

**North Bend/
Cheviot Road
Corridor Study**

**Prepared For:
Hamilton County Engineer's Office**

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**Submitted
August 22, 2003**

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1.0 Introduction

In 1960, the City of Cincinnati's population peaked at 502,000. Cheviot was an established suburban community and Green and Colerain Townships were essentially rural areas connected by two-lane North Bend Road and Cheviot Road to Western Cincinnati and Cheviot on the south and to Mt. Airy, College Hill, Springfield Township and Hartwell on the east.

However, the migration from the urban core of the city was beginning. Green and Colerain Townships began experiencing a rapid growth in population, and the two-lane arterials were now carrying considerably more traffic. In the 1970's, the construction of I-74 was completed to its junction with I-75, and its interchange with North Bend Road changed the role of North Bend and Cheviot Roads to arterials carrying large amounts of commuter traffic out of the area in the morning and back in the evening.

Major commercial development, including Northgate Shopping Center, in Colerain Township coupled with the interchange of I-275 with US27 (Colerain Avenue) changed that area into a major trip-generator, thus attracting even more people to shop and live in the vicinity. Congestion along Colerain Avenue caused by 300 driveways in a 4.5-mile section has also increased traffic on Cheviot Road as drivers avoid the congestion and accidents on Colerain.

Today, daily volumes in the North Bend/Cheviot Road corridor ranging from 25,000 at Westwood-Northern Boulevard to 29,400 at I-74 to 39,300 at the Cheviot/North Bend intersection down to 14,600 at Poole Road are resulting in unacceptable levels of congestion and accidents (Appendix 1). Profusions of driveways in some portions of the corridor contribute to traffic problems. And yet, with the exception of an area north of I-74, North Bend and Cheviot Roads remain essentially two-lane facilities with center lanes added for left turns.

It became evident to officials at the Hamilton County Engineer's Office and in Green and Colerain Townships that transportation improvements would be needed in this corridor. Major improvements, such as widening to five lanes, would be very costly and intrusive since the corridor is now heavily developed in many areas. In addition, the vertical alignment still follows the contours as it did many years ago when the area was rural. Thus, it was concluded that a study investigating improvements that could be made without decimating abutting development should be undertaken.

The Hamilton County Engineer's Office initiated the North Bend/Cheviot Road Corridor Study in September 2001. The purpose of the study has been to develop an Access Management Plan to improve traffic flow and ease congestion for the 5.6 miles of North Bend Road, Blue Rock Road, and Cheviot Road between Harrison Avenue and Poole Road.

1.1 Access Management Overview

Access Management is defined as the control of driveways and intersections to maintain safety at a roadway's full traffic-carrying capacity. Implementing Access Management encourages smooth and safe traffic flow and helps communities avoid some of the traffic problems caused by uncontrolled development.

Access Management can include signalization, controlled access, and limiting the amount of curb cuts on a roadway (driveway consolidation). Improvements such as these help reduce traffic congestion on roadways. Studies have shown that Access Management can reduce accidents as much as 50 percent while safely increasing travel speeds by as much as 40 percent. Fewer delays and accidents also cut transportation costs for businesses, and business locations remain more accessible and attractive to customers when there is less congestion.

1.2 Study Goals

The goals of the North Bend/Cheviot Road Corridor Study have been to identify and evaluate the factors that cause safety and access problems in the corridor. The objectives of the study included:

- Evaluate the existing system
- Determine existing usage/zoning designation for properties abutting North Bend/Cheviot Road
- Inventory and evaluate existing traffic signals
- Analyze existing and future traffic conditions
- Develop short-term and long-term improvement program
- Work closely with the community to:
 - Identify and prioritize existing and future improvements
 - Identify locations for access points

1.3 Study Area

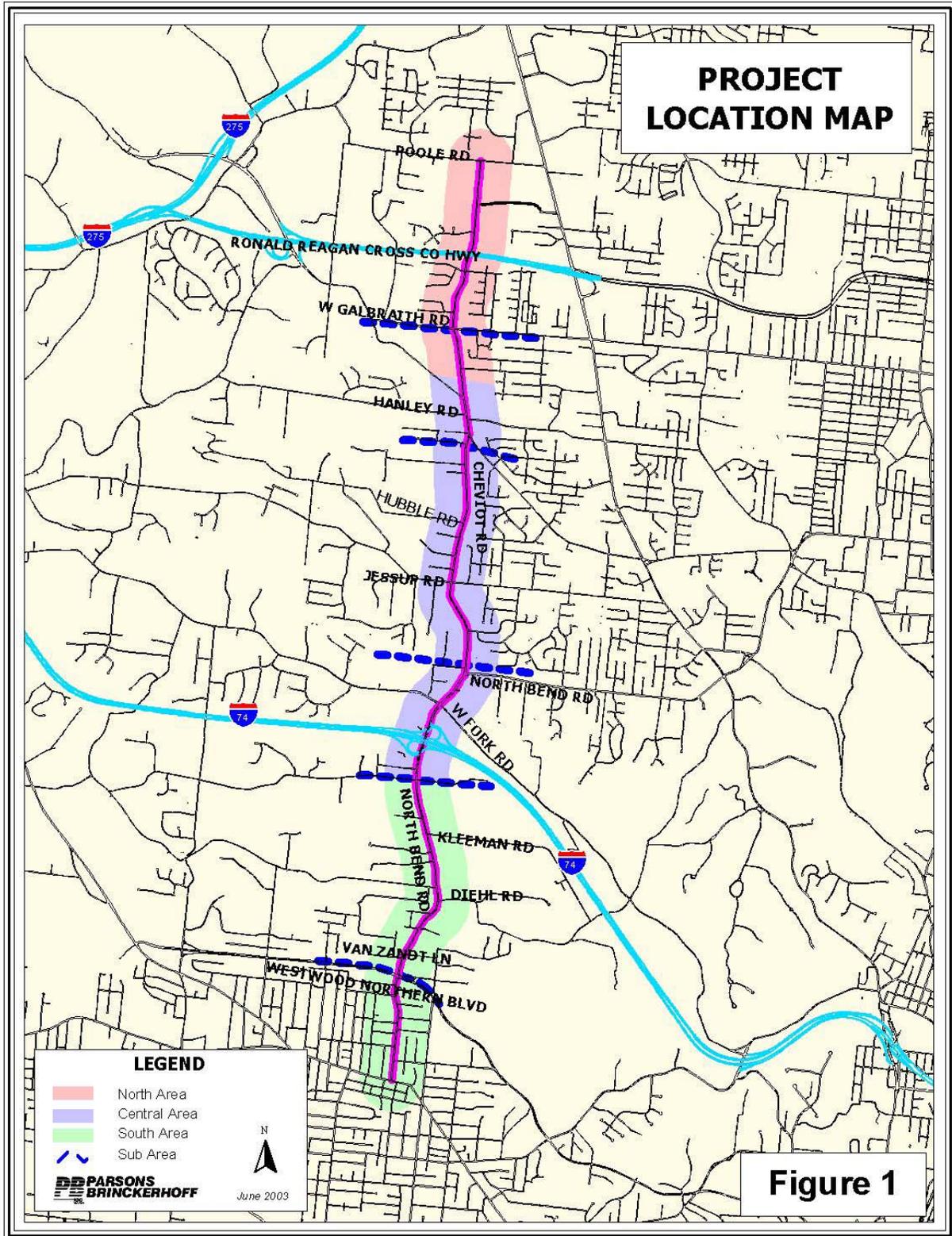
For the purpose of the North Bend/Cheviot Road Corridor Study, the study area was divided into six subareas (Figure 1). These subareas were determined based upon their general characteristics and development trends along North Bend/Cheviot Road. From south to north, the subareas are:

- Harrison Avenue to Westwood Northern Boulevard
- Westwood Northern Boulevard to Boomer Road
- Boomer Road to Epley Lane
- Epley Lane to Benhill Drive
- Benhill Drive to Galbraith Road
- Galbraith Road to Poole Road

As the study progressed, it became evident that the central portion of the corridor would require more-intensive evaluation, so the six subareas were aggregated into three sections (Figure 1):

- Southern Area: Harrison Avenue to Boomer Road
- Central Area: Boomer Road to the north junction of Blue Rock Road

Figure 1. Corridor Area Map



- Northern Area: North junction of Blue Rock Road to Poole Road

For implementation and funding, however, the corridor has been subdivided by political jurisdictions:

- Overall Corridor: Hamilton County Engineer with Townships and Cheviot
- City of Cheviot: Harrison Avenue to Westwood-Northern Boulevard
- Green Township: Westwood-Northern Boulevard to north of Hubble Road
- Colerain Township: North of Hubble Road to Poole Road

During this study, the following features of the corridor were examined:

- Accidents
- Roadway geometry
- Access to and from adjacent properties
- Traffic patterns
- Land uses
- Existing traffic signals and signs

The Hamilton County Sheriff's Office, City of Cheviot Department of Public Safety, Green Township Police Department and Colerain Township Police Department provided accident data for the years 1999 to 2001. Summaries of these data are found in Appendix 2.

Based on this information, future traffic conditions and land use patterns were projected for the corridor. Details on the existing and future traffic conditions are presented in Appendix 1. The Hamilton County Engineer's Office also supplied turning movement counts for the study corridor (Appendix 3).

The study resulted in a comprehensive Transportation System Management plan for the North Bend/Cheviot Road corridor. This plan includes recommendations for:

- Roadway improvements (locations of selected short widenings, turn lanes and bus turnouts)
- Traffic signal or sign improvements
- Access management techniques (driveway consolidations, medians, service roads)
- Sidewalks and other pedestrian facilities
- Bicycle facilities (where appropriate)

Each recommendation was developed interactively with the community through the Corridor Task Force. The Corridor Task Force was formed to represent the various stakeholders in the community and included representatives of area businesses, townships and county officials as well as private citizens. The interactive process began with the identification of community issues, continued through consideration of solutions to the issues, and concluded with the development of proposed recommendations that everyone has been a part of it and "owns" it. A listing of dates of Task Force Meetings and sign-in sheets is found in Appendix 4. The recommendations of the plan range from short-term, low-cost solutions to longer-term, higher-cost solutions.

In addition to the Task Force Meetings, which were open to the general public, two special public outreach meetings were held during the course of this study. The first public informational forum occurred in June 2002. During this session, the general public was able to review maps and identify transportation needs and issues of the corridor. A formal presentation was also made to establish a framework for the Access Management Study. Issues identified during this meeting initiated nearly all of the final project recommendations.

The second special outreach meeting occurred in June 2003. The meeting followed an “open house” format where the public was able to review exhibits of the recommended improvements and discuss them with study team. Those in attendance of this meeting were also asked to make their recommendations as to whether a recommendation should be given high, medium or low priority.

In addition, a project website (www.northbendcheviotroad.com) was established for the study. The purpose of this website was to provide information and solicit input from members of the general public that were unable to attend any of the Task Force or special outreach meetings.

2.0 Improvement Concepts

Access management programs generally focus on retrofitting as much improvement as possible into a corridor under conditions that already exist. The lack of available right-of-way, the presence of development adjacent to the right-of-way, and the need by businesses and zoning for adequate parking areas often preclude the acquisition of sufficient right-of-way for frontage roads and other physical improvements.

The result is normally a compromise between an ideal design meeting all standards and needs, and doing nothing, which simply means maintaining the status quo. Such is the case in the North Bend/Cheviot Road Corridor with the exception of one section, Subarea 2 between Westwood-Northern Boulevard and Boomer Road. This section of the corridor is still lightly developed and future growth can be guided by the principles of good access management as discussed below.

2.1 Access Management

Experience and research have disclosed a strong correlation between the number of access points per mile and the resulting congestion levels and numbers of accidents. Thus, reduction of access points, increased separation between them and reduction of certain movements, generally left turns, are tools used to improve traffic flow and safety.

One of the basic concepts is to reduce the number of full-access points and to improve existing ones by channelization and signalization. Connections can be made to these limited number of upgraded access points by means of cross easements between property owners as well as the construction of formal service roadways. Such actions allow multiple businesses to use the improved access points.

Many existing access points can become right-in/right-out because these movements have very few conflict points. Left turns, especially those out of a driveway onto the arterial, are the movements that result in the most serious accidents as well as congestion. A right-in/right-out driveway has only two conflict points, both of them relatively minor and seldom resulting in injury accidents. On the other hand, a driveway with all movements has nine conflict points, three of them crossing type that often results in injuries and fatalities.

Reducing excessive driveway widths and improving the geometry of driveways can also be instrumental in reducing accidents and congestion. Such improvements also result in safer and more comfortable sidewalks for pedestrians who are discouraged from walking by large open areas devoted to automotive activity. As described below, many techniques can be employed to implement the principles of access management to the Corridor.

2.1.1 Access Management Planning

An example of Access Management Planning is identified for the area between Westwood-Northern Boulevard and Boomer Road. This conceptual plan calls for signalization and improvement of North Bend Road intersections with cross arterials

and collectors such as Boomer Road, Kleeman Road, Reemelin and Diehl Roads and Hader Avenue. New development along and near North Bend Road would connect with these cross arterials and collectors in lieu of having individual uncontrolled access points and would then access North Bend Road at improved, signalized locations. Individual properties could still be served by right-in/right-out drives.

This concept can also be employed in other areas as part of redevelopment plans. For example, in the central area, the reconstruction and signalization of Hanley Road and Banning Road with Blue Rock Road provides the opportunity for the White Oak Nursery and United Dairy Farmers to shift left turns out of their properties onto those roads with the turns being made at the signalized intersection.

2.1.2 Improved Deceleration/Acceleration Characteristics

Improvement of driveway geometry and construction of right-turn and left-turn lanes can be employed to reduce conflicts between successive vehicles and the accidents and congestion that result from these conflicts.

2.1.3 Remove Turning Vehicles from Through Lanes

Construction of right-turn and left-turn lanes not only reduces the conflicts described above. They also improve capacity of the roadway by removing a slowing or stopped vehicle from a position that blocks through traffic. The capacity impact is especially significant for left-turn lanes.

2.1.4 Improved Signalization

Improved signalization can result in a significant increase in capacity and decrease in accidents. Capacity is increased when good coordination allows platoons of vehicles to move through a series of signals without stopping. Good timing provides more time for heavy traffic movements and minimizes time when no one is moving. Good phasing avoids providing dedicated green time for separate movements that do not need it, thus leaving more green time for the traffic that does need it. Good phasing also overlaps non-conflicting movements so no one is stopped unnecessarily. Good operation insures that detectors do not make false calls or hold calls after vehicles have moved off the detector, since doing so provides green time to traffic no longer there at the expense of traffic that needs the time. Finally, use of current technology can allow the employment of a special subsystem that is demand responsive. The demand responsive system would respond to spikes in the amount of traffic going to or from high traffic generators without seriously impacting other traffic in the corridor.

All of these aspects of signalization need to be reviewed to insure that signals are providing the very best time and coordination possible.

2.1.5 Improved Communication

Communication with drivers by means of traffic control devices should be improved to provide better clarification, legibility, etc. This is especially true where access becomes indirect because of intersection turning restrictions.

2.1.6 Pedestrian Friendliness

Many short vehicular trips that add to the congestion in the area are made today because of the difficulty of walking in the area. Many people in nearby residential areas could easily walk to and from shopping areas and schools, and many others could make walking trips between various commercial activities within shopping areas if the environment were more pedestrian-friendly.

Consequently, one of the improvement concepts of the corridor study is to upgrade the pedestrian environment by eliminating wide-open driveways and replacing them with clearly-defined curb cuts, by installing sidewalks on both sides of the corridor whenever possible, and by employment of pedestrian indications and timing and crosswalks at signalized intersections.

Every effort should be made to expand the pedestrian improvements within the right-of-way to abutting properties so people using the pedestrian amenities will not have to struggle through parking lots and other obstructions to reach their destinations.

2.1.7 Multi-modal Transportation

The Transportation Equity Act of 1998 (TEA-21) encourages the employment of multiple modes of travel in order to more efficiently move people through transportation systems. The North Bend/Cheviot Road Corridor improvement proposal reflects this philosophy. The matter of pedestrian circulation has already been addressed.

While available and/or readily-acquired right-of-way may be a limiting factor, the proposed improvement project should also incorporate bicycle facilities wherever possible. The American Association of State Highway and Transportation Officials (AASHTO) standards provide for combined pedestrian and bicycle usage of facilities, but width requirements are often difficult to obtain.

The Corridor is served by Metro, a non-profit public service of the Southwest Ohio Regional Transit Authority (SORTA). Buses using Cheviot and North Bend Roads provide a well-used express service to downtown Cincinnati via I-74 and I-75. While motorists complain about being stopped behind buses that are loading and unloading, transit provides a valuable service in this area because its express service is competitive with automobile travel and therefore reduces the volume of single-occupant vehicles in the corridor and on I-74 and I-75.

Recommended Corridor transit improvements include improved passenger amenities at more heavily used stops and cutouts for buses at those locations to reduce delay to other traffic. In order to assist buses in returning to the traffic flow, "queue-jump" phasing is recommended at some signalized locations. The queue-jumping phase would allow them to enter the flow of traffic prior to the movement of other vehicles.

SORTA's involvement in the project reflects the multi-modal philosophy that is an important component of this corridor improvement.

2.1.8 Illumination

Visibility at night can be improved considerably through judicious use of street lighting. While the improvement recommendations do not incorporate specific actions (other than at Alpine Terrace), preliminary engineering designs that follow should incorporate lighting improvements where appropriate.

3.0 Design Criteria

North Bend and Cheviot Roads are County roads that serve as a north-south urban arterial. Responsibility for the 5.6-mile corridor lies with the Hamilton County Engineer except for the section from Harrison Avenue to Westwood-Northern Boulevard that is controlled by the City of Cheviot (Cheviot) and the I-74 interchange area that is controlled by the Ohio Department of Transportation (ODOT).

With the exceptions of the Cheviot and I-74 sections, design standards for any recommended improvements in the corridor are established by the Hamilton County Engineer.

3.1 Speed Limits, Design Speed and Standards

North Bend Road is a "Through Highway" as defined by Section 4511.65 of the Ohio Revised Code (ORC). The prima facie and statutory speed limit from Harrison Avenue north for approximately 390 feet is 25 miles per hour. From that point north through the entire corridor, the speed limit is 35 miles per hour, as set forth by ORC 4511.21(B)(3) within Cheviot and by ORC Sections 4511.21(B)(5) and 4511.21(I) within the county. The relevance of this is that all geometric features and sight-distance measurements from 390 feet north of Harrison Avenue were evaluated against 35 miles per hour.

3.2 Sight Distance

Stopping sight distance (SSD) is defined as the distance a driver must be able to see an object in front of his/her vehicle in order to bring it to a safe stop. Intersection sight distance (ISD) is the distance required for two drivers approaching each other to perceive what each is going to do and to have sufficient time to take appropriate action. Each of these distance requirements is based on design speed, and therefore the distance requirements increase as the design speed increases. Criteria used in planning and design are contained in the *Location & Design Manual #1* maintained and published by the ODOT.

Stopping sight distance (SSD) for 35 miles per hour (mph) is 250 feet preferred and 225 feet minimum; this is the distance a driver must be able to see in order to stop safely. The minimum intersection sight distance (ISD) for 35 mph is 500 feet; this is the distance required for a driver on a side street or driveway to see an oncoming vehicle and for the driver of the vehicle on the major street to see the vehicle on the side street or driveway. Passing sight distances are much longer, but they are only applicable for two-lane roads where passing is permitted.

In construction of new facilities, these sight-distance measurements become design criteria; in the improvement of existing facilities, they are standards used to determine appropriate and feasible mitigation measures. Consequently, all improvements must be designed for at least 35 mph; anything less would require a design exception. Remedial measures can range from installation of signs to reconstruction.

3.3 Lane Widths

Hamilton County's normal standard for county roads stipulate an 11-foot width for all through lanes plus an extra 1-foot next to vertical curbs. Consequently, a 3-lane road would have a 35-foot width, face-to-face between curbs, and a 5-lane road would be 57 feet wide. These standards, which are compatible with geometric policies established by AASHTO, have been utilized for the recommendations contained in this report.

ODOT's standards for an urban arterial generally require 12-foot lanes with a 1 to 2-foot "shoulder" (gutter plate). These standards may be required for improvements that are partially within the I-74 interchange area. If so, a widening project such as that proposed for North Bend Road between Boomer Road and I-74 may require lane-width transitions or approval from ODOT to deviate from their standards.

3.4 Design Volumes

Significant roadway improvement projects are normally designed for at least a 20-year life. In this study, these projects have been proposed to accommodate traffic volumes up to 2030.

Based on data from the Ohio-Kentucky-Indiana Regional Council of Governments (OKI), 2030 link volumes and turning movements for key intersections were developed and analyzed by HCS software to determine any additional geometry that would be required by 2030. These analyses were then used to develop geometric plans proposed in the study. An annotated list of outputs from the HCS software is found in Appendix 5. In addition to HCS, Synchro was used to determine the existing Arterial Level of Service along the corridor. Synchro is a traffic analysis software designed to handle multiple intersection studies such as corridors. To operate, the software requires data such as traffic volumes, lane geometry, signal timing and segment length. Data used for the Synchro analysis is found in Appendix 6.

Existing and projected 2030 traffic volumes for the corridor were developed (Table 1 and Appendix 1). The first column shows existing link volumes as measured by tube-type traffic counters; the italicized numbers identify the links where the mechanical counters were placed. The next column shows current 24-hour volumes as measured by 12-hour turning-movement surveys conducted by the Hamilton County Engineer's Office. They correlate reasonably well with the tube counts. A listing of the 12-hour turning movement surveys utilized in this study is found in Appendix 3.

The OKI's 2030 projections are shown in the next column; these numbers are based on the long-range regional plan developed by that agency in concert with local planning agencies. The final column shows 2030 design volumes used in this study. They generally agree with the OKI data except for the two ends of the corridor. In the southern end of the corridor, the design volumes for the section between Harrison Avenue and Westwood-Northern Boulevard are less than the OKI projections because it is unlikely that the volumes within the City of Cheviot will increase since the city's population and economic condition are rather stable and there is little reason for new traffic patterns to begin using this section of North Bend Road. Similarly, the OKI projections envision a

significant volume decrease in the north end of the corridor as traffic returns to an improved Colerain Avenue. While this assumption is valid, the reduction in the design volumes has been reduced to better reflect the reality of the situation (Table 1 and Appendix 1).

3.5 Design Criteria

Other than lane widths, design criteria from ODOT's Location and Design Manual were used in the development of planning-level designs. However, the "old" criteria for determining stopping sight distance (a 6-inch height of object on the pavement) rather than the "new" (2-foot height) were used because a 6-inch high object seems more reflective of possible conditions on an urban arterial.

Table 1. Comparative Analysis of Current and Future Traffic Volumes.

Location	Current 24-hour volumes (tube)	Current 24-hour volumes (Turning Movement Survey)	OKI's 2030 Volumes	2030 Design Volumes
Harrison Avenue to Woodbine Avenue	12,500	--	20,700	12,800
Woodbine Avenue to Westwood-Northern Boulevard	12,500	12,800	21,700	12,800
Westwood-Northern Boulevard to Diehl Road	25,000	22,000 – 3,300	30,900	30,900
Diehl Road to Reemelin Road	25,000	23,700 – 4,400	30,900	30,900
Reemelin Road to Kleeman Road	25,000	25,200 – 5,400	35,300	35,300
Kleeman Road to Boomer Road	25,000	25,800 – 6,300	35,300	35,300
Boomer Road to Monfort Heights Drive	25,000	29,600 – 9,600	42,400	42,400
Monfort Heights Dr. to I-74 Eastbound ramps	25,000	29,800 – 5,600	42,400	42,400
I-74 interchange	--	28,300 – 9,400	45,400	45,400
I-74 Westbound ramps to West Fork Road	--	31,900 – 6,700	51,800	51,800
West Fork Road to Cheviot Road	--	39,300 – 6,500	50,400	50,400
Cheviot Road to Tallahassee	23,100	23,700 – 4,600	31,300	31,300
Tallahassee Drive to Jessup Road	23,100	23,700 – 4,600	29,400	29,400
Jessup Road to Hubble Road	23,100	21,900 – 4,000	25,900	25,900
Hubble Road to Blue Rock Road (South Junction)	23,100	24,400 – 2,800	25,900	25,900
Blue Rock Road (South junction) to Hanley/Banning Road	25,500	26,700 – 21,600	28,500	28,500
Hanley/Banning Road to Blue Rock Road (North Junction)	25,500	19,800 – 26,600	28,900	28,900
Blue Rock Road (North Junction) to Galbraith Road	14,600	17,500 – 16,500	12,100	17,000
Galbraith Road to Joseph Road	14,600	14,300 – 11,300	9,800	12,800
Joseph Road to Poole Road	14,600	9,400 – 12,400	7,100	10,900

KEY: 00,000 – Identifies link in each corridor section where mechanical counter was placed
00,000 – 2030 Design Volume different from OKI 2030 projection

4.0 Project-Wide Recommendations

Sections 5 to 7 of this report identify and describe site-specific improvements recommended for the Corridor. They are covered both in text as well as graphically.

However, improvement recommendations relevant to the entire corridor are covered in this section. Some address physical improvements; others describe proposed philosophies and policies to guide future development and construction in the corridor.

4.1 Sidewalks

It is a recommendation, accepted by the Corridor Task Force, that a goal of this study is to ultimately have sidewalks on both sides of North Bend, Blue Rock and Cheviot Roads through the length of the corridor. The purpose of this is to facilitate pedestrian circulation among more closely spaced activities and to eliminate numerous short vehicular trips. Sidewalks could provide safe pedestrian access to schools, churches, libraries, parks and recreational areas, commercial activities, and between neighborhoods.

Sidewalks impacted by construction can be reconstructed with County funds. However, new sidewalks can be constructed only through private/land owner funding, assessments, community development and federal Enhancement funds (as long as federal requirements do not impact other aspects of a project), and by Tax Increment Finance (TIF) programs and the townships.

Related pedestrian amenities to be incorporated into projects are pedestrian indications at signalized intersections and marked crosswalks at signalized intersections and other locations where appropriate.

4.2 Working Together

It is recommended that, as new development and redevelopment occur, the County Engineer and the townships work with property owners, **and** that the property owners work with one another to establish cross easements and service drives in order to reduce the proliferation of access points onto the corridor and to develop a lesser number of improved access points to serve all of the properties.

The proposed access improvement north of Paramount Ridge Drive in the Central Area of the study is an example of this recommendation. See Section 6.9 for details of this site-specific recommendation. While the budget and scope of this corridor study precluded evaluating and recommending more of these similar projects, it is recommended that continuing efforts investigate and pursue the very many other locations where working together could produce improvements for both the property owners as well as the traveling public.

4.3 Three-Laning Policy

Most of North Bend Road, Blue Rock Road and Cheviot Road is three-laned, meaning that intersections have one exit lane, one through/right approach lane and one left-turn

approach lane. Three-laning an intersection, meaning construction of separate lanes for left-turning vehicles, is a significant capacity-increase factor. When left-turning vehicles impede the flow of through traffic, capacity decreases dramatically. The impact is felt even when the left-turning movement is relatively light. A two-lane road augmented by left-turn lanes can forestall the need for a four-lane road. At the same time, a four-lane road without left-turn lanes may have little more capacity than a two-lane road with left-turn lanes.



Therefore, the following is recommended as a policy for the entire North Bend/Cheviot Road Corridor:

- All signalized intersections should have left-turn lanes on all approaches.
- All intersections of North Bend/Cheviot Road with any other intersection or any driveway, other than for a single-family dwelling, should have left-turn lanes or a two-way left-turn lane.
- All cross-roads that are arterials or collectors should have left-turn lanes at North Bend/Cheviot Road.
- All driveways for businesses, institutions, and multiple-dwelling unit developments should have left-turn lanes at North Bend/Cheviot Road.

4.4 Traffic Signal System(s)

Well-coordinated traffic signals improve capacity and safety by facilitating the smooth movement of platoons of vehicles through the corridor.

On the other hand, signals that are not coordinated or which are poorly coordinated result in accidents caused by stopping and starting. They also raise driver irritation and tension levels, both of which have negative impacts on safety.

An overall recommendation of this study is that the signals in the corridor be upgraded into one or more systems with at least one subsystem in the Colerain High School area that would operate in a traffic-responsive manner to facilitate peak flows of traffic into and out of the high school site. The system(s) should operate with a sufficient number of timing periods to reflect variations in volumes and directions of traffic flows. The timing periods should address not only the typical weekday patterns, but also the Saturday and Sunday demands.

Minor movements and side streets with relatively low and/or variable volumes should operate in an actuated manner with detector placement, extension/passage and “maximum” timing cutting off unnecessary side-street and/or minor movement time and returning it to the corridor to maximize green bands of travel.

Some specific signal improvements are contained in this report. In addition, some recommended reconstruction or new construction projects would also include new or upgraded signals.

An overall recommendation of this study is that a more thorough review and analysis of the signals be conducted to assess their current operation, needs for improvement to attain the objectives outlined above, and to determine more specific actions and programs required to:

- Achieve system(s) and subsystems(s) best serving the Corridor's current and future needs
- Implement improvements in existing signals recommended in this report,
- Insure optimum signal design for roadway improvements outlined in this report, and to
- Establish a program to review, evaluate and upgrade the timing, phasing, coordination and operation of other existing signals.

4.5 Four-laning of North Bend Road

During the public informational meetings, the question has been raised about when North Bend Road will be four-laned. The purpose of this study is to improve the efficient, safety and capacity of the existing facility in order that its maximum potential is achieved. If traffic volumes continue to increase and everything possible has been accomplished to optimize the use of the existing road, only then would it be logical to consider four-laning. A basic three-lane road with access management and good traffic controls can carry a large volume of traffic. And as noted in Section 4.3, a four-lane road is not much better than a three-lane road because left turns will significantly reduce the capacity of the inside lanes. Therefore, the only logical future widening would be from three to five lanes, and the impact of this additional width on abutting development will be a major consideration. Capacity analyses conducted of two major intersections in this area – Westwood-Northern Boulevard and Boomer Road – indicate that implementation of the recommended improvements should allow North Bend Road in the Southern Area to operate without major widening until 2030, based on 2030 population projections provided by the planning agencies.

5.0 Improvement Recommendations – Southern Area

The following are access-management/safety improvements recommended for specific sites in the Southern Area from Harrison Avenue in Cheviot to south of Boomer Road in Green Township. The locations are also shown on Figure 2.

The recommendations are based on data, observations and analyses, recommendations offered at Subarea 1 and 2 public meetings, followed by discussion at the meetings and follow-up investigations and analyses. The recommendations generally proceed northwardly from Harrison Avenue.

5.1 Harrison Avenue and North Bend Road

There is no capacity deficiency at this intersection. The signal installation meets design and operational standards and there are pedestrian indications with marked crosswalks. No action is needed.

5.2 Woodbine Avenue and North Bend Road Intersection

There is no capacity deficiency at this intersection. However, there are no pedestrian indications. The signal is non-interconnected and pretimed; this results in stops and delays that do not create capacity problems but which do irritate drivers and thus diminish the positive relationship with drivers that is important in traffic control.

Recommendations for this intersection include:

- The signal should be interconnected, converted to semi-actuated operation with detectors on Woodbine Avenue, and equipped with pedestrian-actuated pedestrian indications.
- A short section of the southbound curb lane north of the intersection is currently used as a right-turn lane; lengthening it by approximately 50 more feet of parking prohibition would better allow the significant number of turning vehicles to move into a separate lane as they slow for the turn, thus reducing the potential of rear-end collisions between them and following vehicles.

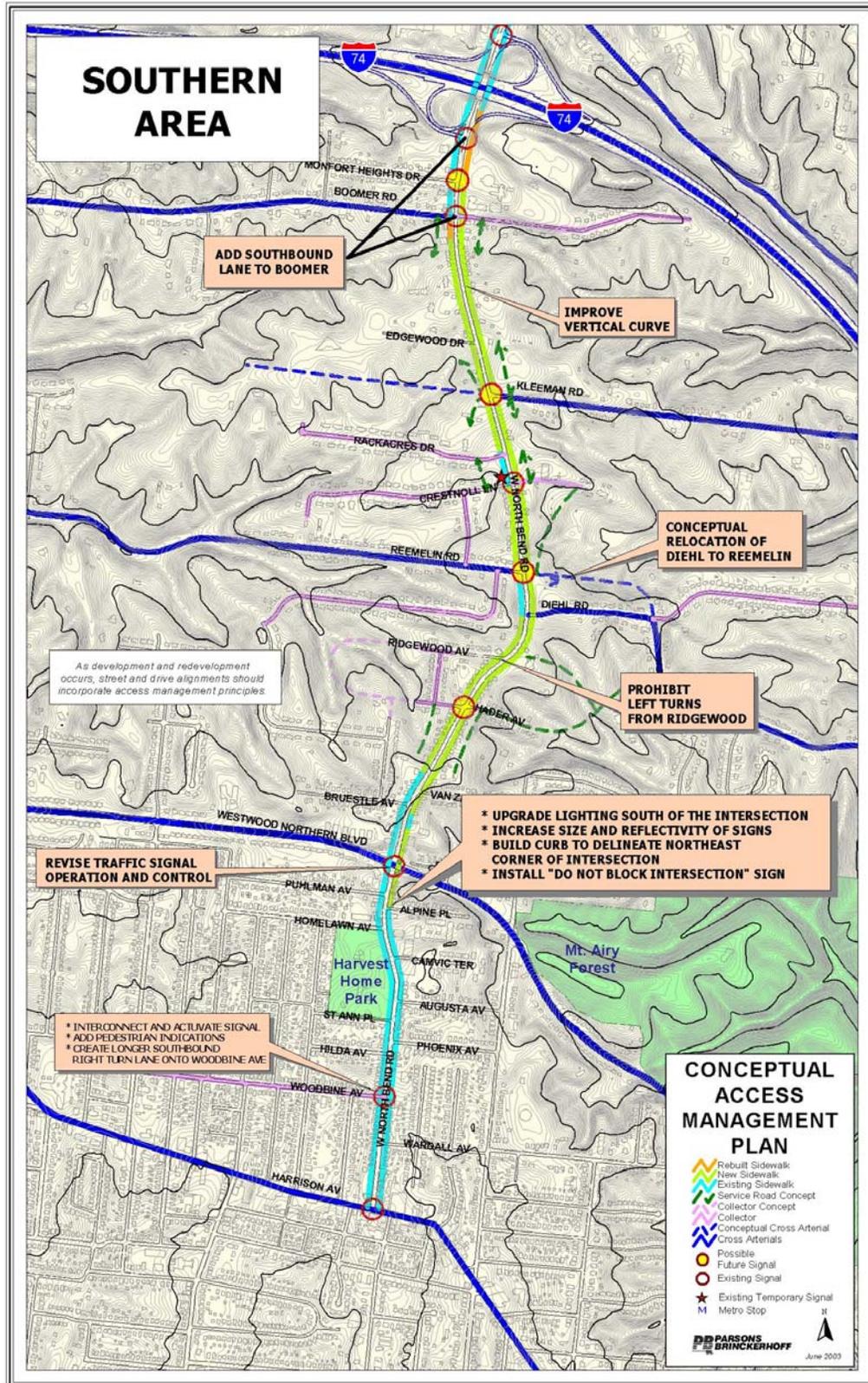
5.3 Alpine Place and North Bend Road Intersection

Recently, a new street-name sign with larger type and reflective sheeting and a “**DO NOT BLOCK INTERSECTION**” sign south of the intersection were recently installed to improve visibility of this intersection. Further recommendations for the intersection include:

- Upgrade the output of the street light just south of the intersection.
- Better define the northeast corner of the intersection by extending the curb on the north side of Alpine Place to and around the corner.

In addition, when vehicles in the parking lot south of Alpine Place are parked near the sidewalk, they obstruct inter-visibility between northbound traffic on North Bend Road and drivers on Alpine Place attempting to enter North Bend Road. It is recommended that the business be requested to rearrange parking, if possible, to avoid having vehicles parked out by the sidewalk.

Figure 2. Improvement Recommendations – Southern Area



5.4 North Bend Road between Alpine Place and Westwood- Northern Boulevard

The recommendation for this area includes the construction of new sidewalk on the east side of North Bend Road between Alpine Place and Westwood-Northern Boulevard together with any sidewalk curb ramps required to meet current Americans with Disabilities Act (ADA) accessibility requirements.

5.5 Westwood-Northern Boulevard and North Bend Road and Intersection

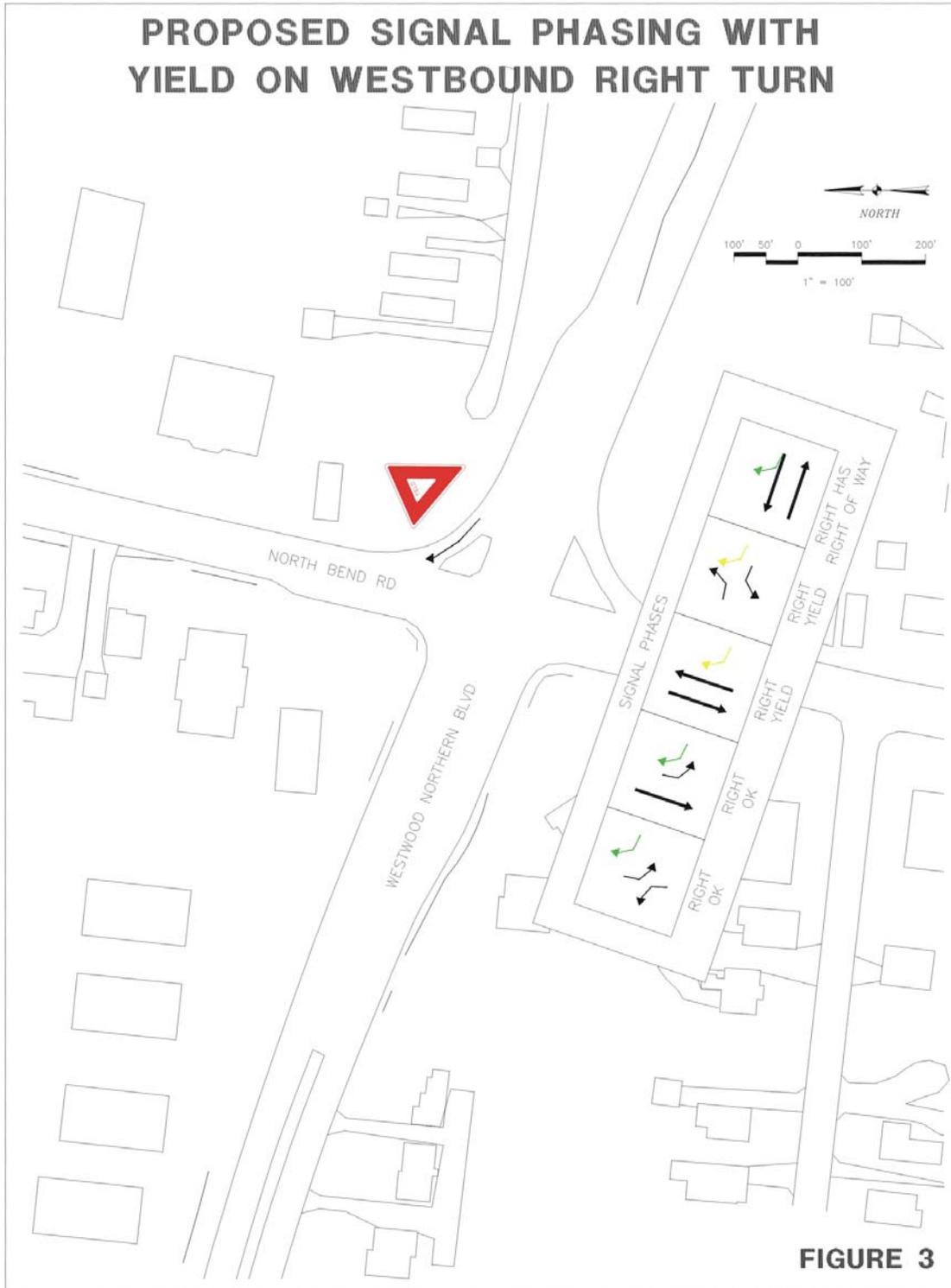
The three-year period from 1999 through 2001 saw 103 crashes at and within the influence area of this intersection (Appendix 2). Forty-two (42) of them were reported by the Hamilton County Sheriff's Office and Green Township; and 61 were taken by the City of Cheviot. Cheviot did not provide detailed information concerning the 61 but comments by the City's Service Director indicate that a significant number of them involve the westbound right turn to northbound North Bend Road. Of the remaining 42, 16 were northbound rear-end collisions on the south approach of the intersection, 5 were westbound rear-end collisions, 9 were collisions between eastbound left turns and westbound through traffic and 4 were collisions between southbound left turns and northbound through traffic. Several problems were identified during this study:

- Inter-visibility between eastbound left-turning vehicles and westbound through vehicles is obscured by a crest vertical curve in Westwood-Northern Boulevard just east of the intersection and sometimes by westbound left-turning vehicles in their turn lane.
- Queuing of northbound vehicles on the south approach is caused by a single through lane and inadequate green time. Green time is restricted by the very heavy southbound left turn. The downgrade on the approach undoubtedly contributes to the rear-end collisions.
- Westbound right turns onto North Bend Road are a major movement and drivers tend to take the right-of-way even when they do not have it. The right-turn lane is controlled by a yield; this means it is technically outside the signal control and that drivers can proceed any time there is no cross traffic (Figure 3). It becomes a special problem when the cross traffic has turned left from eastbound Westwood-Northern Boulevard, a movement that normally yields to the oncoming through and right turns.

Several recommendations are in order for this intersection:

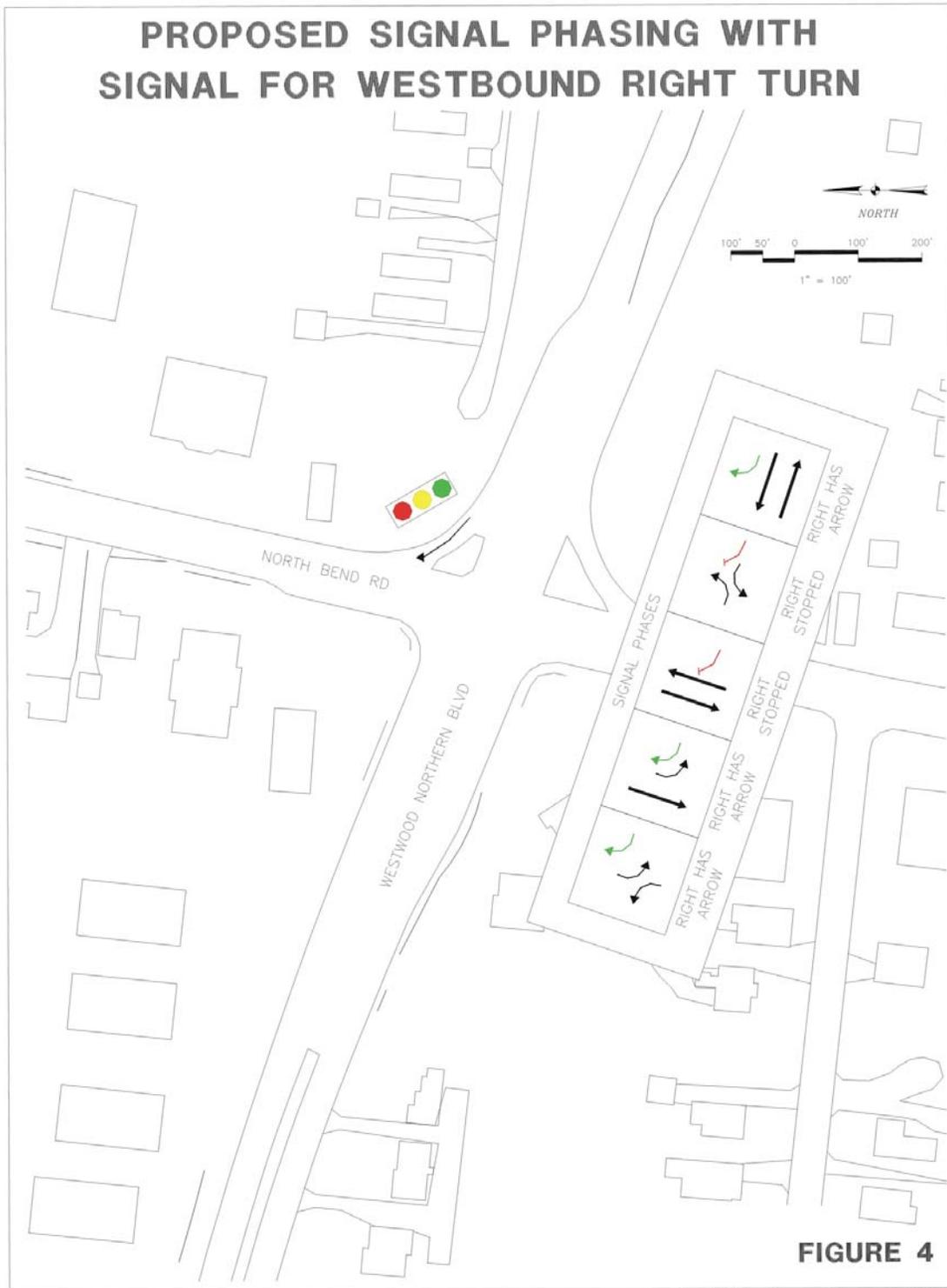
- Install standard R-25F *LEFT TURN YIELD ON GREEN (ball)* signs on the westbound and southbound approaches where most of the left-turn accidents are occurring to emphasize to drivers to yield to oncoming traffic after their arrow interval has passed.
- Implement a signal phase change that would overlap the westbound right turn with the southbound left turn (Figure 4). Remove the yield sign and signalize the westbound right turn (possibly with a NO TURN ON RED) that would allow this movement on east-west green as well as the overlap but stop it at all other times. Capacity analyses indicate that replacing the yield control with right-turn-arrow overlap would have no impact on capacity. *This recommendation should not be implemented until the 61 accident reports by*

Figure 3. Existing signal phasing and yield sign for westbound right turn onto northbound North Bend Road



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Figure 4. Proposed signal phasing with signal for westbound right turn onto northbound North Bend Road.



- Cheviot have been received and reviewed to determine the magnitude of the problem and any other factors that might be contributing to the problem.*
- The pavement within the intersection area is deteriorating and exhibiting considerable irregularities and deformities; it is recommended that the area shown on Figure 5 be rehabilitated. [*This rehabilitation has been previously scheduled and is anticipated for completion in 2003.*]
 - The vertical crest curve on Westwood-Northern Boulevard east of North Bend Road should be lengthened to improve inter-visibility between eastbound left-turners and westbound through traffic. The planning-level analysis of this study, conducted with CAGIS mapping, indicates that the current profile supports an intersection sight distance of at least 35 mph; however, it is recommended that the crest be cut down to provide an ISD of at least 40 to 45 mph. This can be accomplished within the existing right-of-way.
 - Following pavement rehabilitation, shift the opposing east-west left-turn lanes slightly to left to improved inter-visibility between the two approaches.
 - Review the signal timing to explore the possibility of providing more northbound green time without exacerbating conditions on other more-heavily traveled approaches.

5.6 Conceptual Access Management Plan

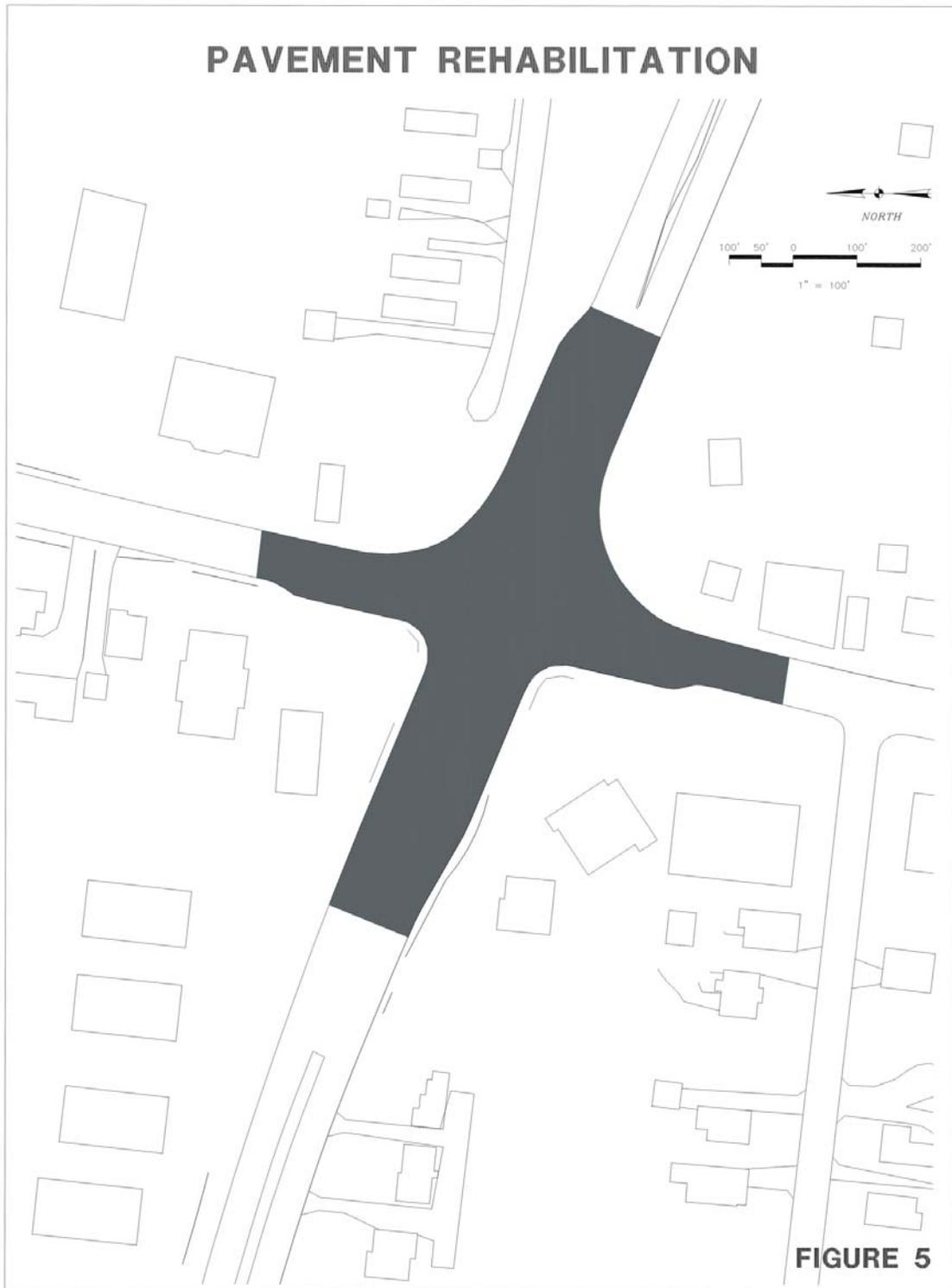
History has shown a direct correlation of congestion and accidents with the number of access points per mile. As access points multiply, so also do accidents and congestion. A local example, is Colerain Avenue which experiences severe congestion and an accident rate far above the average because of several hundred access points in a 4.6-mile length.

Unfortunately, most access-management projects are not undertaken until the access points, congestion and accidents are already there. Projects undertaken at that point are difficult because retrofit actions and restrictions on access points are needed, and they are expensive and also resisted by the businesses.

The North Bend Road area between Westwood-Northern Boulevard and Boomer Road offers an excellent opportunity to plan ahead and avoid a “Colerain Avenue” situation. The area is still lightly developed, but population projections provided by OKI show considerable growth in this area. Based on that growth, traffic on North Bend Road in 2030 is expected to increase by 33% in the south portion of the corridor and up to 54% at I-74.

The Conceptual Access Management Plan depicted on Figure 2 proposes to minimize the number of direct access points by employing a system of service (frontage) roads, collector roads, and arterials to feed traffic into a selected number of improved, signalized access points along North Bend Road. The concept plan shows three signalized access points almost equally spaced along North Bend Road between Westwood-Northern Boulevard and Boomer Road. In Cheviot, Woodbine Avenue and its signalized intersection with North Bend Road already performs the role of a collector

Figure 5. Proposed Pavement Rehabilitation at the Intersection of North Bend Road and Westwood Northern Boulevard



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for the many neighborhood streets in the area. The new Emerald Lakes development on the east side of North Bend Road is already constructing a piece of this system from Emerald Lakes Drive to Reemelin Road.

East River Road in Fairfield is cited as an example of this concept employed in an attractive residential area; individual houses front on parallel frontage/service roads which feed into cross arterials or collectors. Route 4 in Fairfield offers examples of this concept in a business area.

It is recommended that the Conceptual Access Management Plan be adopted as part of the community's planning process to insure that new developments and redevelopment of existing parcels include the elements that will ultimately become a system providing attractive and convenience access for abutting properties without the congestion and accidents that would result from uncontrolled access.

5.7 Study Relocated Diehl Road

Related to the previous topic is the potential relocation of the Diehl Road/North Bend Road intersection north to Reemelin Road (Figure 2). As shown on the Conceptual Access Management Plan, each of these roads is serving as a cross arterial through the corridor. Having them intersect at a common location on North Bend Road would eliminate the offset that, as time goes on and traffic volumes increase, could become a capacity problem. Furthermore, the vertical and horizontal alignment of North Bend Road in this area makes left turns out of Diehl Road difficult. Bringing the two arterials together at a common point would facilitate their signalization; Reemelin Road currently satisfies signal warrants for Peak Hour Delay and Peak Hour Volumes. Signalization would provide the safer alternative for left turns from both Reemelin and Diehl Roads. If Diehl Road is maintained as a separate intersection, the likelihood for signalizing it is remote as the volumes today are considerably below the threshold levels justifying signalization (Appendix 7).

The Diehl Road intersection relocation has been proposed prior to this corridor study. However, planning concerns over the potential increased traffic on Diehl Road from such a change have also been part of the discussion. In the meantime, construction of a new church with its parking lot on the northeast corner of Diehl and North Bend has increased the cost of a relocation project. While the access-management benefits of the proposed realignment are considerable, it is evident that additional study of all aspects is needed. The recommendation at this point is that the proposal be given additional study and that the final decision be made based on all relevant conditions.

5.8 Horizontal Curvature South of Diehl Road

The restrictive horizontal curvature around Ridgewood Avenue and Diehl Road was cited at the public meetings as a problem to be investigated. The curvature was reviewed primarily on the basis of its impact on intersection sight distance (ISD), measure of the ability of drivers on the main street and the side approach to see each other in time for them to make safe decisions.

From Ridgewood Avenue south, intersection sight distance is adequate for the 35 mph speed; however, from Ridgewood north ISD is only 140 feet. This means that the ISD for Ridgewood is well under 20 mph; in fact, stopping sight distance is only good for 23 mph. ISD from Diehl Road north is adequate for the 35 mph speed; however to the south it is only 457 feet, good for 30 mph. The former Forestview Gardens entrance was also checked since it is proposed for redevelopment and ISD from that point south is 380 feet, good for only 25 mph.

One highway engineering solution to the situation is to rebuild North Bend Road with the curvature needed for 35 mph traffic. This would be an expensive and disruptive project; many properties would be impacted. However, a quick look back at the Conceptual Plan shows that the Diehl Road intersection might be relocated north and signalized. A new signal at Hader Avenue would serve the traffic from Ridgewood Avenue as well as any new development along the east side of North Bend Road. If this concept is adopted and implemented, left turns from Ridgewood Avenue, the movement most vulnerable from the restricted sight distance, should be prohibited (Figure 2).

5.9 Vertical Curvature Along North Bend Road

The vertical alignment was evaluated at four locations. The results, which were shown on profiles at the public meetings, are as follows:

- The crest vertical curve north of Van Zandt Lane has a safe stopping distance sufficient for only 22 mph. Intersection sight distance to the north of both Bruestle Avenue and Van Zandt Lane is inadequate for 35 mph.
- Stopping sight distance and intersection sight distance affected by the vertical curvature at Diehl Road, Reemelin Road, and Crestknoll were determined to be adequate.
- Based upon a planning-level analysis of a CAGIS-derived profile, the crest vertical curve between Kleeman Road and Edgewood Drive has insufficient stopping sight distance and a section of insufficient ISD north of Kleeman Road. However, field observations tend to be inconclusive these findings. ISD from Edgewood seems to be adequate in both directions.
- The crest vertical curve north of Edgewood Drive has a stopping sight distance good for only 22 mph.

The difficulty of making significant grade changes in developed areas has previously been noted. However, improvement of the vertical curves north and south of Edgewood Drive appears to be feasible since it could be accomplished with relatively limited impact on abutting development. Therefore, recommendations are as follows:

- Field survey profile from Crestnoll north to Edgewood to precisely determine existing sight distance(s) in this section and improve to



- 35 mph, as needed. This could be accomplished in combination with the construction of a left-turn only lane on Kleeman and North Bend as discussed in the three-laning policy recommendation (see Section 4.3 of this document).
- Lengthen crest vertical curve north of Edgewood to provide a stopping sight distance good for 35 mph.
 - Limited sight distance signing is the only feasible approach to addressing the situation in the southern part of the area.

5.10 Sidewalks

The one sidewalk gap in Subarea 1 was addressed above. In Subarea 2, sidewalks currently exist, on the west side only, between Westwood-Northern Boulevard and north of Van Zandt, between Reemelin and Diehl, and from north of Crestnoll to Rack Acres (Figure 2). Consistent with the overall goals of the study, it is recommended that sidewalks be constructed throughout the entire length of the subarea on both sides of North Bend Road. The sidewalk width should be no less than 4 feet with a 2-foot curb-lawn area between sidewalk and curb.

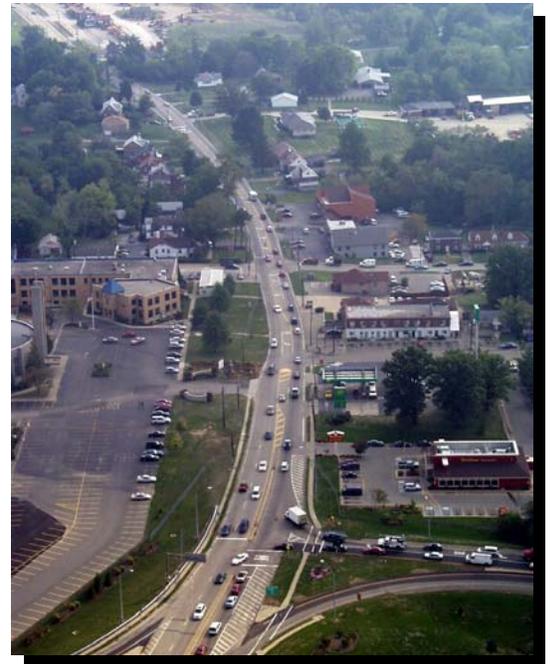
6.0 Improvement Recommendations – Central Area

The following are access-management/safety improvements recommended for specific sites in the Central Area from south of Boomer Road in Green Township to the north junction of Cheviot Road and Blue Rock Road in Colerain Township. The locations are also shown on Figure 6.

The recommendations are based on data, observations and analyses, recommendations offered at Subarea 3, 4 and 5 public meetings, followed by discussion at the meetings and follow-up investigations and analyses. The recommendations generally proceed northwardly from south of Boomer Road.

6.1 North Bend/Boomer Road Intersection

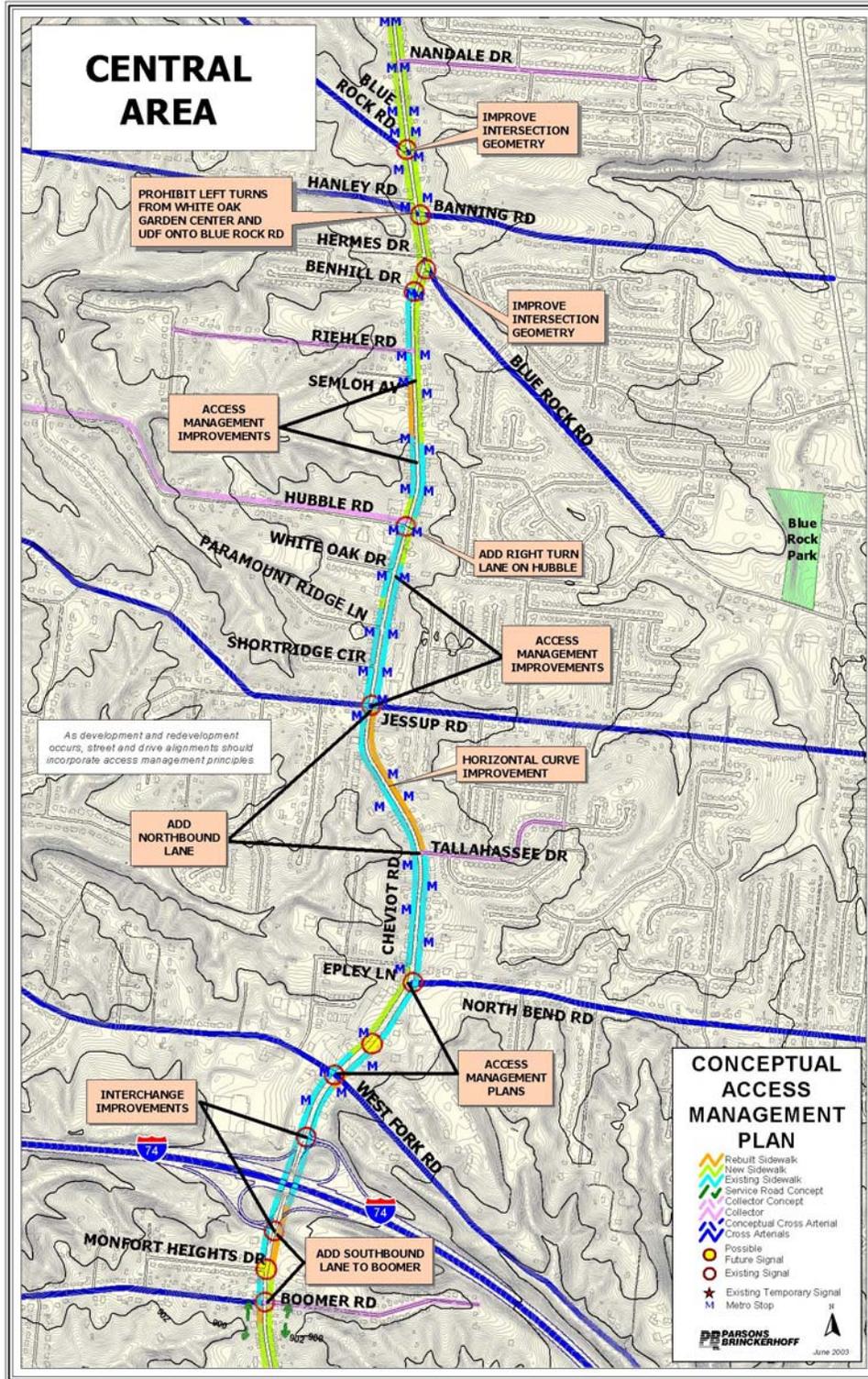
This intersection is a capacity restriction in both morning and afternoon peaks. Morning traffic on North Bend Road approaching I-74 backs up as far as Diehl Road; there is also a back-up, albeit shorter, on Boomer Road. In the afternoon, southbound traffic on North Bend Road backs up into and through the I-74 interchange. The problem is one of capacity – only one lane for through traffic on North Bend Road. If signal timing were changed in the morning to provide more green time for northbound traffic, the problem would simply be transferred to Boomer Road. Capacity analyses have shown that a second northbound through lane beginning south of Boomer Road would provide the necessary capacity for the AM peak (Appendix 8). A second southbound lane would solve the afternoon peak problem. The new lane could terminate as a right-turn lane at Boomer because of the large number of vehicles turning right at this point; the remaining volume going south can be accommodated by a single lane for now (Appendix 8 and Figure 7).



6.2 Interstate-74 and North Bend Road Interchange

The interchange also experiences congestion problems. While Boomer Road tends to “meter” the northbound flow on North Bend Road, the signal at the eastbound off ramp also queues traffic, much of it attempting to reach the eastbound on ramp which lies beyond the signalized intersection. Southbound traffic on North Bend Road as well as from the westbound off ramp backs up in the afternoon at the eastbound off-ramp signal as well as at Boomer Road. Traffic on the eastbound off ramp also queues in the afternoon peak. Part of the problem is caused by the availability of only one southbound through lane on the bridge, even though the structure is sufficiently wide for two. The right southbound lane on the bridge is painted out because there is only a single lane on North Bend Road south of the interchange. This condition also

Figure 6. Improvement Recommendations – Central Area



exacerbates the westbound off-ramp traffic in the afternoon because the left turn south is restricted to only one lane.

6.3 Boomer Road thru the Interstate-74 Interchange

Figures 7 and 8 depict the recommended improvement to address both locations above as well as the section of North Bend Road between them. Elements of the improvement are:

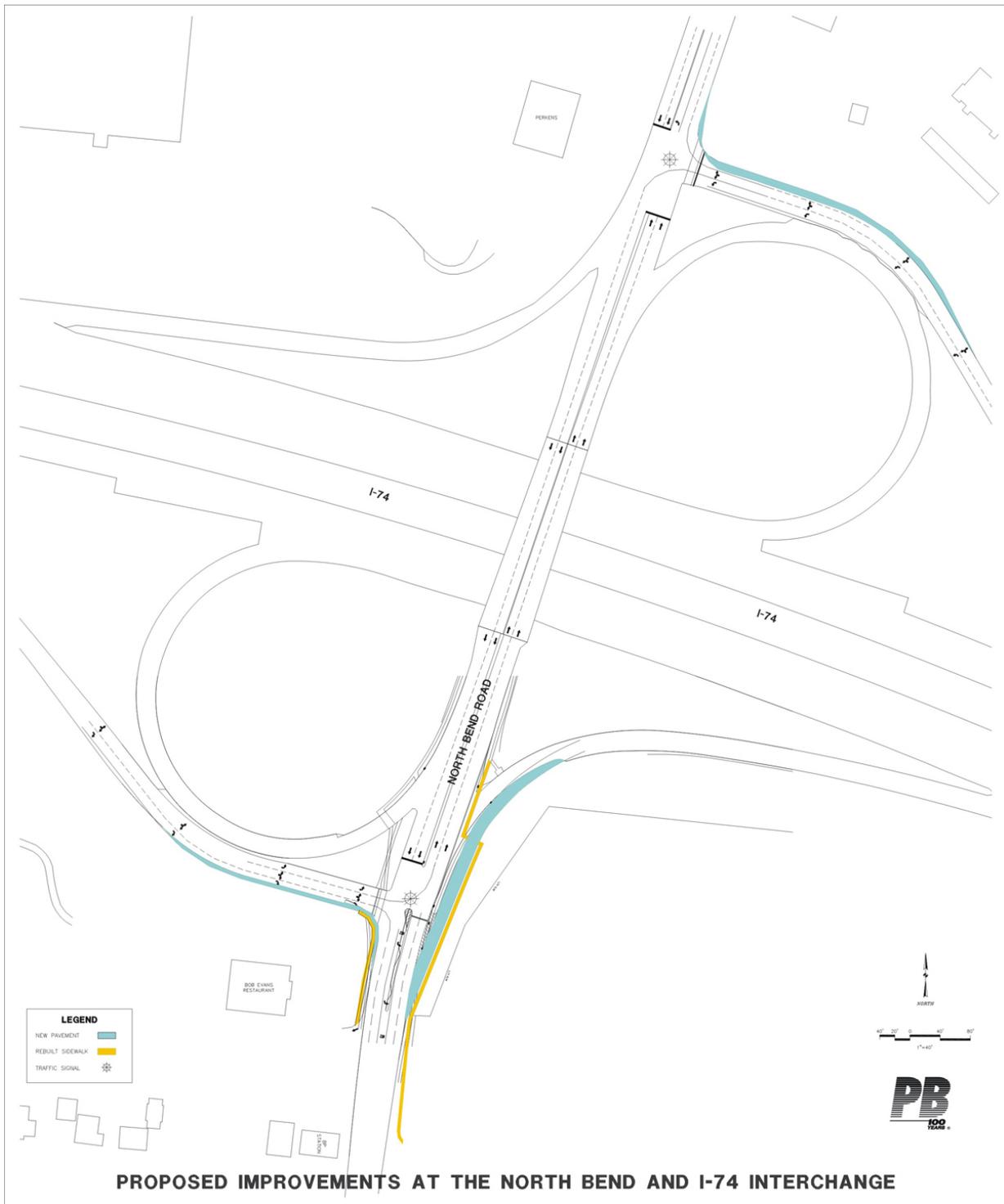
- Added northbound lane from south of Boomer Road to I-74 bridge.
- Reconstruction of eastbound I-74 on ramp to diverge from North Bend Road south of eastbound ramp terminal and bypass the signal,
- Added southbound lane from eastbound ramp terminal to Boomer Road, terminating there as a right-turn lane (until some time in the future when increased volumes may require its extension south),
- Reconstruction of Boomer Road at North Bend Road to align through traffic and provide new eastbound left-turn lane,
- Five-laning of North Bend Road to include long southbound left-turn into St. Ignatius, northbound left-turn lane into Monfort Heights Drive, and southbound left-turn lane into Boomer Road.
- Potential semi-actuated signal at Monfort Heights Drive in combination with driveway left-turn restrictions and for pedestrian crossings between St. Ignatius and west side of street,
- Sidewalk on both sides of street,
- Restriping of I-74 bridge to provide two southbound lanes through eastbound ramp terminal intersection, and
- Widening of both I-74 off ramps to three lanes to provide for double left and double right turns (center lane being optional).

6.4 North Bend Road from Interstate-74 to West Fork Road

This section of North Bend Road is characterized by a heavy northbound left-turning movement – into Sam’s Club and at West Fork Road. A northbound double-left-turn lane at West Fork Drive is not feasible at this time because it would require double receiving lanes of sufficient length that drivers would use both left-turn lanes equally; there is only one westbound lane on West Fork Road. The only feasible improvement at this time is to upgrade the northbound left-turn capacity by converting the two-way-left-turn lane into a dedicated northbound left-turn only into Sam’s and West Fork Road (Figure 9). Also shown are driveway geometry revisions eliminating left turns out and using wayfinding signage to guide those headed north on North Bend Road to West Fork Road from which they can turn left at a signalized intersection.

This section of North Bend Road also includes heavy boarding of and alighting from Metro transit buses because of a 100-vehicle park-and-ride lot leased from Sam’s Club by the transit authority. Little can be done at this time to provide amenities for those awaiting their buses in the morning peak or to minimize delays to automobile traffic from the loading process. However, a combination bus cutout and northbound right-turn lane is recommended at West Fork Road in order to shelter buses while unloading passengers during the heavy PM peak period. In order to encourage bus drivers to use

Figure 8. Proposed improvements at the North Bend and I-74 Interchange



it without being trapped in it by automobile drivers, a queue-jump sequence is recommended for the North Bend/West Fork signal to provide a short transit-only green prior to the green for all traffic (Figure 9).

6.5 North Bend and West Fork Road Intersection

Capacity analyses showed that a relatively minor revision in the intersection's lane-use pattern would improve the level of service, especially during the PM peak period (Appendix 8). Currently, the eastbound approach has one dedicated left-turn lane, one left-through combination, and one right-turn lane. Moving the through movement from the center lane and combining it with the right turn improves the level of service on that approach as well as for the entire intersection. The eastbound right turn incurs a slight delay, but the net for the approach and the intersection as a whole is a significant improvement. Consequently, this lane-use change is recommended (Figure 9).

6.6 North Bend from West Fork Road to Epley Lane

This section of the corridor experiences very high congestion and many accidents. The primary reason for this is the combination of high traffic volumes and many uncontrolled access points. The improvement plan for the area is an access-management plan eliminating some curb cuts, reducing others to right-in/right-out, and eliminating all left turns out except at a new semi-actuated mid-block traffic signal (Figure 10). This would be accomplished by a number of cross easements between adjoining property owners, some minor construction and an extensive wayfinding system to aid drivers in finding their way back to the main roads. Epley Lane, which lies within the influence area of the Cheviot/North Bend Road intersection and is subject to a sight distance restriction to its north, is recommended to become right-in/right-out only as a safety improvement with Audro and West Fork being used as alternate routes to and from the activities on that street (Figure 10).

6.7 Cheviot Road from Tallahassee Drive to Jessup Road

Currently, two lanes of North Bend Road continue north on Cheviot Road with the right lane dropping as a right-turn-only at Tallahassee Drive. Since the right lane does not continue, most drivers during the PM peak hour are reluctant to use it because of their inability to move left into the remaining through lane. The problem is especially acute during the PM peak because of long queues approaching Jessup Road. Capacity analyses show that the level of service of traffic at Cheviot and North Bend would be acceptable if both northbound through lanes were being used equally; however, the current LOS is poor because a very high percent of the vehicles are in only one (the left) lane.

At the same time, the afternoon peak period level of service at Cheviot and Jessup Roads is also poor

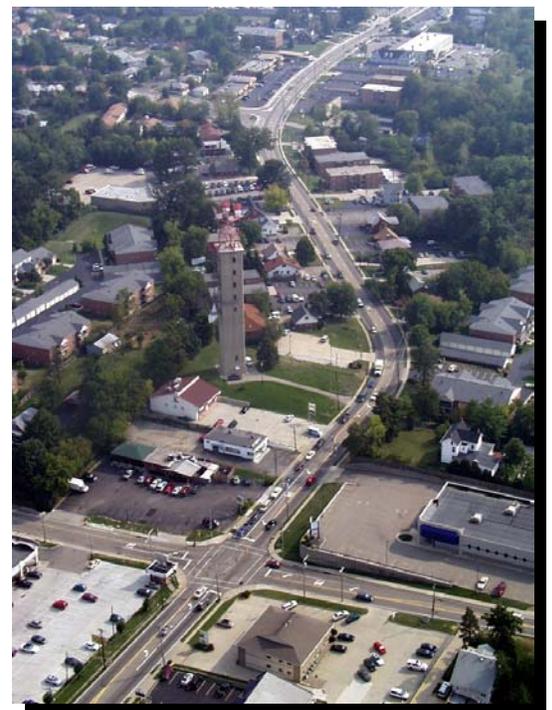
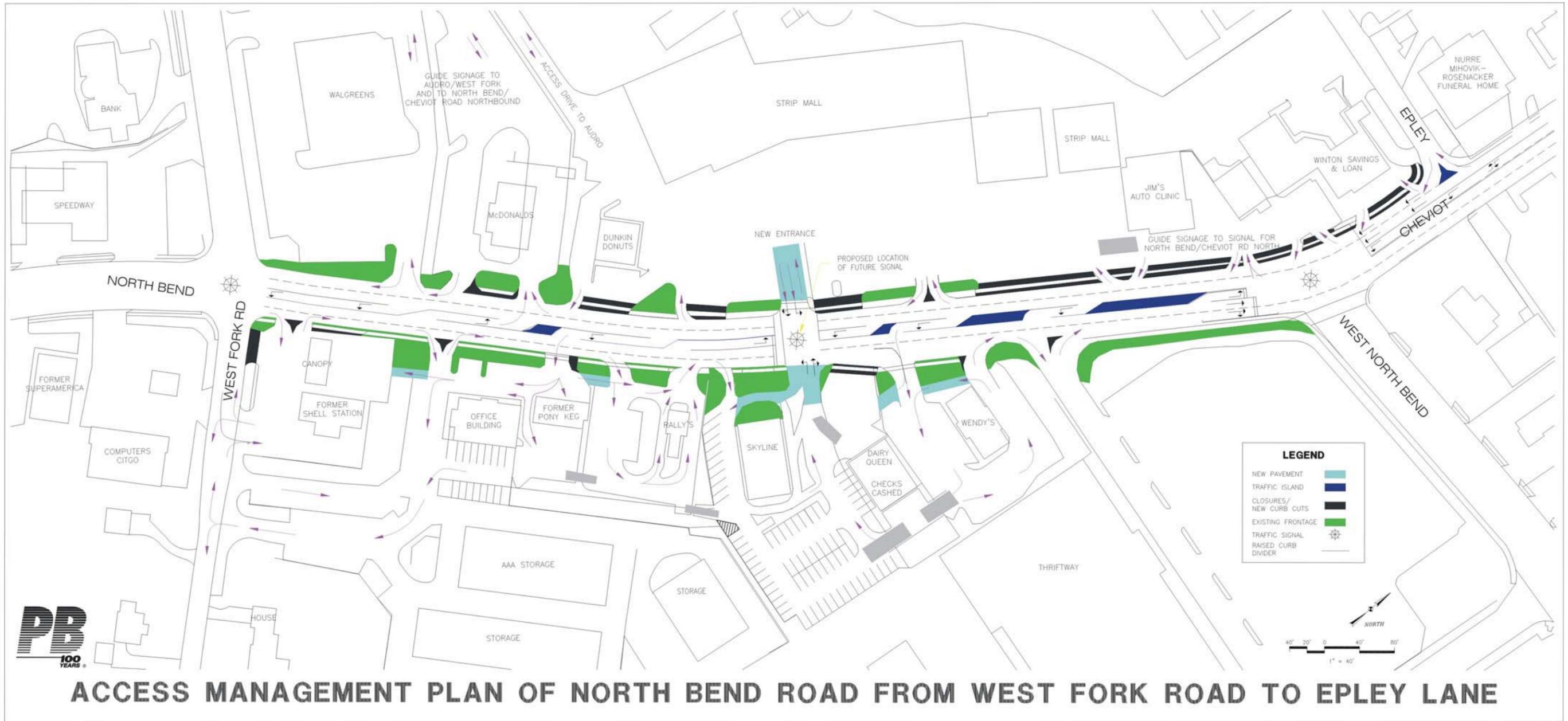


Figure 9. Access Management Plan of North Bend Road from I-74 to West Fork Road.



Figure 10. Access Management Plan of North Bend Road From West Fork Road to Epley Lane



because the single northbound through lane is unable to adequately accommodate both the through as well as the heavy right turn that drops off onto Jessup Road. Capacity analyses show that provision of an adequate northbound right-turn lane would solve that problem. Therefore, because of the ability to solve congestion problems at both Cheviot/North Bend and Cheviot/Jessup, it is recommended that the second northbound lane that now ends at Tallahassee be extended to Jessup Road where it would end as a right-turn lane (Figure 11).

6.8 Cheviot Road from Jessup Road to White Oak Drive

The recommended improvements in this area focus on access management, safety and transit amenities (Figure 12). The primary safety problem in the area is at the Paramount Ridge Drive intersection where southbound left turns into an excessively large curb cut conflict with the northbound left turns into Paramount Ridge. Since a reduced-size curb cut cannot readily be located opposite Paramount Ridge, the plan shows closure at that location with a pair of controlled curb cuts further south (Figure 12). Pavement markings are revised from two-way-left-turn lanes to single-direction left-turn lanes serving Paramount Ridge Drive as well as White Oak Shopping Center. Another White Oak Shopping Center access point has been moved north opposite Shortridge Court and pavement markings revised between Jessup Road and Shortridge Court.

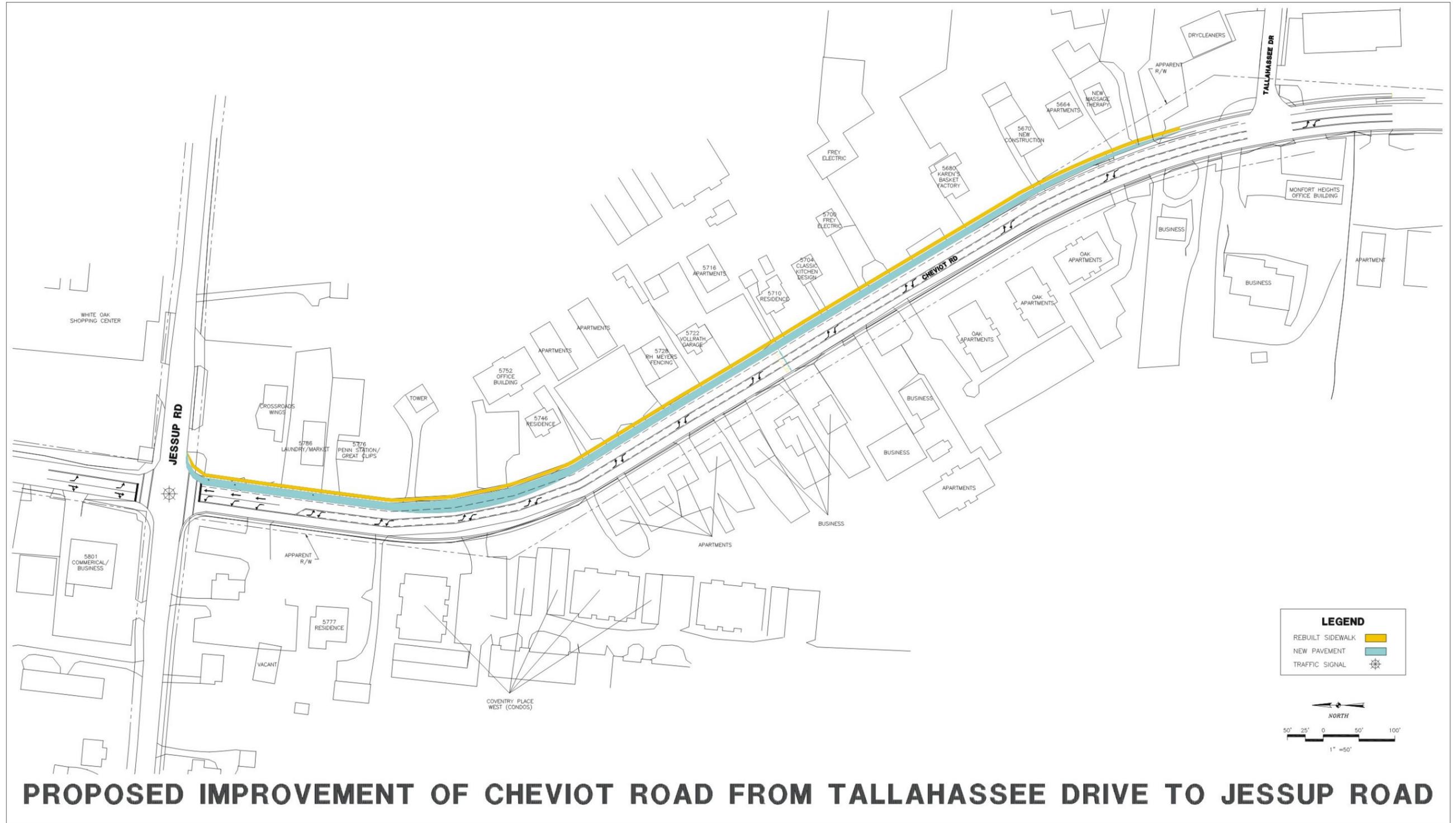
Because of the informal park-and-ride practice at the shopping center, transit bus cutouts are proposed at Shortridge Court with a crosswalk at that location. It is also recommended that an actuated pedestrian signal with transit queue jump be considered at this location.

Finally, Figure 12 also depicts a recommendation to close excessively long accesses into businesses while converting them into right-in and right-out drives only with a common drive between them providing full access for them as well as a building behind them now using the driveway for the area north of Paramount Ridge Drive. The combined access point would be protected by a flashing beacon calling attention, primarily to northbound drivers coming over the crest curve, to its presence (Figure 12).

6.9 White Oak Drive to Semloh Avenue

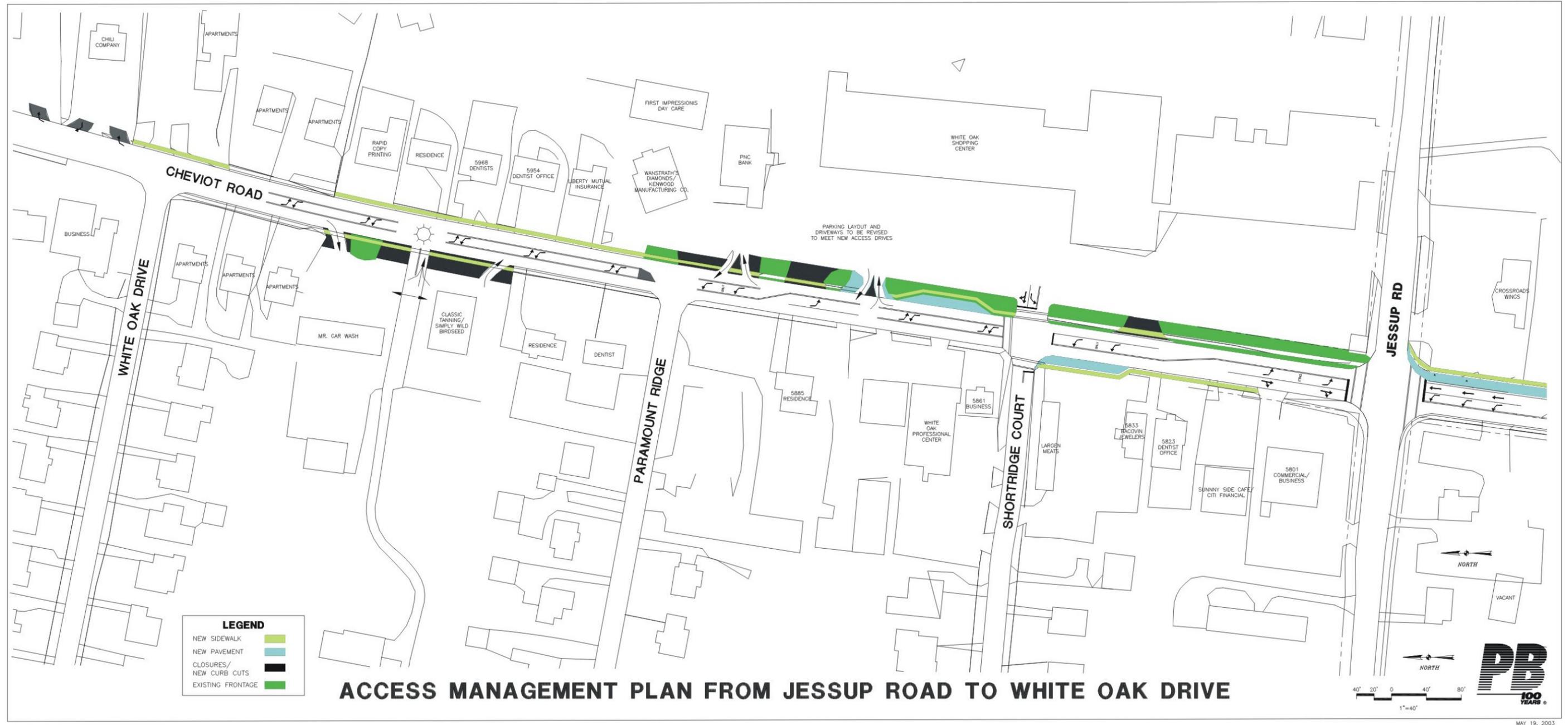
The signalized Cheviot Road intersection with Hubble Road serves St. James Church and School as well as the residential area beyond. However, Hubble Road is quite narrow with only one lane approaching Cheviot Road. The radius on the southwest corner of the intersection is small with a large pole next to the pavement. Consequently, flow out of Hubble Road is slow, thus consuming too much signal time at the expense of the much heavier Cheviot Road traffic. As a result of the existing configuration, the corner turning radius is deficient and school buses taking children home cannot even make the turn, so they go through private property and use White Oak Drive to access Cheviot Road at a location where sight distance is very much impaired by the vertical crest curve to its north.

Figure 11. Proposed Improvement of Cheviot Road from Tallahassee Drive to Jessup Road



JUNE 1, 2003

Figure 12. Access Management Plan from Jessup Road to White Oak Drive



To address these problems, it is recommended that Hubble Road be widened to provide two adequate-width approach lanes to Cheviot Road, one for left turns and the other for right turns, and that the radius on the southwest corner be improved to accommodate school buses and other larger vehicles. As part of the improvement, the signal should be upgraded with improved vehicle detection and a northbound 5-section head to facilitate left turns when traffic is heavy with an eastbound right-turn overlap onto Cheviot Road. St. James and the Archdiocese have been involved in this project and are supportive of the improvement.

From an access-management viewpoint, and as the area develops and/or redevelops, the properties on the east side of Cheviot Road at and south of Hubble Road, should be connected to the intersection with their existing drives converted into right-in/right-out.



This recommended improvement is shown on Figure 13, which also illustrates a proposed access-management improvement just north of Hubble Road. On the west side of Cheviot Road is the St. James ball field complex with its parking area; the parking area is used informally during the week as a park-and-ride by Metro riders.

Opposite the parking area is a complex of businesses, condominiums and apartments. Common parking areas and drives already interconnect some of which; more could be added with a little effort and cooperation among property owners.

The improvement recommended here would relocate the St. James parking lot drive opposite the primary access on the east side of the road and would create a bus cutout and shelter on the west (inbound) side, all the while retaining all parking spaces in the lot. A vehicle and pedestrian actuated traffic signal with crosswalk would be constructed. On the east side, the multitude of parking lots would be interconnected with cross easements and minor construction, and a bus cutout would be placed within the right-of-way. The signal would include a queue-jump phase to facilitate the buses' return to the roadway after making their stops.



The resulting improvement would serve not only commuters using the St. James parking lot but also all others using the sports complex as well as workers, patrons and residents on the east side of Cheviot Road by providing signalized access onto and across Cheviot Road.

6.10 Cheviot Road and South Junction of Blue Rock Road

This Y-type intersection operates at an unacceptable level of service for several reasons. Because of its shape, the

Figure 13. Access Management Plan of Cheviot Road From White Oak Drive to Semloh Avenue



intersection area is large; consequently vehicle clearance time requires a higher percentage of the total time, thus reducing green time available for moving traffic. Turns of approximately 150 degrees require more time than normal turns. Thirdly, the abrupt lane change on the south approach creates safety as well as traffic flow problems.

Several geometric alternatives were evaluated for operational characteristics, safety and capacity. Alternatives included:

- Cheviot Road intersecting Blue Rock in a tee
- Blue Rock intersecting Cheviot Road in a tee
- A roundabout where traffic would diverge and merge at all three intersection legs.

These initial concepts were developed and analyzed by the University of Cincinnati Civil Engineering Class (20-CEE-604) under the direction of Professor John C. Niehaus (March 2003). Based on the analyses, the second alternative is recommended (Figure 14). The improvement would utilize existing rights of way plus the former Chili Company land.

Features of this recommendation include:

- Traffic-actuated signal and turn lanes to facilitate overlapping traffic flows,
- Consolidated access point on east side of Blue Rock Road to serve existing office buildings,
- Upgraded access for Sportsman Club on west side of road with cross easement connection between Hermes and Ben Hill Drive, and
- Interconnection with Ben Hill Drive signal to optimize progressive flow through the two intersections.

The question of retaining the Ben Hill Drive signal was also raised, considering that the signal does not appear to meet warrants and an access from Ben Hill Drive to improved Hanley provides a safe signalized access to points north.

The improvement depicted in Figure 14 is recommended for implementation. It is also recommended that the Ben Hill Drive signal be given further evaluation to determine whether it should remain as part of the final plan for this area.

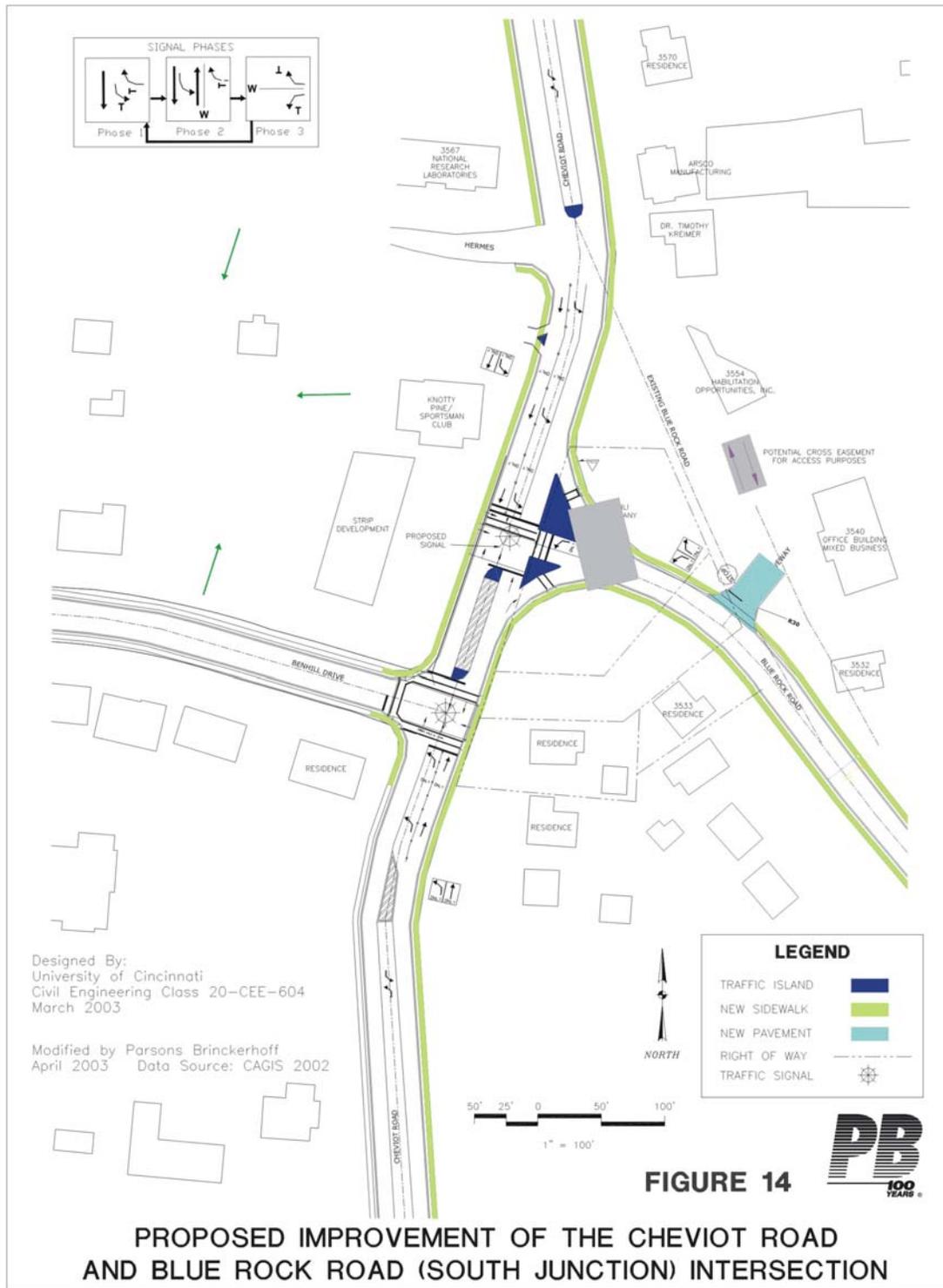
6.11 Banning/Hanley Area

Since the Hanley/Banning reconstruction has resulted in a single signalized intersection, and since United Dairy Farmers and White Oak Garden Center both have direct access to Hanley and Banning Roads, it is recommended that their Blue Rock Road access points be converted to right-in/right-out with appropriate signing and wayfinding leading drivers to the recommended access points for left turns.

6.12 Cheviot Road and North Junction of Blue Rock Road

This Y-shape intersection has some of the same operational, safety and capacity problems described for the south junction. In addition, access from abutting properties is hazardous because northbound traffic never stops and southbound traffic is always

Figure 14. Proposed Improvement of the Cheviot Road and Blue Rock Road (south junction) intersection



moving from one intersection leg or the other. These same factors also make pedestrian crossings quite dangerous.

Two alternative designs were evaluated:

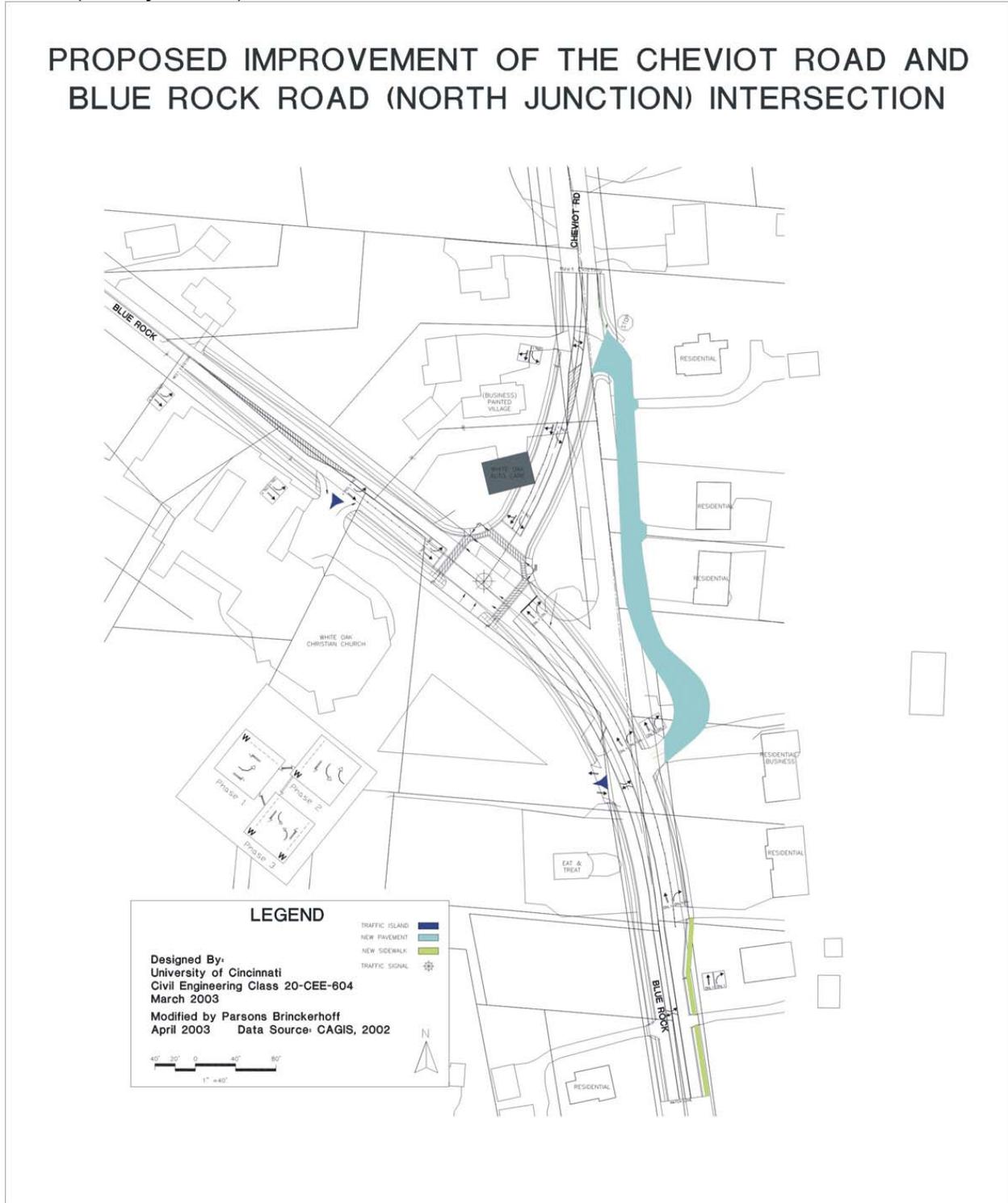
- Cheviot Road intersecting Blue Rock in a tee and
- Blue Rock Road intersecting Cheviot in a tee.

These initial concepts designs were developed and analyzed by the University of Cincinnati Civil Engineering Class (20-CEE-604) under the direction of Professor John C. Niehaus (March 2003).

Analyses showed the first alternative provided greater capacity and is depicted on Figure 15. Characteristics of this recommendation action include:

- Traffic-actuated signal with overlapping movements,
- Actuated signalized access for White Oak Christian Church with other drives becoming right-in/right-out,
- Service drive providing access to residences and businesses on east side of road, and
- The property of White Oak Auto Care would be required for the improvement.

Figure 15. Proposed Improvement of the Cheviot Road and Blue Rock Road (north junction) intersection



7.0 Improvement Recommendations – Northern Area

The following are access-management/safety improvements recommended for specific sites in the Northern Area from the north junction of Cheviot Road and Blue Rock Road in Colerain Township to the intersection of Cheviot Road and Poole Road in Colerain Township. The locations are also shown on Figure 16.

The recommendations are based on data, observations and analyses, recommendations offered at Subarea 5 and 6 public meetings, followed by discussion at the meetings and follow-up investigations and analyses. The recommendations generally proceed northwardly from north of Blue Rock Road.

7.1 Cheviot Road and Galbraith Road

Accident records, capacity analyses, field observations and measurements have identified the need to improve the alignment of Cheviot Road through the intersection and to add left-turn lanes to Galbraith Road. The protrusion of the northeast corner into the intersection essentially reduces the horizontal alignment of Cheviot Road to little more than an angle, far less than a 35 mph-design curve required to maintain safe and smooth traffic flow.

Horizontal curves with 45 mph and 40 mph design speeds were presented to the Task Force for consideration; it was decided that the 40 mph design would be appropriate for a 35 mph road. This curve, and the necessary shaving of the northeast corner, is shown in Figure 17. Also shown is a radius improvement on the southeast corner to facilitate the turning of transit and school buses as well as approximately 6 feet of widening of the Galbraith Road approaches to provide left-turn lanes.

Concern had also been expressed over the vertical alignment of Cheviot Road south of the intersection, but the planning-level analysis of a CAGIS-produced profile did not disclose any deficiencies.

Recommendations are to:

- Proceed with the design and construction of the improvement (Figure 17) and
- Survey the vertical alignment south of the intersection to determine any remedial action required to accompany the horizontal improvement.

7.2 Joseph Drive to Poole Road.

The northern terminus of the corridor serves two significant traffic generators – Colerain High School and the Clippard Family YMCA. Selective widening is needed to maintain required capacities, reduce traffic stoppages by turning movements, and to provide for an efficient signal operation with overlapping of nonconflicting traffic flows. Figure 18 illustrates those recommended improvements. The improvement includes the following characteristics:

- Widening of Cheviot Road to four lanes at north end to provide a northbound right-turn lane, northbound left-turn lane, southbound left-turn lane into Clippard YMCA, and a southbound through lane,

Figure 16. Improvement Recommendations – Northern Area

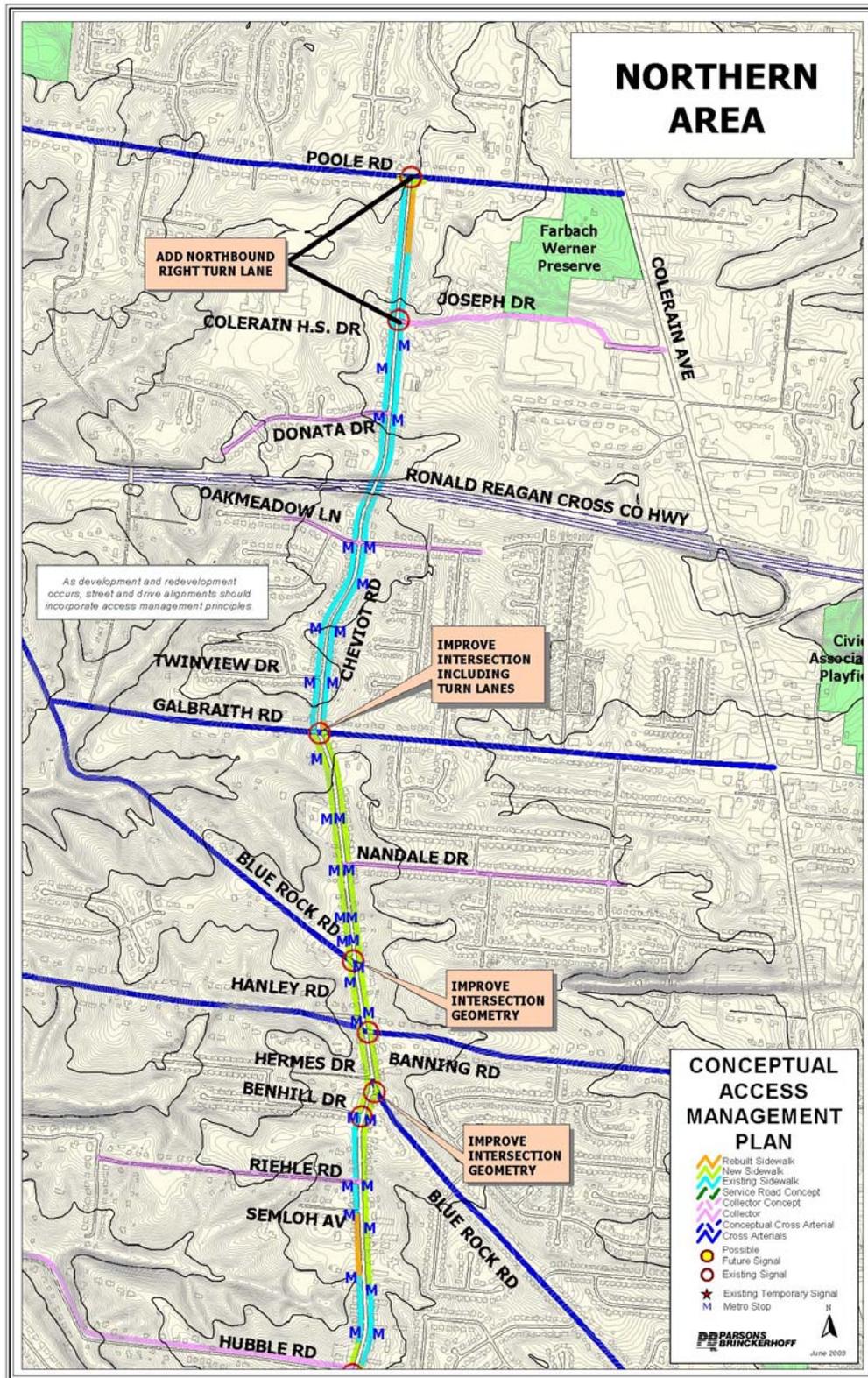
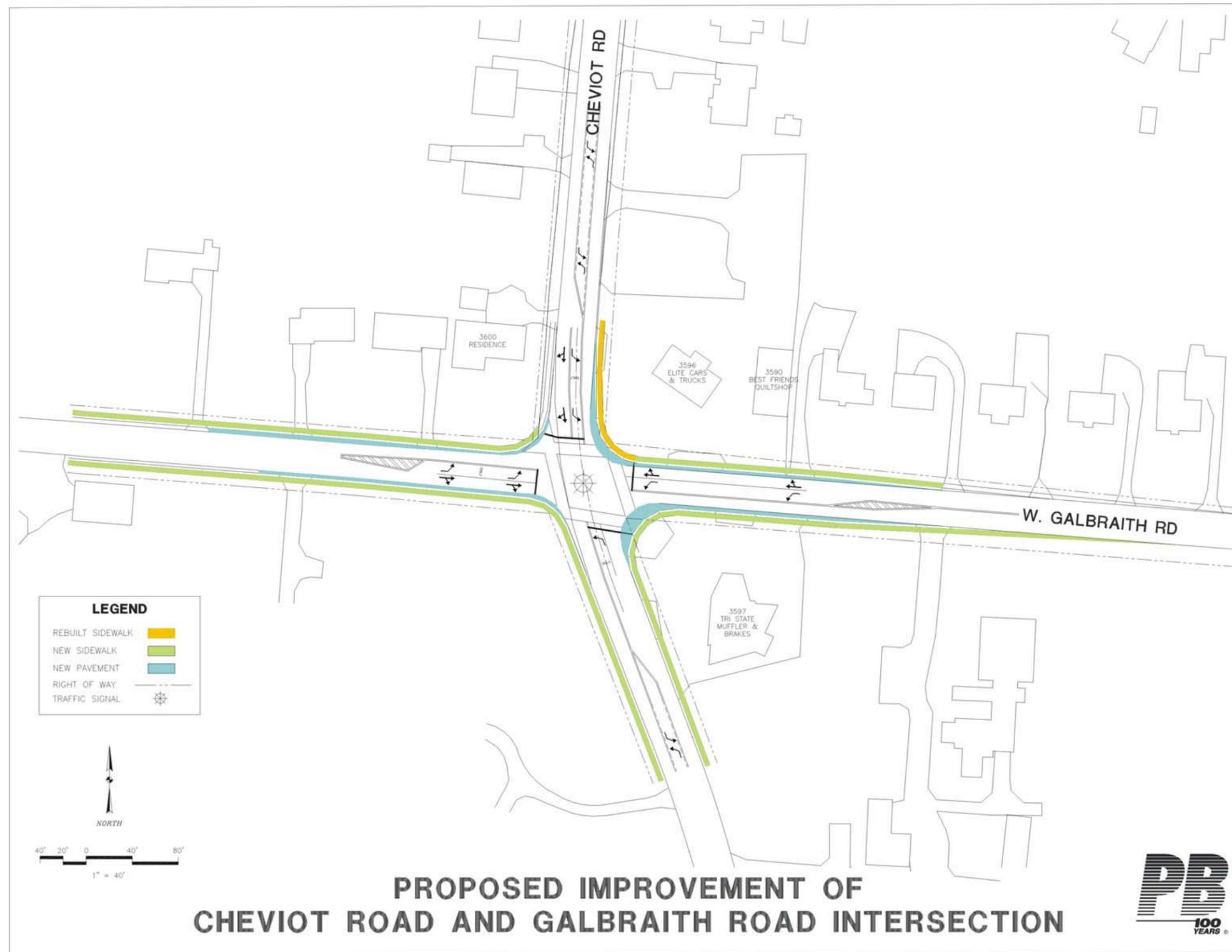


Figure 17. Proposed Improvement of Cheviot Road and Galbraith Road Intersection.



- Widening of Cheviot to three lanes from Clippard Drive south to meet three lanes at Joseph Drive,
- Widening of lanes on Poole Road to bring up to current county standard,
- Addition of eastbound tight-turn lane from Poole to Cheviot Road,
- Improved signalization to provide actuated vehicular and pedestrian movements and overlapping of non-conflicting traffic flows utilizing new auxiliary lanes, and
- Sidewalks and pedestrian indications.

7.3 High School Signal Subsystem

Current traffic signal technology enables signals to be employed to solve short-duration problems and to then return to the more routine daily patterns. The interruption of routine can be accomplished on a regular, predetermined basis when times are predictable or on a traffic-responsive basis to meet needs as and when they occur.

Aerial observations have disclosed long queues of traffic entering Colerain High School in the morning and long queues departing in the afternoon. The queuing occurs because the predetermined sequence and timing of signals is unable to accommodate the short and intense demands. Moreover, queuing also occurs at other times when sports events and other activities at the high school or the YMCA generate short and intense demands on the transportation system.



It is recommended that the signals in this area, including as a minimum the Cheviot Road intersections with Poole Road, Joseph Drive and Galbraith Road, be upgraded into a traffic responsive subsystem that would identify, quantify and address short-term intense needs to “dump” traffic and would then return to their normal sequences. The traffic responsive subsystem would be triggered by system traffic detectors that would detect patterns and volumes that would require short bursts of special attention.

8.0 Construction Cost Estimates

Table 1 lists the construction/implementation cost estimates for the improvement recommendations in the previous four sections. The estimates, that are at a planning level, include roadway and sidewalk construction, signalization and right-of-way. Right-of-way estimates were on parcel data for resources within 1,000 feet of North Bend/Cheviot/Blue Rock Road. Values were provided by CAGIS (2000) using the calculations listed below:

CAGIS Zoning Category	Total acres within the corridor	Total Market Values for the parcels	Acre Average
Business/Commercial/Institutional/Other	449	\$137,074,150	\$305,288
Single Family Residential	595	\$187,757,700	\$315,559

For comparison purposes, for parcels within 1,000 feet of the North Bend/Cheviot/Blue Rock Road corridor, the median acreage for business/other was 0.21 acres with a value of \$88,500. The median values for acreage and values for the single-family residential land uses were, respectively, 0.19 and \$90,900.

The cost estimates are based on current (2002-2003) values and should be increased for inflation to the years that the projects and programs are expected to be implemented. Moreover, as projects and programs move from the planning phase to a preliminary engineering phase, the cost estimates should be refined to reflect more detailed data which will be available at that time

Table 2. Cost Estimates for the recommendations based on 2002-2003 values.

9.0 Implementation Plan

The public attending the final, or comprehensive review, meeting of the North Bend/Cheviot Road Corridor Study were asked to make their recommendations as to whether a project/program should be given high, medium or low priority Table 2.

9.1 Ratings

The ratings are shown in four sections – project-wide, City of Cheviot area, Green Township area and Colerain Township area. The projects and ratings were subdivided because local sources of funding and level of commitment could vary from one political jurisdiction to another even though the Hamilton County Engineer has the overall responsibility for the corridor improvements.

9.1.1 Project Wide

In the “Project Wide” category, upgrading and improved coordination of traffic signals throughout the corridor was clearly the public’s most important project. However, all three projects in the Cheviot area received similar ratings, although based on the scoring the proposed Westwood-Northern/North Bend Road intersection improvement has the most points by a small margin.

9.1.2 Green Township

The most popular project in the Green Township area is the proposed widening to five lanes of North Bend Road from south of Boomer Road to the Interstate 74 interchange. The improvement of the interchange itself was the second most popular followed closely by the proposed additional northbound through lane on Cheviot Road from Tallahassee to Jessup.

It is important to note that the proposed I-74 interchange improvement would probably be funded by ODOT, probably with federal aid and also being subject to certain planning requirements such as an Interchange Modification Study.

9.1.3 Colerain Township

In the Colerain Township area, the reconstruction of the South Blue Rock junction with Cheviot Road and the reconstruction of Cheviot/Galbraith are virtually the same.

9.2 Task Force Recommendations

On June 11, 2003 the Corridor Task Force met, reviewed the public input from the June 4, 2003 public information meeting, and then made its priority list of its four top projects:

- Priority Number 1: Improvements to Hubble Road. This was selected primarily because it can easily be implemented, and has the support of the St. James church and school.
- Priority Number 2: Widen to 5 lanes from just south of Boomer to I-75
- Priority Number 3: South Junction of Blue Rock
- Priority Number 4: Tallahassee to Jessup - Create the second northbound lane

Table 3. Summary of Public Comments and the Task Force Recommendations.

Recommendation	Public Comments Based on the Returned Survey Forms				Estimated Cost (\$)	Task Force Recommendation
	High (#)	Medium (#)	Low (#)	None (#)		
Project Wide						
Sidewalks throughout the corridor, including pedestrian indications at traffic lights.	6	8	3	2	\$306,000 (includes 20% Contingency)	
Reduce the number of access points onto North Bend/Blue Rock/Cheviot roads as redevelopment occurs. This would be accomplished by working with property owners to establish cross easements (connections between properties) and service drives.	11	3	3	2		
Three-lane policy for intersections and driveways (two thru lanes and a center turn lane).	12	5	0	2		
Coordinate traffic signals throughout the corridor.	17	1	0	1	\$900,000	
City of Cheviot						
Woodbine – Actuate Improve signal timing and add pedestrian indications, lengthen the southbound right turn lane from North Bend onto Woodbine.	7	3	4	5	\$30,000	
Alpine – Improve street lighting and signage at the intersection, and build a curb to better define the northeast corner of intersection.	7	4	3	5	\$2,000	
Westwood Northern – Improve signal timing and remove the yield sign from the westbound Westwood Northern onto North Bend turning movement and replace it with a right-turn-on-red sign. Rehabilitate pavement in the intersection area and lengthen the crest vertical curve on the east leg of Westwood Northern Boulevard.	8	3	4	4	\$360,000	

Table 3 continued: Summary of Public Comments and the Task Force Recommendations

Green Township						
Conceptual access management plan from Westwood Northern to Boomer. This plan would include establishing cross easements (connections between adjacent property owners), and service drives as development occurs.	7	3	4	5		
Ridgewood – Prohibit left turn onto North Bend.	6	4	4	5	\$300	
Diehl and Reemelin – Conceptual relocation of Diehl to intersect with Reemelin.	6	5	3	5	Further Study is warranted	
Edgewood – Improve (vertical) curve north of the intersection.	4	3	5	7	\$170,000	
Widen to five lanes from just south of Boomer to I-74.	15	3	0	1	\$407,000	Priority Number 3
Monfort Heights Drive – Possible location for a future traffic signal.	5	6	4	4		
I-74 – Extend the southbound thru lane of North Bend to the I-74 ramp, widen each off ramp.	13	2	2	2	\$410,000	
I-74 to West Fork – Establish the center lane northbound for left turn only into Sam’s Club and other businesses, bus pull out for outbound service.	10	3	3	3	\$90,000	
West Fork Road – Modify pavement markings to have two left turn lanes eastbound onto northbound North Bend Road and a right and thru lane.	8	2	6	3	\$2,000	
West Fork to Epley Lane – Access management plan: reduce curb cuts, develop cross easements, and future traffic signal.	8	7	0	4	\$320,000	
Epley Lane – Convert to right-in/right-out only.	5	4	7	3	\$3,000	
Tallahassee to Jessup – Create a second northbound (outside) lane that will end as a right turn only lane onto Jessup Road.	13	0	3	3	\$486,000	Priority Number 4

Table 3 continued: Summary of Public Comments and the Task Force Recommendations

Jessup to north of Paramount Ridge – Access management plan: reduce curb cuts, develop cross easements, bus pullouts, and a possible flashing light for pedestrian crossings.	10	5	1	3	\$213,000	
Hubble – Widen Hubble to provide right turn/left turn lanes and upgrade the traffic signal.	8	7	1	3	\$132,000	Priority Number 1
Colerain Township						
Area around St. James' Field to Semloh – Access management: plan, realigned drives, traffic signal, create bus pullouts on both sides, proposed service drive.	8	7	1	3	\$331,000	
South Junction of Blue Rock – realign the Blue Rock Road and Cheviot Road intersection.	12	3	1	3	\$729,000	Priority Number 2
Banning/Hanley area – right-in/out of White Oak Garden Center and right-in/out of United Dairy Farmers onto Blue Rock Road.	6	5	5	3	\$900	
North Junction of Blue Rock – realign the Cheviot Road and Blue Rock Road intersection.	8	7	1	3	\$696,000	
Galbraith – Improve intersection including turn lanes for all approaches.	11	5	1	2	\$213,000	
Joseph to Poole – Widen for left turn lane into the YMCA and additional northbound lane while improving (vertical) curve south of the intersection.	6	6	4	3	\$608,000	
Colerain High School – Establish school opening/closing signal timing periods for traffic signals at Joseph, Poole, and Galbraith roads.	10	5	1	3	\$150,000	

9.3 Implementation Strategies

Implementation strategies for these projects are provided below. In addition, Table 2 summarizes the project recommendations, and public support for all of the recommendations of this study. Establishment of an improvement program is based, of course, on more than public support. Some smaller projects may move more quickly because funds of sufficient magnitude and in the proper categories may be available more quickly. Signing and pavement marking improvements normally fall into that category. Other improvements may go more quickly because of popular support by not only the public but also affected property owners; the Hubble Road widening may fall into that category. Some projects and programs may generate local sources of funding, both private and public. Some projects/programs may be accomplished in stages; the overall corridor signal upgrading would fit into that category. And finally, major projects requiring large-dollar funding like the state's Transportation Review Advisory Council (TRAC) and the federal Surface Transportation Program (STP) may require more time because of the competition by many for the available dollars.

9.3.1 Project Wide

In the "Project Wide" category, the two "build" items – sidewalks and upgrading/coordinating of traffic signals – lend themselves to stage construction so implementation of them can begin early.

9.3.2 City of Cheviot

In Cheviot, the City can probably fund the Woodbine and Alpine improvements but would undoubtedly require funding assistance on the Westwood-Northern project. The City can immediately begin the process of programming the improvement, but construction would not occur until funds were committed and engineering design completed.

9.3.3 Green Township

In Green Township, the Hubble Road improvement, which was the Number One priority of the Corridor Task Force, has the support of St. James Church and would result in a safety improvement for school buses now using White Oak Drive, an intersection with limited sight distance, because of the inadequate geometry at Hubble Road. These factors, in addition to a relatively low cost, give this project a high priority.

At the same time, programming of funding and coordination with ODOT should begin for the joint improvement of North Bend Road from south of Boomer Road to the interchange as well as the interchange itself. The new north-to-east on-ramp to I-74, while shown as part of the five-lane widening project, would probably be constructed under the domain of ODOT, so it would be desirable that the two projects be melded into one. The new north-to-east I-74 ramp will also require an interchange modification study because it will increase the flow of traffic onto the eastbound I-74 mainline, so it would be desirable to begin the front-end work on these two projects as early as possible. This project was the Task Force Priority Number 2.

While the I-74 area work is being initiated, preliminary engineering should begin on the second-rated Green Township project, the second northbound through lane on Cheviot Road from Tallahassee to Jessup. Engineering should begin as soon as possible on it because a very small piece of right-of-way will be needed from almost every property owner on the east side of Cheviot Road, and right-of-way acquisition cannot begin until the parcels have been identified and described.

The access-management projects in the I-74-to-Epley Lane area as well as north of Jessup Road and in the St. James Ballfield area will require a considerable amount of dialogue with property owners, businesses and residents, before construction efforts can be initiated. Therefore, it is important that these efforts begin as soon as possible so residents and business groups can participate in the collaborative process, specific plans can be developed and funding sources, some of them private, can be identified.

In summary, in Green Township, the Hubble Road widening and small-budget projects can be implemented quickly; programming and the plan development phase of the Boomer-to-I-74 can begin immediately; preliminary engineering leading to property acquisition can be initiated for the Tallahassee-to-Jessup improvement; and dialogue with residents and businesses can begin leading to access-management improvements.

9.3.4 Colerain Township

In Colerain Township, the relocation of the South Junction of Blue Rock Road was the Task Force's Number 3 priority. Acquisition of the former Chili Company property should be initiated as soon as possible to avoid its re-use and redevelopment with consequent higher acquisition cost. The property situation makes this the most important project in Colerain Township for implementation.

Lower-cost signing and access-management improvements can begin immediately, and the high-school-area traffic-responsive signal subsystem can be the starting point of the Corridor-wide signal system upgrade.