THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION

MCPB
ITEM NO. 3
12-5-2002

November 27, 2002

MEMORANDUM

TO: Montgomery County Planning Board

VIA: Jeffrey Zyontz, Chief
County-wide Planning Division

Richard C. Hawthorne, Chief
Transportation Planning

William Barron, Eastern County Team Leader
Community-Based Planning Division

FROM: Larry Cole: 301-495-4528, for the Park and Planning Department

PROJECT: Fairland Road Improvements
From Columbia Pike (US 29) to Prince George's County
CIP Project No. 509337

REVIEW TYPE: Mandatory Referral No. MR# 02813-DPW&T-1

APPLICANT: Montgomery County Department of
Public Works and Transportation

APPLYING FOR: Plan Approval

COMMUNITY-BASED PLANNING TEAM AREA: Eastern County (Fairland)

RECOMMENDATION: APPROVAL WITH COMMENTS TO DPWT

Staff recommends that the Board approve the proposed project with the following comments to the Montgomery County Department of Public Works and Transportation (DPWT):

Pedestrian and Bicyclist Accommodation

1. Median pedestrian refuges should be constructed at T intersections and on both legs of Fairland Road at the park entrance. Consider using alternative paving materials for the crosswalks at the park entrance.

2. Construct dual handicap ramps where feasible at all intersections to provide the best ADA accommodation and shortest pedestrian crossings of Fairland Road. All T intersections should have at least one ADA-accessible crosswalk across Fairland Road, whether marked or unmarked.

3. Sidewalks should be constructed within the limits of the proposed curbing on all side streets.

4. Modify the design of the proposed roundabouts to reflect the bicycle treatment recommendations of the Federal Highway Administration (FHWA) in their publication "Roundabouts: An Informational Guide".

Landscaping and Environment

5. The proposed landscape panel between the curb and sidewalk should be seven-feet wide. Landscape panels should be planted with street trees in areas without closely-spaced driveways.

6. Modify the typical fifty foot-spacing of street trees where necessary to accommodate the irregular spacing of driveways and retention of existing trees.

7. Minimize impacts to large trees where possible by adjusting the proposed slopes to reduce construction activity within the critical root zones of these trees. Reducing the width of the Verizon driveway opening and elimination of the splitter island should be considered.

8. Plant ornamental trees and other landscaping in the proposed roundabouts. Provide an enhanced landscape treatment at other intersections to provide a transition between segments of roadway with different street tree locations.

9. A final Forest Conservation Plan (FCP), including a detailed tree save plan, must be approved by M-NCPPC prior to grading or land disturbance.

Parks Impacts

10. No storage of materials or staging areas for equipment will be allowed on park property without prior approval by the M-NCCPC inspector and/or Park manager.

11. A park permit is required for work on park property. All proposed removal of trees on park property must be coordinated with Mr. Eugene Rose, M-NCPPC-Natural Resources staff.

12. During construction of this project, the public's access to and use of neighborhood parks shall be maintained and disruption kept to a minimum.

General

13. Staff recommends that DPWT continue to coordinate the design of its project with the Maryland State Highway Administration (SHA) to minimize the overlap of project areas.

PREVIOUS BOARD ACTION: The draft Facility Planning Prospectus for this project was reviewed by the Planning Board on May 3, 2001. The Board's follow-up letter is shown as Attachment 1.

PROJECT DESCRIPTION

This project (see Attachment 2: Vicinity Map) would construct a center-turn lane and curbing on Fairland Road within the project limits, a distance of 1.16 miles. Between Brahms Avenue and Marlow Farm Terrace/Musgrove Road, and between Beethoven Boulevard and Galway Drive, a curbed seven-foot wide grass median would be constructed in place of the center-turn lane since there are no driveways in these two segments. Roundabouts are proposed at Brahms Avenue, Marlow Farm Terrace/ Musgrove Road and Galway Drive.

An eight-foot wide hiker-biker trail would be constructed along the south side of Fairland Road and a five-foot wide sidewalk on the north side through the project limits. The trail and sidewalk would typically be separated from the roadway by a five-foot grass strip. Street trees would be located behind the trail and sidewalk.

SUMMARY

The major philosophical difference between M-NCPPC and DPWT staffs is in how we would characterize the project area. Almost all national design standards and guidelines are divided into two parts: urban and rural. DPWT believes that for most areas outside the Central Business Districts, the more generous clear zones for rural areas should be used, forcing street trees to the back of the sidewalk, rather than in their normal location between the curb and sidewalk. However, closed section roads, as proposed for Fairland Road, are by their nature urban. The area is designated as urban by the U.S. Census. The roundabouts proposed for the project are urban single-lane roundabouts. Suburban areas are problematic because they do not easily fall completely into either the urban or rural category. However, staff believes that Fairland Road is much more heavily weighted toward the urban category.

Staff believes that the overall project concept is good but that the design fails to consistently reflect these more urban conditions. Rather than attempt to alleviate an existing speeding problem, the design would accommodate it by means of moving the street trees away from their normal location next to the roadway. Staff believes that in addition to keeping street trees between the curb and sidewalk, traffic-calming devices such as median pedestrian refuges are needed to ensure that the design of the road encourages a consistently low speed that is close to the posted speed of 30 mph, rather than have a road where the operating speeds vary between the current 45 mph and the 20 mph required at the roundabouts. Promoting consistently low speeds is the best means to ensure the safety of drivers and the other users of Fairland Road - pedestrians and bicyclists.

STAFF ANALYSIS

This project would be constructed to reduce the likelihood of rear-end crashes and improve traffic flow along Fairland Road. On-road bike lanes, the off-road hiker-biker trail and the five-foot sidewalk would provide substantial benefits to bicyclists and pedestrians in this area.

Fairland Road would be constructed as a three-lane road, including a center turn lane, except in two areas where there are no driveways or side streets between Brahms Avenue and Marlow Farm Terrace/Musgrove Road, and between Beethoven Boulevard and Galway Drive. In these two areas, a seven-foot wide landscaped median would be constructed. Roundabouts are proposed to be constructed to control traffic at the Brahms Avenue, Marlow Farm Terrace/Musgrove Road and Galway Drive intersections.

Street Trees and Safety

The issue of where street trees should be located was discussed during the facility planning of this project but was not resolved. The typical location per the County's road standards on closed section roads is between the curb and sidewalk (see Attachment 3).

DPWT staff has expressed a concern generally that the typical location of street trees does not provide a sufficient degree of safety for errant drivers who leave the roadway on arterials and major highways, and that a greater offset of trees from the roadway needs to be provided.

The zoning along this segment of Fairland Road is mostly R-90, with a small area of R-200 and R-60. One of DPWT's reasons on this project as to why the trees should be moved to the back of the sidewalk is the presence of closely spaced driveways and the likelihood that a driver's view of oncoming vehicles might be blocked by street trees between the curb and sidewalk.

There are two areas within the project limits where there are closely-spaced driveways: on the south side of Fairland Road between Musgrove Road and Marlow

Place, and along both sides of Fairland Road between Galway Drive and Big Horn Drive. These areas are shown as Attachment 4. Staff believes that the driveways are a reasonable concern, but one that in this case is alleviated by the proposed four-foot wide on-road bike lanes. Drivers should have an unobstructed view of oncoming traffic without pulling out into the travel lane. Staff agreed not to contest moving the trees to the back of the sidewalk in these areas, but DPWT has insisted that all trees be moved to the back of the sidewalk.

Speed and Traffic-Calming

The posted speed is low - 30 mph. The design speed has been set at 35 mph and the profile in some areas would be modified to meet this higher design speed. DPWT has agreed that vehicles traveling at even 35 mph would not be a sufficient reason to move the trees to the back of sidewalk.

DPWT proposes to move all the trees to the back of the sidewalk throughout the project area however, including those areas without closely-spaced driveways, based on the current *operating* speed, which they state as approximately 45 mph. Staff strongly disagrees with this reasoning. Rather than accommodate the existing speeding problem, staff believes that DPWT should design this project in such a way that speeding is reduced. While traffic-calming has not normally been done by DPWT on arterials, Fairland Road is not a typical arterial, since its frontage is primarily dense residential. DPWT has previously constructed traffic-calming devices on only one arterial, Leland Street between Bradley Boulevard and Woodmont Avenue in Bethesda.

By contrast, SHA has had several traffic-calming projects on arterials in Montgomery County including the following:

- Piney Branch Road (MD 390) from Sligo Creek Parkway to the D.C. line (three separate projects-constructed)

- Metropolitan Avenue (MD 192) from Connecticut Avenue (MD185) to Kensington Parkway (under construction)

- Carroll Avenue from Garland Avenue to University Boulevard (construction scheduled to begin in March 2003)

- Strathmore Avenue (MD 547) within the Town of Garrett Park (This project is scheduled to be reviewed as a Mandatory Referral by the Planning Board in January, with construction scheduled to begin in April 2003.)

- Strathmore Avenue (MD 547) from the Garrett Park Town Line to MD 355 (currently in conceptual design with a citizen task force assembled by SHA)

The traffic-calming devices and techniques used by SHA do not include devices that are suitable only for use on residential streets, such as speed humps and chicanes

that radically divert traffic. Other methods are used, such as reducing roadway widths, providing chokers at intersections, using unit pavers for crosswalks, landscaping, median pedestrian refuges and lesser diversions of traffic around these refuges, to more gently encourage vehicular speeds that are closer to the posted speed. Attachment 5 shows a State highway project on an arterial in Barrington, Rhode Island, with a typical section similar to Fairland Road, that used patterned concrete to delineate the center turn lane to keep traffic speeds low.

Trees close to the roadway provide a passive traffic calming benefit when used in conjunction with these other devices. While the roundabouts on Fairland Road have been proposed for traffic control rather than traffic-calming, they will slow traffic down. The urban single-lane roundabouts proposed have a recommended entry speed of 20 mph (see Attachment 6). In addition, the proposed segments of median should help to keep speeds down since there will only be a single lane roadway on each side. Staff believes that other devices need to be used on the rest of Fairland Road within the project limits to alleviate the existing speeding problem and to ensure that is not unintentionally worsened when the road is widened and the profile improved. Eliminating the speeding problem should eliminate the safety concern about trees close to the roadway.

Staff believes that DPWT should be undertaking the reconstruction of arterials similar to what SHA has been doing: creating a design that responds to the neighborhood rather than trying to design an "ideal" arterial when the roadside conditions do not fit the ideal. Moving the trees back from the curb because of closely-spaced driveways without considering the development requiring those driveways will not achieve a coherent design.

Staff recommends that the following traffic calming devices be considered for use on Fairland Road:

- Constructing median islands where possible at side streets

- Constructing crosswalks of alternative paving materials at the Calverton-Galway Park entrance that will highlight the greater likelihood of pedestrians at this intersection

Pedestrian Accommodation

To provide the desired traffic-calming benefit discussed above and to improve pedestrian safety, staff recommends that median pedestrian refuges be constructed at T intersections where the center-turn lane is not needed on one leg of Fairland Road. In addition, pedestrian refuges are needed in the proposed median on both legs of Fairland Road at the park entrance. As can be seen on Attachment 4, the park entrance is the most direct point of access to the park from the large residential area to the north of Fairland Road.

Dual handicap ramps are needed to provide the shortest crossing of Fairland Road at Marlow Drive/Marlow Farm Terrace and at the Beethoven Boulevard intersection/Galway Park entrance. All intersections should be made ADA-accessible and require at least one crosswalk, marked or unmarked, across Fairland Road with handicap ramps on either side. Sidewalks should be constructed within the limits of the proposed curbing on all side streets.

Roundabouts

Roundabouts are proposed to be constructed to control traffic at the Brahms Avenue, Marlow Farm Terrace/Musgrove Road and Galway Drive intersections. The roundabouts would be constructed in lieu of traffic signals that are not now warranted, but are anticipated to be needed in the future as traffic volumes rise.

Roundabouts have a higher initial construction cost than stop sign-controlled intersections. They cost approximately the same as traffic signal-controlled intersections however, but require less maintenance and cause fewer traffic delays. Building the roundabouts now would avoid the much higher cost of constructing them as a separate project in the future. Attachment 7 is an excerpt from DPWT's technical report discussing the traffic Level-of-Service, travel speeds and aesthetics of the proposed roundabouts.

The proposed roundabouts to be constructed would have an inscribed circle (outside curb to outside curb) diameter of 112'-124'. This size is within the typical range noted for urban single-lane roundabouts in the FHWA publication "Roundabouts: An informational Guide".

Attachment 8 is an excerpt from this guide illustrating the urban single-lane roundabout. The left side of the diagram has an arrow to a second set of ramps on this leg of the intersection with the designation "bike treatment". These ramps would allow bicyclists the option of riding on the sidewalk through the roundabouts area. Beyond the ramps the roadway is narrowed to force bicyclists who wish to remain on-road through the roundabout to share the travel lane with other vehicles, reducing the potential for angle collisions around the central island. ***Staff recommends that the design for the proposed roundabouts be modified to reflect these bicycle features.***

Landscaping

The County's standard for a closed section arterial road with an eighty-foot right-of-way has an eight-foot wide landscape panel between the curb and sidewalk (see Attachment 9). While the proposed roadway has been reduced to forty-one feet rather than fifty feet, to accommodate a lesser number of lanes, the landscape panel is also proposed to be reduced to five feet. This would pre-empt the planting of street trees since the County's minimum width is six feet. In addition, the narrower landscape panel would mean that the sidewalk and bikeway would have to be warped at handicap ramps, which are six feet in length, and at driveways, which are seven feet in length.

Staff recommends that the proposed landscape panels between the curb and sidewalk/bikeway be seven feet wide to provide a good accommodation for pedestrians and bicyclists.

Where not affected by closely-spaced driveways, staff recommends that the landscape panels be planted with street trees, providing a good match with the future interchange project now in design. SHA's typical section for the Fairland Road interchange would have a seven-foot landscape panel on Fairland Road, with street trees. The three US 29 interchange projects already reviewed by the Planning Board as Mandatory Referrals, now under construction or scheduled to begin shortly, also include street trees between the curb and sidewalk where possible along Randolph Road, Briggs Chaney and Spencerville Road.

The north side of Fairland Road between Musgrove Road/Marlow Farm Road and Marlow Farm Road/Marlow Place was recently widened and street trees planted between the curb and sidewalk as part of the Marlow Farm development. This area is proposed to remain undisturbed.

To help manage the visual change between the road sections with different street tree locations, staff recommends that the intersections receive an enhanced landscape treatment. The typical fifty-foot street tree spacing should be modified as necessary to account for the presence of closely-spaced driveways.

Staff recommends that ornamental trees and other landscaping materials be planted in the proposed roundabouts. As noted in Attachment 10, from the FHWA guide referenced above, landscaping in the central island helps to enhance the safety of the intersection by making it a focal point and lowering speeds. Well-designed landscaping would also help to mitigate the intrusion posed by the size of the roundabouts, which would bring the roadway closer to homes and apartments than the existing intersection. Good landscaping would help to make the central island a visual asset.

Environmental

An estimated 1.15 acres of forest would be impacted by the proposed project. A total of 5 specimen trees and 13 significant trees would be either inside or directly adjacent to the Limits of Disturbance (LOD). Some of these trees could potentially be saved but grading and landscaping will impact them significantly. Staff recommends that the project design be reviewed to minimize tree impacts, including tightening the grading line where possible. Efforts should be made to reduce the grading limits along Fairland Road between Brahms Avenue and Musgrove Road/Marlow Farm Terrace to retain as much forest as possible and to reduce the impacts on the critical root zones of the large trees within the limit of disturbance at Brahms Avenue. Reducing the width of the Verizon driveway opening and elimination of the splitter island should be considered.

Approval of a final Forest Conservation Plan (FCP) by M-NCPPC is required prior to grading or land disturbance of the project area. A detailed tree save plan, which fully meets the directives of M-NCPPC Forest Conservation Regulations (#1-10, Section 109B) shall be prepared as part of the FCP. The plan shall include, but not be limited to, identification of stress reduction measures designed to reduce root destruction and increase root growth, pre-construction watering and fertilizing, fencing, root pruning, removal of dead wood from any trees impacted by the project, and measures to minimize edge effects and the entry of invasive species into existing forests. Mitigation will be required for park impacts, forest loss and impacts to specimen trees.

With regard to street tree location, in addition to creating a more pedestrian-friendly environment, street trees between the bikeway/sidewalk and the roadway provide better shading of the roadway pavement to reduce the warming of stormwater. Increased temperatures in stormwater lead to increased temperatures and decreased oxygen in streams. Environmental staff reiterates the recommendation to plant street trees between the curb and sidewalk. Where reducing the landscape panel to less than seven feet in width would allow the saving of large individual trees, this width could be reduced.

Parks Impacts

The proposed project will impact Calverton-Fairland Community Park and Galway Park, of M-NCPPC property along Fairland Road. The approximate impacts are as shown in the chart below.

RIGHT OF WAY IMPACTS TO PARK PROPERTIES						
PROPERTY	AREA REQUIRED					
	RIGHT-OF-WAY		TEMPORARY CONSTRUCTION EASEMENT		GRADING EASEMENT	
	SF	AC	SF	AC	SF	AC
CALVERTON/FAIRLAND COMMUNITY PARK	9,061	0.208	2,237	0.051	3,212	0.074
			321	0.007	728	0.017
					439	0.010
TOTALS	**9,061**	**0.208**	**2,558**	**0.059**	**4,379**	**0.101**
GALWAY PARK	1,822	0.042	162	0.004	1,497	0.034
TOTALS	**1,822**	**0.042**	**162**	**0.004**	**1,497**	**0.034**

With the exception of the traffic circle at Galway Drive, the proposed work is within the Master Plan right-of-way of Fairland Road. Parks staff does not object to the proposed project. Finalization of the proposed physical and right-of-way impacts must

be agreed to prior to issuance of the required Parks permit. During construction of this project, the public's access to and use of neighborhood parks shall be maintained and disruption kept to a minimum.

RELATED PROJECTS

As part of its study of US 29, SHA is undertaking the design of the Master Plan-recommended interchange at Fairland Road. The preliminary plans for this project would extend the limit of work along Fairland Road to Musgrove Road, overlapping DPWT's project by about 1,100 feet. The coordination of DPWT's and SHA's projects has begun but no joint design has yet been submitted to staff for review. While funded for design, SHA's project is not yet funded for construction. ***Staff recommends that DPWT continue to coordinate the design of its project with SHA to minimize the overlap of project areas***. If the subject project is constructed in advance of the interchange project, the proposed sidewalks should be carried up to US 29.

PUBLIC OUTREACH

During the Facility Planning of this project, two public information meetings were held. DPWT held a public information meeting to discuss the preliminary design of this project on September 30, 2002. Since then, an additional information meeting was held for the board of the Tanglewood Home Owners' Association. A similar presentation will be made to the Calverton Citizens Association in December.

BACKGROUND

The draft Facility Planning Prospectus for this project was reviewed by the Planning Board on May 3, 2001. The Fairland Master Plan for this segment of Fairland Road to be two to four lanes wide. DPWT proposed that a three-lane section be constructed as being sufficient to handle the forecast traffic and as being safer than a four-lane design. The Planning Board concurred in the decision to construct a three-lane section. The Board's follow-up letter is shown as Attachment 1.

The detailed design has since been developed, per Comment #1, however, the center left-turn would be constructed only where there is a need to make a left-turn. Staff believes that this is the best design.

Comment #2a, regarding the location of the proposed street trees, remains unresolved, as noted above.

Comment #2b, regarding pedestrian connections across Fairland Road, is addressed in the recommended Board comments above.

LC:cmd

Attachments

MR Fairland Road2.doc

THE MARYLAND-NATIONAL CAPITAL PARK AND PLANNING COMMISSION
8787 Georgia Avenue • Silver Spring, Maryland 20910-3760
(301) 495-4605

Montgomery County Planning Board
Office of the Chairman

June 12, 2001

Albert J. Genetti, Jr., Director
Department of Public Works and Transportation
Executive Office Building, Tenth Floor
101 Monroe Street
Rockville, MD 20850

Dear Mr. Genetti:

The Planning Board reviewed the results of Phase I of the Fairland Road Facility Planning Study at its May 3, 2001 meeting. The Fairland Master Plan recommends that Fairland Road could be either two lanes or four lanes wide. The primary purpose of this review, therefore, was to develop concurrence, prior to beginning detailed design, that the recommended two-lane roadway design would accommodate forecast travel demand.

The Planning Board approved the staff comments on the Draft Project Prospectus as follows:

1. The Fairland Road Facility Planning Study should proceed to Phase II of the facility planning process, developing detailed design for a two-lane cross section with a continuous left-turn lane, as recommended in the Draft Project Prospectus.

2. During detailed design, alternatives should be considered for providing:

   a) trees in the landscape panel between the roadway and the sidewalk/bike path, rather than outside the sidewalk/bike path as shown in the Draft Project Prospectus.

   b) direct and effective pedestrian connections across Fairland Road to the community facilities along the south side.

We appreciate your continued coordination with our staff and look forward to reviewing this project as a Mandatory Referral.

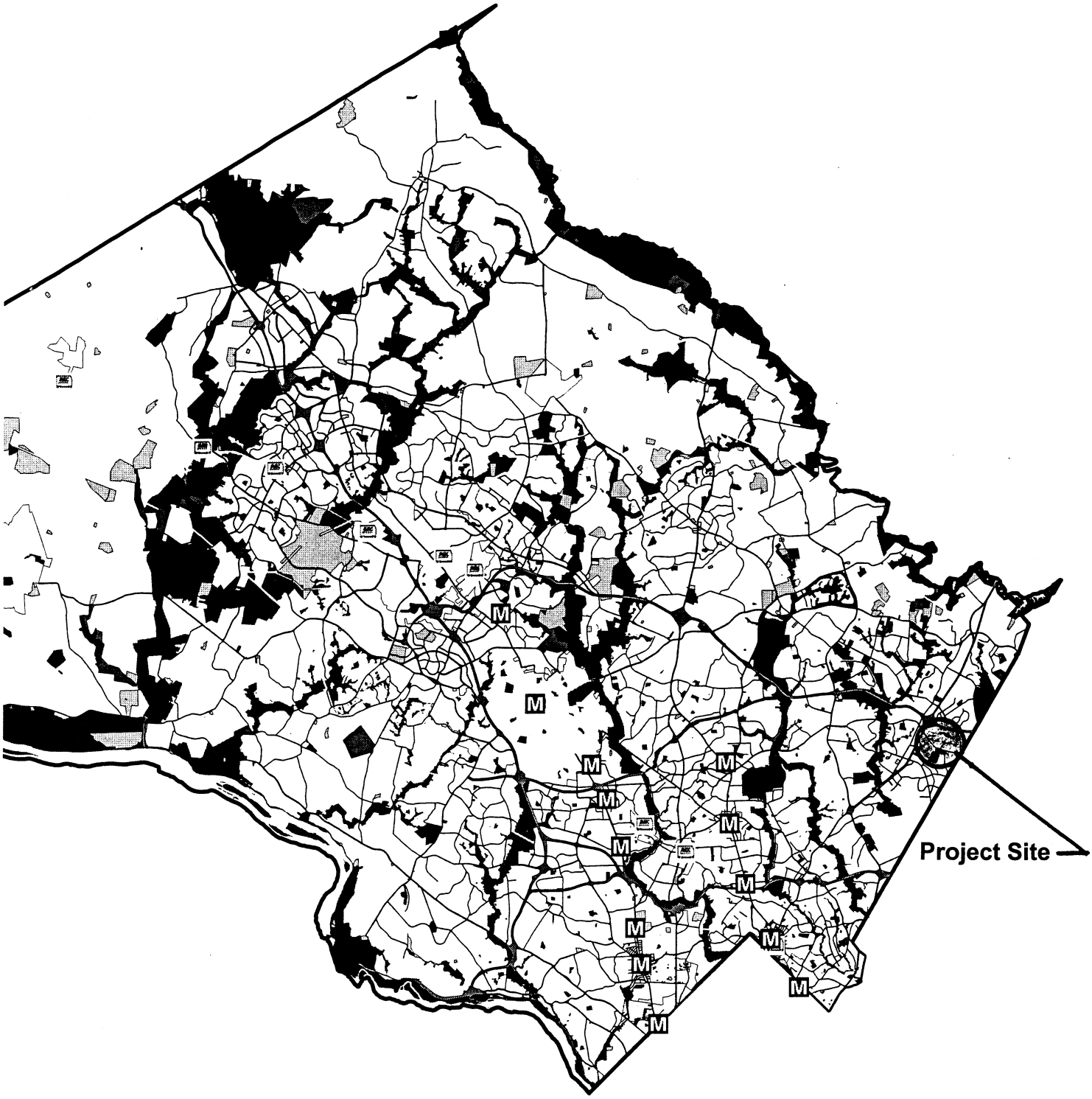
Sincerely,

Arthur Holmes, Jr.
Vice Chairman

AH:DKH:kcw

ATTACHMENT 1

Vicinity Map



ATTACHMENT 2

Map Compiled On 11-26-2002 at 10:43 AM
Map Scale: 1 inch = 20000 feet or 1:240000

0 20000 Feet

The Maryland-National Capital Park and Planning Commission
Montgomery County Department of Park and Planning
Transportation Planning Unit
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M Metro Stations
MARC Stations
Master Plan of Highways Right-of-Way
Master Plan of Historic Preservation Individual Sites
All Parks
Existing
Proposed
Municipalities
Montgomery County

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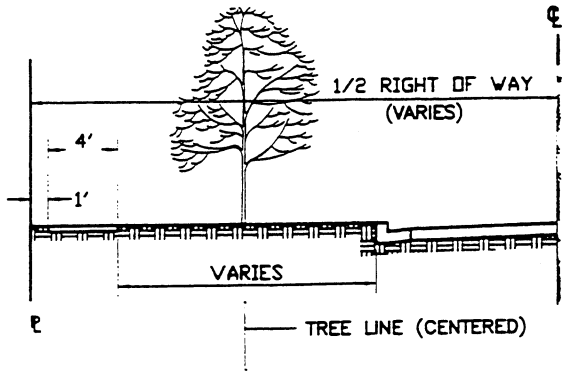
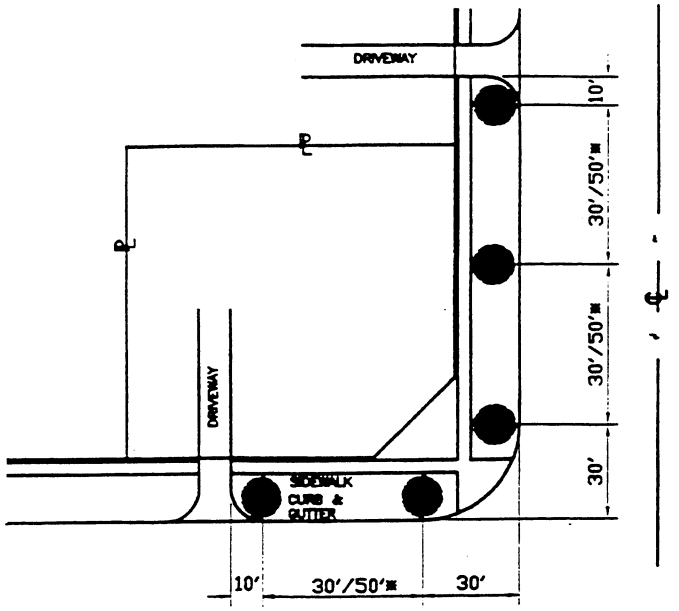


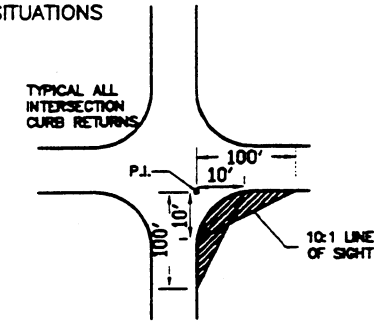
PROFILE VIEW
NO SCALE



PLAN VIEW
NO SCALE

NOTES

1. THE DIMENSIONS SHOWN HERE ARE TYPICAL AND MAY BE MODIFIED IN SPECIFIC SITUATIONS BY THE DEPARTMENT OF TRANSPORTATION.
2. TREES ARE TO BE LOCATED WITH THE FOLLOWING MINIMUM CLEARANCES:
   a. 5' FROM WATER MAIN
   b. 5' FROM GAS BOX
   c. 5' FROM INLET OR MH
   d. 10' FROM FIRE HYDRANT
   e. 15' FROM STREET LIGHT
3. • MINOR TREE SPACING 30' (±5')O.C. MIN.
4. • MAJOR TREE SPACING 50' (±5')O.C. MIN.
5. SHADE TREES TO BE 1 1/2" MINIMUM CALIPER 10' MINIMUM HEIGHT.
6. FLOWERING TREES TO BE 3/4" MINIMUM CALIPER 6' MINIMUM HEIGHT.
7. SPECIES TO BE AS APPROVED BY THE MONTGOMERY COUNTY DEPARTMENT OF TRANSPORTATION.
8. SEE STANDARD NO. MC-702.01 FOR PLANTING DETAILS.
9. NO TREE IS PERMITTED IF GREENSPACE IS LESS THAN 6'.
10. NO TREE IS PERMITTED WITHIN LIMIT OF SIGHT.



ATTACHMENT 3

APPROVED JAN 5/96
DATE

DIRECTOR, DEPT. OF TRANS.

CHIEF, DIV. OF ENG. SERVICES

REVISED

MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION

TREE LOCATIONS
CLOSED SECTION ROADS

STANDARD NO. MC-700.01

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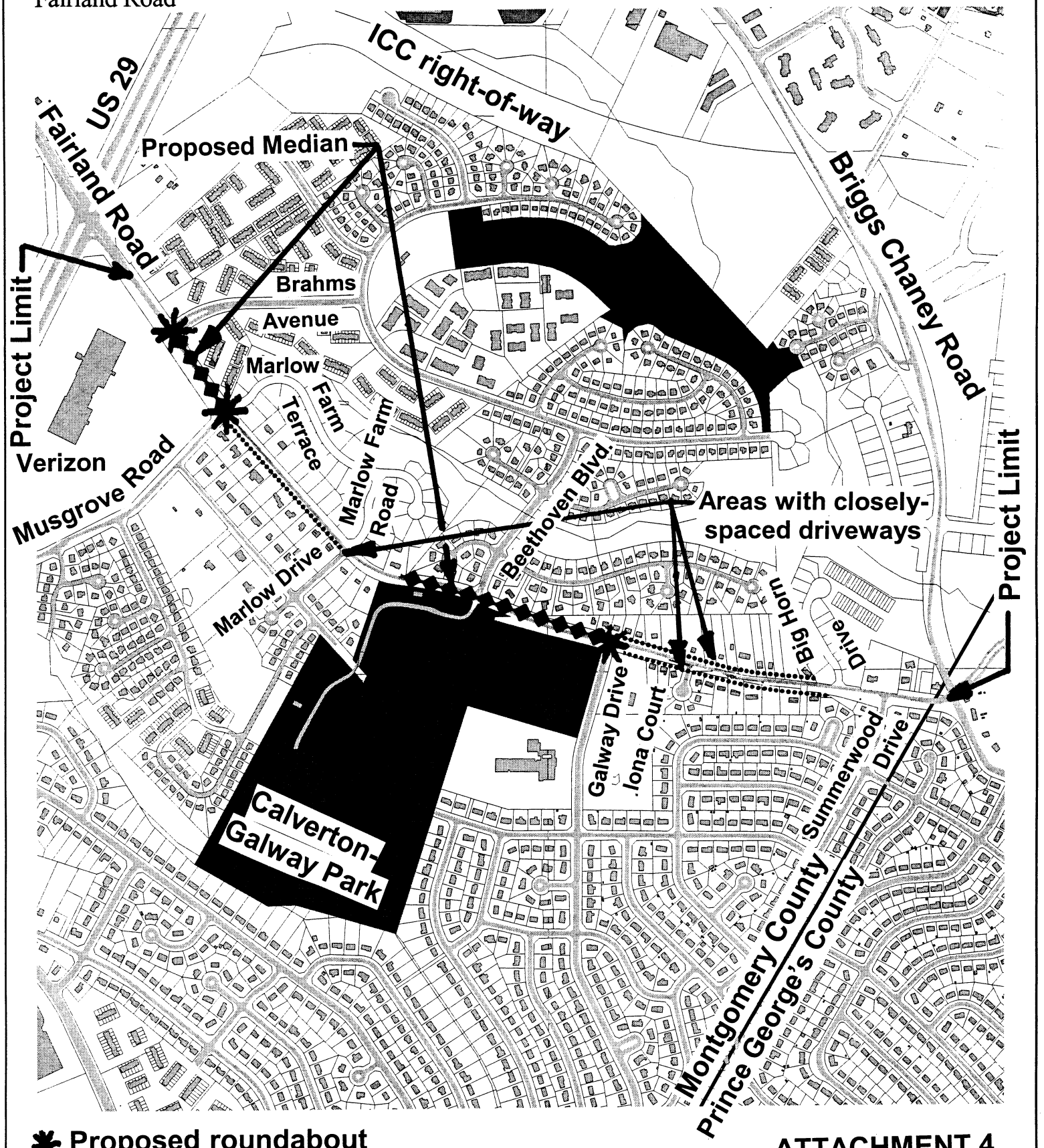

ATTACHMENT 4

Map Compiled On 11-19-2002 at 08:51 AM
Map Scale: 1 inch = 800 feet or 1:9600

0 800 Feet

The Maryland-National Capital Park and Planning Commission
Montgomery County Department of Park and Planning
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Streams
Street Pavement
Buildings
Parking Lots
PAVED PARKING LOT
UNPAVED PARKING LOT
Master Plan of Historic Preservation Historic Districts
Master Plan of Historic Preservation Individual Sites
All Parks
Existing
Proposed
Property
Municipalities
Montgomery County

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ATTACHMENT 5

design of flaring approaches from one to two lanes. Although not explicitly discussed, this guidance could be extended to the design of larger roundabout entries.

Suburban roundabouts incorporate elements of both urban and rural roundabouts.

Note that separate categories have not been explicitly identified for suburban environments. Suburban settings may combine higher approach speeds common in rural areas with multimodal activity that is more similar to urban settings. Therefore, they should generally be designed as urban roundabouts, but with the high-speed approach treatments recommended for rural roundabouts.

Roundabout design should generally accommodate pedestrian, bicycle, and large vehicle use.

In most cases, designers should anticipate the needs of pedestrians, bicyclists, and large vehicles. Whenever a raised splitter island is provided, there should also be an at-grade pedestrian refuge. In this case, the pedestrian crossing facilitates two separate moves: curb-to-island and island-to-curb. The exit crossing will typically require more vigilance from the pedestrian and motorist than the entry crossing. Further, it is recommended that all urban crosswalks be marked. Under all urban design categories, special attention should be given to assist pedestrian users who are visually impaired or blind, through design elements. For example, these users typically attempt to maintain their approach alignment to continue across a street in the crosswalk, since the crosswalk is often a direct extension of the sidewalk. A roundabout requires deviation from that alignment, and attention needs to be given to providing appropriate informational cues to pedestrians regarding the location of the sidewalk and the crosswalk, even at mini-roundabouts. For example, appropriate landscaping is one method of providing some information. Another is to align the crosswalk ramps perpendicular to the pedestrian's line of travel through the pedestrian refuge.

1.6.1 Comparison of roundabout categories

Exhibit 1-7 summarizes and compares some fundamental design and operational elements for each of the six roundabout categories developed for this guide. The following sections provide a qualitative discussion of each category.

Exhibit 1-7. Basic design characteristics for each of the six roundabout categories.

Design Element	Mini-Roundabout	Urban Compact	Urban Single-Lane	Urban Double-Lane	Rural Single-Lane	Rural Double-Lane
Recommended maximum entry design speed	25 km/h (15 mph)	25 km/h (15 mph)	35 km/h (20 mph)	40 km/h (25 mph)	40 km/h (25 mph)	50 km/h (30 mph)
Maximum number of entering lanes per approach	1	1	1	2	1	2
Typical inscribed circle diameter[1]	13 m to 25 m (45 ft to 80 ft)	25 to 30 m (80 to 100 ft)	30 to 40 m (100 to 130 ft)	45 to 55 m (150 to 180 ft)	35 to 40 m (115 to 130 ft)	55 to 60 m (180 to 200 ft)
Splitter island treatment	Raised if possible, crosswalk cut if raised	Raised, with crosswalk cut	Raised, with crosswalk cut	Raised, with crosswalk cut	Raised and extended, with crosswalk cut	Raised and extended, with crosswalk cut
Typical daily service volumes on 4-leg roundabout (veh/day)	10,000	15,000	20,000	Refer to Chapter 4 procedures	20,000	Refer to Chapter 4 procedures

1. Assumes 90-degree entries and no more than four legs.

TABLE 2

RESULTS OF CAPACITY ANALYSES

Intersection	2020 Peak Hour	Roundabout		Two-Way Stop Controlled Intersection		Signalized Intersection	
		Level of Service	Average Delay (sec/veh)	Level of Service	Average Delay (sec/veh)	Level of Service	Average Delay (sec/veh)
Brahms Avenue	AM	B	18.4	F	96.7	C	24.0
	PM	B	15.3	F	87.6	D	39.5
Musgrove Road	AM	B	13.1	---	---	C	30.7
	PM	B	12.9	---	---	B	19.9
Beethoven Boulevard	AM	B	12.1	D	31.8	---	---
	PM	B	11.7	C	18.8	---	---
Galway Drive	AM	B	12.3	---	---	B	15.4
	PM	B	11.1	---	---	B	19.2

Safety Analysis

Prediction of accident rates, and comparison of anticipated accident rates under varying geometric conditions, is difficult under the best of circumstances. This is particularly true in the case of Fairland Road, where improvements will be made, even if roundabouts are not constructed. With that caveat in mind, the following discussion is offered.

The *Fairland Road Project Prospectus* noted that this corridor had a greater-than-normal accident history during the years of 1996 - 1998, and also noted accidents at each of the four locations under study for roundabouts. At Brahms Avenue, two of the six reported accidents were angles; the frequency of these types of accidents tends to be reduced by roundabouts. At Musgrove Road, both accidents involved failure to yield when making a left turn; the frequency of these types of accidents also tends to be reduced by roundabouts. One angle accident occurred at Beethoven Boulevard. Of the nine accidents at Galway Drive, four were of the types mentioned above. It should also be noted that two of the intersections (Brahms Avenue and Galway Drive) had deficiencies in horizontal and vertical geometry, which will be addressed by this project, regardless of whether roundabouts or traditional intersections are constructed.

Well-designed roundabouts generally have been shown to have lower accident rates and lesser accident severities than the intersections which they were replacing. There is no reason to expect that roundabouts at these four intersections would differ from the norm.

Travel Speeds and Aesthetics

Roundabouts tend to force a reduction in the speed of traffic on the mainline roadway (Fairland Road, in this instance), as those vehicles are forced to negotiate the roundabout. This applies to all mainline traffic at two-way stop-controlled intersections, and to mainline traffic which is not delayed at a signalized intersection. Vehicles which would have been stopped at a signalized intersection actually have an increase in average speed at those roundabouts which decrease delay. As a result of the combination of these two factors, speeds on the mainline roadway tend to be more uniform with roundabouts than they would with more traditional intersections.

Roundabouts also can offer an opportunity for different aesthetic treatments, in terms of landscaping and gateways, than those available with traditional intersection design. Many communities value these opportunities highly.

Construction Costs and Right-of-Way Implications

URS has performed some preliminary highway engineering analyses of the four locations, in an effort to ascertain differences in construction costs and right-of-way requirements. The results of these efforts are shown in **Appendix B.**

URS developed concept level plans for both a single lane roundabout and a traditional intersection at each of the four locations. These are shown in **Appendix B (Tables B.1 - B.8**). The locations of the intersections were based on a preliminary horizontal and vertical alignment of Fairland Road. The geometry for the roundabout was based on Montgomery County Standard No. MC-221.02. The roundabouts have an inscribed circular diameter of 112

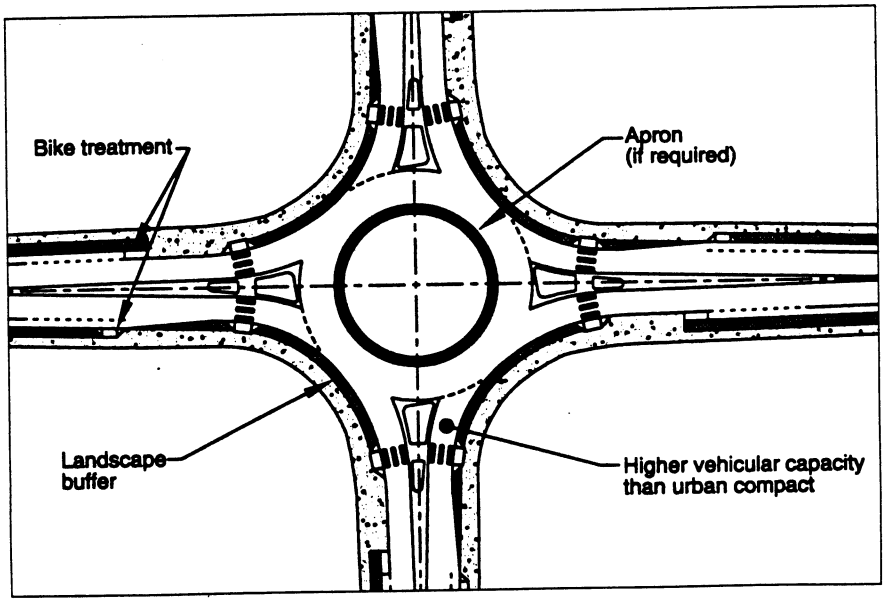
1.6.4 Urban single-lane roundabouts

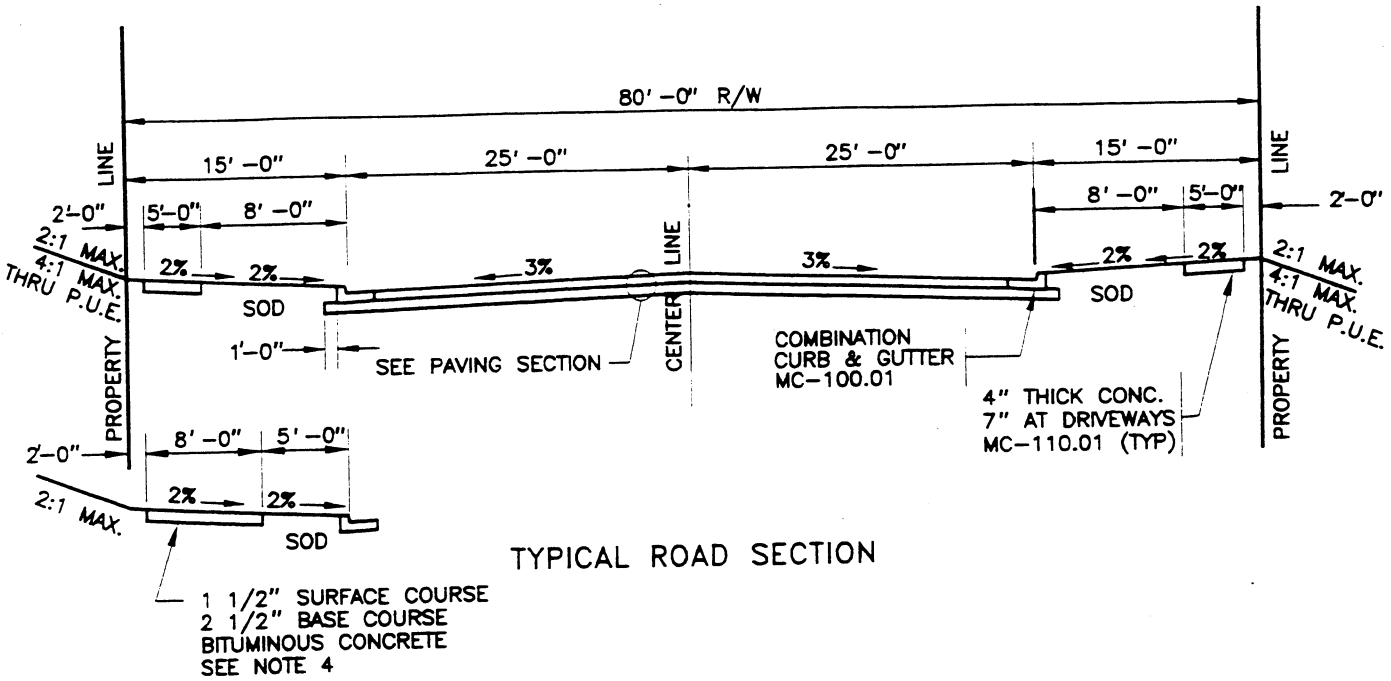
Urban single-lane roundabouts have slightly higher speeds and capacities than urban compact roundabouts.

This type of roundabout is characterized as having a single lane entry at all legs and one circulatory lane. Exhibit 1-10 provides an example of a typical urban single-lane roundabout. They are distinguished from urban compact roundabouts by their larger inscribed circle diameters and more tangential entries and exits, resulting in higher capacities. Their design allows slightly higher speeds at the entry, on the circulatory roadway, and at the exit. Notwithstanding the larger inscribed circle diameters than compact roundabouts, the speed ranges recommended in this guide are somewhat lower than those used in other countries, in order to enhance safety for bicycles and pedestrians. The roundabout design is focused on achieving consistent entering and circulating vehicle speeds. The geometric design includes raised splitter islands, a nonmountable central island, and preferably, no apron. The design of these roundabouts is similar to those in Australia, France, and the United Kingdom.

The design focuses on consistent entering and exiting speeds.

Exhibit 1-10. Typical urban single-lane roundabout.





TYPICAL ROAD SECTION

BIKE PATH OPTION

3" BITUMINOUS CONCRETE SURFACE COURSE IN 2 – 1 1/2" LAYERS
5" BITUMINOUS CONCRETE BASE COURSE
8" GRADED AGGREGATE BASE COURSE IN 2 – 4" LAYERS
*
APPROVED SUBGRADE

PREFERRED

3" BITUMINOUS CONCRETE SURFACE COURSE IN 2 – 1 1/2" LAYERS
9" BITUMINOUS CONCRETE BASE COURSE IN 2 – 4 1/2" LAYERS
*
APPROVED SUBGRADE

ALTERNATE

* SUBGRADE DRAINS REQUIRED
SEE MC-525.01

ALTERNATE PAVING SECTIONS

GENERAL NOTES

1. REFER TO MARYLAND STATE HIGHWAY ADMINISTRATION SPECIFICATIONS FOR MATERIALS AND METHODS OF CONSTRUCTION.
2. SEE STANDARD NO. MC-811.01 – METHODS OF GRADING SIDE SLOPES.
3. TOP OF CURB ELEVATION = CENTERLINE ELEVATION -0.34' (FOR 6" CURB HEIGHT).
4. BIKE PATH WILL BE REQUIRED ONLY IF SPECIFIED IN MASTER PLAN.
5. WHEN A TRAFFIC BARRIER IS WARRANTED INCREASE THE RIGHT OF WAY TO ALLOW THE TRAFFIC BARRIER TO BE PLACED OUTSIDE OF THE SIDEWALK.

APPROVED JAN 5/96
DATE

DIRECTOR, DEPT. OF TRANS.

CHIEF, DIV. OF ENG. SERVICES

REVISED

MONTGOMERY COUNTY
DEPARTMENT OF TRANSPORTATION

ARTERIAL ROAD

STANDARD NO. MC-213.01

P:\DOTSTD\MC21301 6-24-94 80520 am EST

ATTACHMENT 9

7.5.2 Central island landscaping

The central island landscaping can enhance the safety of the intersection by making the intersection a focal point and by lowering speeds. Plant material should be selected so that sight distance (discussed in Chapter 6) is maintained, including consideration of future maintenance requirements to ensure adequate sight distance for the life of the project. Large, fixed landscaping (trees, rocks, etc.) should be avoided in areas vulnerable to vehicle runoff. In northern areas, the salt tolerance of any plant material should be considered, as well as snow storage and removal practices. In addition, landscaping that requires watering may increase the likelihood of wet and potentially slippery pavement. Exhibit 7-24 shows the recommended placement of landscaping within the central island.

The slope of the central island should not exceed 6:1 per the requirements of the AASHTO *Roadside Design Guide* (9).

Avoid items in the central island that might tempt people to take a closer look.

Where truck aprons are used in conjunction with a streetscape project, the pavement should be consistent with other streetscape elements. However, the material used for the apron should be different than the material used for the sidewalks so that pedestrians are not encouraged to cross the circulatory roadway. Street furniture that may attract pedestrian traffic to the central island, such as benches or monuments with small text, must be avoided. If fountains or monuments are being considered for the central island, they must be designed in a way that will enable proper viewing from the perimeter of the roundabout. In addition, they must be located and designed to minimize the possibility of impact from an errant vehicle.

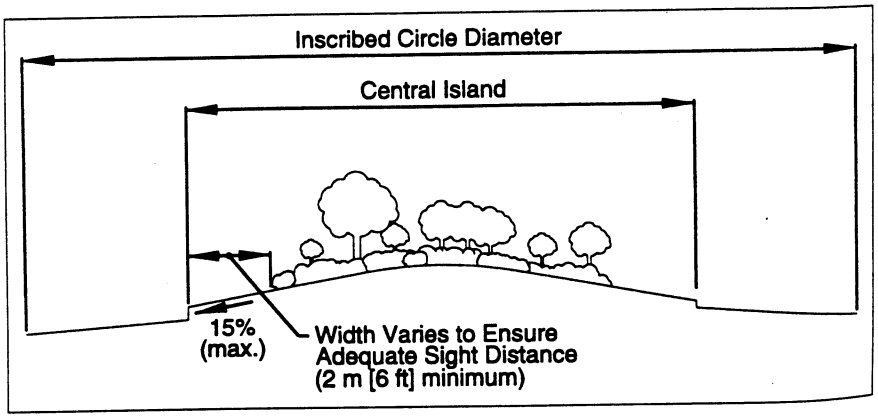


Exhibit 7-24. Landscaping of the central island.

7.5.3 Splitter island and approach landscaping

In general, unless the splitter islands are very large or long, they should not contain trees, planters, or light poles. Care must be taken with the landscaping to avoid obstructing sight distance, as the splitter islands are usually located within the critical sight triangles (see Chapter 6).

ATTACHMENT 10

Landscaping on the approaches to the roundabout can enhance safety by making the intersection a focal point and by reducing the perception of a high-speed through traffic movement. Plant material in the splitter islands (where appropriate) and on the right and left side of the approaches can help to create a funneling effect and induce a decrease in speeds approaching the roundabout. Landscaping in the corner radii will help to channelize pedestrians to the crosswalk areas and discourage pedestrians from crossing to the central island.

7.5.4 Maintenance

Ensure that whatever landscaping is installed, it will be maintained.

A realistic maintenance program should be considered in the design of the landscape features of a roundabout. It may be unrealistic to expect a typical highway agency to maintain a complex planting plan. Formal agreements may be struck with local civic groups and garden clubs for maintenance where possible. Liability issues should be considered in writing these agreements. Where there is no interest in maintaining the proposed enhancements, the landscape design should consist of simple plant materials or hardscape items that require little or no maintenance.

7.6 References

1. Federal Highway Administration (FHWA). *Manual on Uniform Traffic Control Devices*. Washington, D.C.: FHWA, 1988.
2. Federal Highway Administration (FHWA). *Standard Highway Signs*. Washington, D.C.: FHWA, 1979.
3. Smith, S.A., and R.L. Knoblauch. "Guidelines for the Installation of Crosswalk Markings." In *Transportation Research Record 1141*. Transportation Research Board, National Research Council, Washington, D.C., 1987.
4. Herms, B.F. "Some Visual Aspects of Pedestrian Crosswalks." In *Proceedings, 22nd California Street and Highway Conference*, Institute of Transportation and Traffic Engineering, University of California, Los Angeles, January 1970.
5. Centre d'Etudes sur les Réseaux les Transports, l'Urbanisme et les constructions publiques (CERTU). *L'Éclairage des Carrefours à Sens Giratoire (The Illumination of Roundabout Intersections)*. Lyon, France: CERTU, 1991.
6. American Association of State Highway and Transportation Officials (AASHTO). *An Information Guide for Roadway Lighting*. Washington, D.C.: AASHTO, 1985.
7. American Association of State Highway and Transportation Officials (AASHTO). *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. Washington, D.C.: AASHTO, 1994.
8. Illuminating Engineering Society (IES). *American National Standard Practice for Roadway Lighting*. Standard RP-8. December 1982.
9. American Association of State Highway and Transportation Officials (AASHTO). *Roadside Design Guide*. Washington, D.C.: AASHTO, 1989.