MacPhail Rd	C	D	C	C		D	D	C	C	Modify the NB TH-RT lane to a TH lane and add a RT lane. Modify the EB LT-TH-RT to a TH-RT lane and add a LT lane.	D	E	D	D	Install exclusive/ permissive phasing for EB & WB left turns.
	16	MD 24 at W. Ring Factory Rd	C	D				F	E	D	C	Add a WB LT lane and modify the WB LT-TH to a TH lane. Add NB and SB TH lanes.	F	F	D	D	Install a second WB LT lane.
	17	MD 24 at W. MacPhail Rd	C	C				C	D	C	C	Add WB LT lane and NB and SB TH lanes.	C	E*	C	C	Add NB LT lane, and adjust west leg lanes to accommodate an extra receiving lane.

*Delay is less than 10 seconds above the LOS D/E threshold
**Signal Cycle Lengths, Splits and Interconnection Optimized (Unless otherwise noted)
***Delay is 12.5 seconds above the LOS D/E threshold

3. Grade-Separation of MD 24/Singer Road Intersection

Based on the analyses presented for the 2040 Design-Year, an eight-lane section with double turn lanes southbound would be required along MD 24, and an eight-lane section with double right, through, and left turn lanes would be necessary along the west leg of Singer Road to provide acceptable operations. The magnitude of the widening necessary to accommodate the required number of lanes is not feasible to construct. Therefore, grade-separation should be considered to eliminate as many movements as possible from signalized control. In lieu of a standard diamond or cloverleaf interchange that would have significant right-of-way impacts, a median interchange is proposed. The proposed grade-separation would bring the MD 24 left turn movements into the median to intersect with the through and left turn volumes from Singer Road. The intersection would be elevated providing for the free-flow of MD 24 through traffic and the right turn movements from each intersection approach. The new elevated intersection could potentially be under signalized control. The existing topography facilitates the design since the intersection is in a sag vertical curve. The ramp touch down points to the east would occur prior to the first intersection along Singer Road. Traffic would merge and diverge in the MD 24 median. Figure III.5 illustrates the concept design.

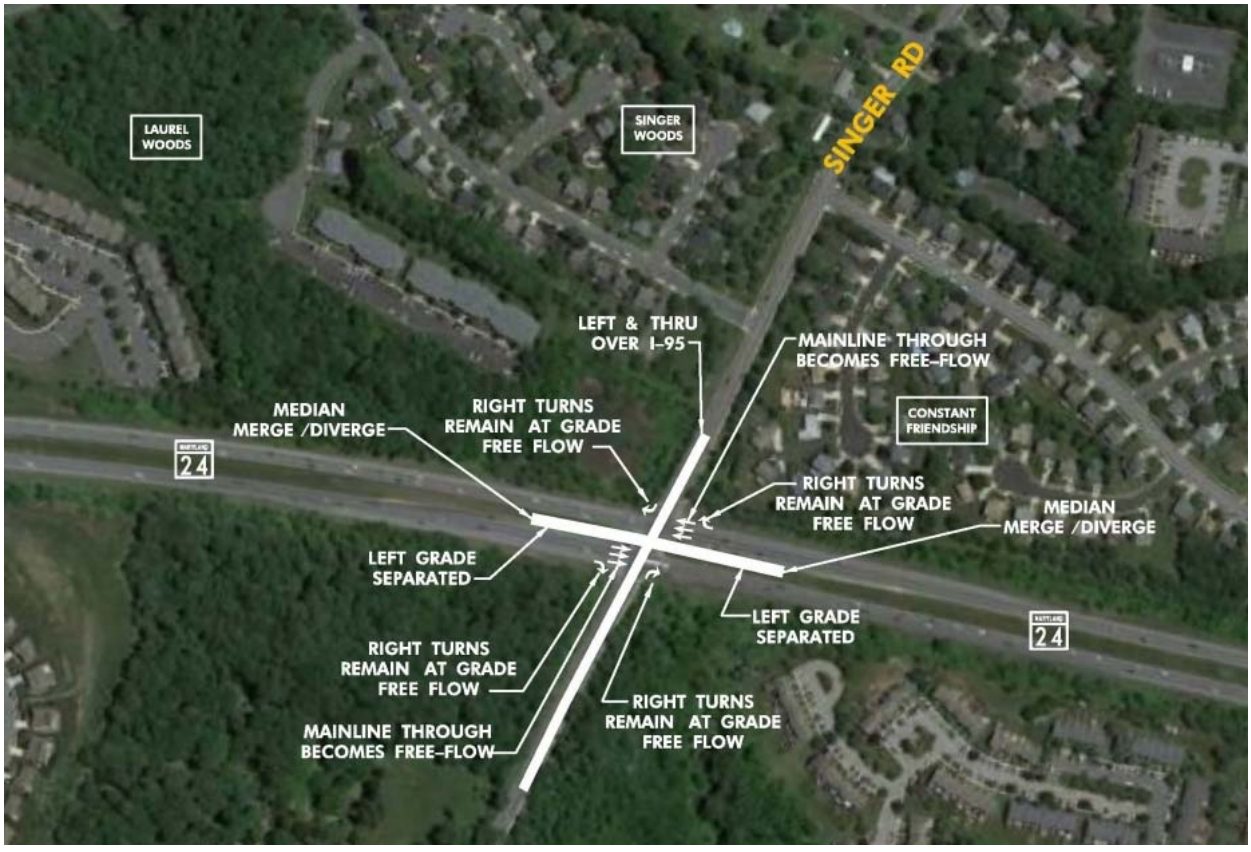


Figure III.5. Grade-Separation of MD 24/Singer Road

4. Grade-Separation of MD 24/Wheel Road Intersection

Similar to the intersection of MD 24 and Singer Road, the intersection of MD 24 with Wheel Road is projected to experience excessive delays, requiring significant roadway widening to provide the required lane capacity. Therefore, the feasibility of grade-separation of major movements was explored. As with the proposed grade-separation at Singer Road, all left turn movements, the east/west through movements and the eastbound right turn movements would be accommodated by the grade-separated median intersection. Mainline through movements and all right turn movements (excluding eastbound right turn) would remain at-grade in free-flow without signalized control. The topography along MD 24 at Wheel Road is like that at Singer Road, with a sag vertical curve along MD 24 and an upward slope leading to MD 924. Grades were held to a maximum of 6 percent. Some reconfiguration of Wheel Road west of MD 24 would be required to facilitate the ramp intersection. The roadway grade adjustments could be included as part of the development plan for the parcels on the west side of MD 24. The ramp touch down point to the east along Wheel Road would be prior to the Festival at Bel Air access. Figure III.6 illustrates the concept design.

Figure III.6. Grade-Separation of MD 24/Wheel Road and Direct Access to Festival at Bel Air & Plumtree Parcel

5. T-Ramp Connection to Festival at Bel Air

The Festival at Bel Air is a major trip generator for the study area. The retail trips are a significant component of the high turning movements at the MD 24/Bel Air South Parkway intersection. Major capacity upgrades at the intersection of MD 24/Bel Air South Parkway are not feasible due to the constrained right-of-way. A T-ramp could be constructed that would provide direct and grade-separated access from MD 24 to the Festival at Bel Air. The ramp concept shown above (Figure III.6) illustrates that movements to and from MD 24 would be accommodated by the ramp with traffic entering and exiting MD 24 from the median. As shown, the median roadway would link the grade-separated T-Ramp and the Wheel Road intersection due to limited space between the intersections to accommodate bringing the lanes back to grade. Since the Festival at Bel Air site is higher than MD 24, ramp access is facilitated and the

ramp would intersect the parking lot before the main internal drive aisle. Some reconfiguration of the internal roadway network at the Festival at Bel Air would be required. Trip diversion to the T-ramp could potentially reduce the turning movements at Bel Air South Parkway, thus improving intersection operations. Figure III.6 illustrates the concept design.

6. Direct Access to Plumtree Parcel

Like the Festival at Bel Air, the parcel of land bounded by MD 924, MD 24 and Plumtree Road will be a major traffic generator with significant retail trips. During the planning stages of the parcel development, the County should require that a spine road be provided paralleling MD 924 and MD 24 and linking with Plumtree Road and Bel Air South Parkway. A ramp connection could then be provided from MD 24 northbound entering, and to MD 24 southbound exiting the site. The access could reduce turning movements and provide a facilitated connection to MD 24 from MD 924. Figure III.6 illustrates the concept design.

H. Impacts to Surrounding Properties – MD 924

The MD 924 Roadway Geometry plans provided as Exhibit 2 detail the proposed roadway, intersection and path design, and associated impacts to surrounding properties. The proposed roadway improvements would only require a few areas of right-of-way acquisition. The median can be reduced to minimize impacts and minor retaining walls are shown to further limit the impacts to properties. The recommendations for MD 924 follow a "Practical Design." Providing the joint use trail should alleviate the need for bike lanes along MD 924 and significantly reduce the pavement footprint. In addition, reducing lane widths to 11 feet and elimination or reduction of the buffer between MD 924 and the shared use trails in some areas would reduce the overall roadway footprint and help to minimize impacts.

IV. MOVING FORWARD

A. Implementation

The MD 924 Multi-Modal Corridor Study outlines many measures designed to improve the safety and operations of the MD 924 and MD 24 study area. Some measures, such as modifications to existing signing, could be implemented by County or SHA maintenance forces. Other upgrades will require multi-jurisdictional and agency cooperation, negotiations with impacted property owners and buy-in from local stakeholders. To facilitate implementation of the corridor upgrades, the following actions should be considered.

B. General Requirements

- Provide briefings for local officials and educate them on the reasons why implementing the upgrades is important and, what the study area operations would be like if the upgrades are not provided. Distill the complicated engineering analyses into basic areas of understanding regarding operations and queues and the associated impacts to quality of life and commerce. Informed political leaders make great advocates and are necessary as the SHA tries to prioritize projects.

- Ensure that the transportation needs of the MD 924 study area are prioritized by the County during the SHA's annual tour to review priority projects. Without the support of the County leaders, the upgrades will most likely not be constructed.
- "Market" the proposed study area upgrades by illustrating to the State agencies that a definite need exists, what would happen if the proposed upgrades are not implemented, that the County has identified cost effective measures to address demand (such as the use of median ramps rather than a typical diamond or cloverleaf interchange), multi-modal elements are being included, proposed designs are based on "Practical Design" to minimize costs while addressing safety and operations, opportunities for grant monies are being pursued and that the County has participation from local developers to facilitate implementation of upgrades.
- County officials could organize a MD 924 Study Area Task Force to address transportation issues impacting the study area. The County would need to include the SHA and MTA as part of the Task Force. The SHA task force members would include representatives from SHA's District 4 Traffic, District 4 Community Relations, District 4 Special Projects and SHA Planning. Also included should be a representative from Harford Transit.
- Coordinate with SHA and County review agencies to ensure roadway infrastructure requirements are incorporated into Development site plans. The Adequate Public Facilities Ordinance should be employed to leverage the dedication of right-of-way for roadway upgrades or construction of plan elements such as trails and sidewalks.
- Include the MD 24 and MD 924 corridors as part of the SHA's test sites for advanced traffic signal control to improve operations based on real-time data.

C. Short-Term Objectives

The Short-Term objectives are those measures that could be constructed with County or SHA maintenance forces or area-wide contractors in less than one year. Coordination with the SHA and MTA would be required. Short Term measures also relate to projects in the development pipeline that are impacted by the proposed improvements. Implementation of Short Term measures would include:

- Meet with SHA District 4 to coordinate the reviews of Traffic Impact Studies to ensure that any right-of-way dedications or access modifications required to accommodate the proposed MD 924 improvements are incorporated as part of the development's overall transportation mitigation plan. Figures from the report serve as a valuable tool for identifying the overall system requirements, and how the upgrades will relate to pending development.
- Coordinate internally with the County agencies responsible for the development of the proposed Center for the Arts and the proposed park along Wheel Road to ensure that the potential right-of-way requirements and pedestrian/bicycle amenities necessary for implementation of the long-range transportation plan are integrated into the design process. Also, include an assessment of required stormwater management facilities for the roadway improvements, and potential for constructing joint-use ponds.

- Coordinate with SHA for the concurrence and implementation of the traffic control device modifications noted in the Road Safety Audit section of the report.
- Coordinate with the MTA regarding new bus stops or relocation of existing stops. Also, begin the process of modification of existing routes.
- Meet with the SHA to review and receive concurrence on the elements of the Walkability Audit. Work with the SHA to implement the sidewalk repairs noted in the Audit and construct minor missing links in the sidewalk network. The sidewalk construction and repair could be included as part of SHA's Sidewalk Retrofit Program or through an Area-Wide construction contract.
- Perform a detailed utility investigation and prepare a utility mosaic for the study area to identify any major utilities that would require relocation to implement the proposed upgrades.
- Begin the preliminary engineering for the linkage of MacPhail Road between MD 24 and MD 924.

D. Medium-Term 2025 Objectives

The Medium-Term improvements would require additional coordination with other County/State agencies, property owners and utility companies. The measures would require additional time to implement due to the potential for property owner negotiations, right-of-way acquisition, utility relocations and approvals from various State agencies including environmental compliance groups. Work efforts would also involve the advanced planning for long range projects. Medium term implementation items would include:

- Monitor development along the corridor. As residential parcels fronting MD 924 transition to commercial sites, include elements to minimize direct access to MD 924 and dedicated right-of-way for implementation of the corridor improvements, including stormwater management.
- Begin the preliminary engineering for the proposed grade-separated intersections and T-ramp connections along MD 24.

E. Long-Term 2040 Objectives

Proposed system upgrades would require several years to transition from preliminary planning through final design and construction. It is anticipated that the grade-separated intersections and access points along MD 24 will be completed by the 2040 Design-Year.

F. Implementation Summary

Tables III.2 provides a summary of the implementation strategies for short (Table III.2.A), medium (Table III.2.B) and long (Table III.2.C.) term improvements including proposed elements of the plan, approximate timeframe for implementation including anticipated design, right-of-way and construction durations, approximate cost, and potential funding sources.

Matrix of Recommendations, Costs and Durations
Short-Term Improvements

Project	Cost*	Timeframe						Process to Implement/Remarks
		2017	2018	2019	2020	2021	2022	
Travel Demand Management Solutions								
5% Reduction in Through Traffic Along MD 924 and MD 24 (telecommuting, shifting commute times, etc.)								
Modification of Signal Timing and Phasing								
Revised Lane Assignments Within the Existing Pavement Footprint								
Transit Improvements								
General Improvements: Accessibility, Span of Service and Frequency of Service								
Bus Stop and Route Alignment Improvements – Harford Transit LINK								
Bus Stop Improvements – MTA Commuter Bus								
Install Park & Ride Facility								
Initiatives to Increase Transit Ridership								
Physical Improvements (Noted in Road Safety & Walkability Audits)								
Crosswalk and Stop Line Pavement Marking Upgrades								
Guard Rail Improvements			Maintenance					
Sidewalk Improvements to meet current SHA and ADA Standards								
Pavement Marking and Signing Upgrades that Conform to the MDMUTCD								
Roadway Improvements Within Zone 2 (MD 924)								
07- MD 924 at Laurel Bush Road/Bel Air S. Parkway: Create a double left turn onto Maryland 924 from Bel Air S. Parkway eastbound; install associated receiving lane along MD 924 northbound. Modify the existing westbound left turn lane to a shared left-through lane.	$0.7-$1.0		Design	Construction				
08-MD 924 at Bright Oaks Drive: Convert northbound right turn lane to through-right								
09-MD 924 at Plumtree Road/Medstar Boulevard: Install eastbound and westbound exclusive/permissive signals								
Roadway Improvements Within Zone 3 (MD 924)	$0.1-$0.2							
14-MD 924 at W./E. Ring Factory Road								
Remove eastbound and westbound split phasing and install exclusive/permissive left turn signals. Convert westbound shared left-through and right turn lanes to a left and shared through-right.			Design	Construction				

*(Millions) – Does not include ROW.

Matrix of Recommendations, Costs and Durations
Medium-Term Improvements

Project	Cost*	Timeframe									Process to Implement/Remarks
		2017	2018	2019	2020	2021	2022	2023	2024	2025	
Upgrade the Pedestrian Network to be ADA Compliant											
Minor Pedestrian and Bicycle Improvements (to accommodate Medium-Term Improvements Only)	$0.5-$1.5										
Transit Improvements 1. Bus Stop Landing Pads, Shelters, Seating, Signing, etc. 2. Queue Jump Equipment	$0.6-$0.8		Design	Construction (Intermittent, as MD 924 projects are complete)							
Roadway Improvements within Zone 1 (MD 924) **02- MD 924 at Porter Dr/Box Hill S. Parkway:** Installation of a second northbound through lane and a second southbound left turn lane. **04- MD 924 at Holly Wreath Ct/Holly Wreath Rd:** Modify eastbound and westbound right and shared through/left lanes by restriping to a shared through/right lane and left turn lane. Install a northbound and southbound right turn lane (to accommodate queue jump); convert through-right turn lanes to through.	$1.5-$2.5			Design	ROW	Construction					
Roadway Improvements within Zone 1 (MD 24) **05- MD 24 at Singer Rd and Singer Rd Connection:** Widen MD 24 to a six-lane section. Add a second eastbound right turn lane and right turn overlap phase. Add a second southbound left turn lane. Widen Singer Rd to a five lane section with sidewalks.	$5.0-$8.0					Design	ROW		Construction		Widening MD 24 to a 6-lane section is an SHA planned improvement; however, the cost to widen is included in the estimate.
Roadway Improvements within Zone 2 (MD 924) **06- MD 924 at Wheel Rd:** Construct eastbound right turn lane. **07- MD 924 at Bel Air S. Parkway/Laurel Bush Rd:** Construct additional eastbound through, westbound left and right turn, northbound through and southbound left turn lanes. **08- MD 924 at Bright Oaks Dr:** Install additional southbound through lane. **09- MD 924 at Plumtree Rd/Medstar Boulevard:** Install additional northbound, eastbound and westbound lanes. **10- MD 924 at Barrington Pl/Patterson Mill Rd:** Construct additional westbound left turn lane; install exclusive left turn signal phase. Install southbound right turn lane (to accommodate queue jump).	$3.0-$5.0			Design	ROW		Construction				
Roadway Improvements within Zone 2 (MD 24) **11- MD 24 at Wheel Rd:** Construct additional northbound, southbound and eastbound through lanes. Install additional westbound left, through and right turn lanes. **12- MD 24 at Bel Air S. Parkway:** Construct additional eastbound and westbound left turn lanes and northbound and southbound through lanes. Convert existing eastbound left-through lane to through. **13- MD 24 at Plumtree Rd:** Install additional northbound and southbound through lanes.	$6.0-$9.0						Design		Construction		Widening MD 24 to a 6-lane section is an SHA planned improvement; however, the cost to widen is included in the estimate.
Roadway Improvements Within Zone 3 (MD 924) **14- MD 924 at E./W. Ring Factory Rd:** Construct an additional lane on the eastbound and westbound approaches to provide separate left, through and right turn lanes. **15- MD 924 at W./E. MacPhail Rd:** Construct northbound right turn and eastbound left turn lanes.	$2.0-$3.0			Design	ROW	Construction					

*(Millions) – Does not include ROW.

Matrix of Recommendations, Costs and Durations
Medium-Term Improvements

Project	Cost*	Timeframe									Process to Implement/Remarks
		2017	2018	2019	2020	2021	2022	2023	2024	2025	
Roadway Improvements Within Zone 3 (MD 24) **16- MD 24 at W. Ring Factory Rd:** Install additional northbound and southbound through lanes. Install westbound left turn lane; modify westbound shared left-through lane to through only. **17- MD 24 at W. MacPhail Rd:** Install additional northbound and southbound through lanes. Install additional westbound left turn lane.	$10.0-$15.0						Design	ROW	Construction		Widening MD 24 to a 6-lane section is an SHA planned improvement; however, the cost to widen is included in the estimate.
MacPhail Roadway Connection Create an additional connection between MD 24 and MD 924 using MacPhail Road; includes a shared use path and two roundabouts.	$8.0-$12.0					Design	ROW	Construction			
W. Ring Factory Road Connection Widen road to a three-lane section with a center turn lane. Install sidewalk with an offset on both sides of roadway.	$4.0-$6.0			Design	ROW	Construction					
Plumtree Road Connection Widen the road to three lanes including a center turn lane, with new left/right turn lanes at the intersection with MD 924	$3.0-$5.0					Design	ROW	Construction			
W. Wheel Road Connection Create five lane section in area adjacent to the Festival entrance	$3.0-$5.0						Design	Construction			

*(Millions) – Does not include ROW.

Matrix of Recommendations, Costs and Durations
Long-Term Improvements

Project	Cost*	Timeframe	Process to Implement/Remarks
		2020-2030 / 2031 / 2032 / 2033 / 2034 / 2035 / 2036 / 2037 / 2038 / 2039 / 2040	
Pedestrian and Bicycle Improvements to Complete the MD 924 Network	$7.0-$12.0		
Transit Improvements			
Transportation-Efficient Land Use			
Roadway Improvements within Zone 1 (MD 924)	$3.0-$5.0		
03- MD 924 at Singer Rd/Abingdon Rd: Add a second northbound through lane (shared through/right).		Design; ROW; Construction	
04- MD 924 at Holly Wreath Ct/Holly Wreath Rd: Add a second northbound through lane.			
Roadway Improvements within Zone 1 (MD 24)	$50.0-$75.0		
05- MD 24/Singer Road Grade Separation: Provide free-flow operation for MD 24 through and all right turn movements. Accommodate all left turn movements and Singer Road through movements on a grade separated roadway.		**START 2027** Design; **START 2030** ROW; Construction	
Roadway Improvements within Zone 2 (MD 924)	$0.7-$1.1		
06- MD 924 at Wheel Rd: Construct westbound right turn lane and additional northbound through lanes.		Design; ROW; Construction	
09- MD 924 at Plumtree Rd/Medstar Boulevard: Install additional southbound through lane.			
Roadway Improvements within Zone 2 (MD 24)	$110.0-$175.0		
11- MD 24 at W. Wheel Road Grade Separation: Provide free-flow operation for MD 24 through and all right turn movements (excluding eastbound right turn). Accommodate all left turn, W. Wheel Road through and eastbound right turn movements on a grade separated roadway.		**START 2025** Design; ROW; Construction	
MD 24/Festival at Bel Air Grade Separated Access: Provide an additional grade separated access point for the Festival at Bel Air to alleviate turn volumes at Bel Air S. Parkway intersection.			
12- MD 24 at Bel Air South Parkway: Widen MD 24 at the intersection to accommodate the Plumtree Road fly-over ramp and grade separated roadway merge/ diverge areas.			
MD 24 at Plumtree Road Directional Ramps: Provide a link to the internal roadway proposed between Plumtree Road and Bel Air S. Parkway utilizing a fly-over ramp to MD 24 southbound and an at-grade ramp from MD 24 northbound.			
13- MD 24 at Plumtree Rd: Adjust northbound and southbound lane alignment to accommodate the Plumtree Road directional ramps.			
Roadway Improvements Within Zone 3 (MD 924)	$0.1-$0.2		
15- MD 924 at W./E. MacPhail Rd: Install eastbound and westbound left turn exclusive/permissive phasing.		Design; Constr.	
Roadway Improvements Within Zone 3 (MD 24)	$1.0-$1.5		
16- MD 24 at W. Ring Factory Rd: Install a second westbound left turn lane.		Design; ROW; Construction	
17- MD 24 at W. MacPhail Rd: Install a second northbound left turn lane. Adjust west leg lanes to accommodate an additional receiving lane.			
Access Management to minimize the amount of direct access points along MD 924	$3.0-$5.0	Design; ROW; Construction	

*(Millions) – Does not include ROW.

Legend

- Route 2/2A Stop
- 410 MTA Commuter Bus Stop
- Route 3 Stop

WBCM
JACOBS

MARYLAND 924

PROPOSED TRANSIT MAP

FULL STUDY AREA

N.T.S.	EXHIBIT 1.1	JUNE 2017

Legend

- Route 2/2A Stop
- 410 MTA Commuter Bus Stop
- Route 3 Stop

WBCM
JACOBS

MARYLAND 924

PROPOSED TRANSIT MAP

ZONE 1 BOX HILL
WOODSDALE ROAD TO HOLLY WREATH ROAD

N.T.S.	EXHIBIT 1.2	JUNE 2017

LORIAN BEL AIR

MEDSTAR HEALTH BEL AIR

FUTURE SITE DEVELOPMENT

ON STREET PATRON PARKING

HARFORD TRANSIT ROUTE 2

FUTURE ROUTE ALIGNMENT AND STOP WITH SITE DEVELOPMENT

924

24

EMMORTON RD

OLD EMMORTON RD

VIETNAM VETERANS MEMORIAL HWY

LAUREL BUSH RD

PATTERSON MILL RD

WHITNEY LN

ROYAL OAK DR

RAINIER AVE

BRIGHT OAKS DR

MUIR WAY

HUNTERS RUN DR

SHETLAND WAY

FOX HOUND CT

POINT TO POINT RD

SEDGEFIELD CT

CHANTAWAY CT

E WHEEL RD

WHEEL RD

CABOT CT

WINDOM CT

HUNTSMAN CT

BRIGHT OAKS DR

WYE OAK DR

OAK CREST CT

HUNTERS RUN TER

TEMPLE DR

TURNER LN

GRAND OAKS CIR

GRAND OAKS CT

SAINT MARYS CHURCH RD

LAUREL VALLEY CT

LAUREL VALLEY GARTH

PARALLEL PATH

LONG MEADOW DR

HOLLY WREATH RD

CINNAMON TREE DR

EDITH STONE DR

LOVE GROVE CT

MERRICK WAY

PRESTON LN

SINGER WOODS DR

LAUREL WOODS CT

SPRUCE WOOD CT

MAPLE WREATH CT

OAK LEAF CIR

TALL PINES CT

LAUREL WOODS DR

BARRINGTON VILLAGE CT

BARRINGTON PL

CRYSTAL CT

PLUMTREE RD

BEL AIR SOUTH PKWY

W WHEEL RD

S TOLLGATE RD

N TOLLGATE CIR

DARBY CT

DARBY LN

BURKWOOD CT

GOLDEN RAIN LN

ALTHEA CT

QUILTING WAY

AMELANCHIER CT

CYPRESS DR

DEADORA RD

WISTERIA CT S

CEDAR SPRINGS RD

LEELAND CT

VALLEY VIEW CT

AIRDRIE AVE

CLYDEBANK DR

LANARKSHIRE WAY

MONTROSE WAY

SINGER RD

Legend

- Route 2/2A Stop
- 410 MTA Commuter Bus Stop
- Route 3 Stop

MARYLAND 924

PROPOSED TRANSIT MAP

ZONE 2 COMMERCIAL
HOLLY WREATH ROAD TO PATTERSON MILL ROAD

N.T.S.	EXHIBIT 1.3	JUNE 2017

WBCM
JACOBS

Legend

- Route 2/2A Stop
- 410 MTA Commuter Bus Stop
- Route 3 Stop

WBCM JACOBS

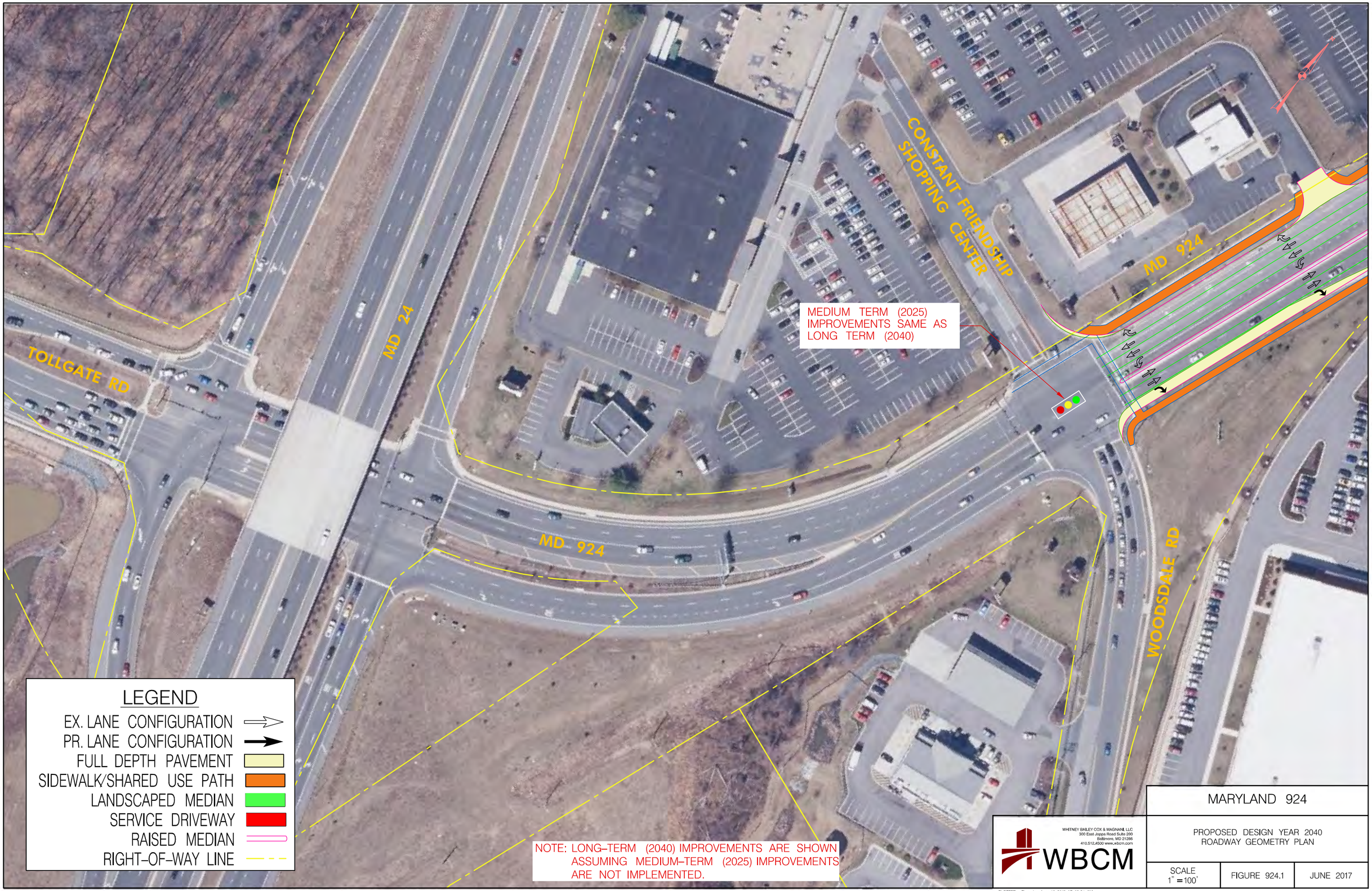
MARYLAND 924

PROPOSED TRANSIT MAP

ZONE 3 WESTERN RESIDENTIAL
PATTERSON MILL ROAD TO MACPHAIL ROAD

N.T.S.	EXHIBIT 1.4	JUNE 2017

EXHIBIT 2



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MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE 2017
1" = 100'	924.1	

PLOTTED: Thursday, June 15, 2017 AT 09:24 AM
FILE: P:\2015\15025100\Drawings\08-Traffic\Dgn\pHD-P001_MD924.dgn

TRELLIS LN

MD 924

PORTER DR

WEGMANS BLVD.

BOX HILL S PARKWAY

* R/W REQUIRED IN THIS AREA
* SMALL RETAINING WALL NEEDED BEHIND SHARED USE PATH

MEDIUM TERM (2025) IMPROVEMENTS SAME AS LONG TERM (2040)

* R/W REQUIRED IN THIS AREA.
* SMALL RETAINING WALL NEEDED. BEHIND SHARED USE PATH

* R/W REQUIRED IN THIS AREA
* SMALL RETAINING WALL NEEDED
* SHARED USE PATH WIDTH REDUCTION TO 8' REQUIRED; MAINTAIN 2' BUFFER

* R/W REQUIRED IN THIS AREA.
* SMALL RETAINING WALL NEEDED
* SHARED USE PATH WIDTH REDUCTION TO 8' REQUIRED; MAINTAIN 2' BUFFER

* R/W REQUIRED IN THIS AREA.
* DEDICATE LAND FROM NEW DEVELOPMENT

LEGEND

- EX. LANE CONFIGURATION
- PR. LANE CONFIGURATION
- FULL DEPTH PAVEMENT
- SIDEWALK/SHARED USE PATH
- LANDSCAPED MEDIAN
- SERVICE DRIVEWAY
- RAISED MEDIAN
- RIGHT-OF-WAY LINE

TRANSIT LEGEND

- ROUTE 22A Stop
- 410 MTA Commuter Bus Stop

NOTE: LONG-TERM (2040) IMPROVEMENTS ARE SHOWN ASSUMING MEDIUM-TERM (2025) IMPROVEMENTS ARE NOT IMPLEMENTED.

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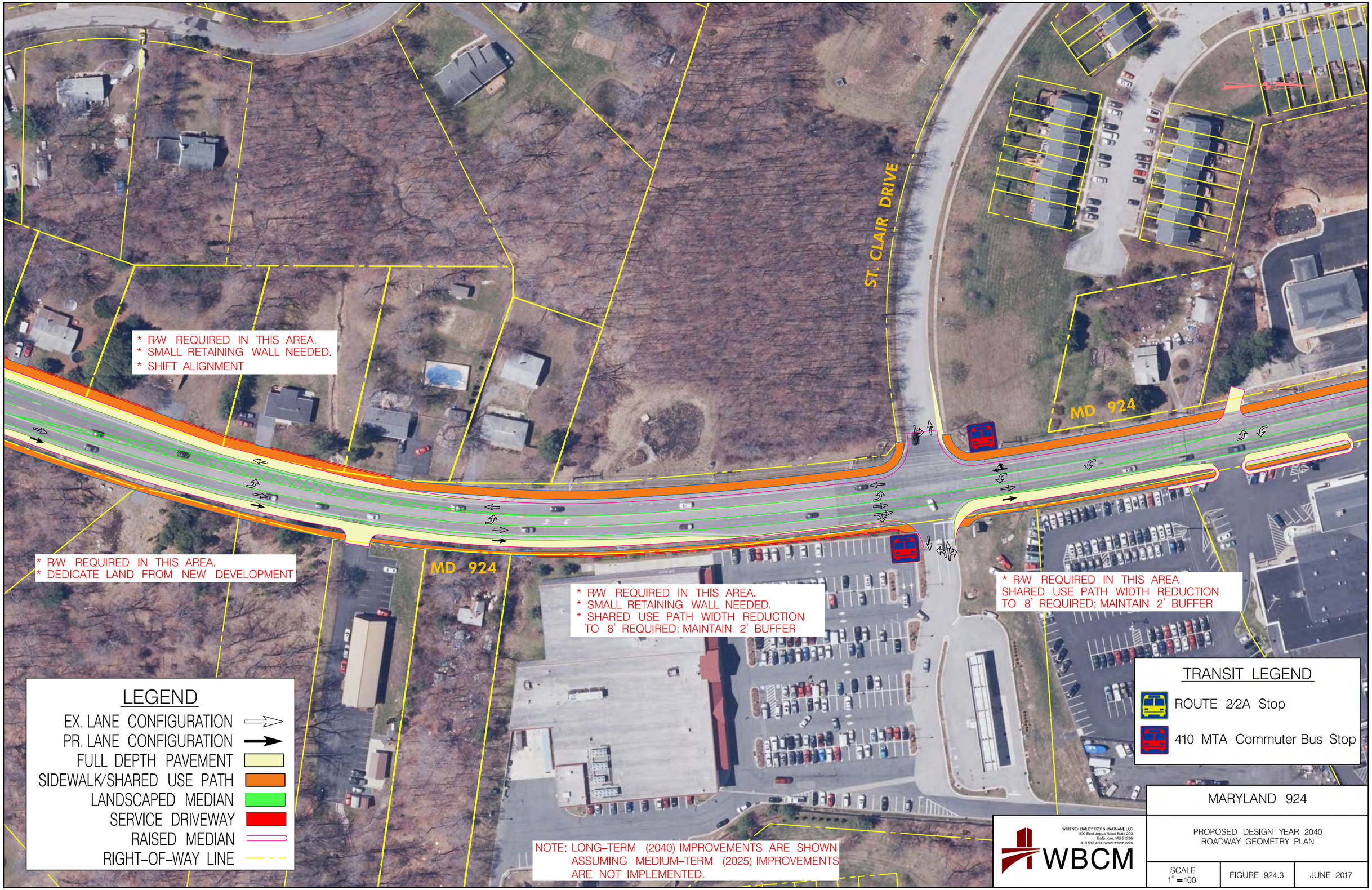
MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE
1" = 100'	924.2	2017

PLOTTED: Friday, June 30, 2017 AT 10:36 AM
FILE: P:\2015\15025100\Drawings\06-Traffic\Dgn\pHID-P002_MD924.dgn



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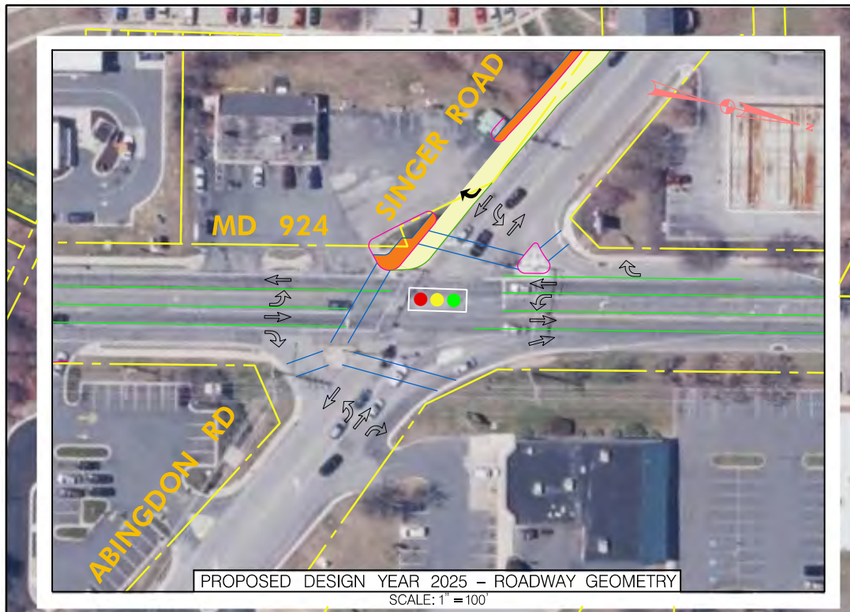
MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE 2017
1" = 100'	924.3	

PLOTTED: Friday, June 30, 2017 AT 11:02 AM
FILE: P:\2015\15025100\Drawings\06-Traffic\Dgn\pHD-P003_MD924.dgn



PROPOSED DESIGN YEAR 2025 – ROADWAY GEOMETRY
SCALE: 1" = 100'

MD 924

* R/W REQUIRED IN THIS AREA.

SINGER ROAD

* R/W REQUIRED IN THIS AREA.
* CHANGE RIGHT TURN LANE TO 11'.

* R/W REQUIRED IN THIS AREA.
* SHARED USE PATH WIDTH REDUCTION TO 8' REQUIRED; MAINTAIN 2' BUFFER.

ABINGDON RD

* SMALL RETAINING WALL NEEDED BEHIND THE SHARED USE PATH IN THIS AREA.
* SHARED USE PATH WIDTH REDUCTION TO 8' REQUIRED; MAINTAIN 2' BUFFER.

LEGEND

- EX. LANE CONFIGURATION
- PR. LANE CONFIGURATION
- FULL DEPTH PAVEMENT
- SIDEWALK/SHARED USE PATH
- LANDSCAPED MEDIAN
- SERVICE DRIVEWAY
- RAISED MEDIAN
- RIGHT-OF-WAY LINE

NOTE: LONG-TERM (2040) IMPROVEMENTS ARE SHOWN ASSUMING MEDIUM-TERM (2025) IMPROVEMENTS ARE NOT IMPLEMENTED.

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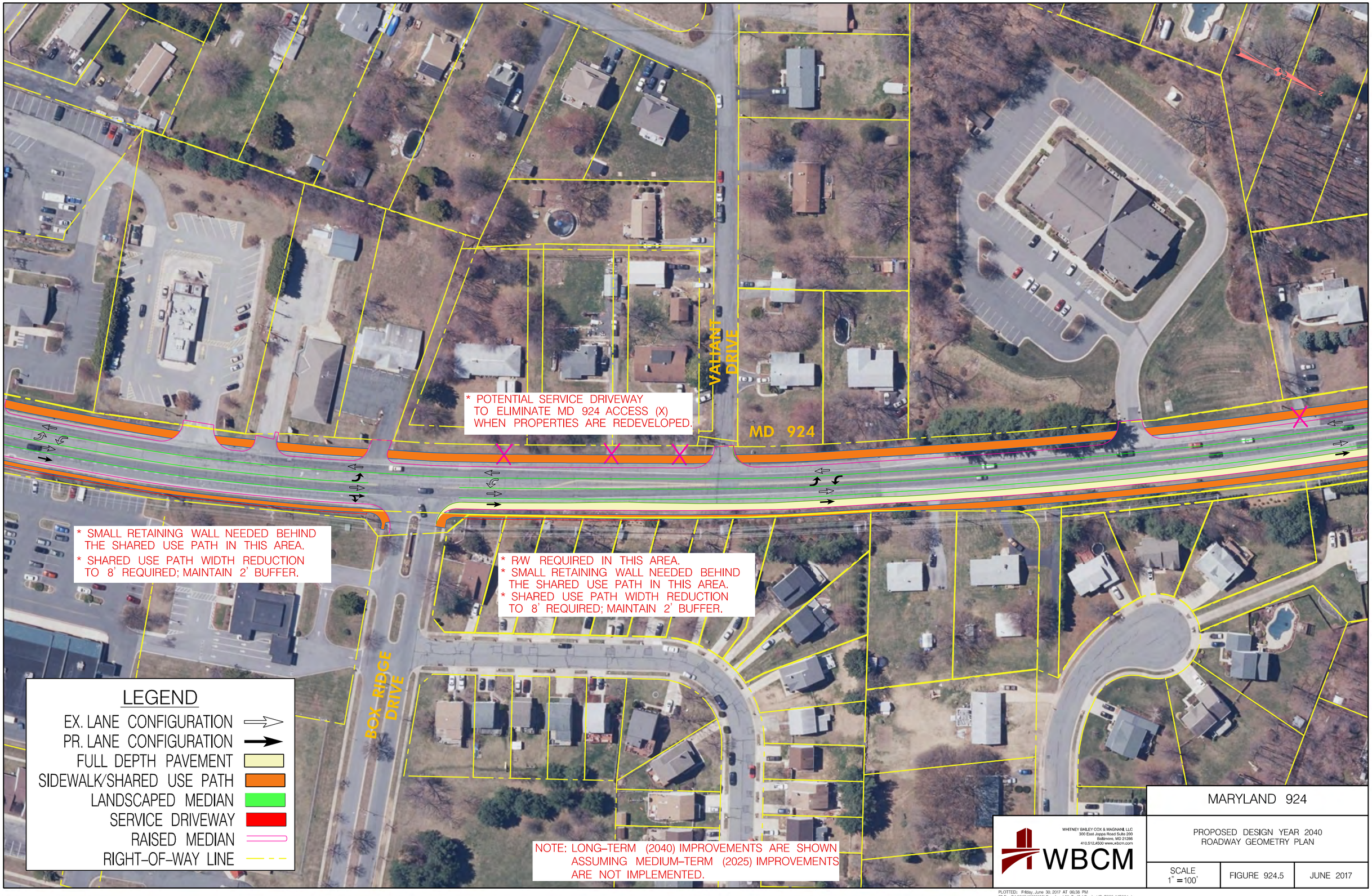
MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	DATE
1" = 100'	FIGURE 924.4	JUNE 2017

PLOTTED: Friday, June 30, 2017 AT 11:42 AM
FILE: P:\2015\15025100\Drawings\06-Traffic\Dgn\pHD-P004_MD924.dgn



MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE 1" = 100'

FIGURE 924.5

JUNE 2017

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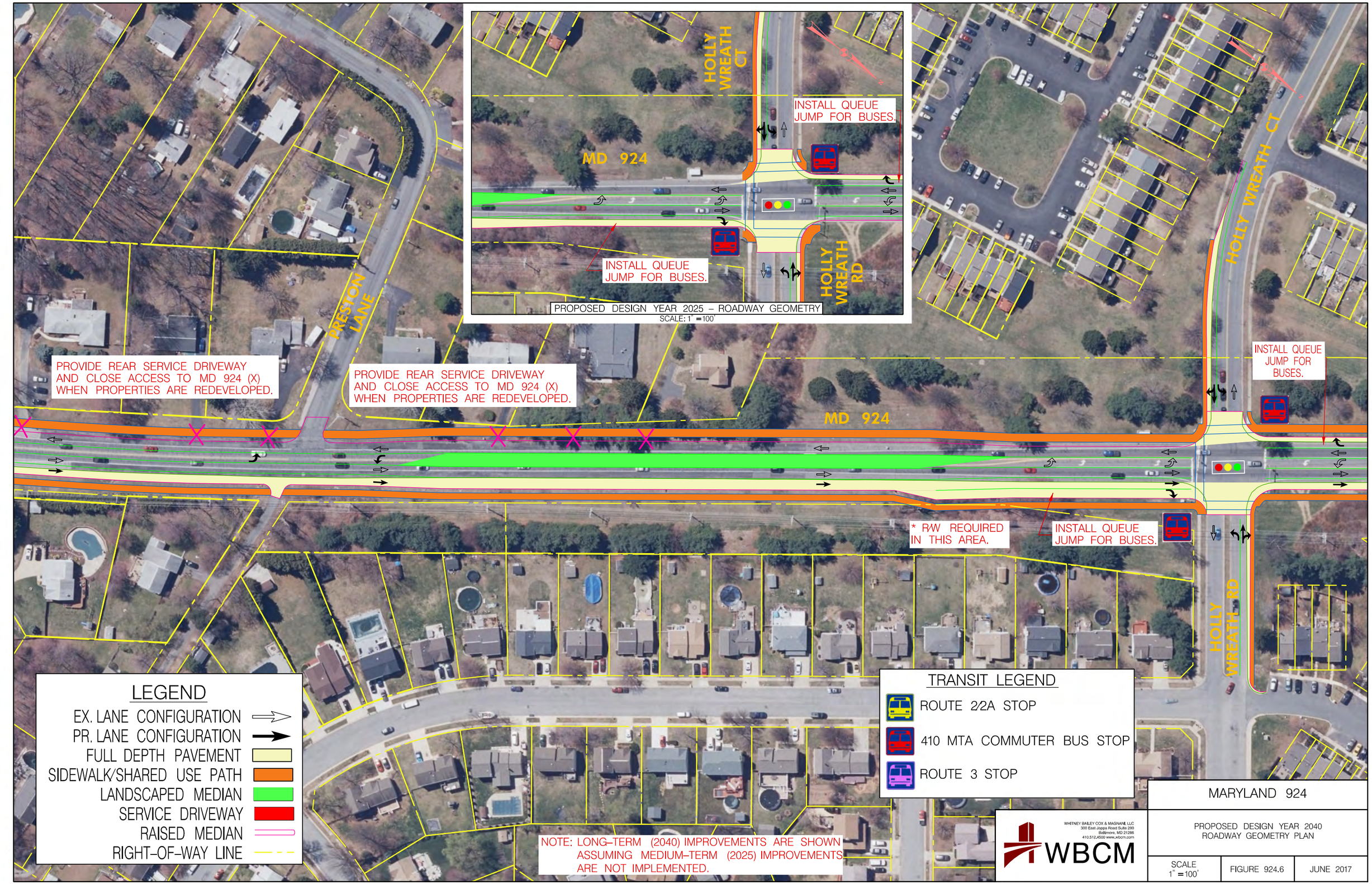

MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	DATE
1" =100'	924.6	JUNE 2017

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PLOTTED: Friday, June 30, 2017 AT 05:45 PM
FILE: P:\2015\15025100\Drawings\08-Traffic\Dgn\pHD-P006_MD924.dgn

MD 924

ST MARYS CHURCH ROAD

* MODIFY ROADWAY ALIGNMENT TO PREVENT ENCROACHMENT ON ST. MARY'S CHURCH HISTORICAL SITE PROPERTY.

LEGEND

- EX. LANE CONFIGURATION
- PR. LANE CONFIGURATION
- FULL DEPTH PAVEMENT
- SIDEWALK/SHARED USE PATH
- LANDSCAPED MEDIAN
- SERVICE DRIVEWAY
- RAISED MEDIAN
- RIGHT-OF-WAY LINE

NOTE: LONG-TERM (2040) IMPROVEMENTS ARE SHOWN ASSUMING MEDIUM-TERM (2025) IMPROVEMENTS ARE NOT IMPLEMENTED.

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PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	DATE
1" = 100'	FIGURE 924.7	JUNE 2017

PLOTTED: Friday, June 30, 2017 AT 01:31 PM
FILE: P:\2015\15025100\Drawings\08-Traffic\Dgn\pHD-P007_MD924.dgn

MD 924

OLD EMMORTON ROAD

E WHEEL ROAD

* R/W REQUIRED IN THIS AREA.

NOTE: LONG–TERM (2040) IMPROVEMENTS ARE SHOWN ASSUMING MEDIUM–TERM (2025) IMPROVEMENTS ARE NOT IMPLEMENTED.

LEGEND

- EX. LANE CONFIGURATION
- PR. LANE CONFIGURATION
- FULL DEPTH PAVEMENT
- SIDEWALK/SHARED USE PATH
- LANDSCAPED MEDIAN
- SERVICE DRIVEWAY
- RAISED MEDIAN
- RIGHT–OF–WAY LINE

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PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	DATE
1" = 100'	FIGURE 924.8	JUNE 2017

PLOTTED: Friday, June 30, 2017 AT 12:24 PM
FILE: P:\2015\15025100\Drawings\08-Traffic\Dgn\pHD-P008_MD924.dgn

LEGEND

- EX. LANE CONFIGURATION
- PR. LANE CONFIGURATION
- FULL DEPTH PAVEMENT
- SIDEWALK/SHARED USE PATH
- LANDSCAPED MEDIAN
- SERVICE DRIVEWAY
- RAISED MEDIAN
- RIGHT-OF-WAY LINE

PROPOSED DESIGN YEAR 2025 – ROADWAY GEOMETRY

SCALE: 1" = 100'

W WHEEL ROAD

E WHEEL ROAD

MD 924

OLD EMMORTON RD

* SMALL RETAINING WALL NEEDED BEHIND SHARED USE PATH.

* SHIFT ALIGNMENT ON E WHEEL ROAD OR R/W REQUIRED IN THIS AREA.

* RETAINING WALL NEEDED IN THIS AREA.

* R/W REQUIRED IN THIS AREA.

NOTE: LONG-TERM (2040) IMPROVEMENTS ARE SHOWN ASSUMING MEDIUM-TERM (2025) IMPROVEMENTS ARE NOT IMPLEMENTED.

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PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE
1" = 100'	924.9	2017

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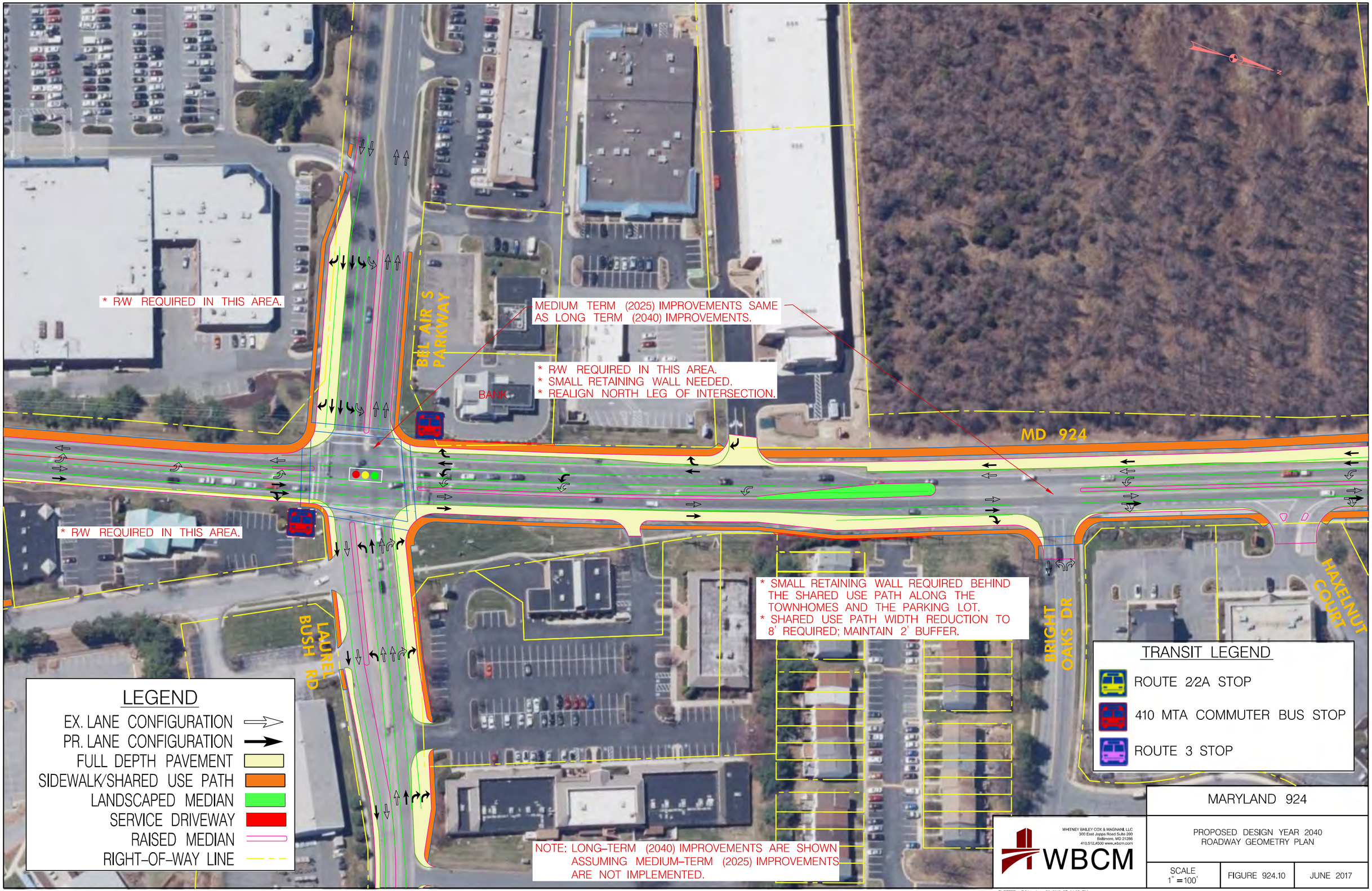

LEGEND

- EX. LANE CONFIGURATION
- PR. LANE CONFIGURATION
- FULL DEPTH PAVEMENT
- SIDEWALK/SHARED USE PATH
- LANDSCAPED MEDIAN
- SERVICE DRIVEWAY
- RAISED MEDIAN
- RIGHT-OF-WAY LINE

TRANSIT LEGEND

- ROUTE 22A STOP
- 410 MTA COMMUTER BUS STOP
- ROUTE 3 STOP

NOTE: LONG-TERM (2040) IMPROVEMENTS ARE SHOWN ASSUMING MEDIUM-TERM (2025) IMPROVEMENTS ARE NOT IMPLEMENTED.

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PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE 2017
1" = 100'	924.10	

PLOTTED: Friday, June 30, 2017 AT 04:53 PM
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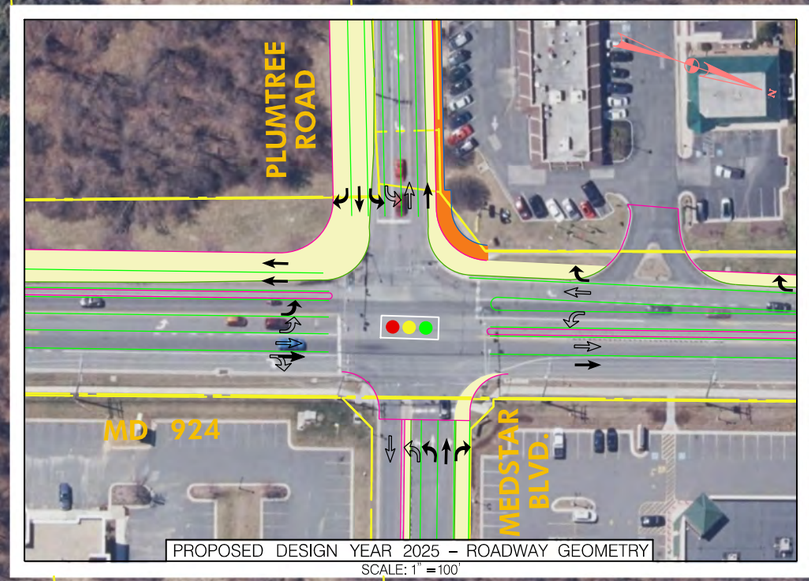

PROPOSED DESIGN YEAR 2025 – ROADWAY GEOMETRY

SCALE: 1" = 100'

PLUMTREE ROAD

MEDSTAR BLVD.

MD 924

* R/W REQUIRED IN THIS AREA.
* CHANGE ALL LANES TO 11'.

LEGEND

- EX. LANE CONFIGURATION
- PR. LANE CONFIGURATION
- FULL DEPTH PAVEMENT
- SIDEWALK/SHARED USE PATH
- LANDSCAPED MEDIAN
- SERVICE DRIVEWAY
- RAISED MEDIAN
- RIGHT-OF-WAY LINE

TRANSIT LEGEND

- ROUTE 22A Stop
- 410 MTA Commuter Bus Stop

NOTE: LONG-TERM (2040) IMPROVEMENTS ARE SHOWN ASSUMING MEDIUM-TERM (2025) IMPROVEMENTS ARE NOT IMPLEMENTED.

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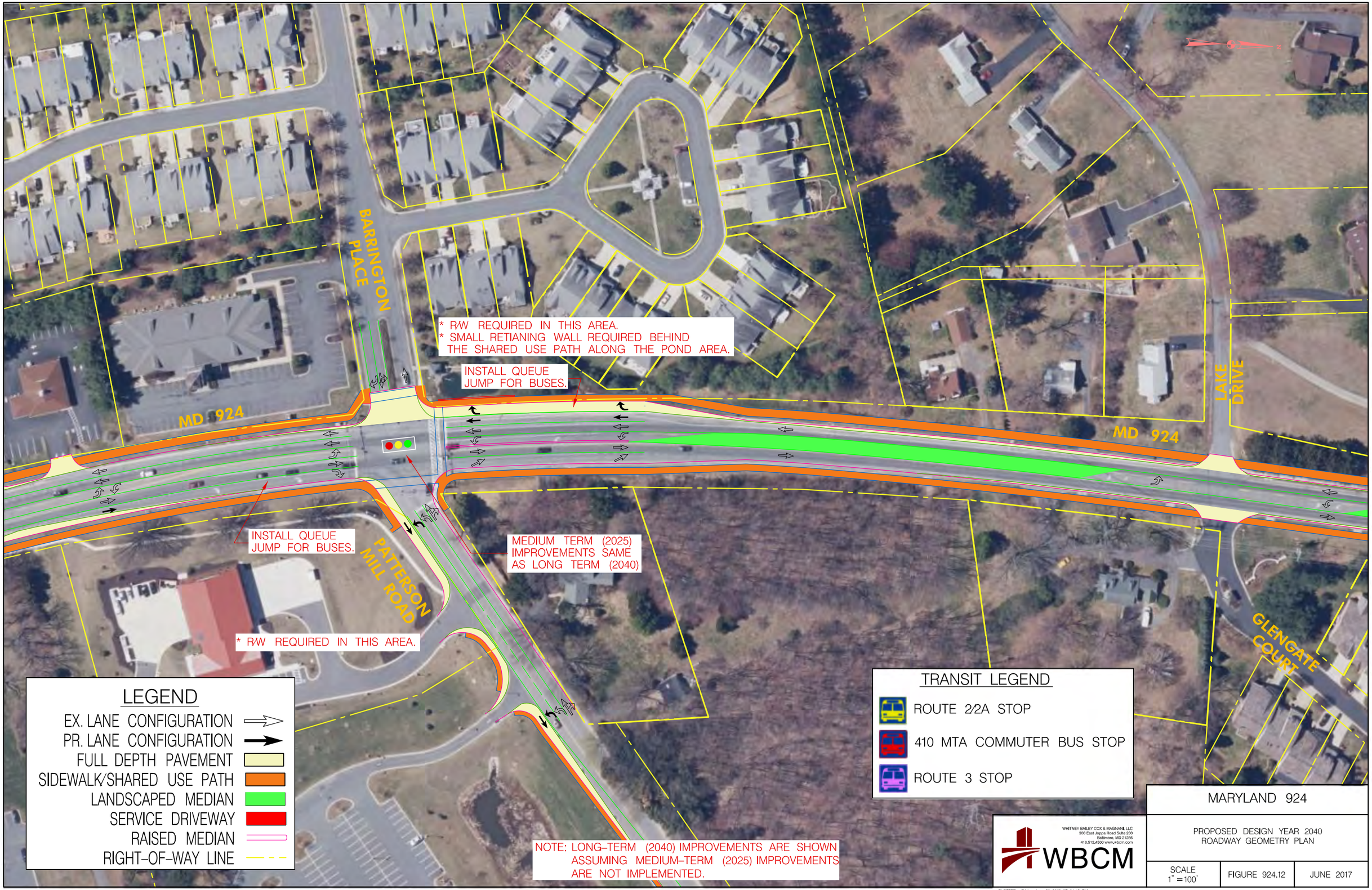
MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE 2017
1" = 100'	FIGURE 924.11	

PLOTTED: Friday, June 30, 2017 AT 08:06 PM
FILE: P:\2015\15025100\Drawings\08-Traffic\Dgn\pHD-P011_MD924.dgn



MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	DATE
1" = 100'	924.12	JUNE 2017

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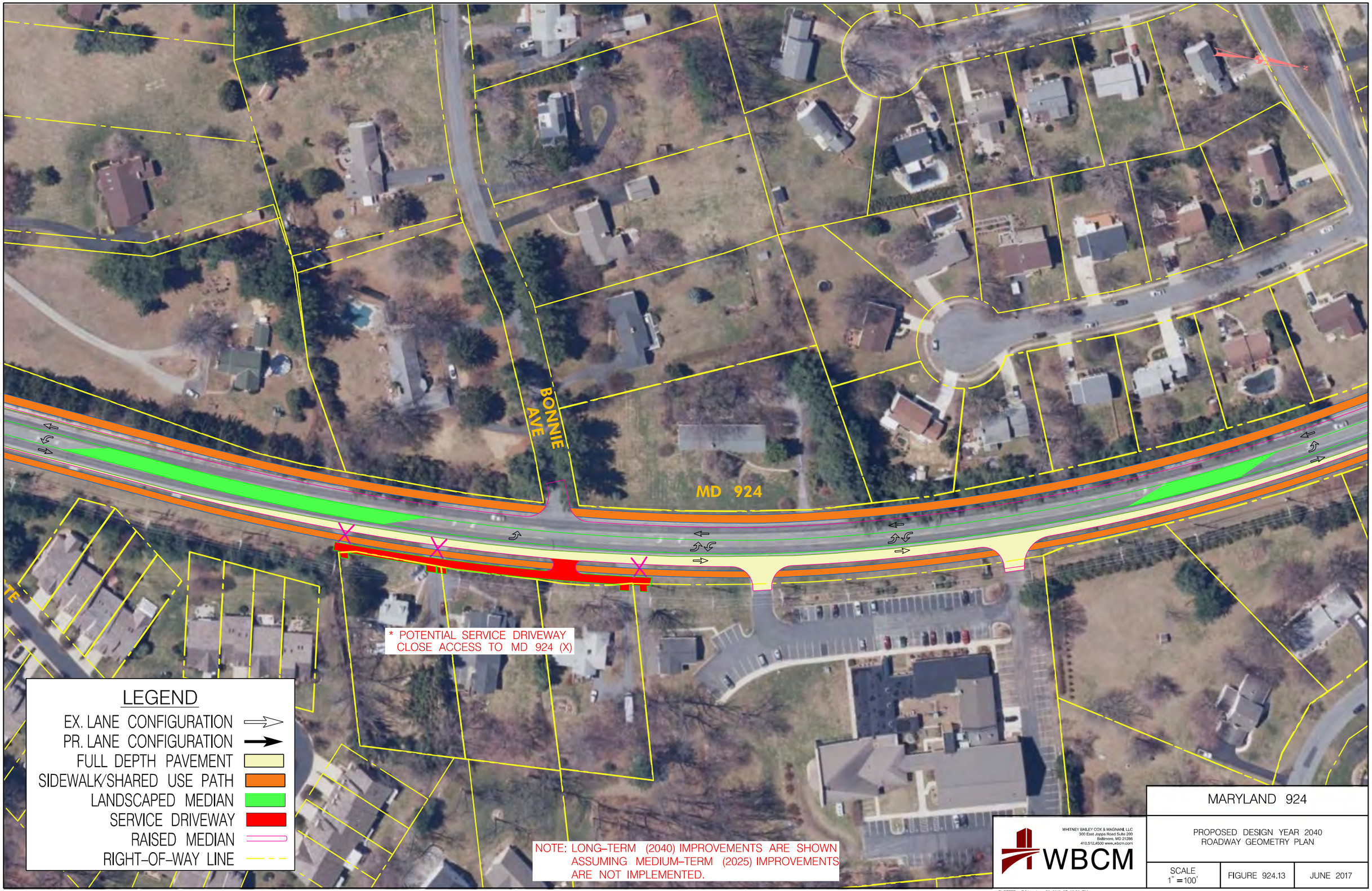

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MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE 2017
1" = 100'	924.13	

PLOTTED: Friday, June 30, 2017 AT 02:35 PM
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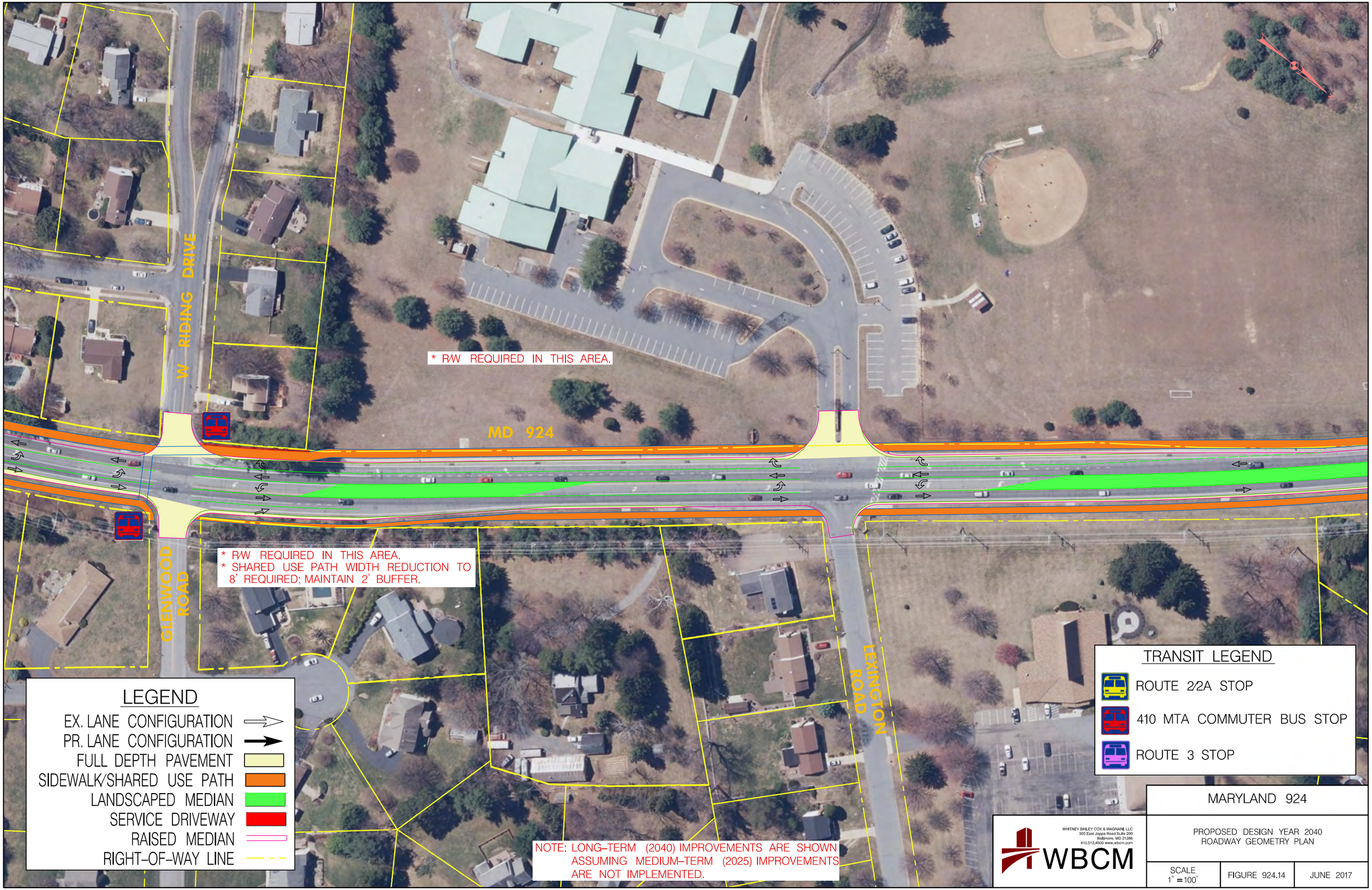

MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE 1" = 100'

FIGURE 924.14

JUNE 2017

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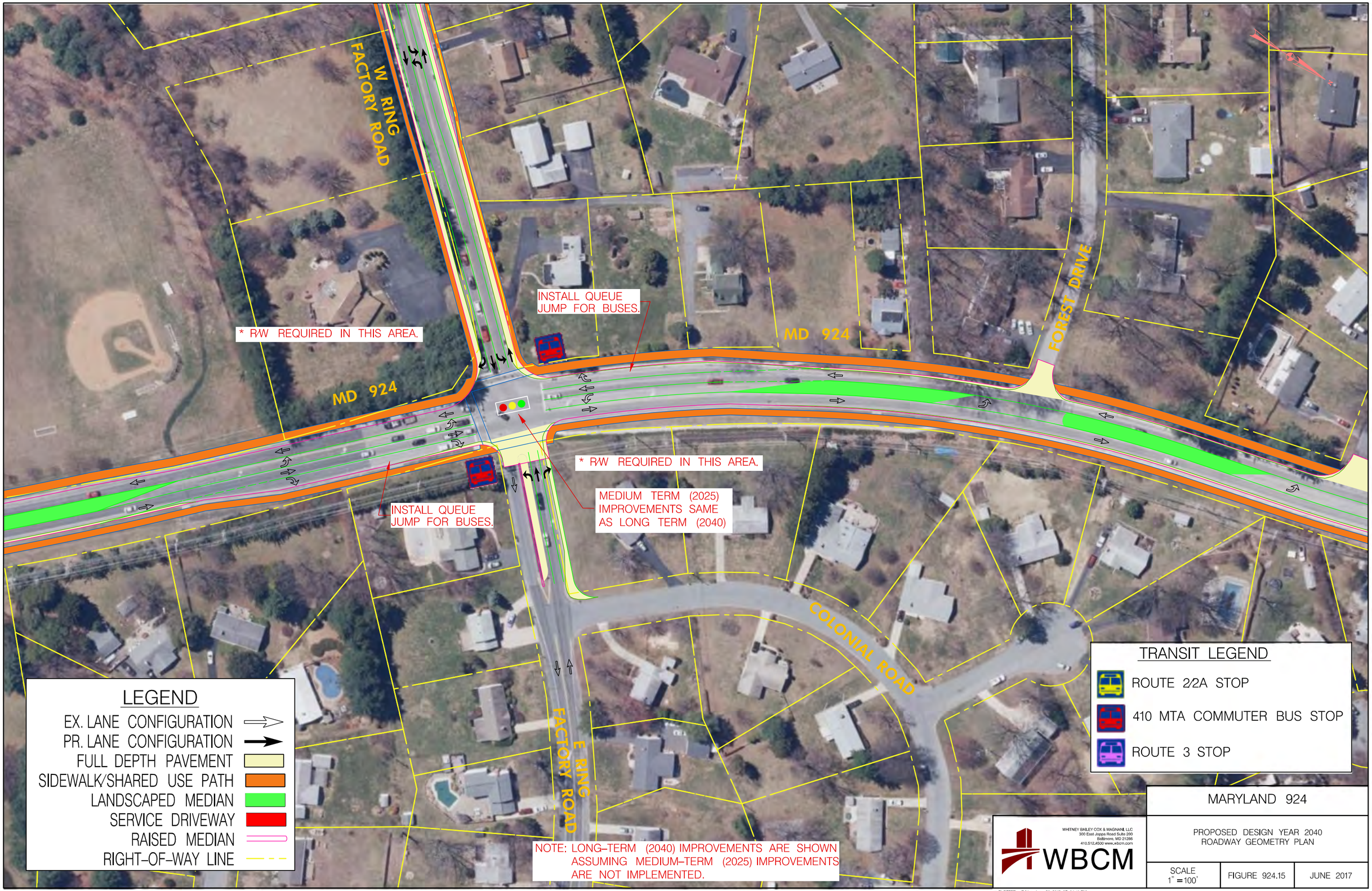

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PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE 2017
1" = 100'	924.15	

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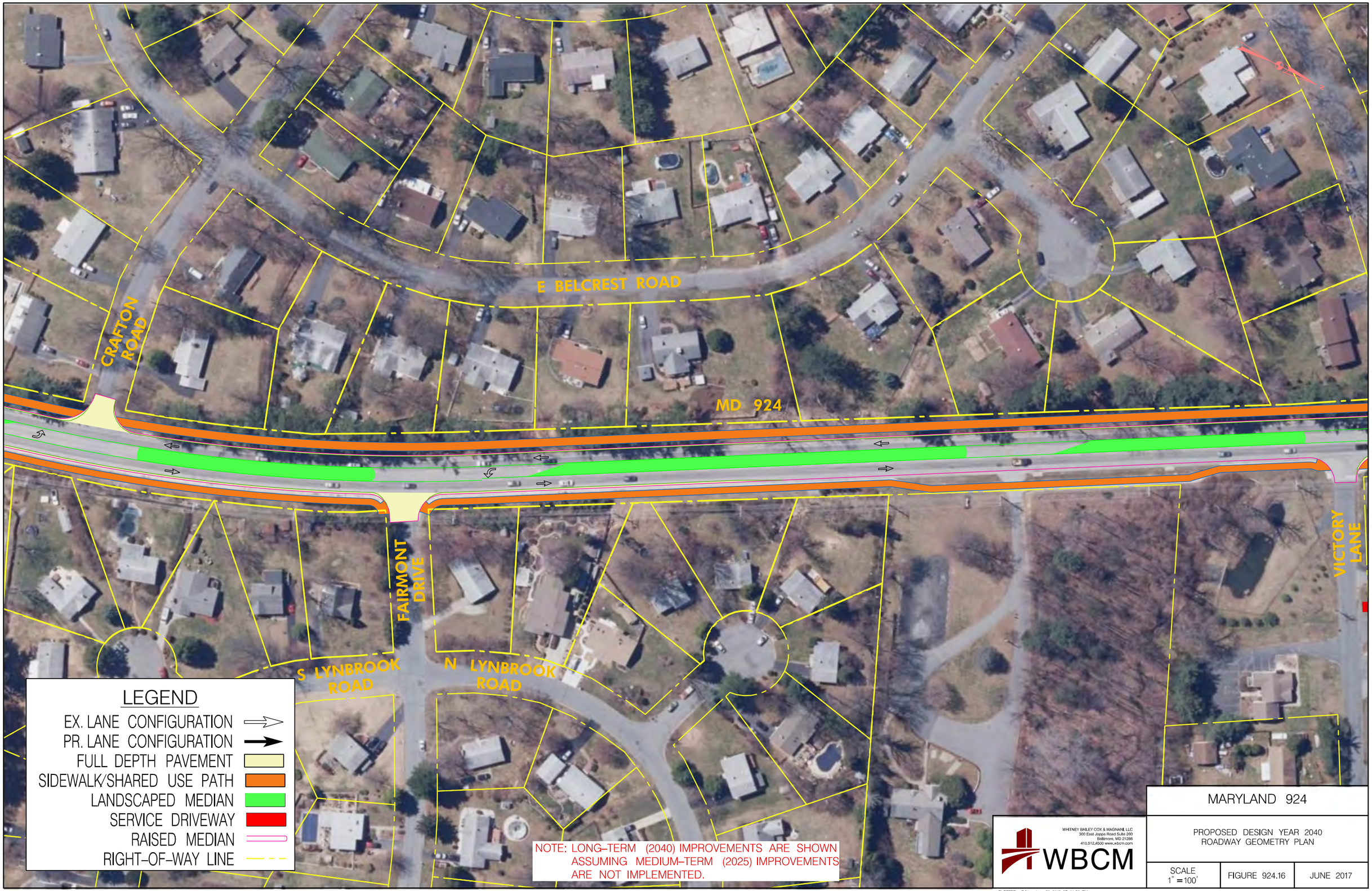

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PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	DATE
1" = 100'	924.16	JUNE 2017

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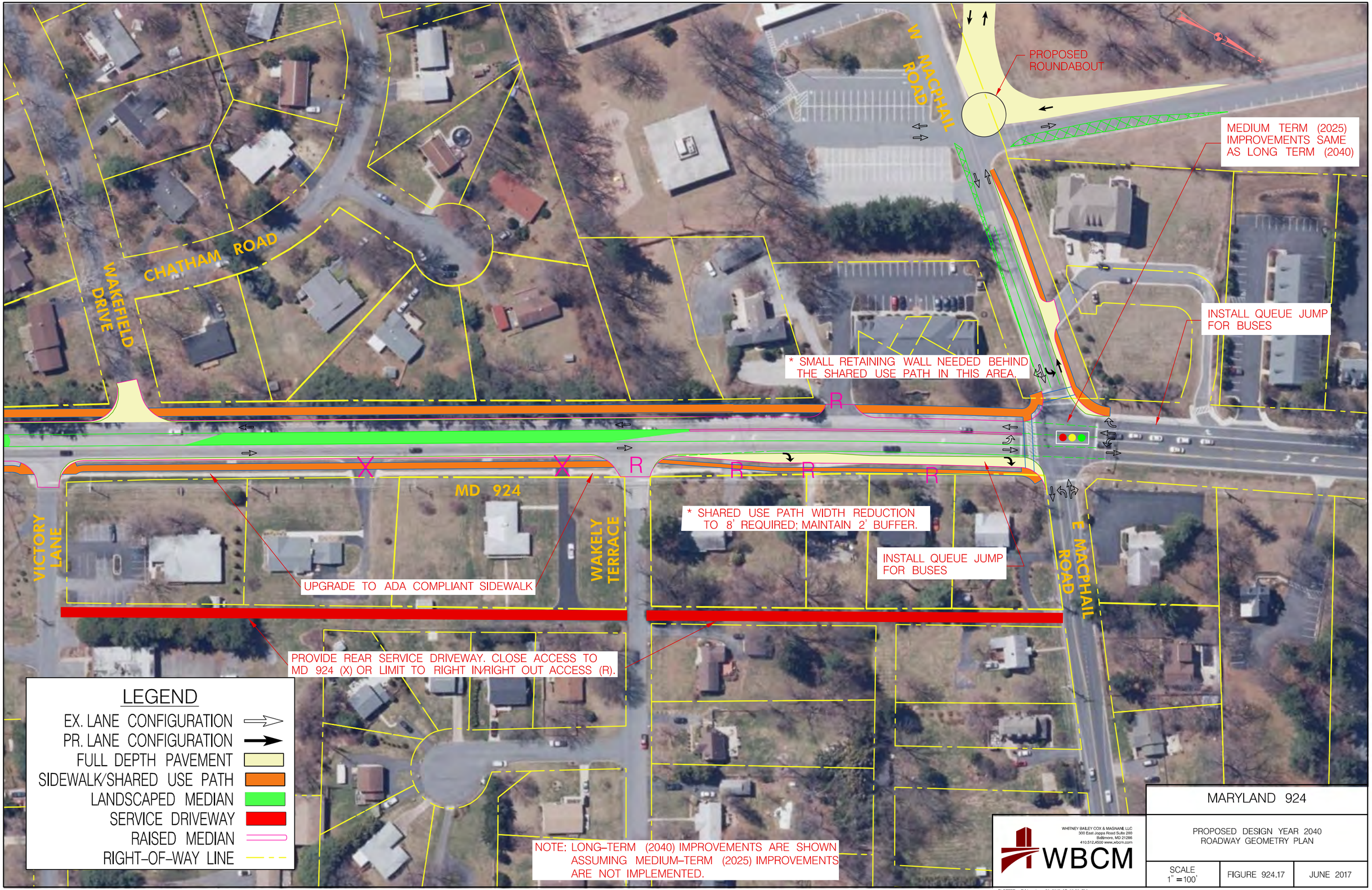

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MARYLAND 924

PROPOSED DESIGN YEAR 2040
ROADWAY GEOMETRY PLAN

SCALE	FIGURE	JUNE
1" = 100'	924.17	2017

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MD 924 Multi-Modal Corridor Study

Plan for the Corridor

WBCM JACOBS

A Joint Venture

June 2017