



THOROUGHFARE PLAN

An examination of the transportation network within a community is an important part of a Master Plan as land uses and roads are interdependent. A well designed and maintained road network is needed to provide access to development; yet the pattern of land uses and number and type of access points onto roads impact the function of the road system. The function of the road system and its ability to move traffic in an efficient and convenient manner has a significant impact on the viability of land uses and the overall quality of life in a community.

EXISTING CONDITIONS

The process for planning a community's transportation system is similar to the land use planning process; it must begin with a study and analysis of existing conditions. This includes an analysis of current traffic volumes, recent vehicle crash data, and the existing conditions of the Township's roadways.

Traffic Volumes

The Existing Road Conditions Map shows 24-hour traffic volumes on major roadways. To prepare this map, data were obtained from the Washtenaw County Road Commission and Michigan Department of Transportation.

The highest volume roads in Bridgewater Township are US 12, Austin Road, and Clinton Road. US 12 is a two-lane state highway crossing the southeastern corner of the Township. A 1999 count on US 12, near the Township's eastern boundary, found that it was carrying about 12,800 vehicles per day. The volume on US 12 decreases slightly, to about 12,600 vehicles per day, northeast of the Village of Clinton.

Austin Road, which serves as the Township's main east-west travel route, carried between 3,905 and 4,696 vehicles per day in 1999. Clinton Road, running north-south, carried between 1,806 and 2,479 vehicles per day.

Existing Road Network

As indicated on the Existing Road Conditions Map, the majority of Bridgewater Township's roads are unpaved. According to the latest traffic volume counts, most of these roads carry very low volumes (under 400 vehicles per day). The ability of unpaved roads to carry high traffic volumes depends on their width, alignment, and state of maintenance.

The Existing Road Conditions Map also identifies locations on the Township's road system that may be of concern. Such locations include:

- Severe curves
- Offset intersections
- Skewed intersections (angles less than ninety degrees or other unusual configurations)
- Intersections having more than one crash per year

Traffic Crashes

This section includes a general examination of traffic accident causes, factors that influence traffic safety, and traffic accident trends and conditions, as well as specific traffic crash data and trends within Bridgewater Township.

Causes of Traffic Accidents and Factors that Influence Safety

Roadway design, driver behavior, and weather conditions may all be contributing factors to the cause of an accident. The most frequent cause of traffic accidents is attributed to improper driving. Excessive speed, failure to yield the right-of-way, and following too closely are the principal types of improper driving behavior that lead to accidents. Alcohol and other drugs were reported to be a factor in over one-half of the fatal traffic accidents in the United States.

The impact of weather on traffic accidents may seem significant because a high number of traffic accidents can occur during a short period of time; however, over one-half of total traffic accidents take place when pavement is dry.

The general characteristics of traffic accidents vary significantly in urban and rural areas. Approximately one-quarter of all rural accidents take place at intersections versus about one-half for urban areas. Although more accidents take place in urban areas, accidents in rural areas are more severe; the severity is primarily due to higher rural speeds.

The impact of congestion becomes apparent when examining the relationship between increased traffic volumes and accident frequency. Studies have shown that accident rates increase with increasing volume to a certain point, and then the accident rate drops as congestion and volumes increase. The peak in one study was found to be 650 vehicles per hour on California highways; another study of two-lane rural roads showed similar results with a peak at about 8,000 vehicles per day.

Roadway design and safety features also impact accident rates. Several roadway design and safety features are discussed below.

Lane Width

The effect of roadway width on traffic accidents generally increases as vehicle speeds increase. One study showed that widening 240 miles of highway from nine-foot wide lanes to 11-foot wide lanes reduced accidents by 21 percent on low-volume roads and 47 percent on high volume roads.

Highway Shoulders

Studies have shown that accident rates decrease with increasing shoulder width. This is primarily due to the fact that motorists traveling on roads with wide shoulders have a stable area to use if they cross the outer pavement edge.

Horizontal Curves

Curves in roadway pavement increase the possibility of traffic accidents. The most frequent accident type is skidding.

Vertical Alignment

A change in pavement elevation can also have an impact on accident rates. Long, steep grades and steep grade/horizontal curve combinations can greatly increase the frequency of accidents.

Intersections

The design, location, number of approaches, traffic controls and vehicular volume of an intersection influence the number and type of accidents that will occur at a given intersection. For example, an intersection with three approaches is generally safer than one with four approaches because of the reduced number of conflicting movements. The sight distance for the motorists approaching the intersection is also a critical variable.

Speed

The speed at which vehicles travel must reflect an appropriate response to existing road and traffic conditions in order to minimize the frequency and

severity of accidents. High speeds are often safer than slow speeds on roads designed for high speed travel, provided road and weather conditions are good. However, high speeds can both increase the severity of accidents and decrease the frequency of accidents.

Other Factors

Other factors that influence speed and safety include night lighting, railroad crossings, pedestrian crossing, interchanges, and median designs. A comprehensive discussion of all these factors is beyond the scope of this report. However, the general discussion above has been included to provide the reader with some background on the cause of traffic accidents and factors influencing safety before examining accident data within Bridgewater Township.

Traffic Crash Data and Trends

The purpose of crash analysis is to identify hazardous locations based on crash history, traffic volumes, and roadway characteristics. Several analysis techniques are available, including the frequency method, rate method, and severity method. For this analysis, the first two techniques were used. The frequency method identifies and ranks locations on the basis of the number of crashes. It is the easiest to apply but does not consider “exposure” - i.e., traffic volume. More reflective of the “true” hazard level is the crash rate, which combines the crash frequency with the amount of traffic exposure or volume. For intersections, crash rate is generally expressed in crashes per million entering vehicles.

Crash data obtained from the Southeast Michigan Council of Governments (SEMCOG) were analyzed, along with the above-cited traffic volume data from the Michigan Department of Transportation and Washtenaw County Road Commission. The SEMCOG crash data consisted of the number of crashes occurring by intersection, year (1997-99), and severity. Crash severity levels are based on the most harmful injury among the persons involved in a crash and are designated by letters, as follows:

- θ F - Fatality
- θ A - Incapacitating injury (e.g., paralysis, broken limb)
- θ B - Non-incapacitating injury (e.g., abrasions, bruises, swelling)
- θ C - Probable but not visible injury (e.g., sore or stiff neck)
- θ PDO - No injury, i.e., property damage only

Figure TH 1 shows the number of total crashes (between 1997 – 1999) at each of the 26 intersections in descending order, based on severity of crash identified above. All these 26 intersections had at least one crash in the three-year study period. Key findings include:

- ❑ The intersections along Austin corridor generally have the highest number of crashes compared with intersections elsewhere.
- ❑ The worst type of crash experienced was incapacitating injury crash, i.e., there were no reported fatal crashes during the period.
- ❑ Property damage only crashes accounted for the majority of total crashes reported.

The Crash Data Map presents crash frequency and rate for the same 26 intersections as above. Key findings include:

- ❑ The intersections along Austin corridor generally held the highest crash rates, followed by the intersections along the Clinton Road corridor.
 - ❑ The highest crash rate occurred at the intersection of Hogan and Wilbur. However, this may be a case where the hazard is over-represented due to very low entering volumes.
- θ US 12, a state highway crossing through southeast part of the Township, had the lowest crash rates.

SEMCOG's *Traffic Safety Manual (First Edition)* defines the level needed to establish statistically that some intersections are more "hazardous" than the others, based on certain types of road systems under study, i.e., urban vs. rural, arterial vs. collector, and so on. A review of the crash data indicates that only one of the intersections within the Township's road systems had a crash rate greater than SEMCOG's established critical rate of 1.75 per million entering vehicles for the class of road and intersections under study. The intersection of Hogan and Wilbur had a crash rate of 2.9. This intersection was also the only one that exceeded SEMCOG's average rate calculated to be 1.04 crashes per million entering vehicles.

Austin Road, one of the few paved roads within the Township, serves as a thoroughfare across the Township and between Manchester (US-52) and Saline (US 12). The relative high intersection-related crash rates along this corridor are likely related to both the road's function and the many changes in horizontal alignment (curves in the road). Similarly, the same is true for intersections along Clinton Road. However, due to the nature of other Township roads (excluding US 12), i.e., unpaved collectors and minor collectors carrying very low traffic volumes, it is reasonable to expect that the crash incidence would be rare, as reflected in the SEMCOG's crash data.

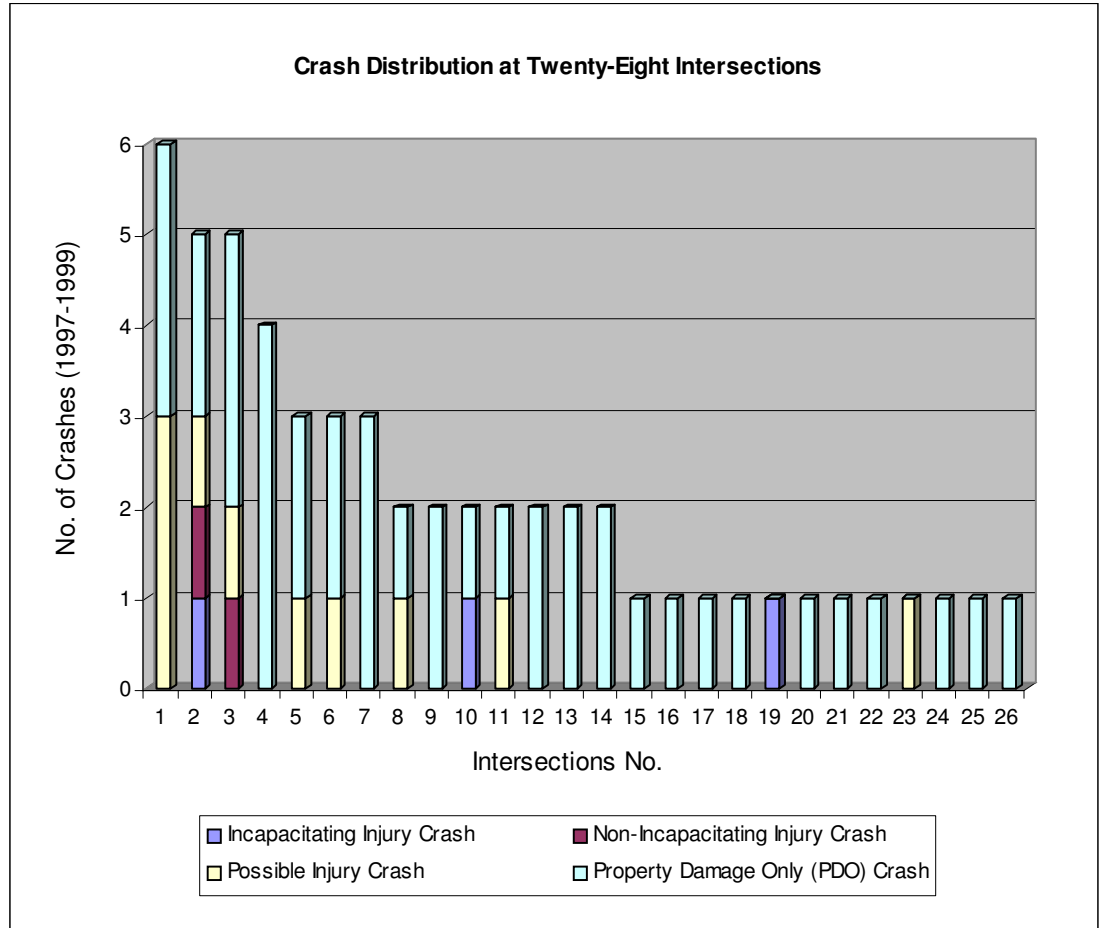
Table TH 1
Crash Locations

Intersection Number	Intersection Location	Crash Rates¹
1	Austin @ Eisman	N/A
2	Austin @ Schneider	0.93
3	Austin @ Ernst	1.01
4	Austin @ Boettner	0.83
5	Austin @ Kies	0.57
6	US 12 @ Lima Center	0.22
7	Austin @ Schellenberger	N/A
8	US 12 @ Neblo	N/A
9	Austin @ Parker	N/A
10	US 12 @ Arkona	N/A
11	Clinton @ Braun	0.87
12	Austin @ Neal	N/A
13	Austin @ Clinton	0.33
14	Clinton @ Kies/Wallace	0.74
15	Hogan @ Wilbur	2.9
16	Clinton @ Burmeister	N/A
17	Ernst @ Bemis	N/A
18	Allen @ Sheridan	N/A
19	Clinton @ Fisk	N/A
20	Sheridan @ Logan ²	N/A
21	Clinton @ Wilbur	0.42
22	Clinton @ Hoelzer	N/A
23	Sheridan @ Willow	N/A
24	Schneider @ Bemis	N/A
25	US 12 @ McCollum	0.07
26	Allen @ Hogan	N/A

¹ Crash rate is expressed in number of crashes per million entering vehicles. Crash rates are not available for all intersections due to the lack of traffic volume data (N/A).

² Assuming single crash reported at “Adrian/Hogan” occurred here.

Figure TH 1
Crash Distribution at 26 Intersections



- PAVED ROADS
 - UNPAVED ROADS
 - INTERSECTIONS WITH 1 OR MORE CRASHES PER YEAR
 - SKWEVED INTERSECTIONS
 - OFF SET INTERSECTIONS
 - SEVERE CURVES
- 176 (99) DAILY TRAFFIC VOLUME (YEAR)

DAILY TRAFFIC VOLUME (ADV) SOURCES:
 WASHINGTON COUNTY ROAD COMMISSION &
 (*) MICHIGAN DEPARTMENT OF TRANSPORTATION
 ** TRAFFIC VOLUME COUNTED DURING
 OFF PEAK HOURS. TRAFFIC VOLUME
 IS UNUSUALLY LOW AND IS EXPECTED
 TO BE SUBSTANTIALLY LOWER THAN
 RECORDED.

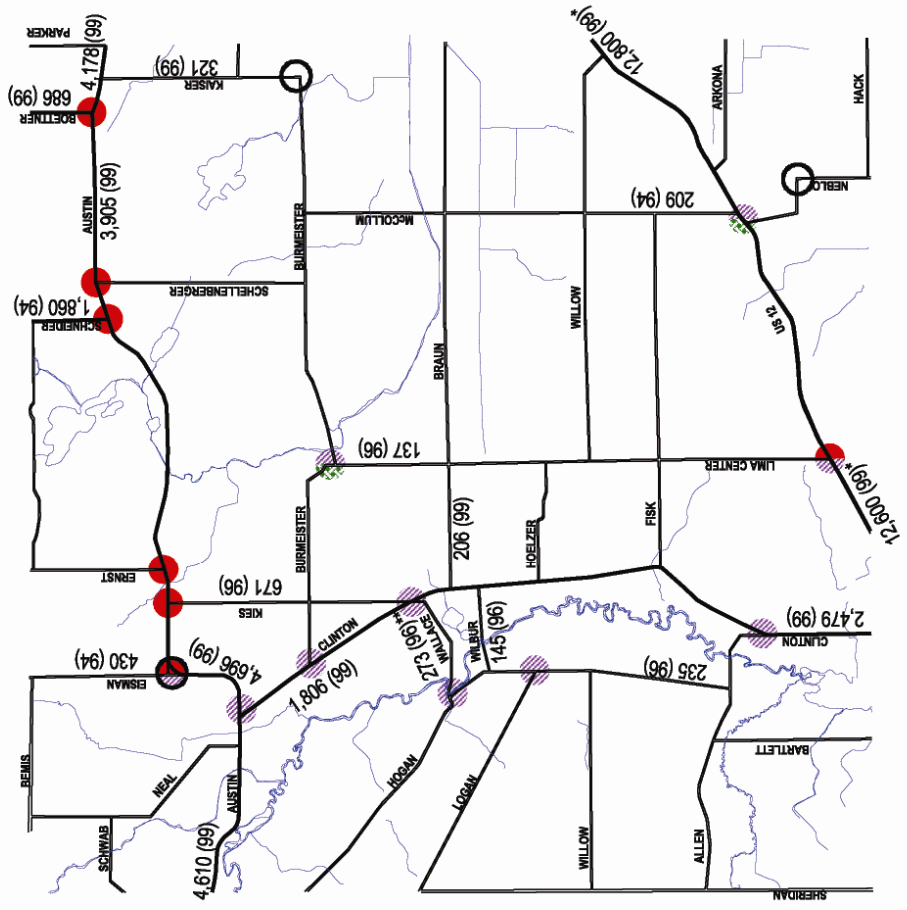
EXISTING ROAD CONDITIONS

BRIDGEWATER TOWNSHIP

GIS by

 BIRCHLER ARBOLD
 ASSOCIATES, INC.

MAP TH 1

THOROUGHFARE PLAN

The Thoroughfare Plan is designed to achieve the goals and objectives for traffic and circulation in Bridgewater Township that were identified by the Planning Commission through the community vision and goals process.



Traffic and Circulation

Goal

Maintain a transportation network that facilitates efficient circulation while reinforcing the Township's rural character.

Objectives

Retain unpaved roads where appropriate.

Improve traffic circulation patterns and alleviate potential traffic hazards.



“Unpaved roads maintain Bridgewater Township’s rural character.”

Traffic Planning Design Principles

Traffic is concentrated on certain roadways due to the road's physical condition, level of use, and direction of travel, as well as the overall land-use pattern. On average, about 20 percent of the roads in the United States carry approximately 80 percent of vehicle miles traveled. In order to set funding priorities for the roads that carry the highest volumes, transportation planners established a street classification system.

Although there is some variation in their classification, roadways are typically divided into those that carry through traffic and those that carry local traffic. It is desirable to physically separate these two road types as much as possible to eliminate conflicting traffic movements, traffic congestion, delays, and accidents. In order to function successfully, the overall traffic circulation system must be carefully integrated. In Bridgewater Township, the five basic types of roads are principal arterials, arterials, collectors, minor collectors and local streets.

Principal Arterials

Principal arterials provide travel routes from one city to another, and can traverse one or more states. They are most often used for longer trips, as

higher speeds are allowed. When a principal arterial passes through a more populated area, however, the highway functions more like an arterial. The number of intersections increases and speeds decrease. Principal arterials are planned for 150-foot rights-of-way. US 12 is currently the only principal arterial in Bridgewater Township.

Arterials

Arterial roads carry trips of shorter length than do principal arterials. They can provide routes for lengthy trips if a principal arterial or freeway is not available. Arterial roads have a dual function: to provide routes for through traffic while providing access to abutting properties and minor intersecting streets. This can lead to congestion and traffic crashes because of turning vehicles conflicting with through traffic. As indicated on the Thoroughfare Plan Map, Schneider, Clinton, and Austin Roads are designated as arterials within the Township. These roads are planned for 86-foot rights-of-way, except Austin Road within the Hamlet area. In order to retain the Hamlet's established character, this section of Austin Road has been designated as a village arterial with a 66-foot right-of-way.

Collectors

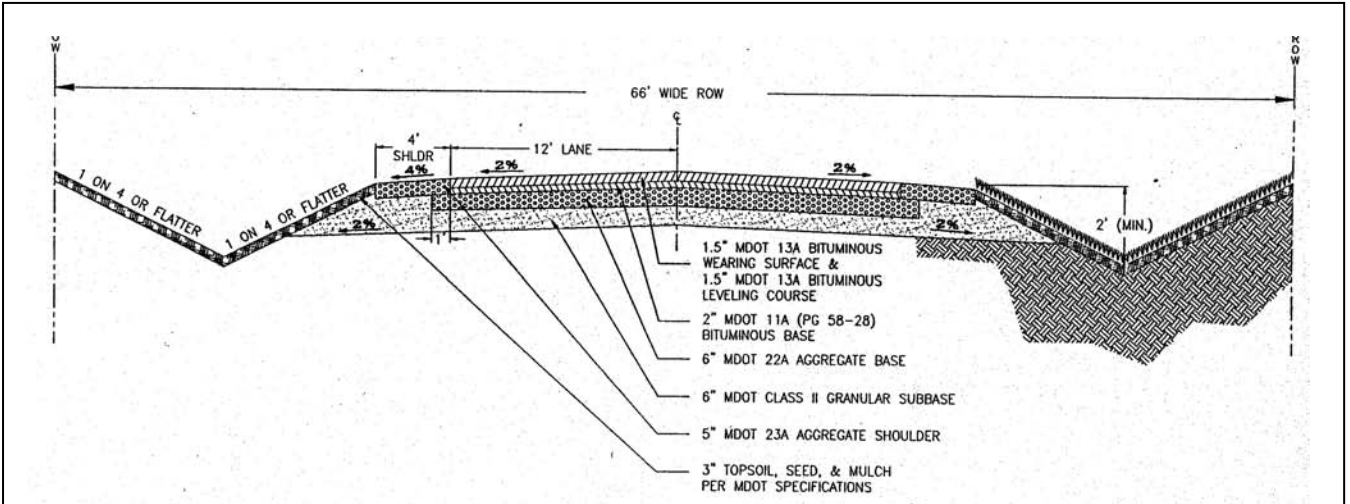
The intent of a collector street is to collect vehicles from the local streets or rural areas and distribute them to either local destinations or to an arterial. The collector street system serves both land access and through traffic. Collectors in the Township are Lima Center, McCollum, Kaiser, Burmeister, Braun, Parker, Hogan, Ernst, and Logan Roads. These roads are planned for an 86-foot right-of-way.

Minor Collector

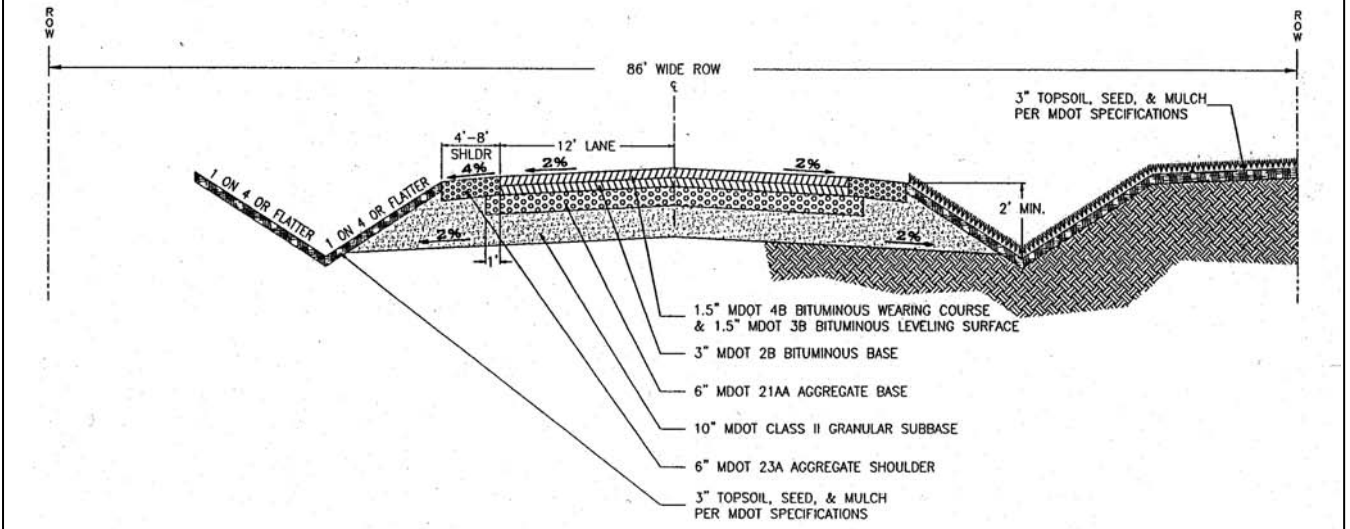
Minor collector streets also collect traffic from local streets, but they generally carry shorter trips and the routes are less traveled than collector streets. Minor collectors are also planned for an 86-foot right-of-way and include all of the remaining roads within the Township.

Local Streets

Providing access to adjacent land is the sole function of local streets. These streets make up a large percentage of total street mileage in urban areas and a small percentage in rural areas, but they almost always carry a small portion of vehicle miles traveled. The aim of local streets is to provide access to collector streets and through routes, but in such a manner that through traffic is not encouraged to use the local streets as a shortcut route. Local streets are planned for 66-foot rights-of-way.



Local Street Cross-section – 66' ROW



Arterial, Collector, & Minor Collector Street Cross-section – 86' ROW

Source: Washtenaw County Road Commission

Access Management Recommendations

As discussed above, most streets provide two functions: 1) to move traffic, and 2) to provide access to land uses that abut them. However, these functions can often conflict because each access point interrupts traffic movement as vehicles turn off and onto the roadway. In order to balance these two road functions, access management techniques should be used.

The access management techniques described below primarily apply to more intensive, non-residential land uses. However, the standards for shared access driveways are appropriate for individual residential home sites. Access management is usually implemented through the site plan review process, and these techniques are suggested as guidelines in that process. Each case will require an individual analysis to determine the appropriate action given the characteristics of the site and use.

➤ Restricting the Number and Spacing of Access Points

Limiting the number of driveways permitted for each land use can help preserve the traffic movement function of a roadway. Proposed and existing land uses should provide the minimum number of driveways needed to provide access to a development site. If additional driveways are proposed, additional street frontage for the subject site, and appropriate spacing between existing driveways should be provided.

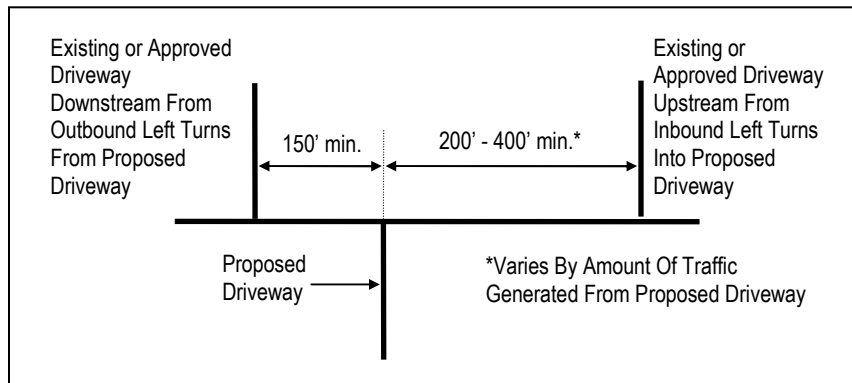
Even if only one access point is proposed, the most appropriate location should be selected to preserve the function of the roadway and more importantly, to assure public safety. Driveways located too close together are safety hazards and they can negatively impact road capacity. Recommended spacing standards for non-residential driveways on the same and opposite sides of the roadway are provided below.

Table TH 2
**Spacing Standards for
Driveways on Same Side of Street**

Road Speed (mph)	Driveway Spacing (feet)
20	85
25	105
30	125
35	150
40	185
45	230
50	275

Source: FHWA Report IP-82-3, June 1982; FHWA Report RD-76-86, August 1975

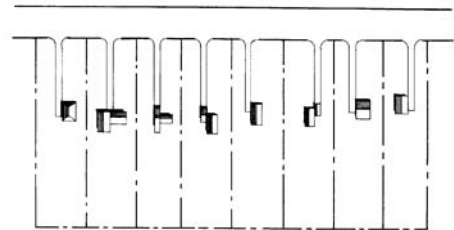
Figure TH 2
**Spacing Standards for
 Driveways on Opposite Side of Street**



➔ Encouraging Shared Access

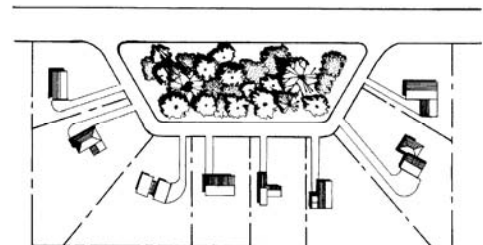
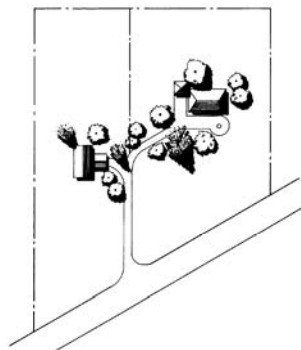
Providing shared access to a site reduces the number of access points, preserves the capacity of the road, and can even help to maintain the character of the community. Shared access can be achieved through a variety of techniques including shared driveways, frontage roads, service roads and internal connections between sites.

As illustrated in the graphics, individual driveways serving residential acreage parcels can reduce the capacity of the roadway and the rural character of the community. As new houses are developed on acreage parcels, shared driveways or frontage roads are desirable alternatives.

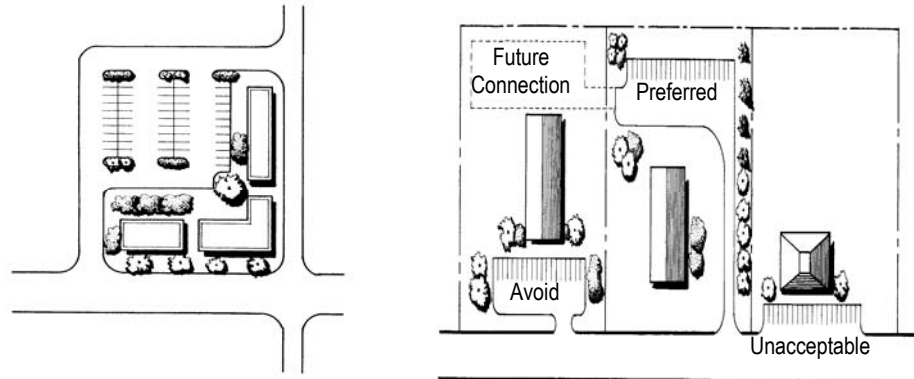


Common access problem created by individual driveways serving large acreage parcels off a major roadway (above).

Shared access driveways and frontage roads preserve capacity of the roadway, views from the road, and provide a buffer area for the houses from traffic noise (below).



As discussed above, access management is also critical for non-residential land uses because of their intensive nature and tendency to demand a higher number of access points. The following graphics illustrate ways in which non-residential uses can utilize access management techniques.



Shared access for a number of non-residential uses preserves the road capacity, which is especially important near intersections. Shared parking at the rear of the buildings also helps preserve the aesthetic appearance and character of the community. If shared access drives are not feasible, internal service roads and/or internal parking lot connections between uses should be provided to preserve roadway capacity.

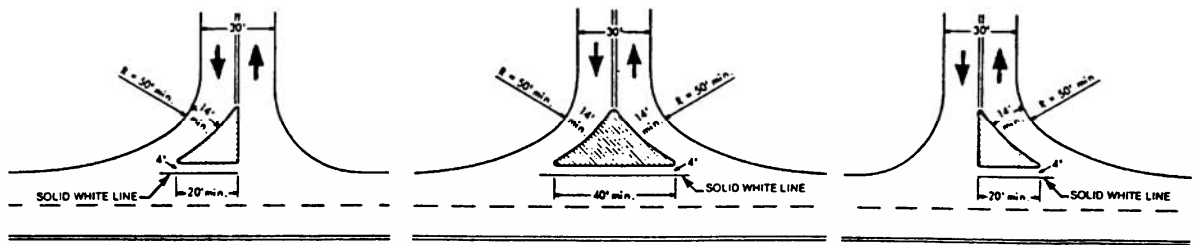
➤ Access/Driveway Design

Another access management technique is assuring proper driveway and intersection design. To begin with, driveways should be designed with adequate width, turning radius, and depth to allow automobiles and large trucks to enter and exit a site safely and efficiently. A clear vision area at the corners of all driveways and intersection is also needed for safe driver visibility.

In addition, uses that generate high volumes of traffic may warrant the construction of deceleration and acceleration lanes adjacent to driveways and intersections. Left turn passing lanes or center left turn lanes may also be necessary. Such improvements are often identified by the completion of traffic impact studies. In general, traffic impact studies are recommended whenever a proposed land use will generate more than 750 vehicle trips per day and/or more than 100 vehicle trips in one direction during the morning (e.g., 7 a.m. - 9 a.m.) or afternoon (4 p.m. - 6 p.m.) peak hour.

Finally, restricting turning movements at a driveway or intersection is often warranted due to traffic volumes or poor spacing of proposed access points to existing driveways and/or intersections. For example, when an existing driveway is too close to an intersection, it is possible to improve the access

and safety by restricting turning movements to right turns in and out of a proposed or existing development site. The following graphic illustrates ways in which driveways can be “channelized” to restrict turning movements.



PREVENTS LEFT-TURN EGRESS

**PREVENTS LEFT-TURN EGRESS
AND INGRESS**

PREVENTS LEFT-TURN INGRESS

Natural Beauty Road Designation

Many of the Township’s roadways offer beautiful views of natural features and vegetation. Natural vegetation along these roads should be maintained, provided safety concerns are addressed. Natural Beauty Road status for Bemis and Sheridan Roads should be explored through the Washtenaw County Road Commission. The Township should continue to evaluate other roads within the Township in order to identify others that may be appropriate for the Natural Beauty Road designation.

CONCLUSION

Because Bridgewater Township does not have direct control over the roads in the Township, it is important that the Washtenaw County Road Commission and the Michigan Department of Transportation be kept aware of the plans of the Township. Because land use and thoroughfare elements are closely interrelated, and any change in one may have a marked effect upon the other; therefore, information regarding plans of the State, County and Township should be exchanged on a regular basis.

As new development and redevelopment is proposed, it should be examined with regard to impact on the thoroughfare system. When a site plan for any type of use is submitted, adequate rights-of-way should be provided and access management techniques should be utilized, where appropriate. If and when subdivision plats and site condominiums are proposed, adequate rights-of-ways should be required from the developer, to the extent permitted by law. In addition, individual home sites should be encouraged to develop shared access drives or frontage roads.

