## 10.1 URBAN AND SECONDARY HIGHWAY DESIGNATIONS

It is appropriate when completing a regional Transportation Plan to discuss the state system in place in the community. The formal system in place in the Greater Bozeman area consists of both urban roadways and secondary roadways. These roadways are designated through existing Montana statute, the Montana Transportation Commission, and MDT guidelines. Because these roads are Montana systems, the Federal government has no direct involvement in the designations.

Urban and secondary routes are designated by the Montana Transportation Commission, in cooperation with local governing authorities. When revisions to the system are proposed, the Transportation Commission may require when adding mileage that a reasonably equal amount of mileage be removed. This is not an absolute, and situations do exist where mileage is added without a corresponding reduction. With that in mind, to meet eligibility requirements for placement on a system of urban and secondary highways, the following criteria must be met:

### Urban Highways

The route must be within a designated urban area and must be functionally classified by the Transportation Commission and Federal Highway Administration as either an urban arterial or collector. The route must also meet urban design standards in order to qualify as an urban route. A list of the urban routes located in the Greater Bozeman area can be found in **Table 10-1**.

**Table 10-1**
**Urban Routes in the Greater Bozeman Area**

| Urban Route ID | Roadway Common Designation |
|---|---|
| U-1201 | 19th Avenue |
| U-1202 | Oak Street |
| U-1203 | S. 11th Avenue |
| U-1204 | Durston Road |
| U-1205 | 8th Street |
| U-1206 | Mendenhall Street |
| U-1207 | Frontage Road / N. 7th Avenue |
| U-1208 | Babcock Street |
| U-1209 | 3rd Street / Graff Street / Willson Avenue |
| U-1210 | College Street |
| U-1211 | Valley Center Road |
| U-1212 | Kagy Boulevard /Bozeman Trail |
| U-1213 | Church Street |
| U-1215 | Highland Boulevard |
| U-1216 | S. 19th Avenue |
| U-1217 | Griffin Drive |
| U-1218 | Baxter Lane |

## Secondary Highways

The route must be outside a designated urban area and must be functionally classified as either a rural minor arterial or major collector. A list of the secondary routes located in the Greater Bozeman area can be found in **Table 10-2**.

**Table 10-2**
**Secondary Routes in the Greater Bozeman Area**

| Secondary Route ID | Roadway Common Designation |
|---|---|
| S-235 | Valley Center Road |
| S-205 | Frontage Road |
| S-411 | Springhill Road |
| S-412 | N. 19th Avenue |
| S-345 | S. 19th Avenue / Cottonwood Road |

As conditions change in the community, driven by outlying growth and travel characteristic shifts, it is advisable to revisit the urban and secondary highway classifications from time to time. To add, or delete, a route from the system, a very specific "six-step" process is in place and must be adhered to. This process is as follows:

**Step 1** – Requests for new route designations or changes in existing designations are initiated by the local government. Requests must have the support of local elected officials and local transportation committees (if applicable).

**Step 2** – MDT staff reviews the requests to determine whether the routes meet eligibility requirements.

**Step 3** – If a route does not meet functional classification eligibility requirements, MDT staff advises the local government about the process for requesting a formal review of the routes functional classification.

**Step 4** – If necessary, MDT staff advises the local government about the Montana Transportation Commission policy that requires no significant net changes in secondary and urban highway mileage within the affected county or urban area as a result of designation changes. Local governments may have to adjust their original request to comply with this requirement.

**Step 5** – If the proposal meets all eligibility requirements and complies with Transportation Commission policy, MDT staff asks the Transportation Commission to approve the request.

**Step 6** – If the Transportation Commission approves the request, MDT staff notifies the affected local governments and makes appropriate changes in MDT records.

## 10.2 CORRIDOR PRESERVATION MEASURES

Corridor preservation is the application of measures to prevent or minimize development within the right-of-way of a planned transportation facility or improvement within a defined corridor. That includes corridors, both existing and future, in which a wide array of transportation improvements may be constructed including roadways, bikeways, multi-use trails, equestrian paths, high occupancy vehicle lanes, fixed-rail lines and more.

Corridor preservation is important because it helps to ensure that a transportation system will effectively and efficiently serve existing and future development within a local community, region or state, and prevent costly and difficult acquisitions after the fact. Corridor preservation policies, programs and practices provide numerous benefits to communities, taxpayers and the public at large. These include, but are not limited to, the following:

- **Reducing transportation costs by preservation of future corridors in an undeveloped state.** By acquiring or setting aside right-of-way well in advance of construction, the high cost to remove or relocate private homes or businesses is eliminated or reduced.

- **Enhancing economic development by minimizing traffic congestion and improving traffic flow, saving time and money.** Low cost, efficient transportation helps businesses contain final costs to customers and makes them more competitive in the marketplace. Freight costs, for instance, accounts for ten percent of the value of agricultural products, the highest for any industry.

- **Increasing information sharing so landowners, developers, engineers, utility providers, and planners understand the future needs for developing corridors.** An effective corridor preservation program ensures that all involved parties understand the future needs within a corridor and that state, local and private plans are coordinated.

- **Preserving arterial capacity and right-of-way in growing corridors.** Corridor preservation includes the use of access management techniques to preserve the existing capacity of corridors. When it is necessary, arterial capacity can be added before it becomes cost prohibited by preserving right-of-way along growing transportation corridors.

- **Minimizing disruption of private utilities and public works.** Corridor preservation planning allows utilities and public works providers to know future plans for their transportation corridor and make their decisions accordingly.

- **Promoting urban and rural development compatible with local plans and regulations.** The state and local agencies must work closely together to coordinate their efforts. Effective corridor preservation will result in development along a transportation corridor that is consistent with local policies.

To effectively achieve the policies and goals listed above, corridor management techniques can be utilized. These techniques can involve the systematic application of actions that:

- Preserve the safety and efficiency of transportation facilities through **access management**; and,

- Ensure that new development along planned transportation corridors is located and designed to accommodate future transportation facilities (**corridor preservation measures**).

## 10.3 ACCESS MANAGEMENT GUIDELINES

Access management techniques are increasingly fundamental to preserving the safety and efficiency of a transportation facility. Access control can extend the carrying capacity of a roadway, reducing potential conflicts. There are six basic principles of access management that are used to achieve the desired outcome of safer and efficient roadways. These principles are:

- Limit the number of conflict points.
- Separate the different conflict points.
- Separate turning volumes from through movements.
- Locate traffic signals to facilitate traffic movement.
- Maintain a hierarchy of roadways by function.
- Limit direct access on higher speed roads.

It is recommended that local government adopt a set of Access Management Regulations through which the need for access management principles can be evaluated on a case-by-case basis. For roadways on the State system and under the jurisdiction of the Montana Department of Transportation (MDT), access control guidelines are available which define minimum access point spacing, access geometrics, etc., for different roadway facilities. For other roadways (non-State), the adoption of an access classification system based upon the functional classification of the roadway (principal arterial, minor arterial or major collector) is desirable. These local regulations should serve to govern minimum spacing of drive approaches/connections and median openings along a given roadway in an effort to fit the given roadway into the context of the adjacent land uses and the roadway purpose. The preparation and adoption of a local Access Management Ordinance should be pursued that can adequately document the local government's desire for standard approach spacing, widths, slopes and type for a given roadway classification.

Different types of treatment that can assist in access control techniques are:

- Non-traversable raised medians.
- Frontage roads
- Consolidation and/or closure of existing accesses to the roadway.
- Directional raised medians.

- Left-turn bay islands.
- Redefinition of previously uncontrolled access.
- Raised channelization islands to discourage turns.
- Regulate number of driveways per property.

### 10.3.1 Corridor Preservation Measures

Another tool used to fulfill the policies and goals listed earlier in this chapter is that of specific corridor preservation measures. As was stated earlier regarding developing a local Access Management Ordinance, it is desirable to develop a Corridor Preservation Ordinance as well. Such an ordinance would serve to accomplish the following:

- Establish criteria for new corridor preservation policies to protect future transportation corridors from development encroachment by structures, parking areas, or drainage facilities (except as may be allowed on an interim basis). Some possible criteria could include the on-site transfer of development rights and the clustering of structures.

- Establish criteria for providing right-of-way dedication and acquisition while mitigating adverse impacts on affected property owners.

## 10.4 TRANSPORTATION DEMAND MANAGEMENT

### 10.4.1 Role of TDM in the Transportation Plan

Transportation Demand Management (TDM) measures came into being during the 1970s and 1980s in response to a desire to save energy, improve air quality, and reduce peak-period congestion. TDM strategies focused on identifying alternates to single occupant vehicle use during commuting hours. Therefore, such things as carpooling, vanpooling, transit use, walking and bicycling for work purposes are most often associated with TDM. Many of these methods were not well received by the commuting public and therefore, provided limited improvement to the peak-period congestion problem. Due to the experiences with these traditional TDM measures over the past few decades, it became clear that the whole TDM concept needed to be changed. TDM measures that have been well received by the commuting public include flextime, a compressed workweek and telecommuting. In addition to addressing commute trip issues, managing demand on the transportation system includes addressing traffic congestion associated with special events, such as the Sweet Pea Festival, Christmas Stroll, Music on Main, and other large cultural or sporting events. A definition of TDM follows:

> *TDM programs are designed to maximize the people-moving capability of the transportation system by increasing the number of persons in a vehicle, or by influencing the time of, or need to, travel. (FHWA, 1994)*

Since 1994, TDM has been expanded to also include route choice. A parallel arterial with excess capacity near a congested arterial can be used to manage the transportation system to decrease congestion for all transportation users. In Montana, an excellent model for TDM strategies can be found by examining the Missoula Ravalli Transportation Management Association (MRTMA).

The Bozeman area is projected to grow. The accompanying expansion of transportation infrastructure is expensive and usually lags behind growth. Proper management of demand now will maximize the existing infrastructure and delay the need to build more expensive additional infrastructure. TDM is an important and useful tool to extend the useful life of a transportation system. It must be recognized that TDM strategies aren't always appropriate for certain situations and may be difficult to implement.

As communities such as Bozeman grow, the growth in number of vehicles and travel demand should be accommodated by a combination of road improvements; transit service improvements; bicycle and pedestrian improvements; and a program to reduce travel (vehicle trips and the vehicle miles traveled) via transportation demand management in conjunction with appropriate land use planning. This section of the Transportation Plan describes which TDM measures are appropriate and acceptable for the Bozeman community.

TDM strategies are an important part of the Transportation Plan due to their inherent ability to provide the following benefits to the commuting public:

- Better transportation accessibility;
- Better transportation predictability;
- More, and timelier, information;
- A range of commute choices; and
- Enhanced transportation system performance.

TDM measures can also be applied to non-commuter traffic and are especially easy to adapt to tourism, special events, emergencies and construction. The benefits to these traffic users are similar to those for commuters, and are listed as follows:

- Better transportation accessibility;
- More transportation reliability;
- More, and timelier, information;
- A range of route choices; and
- Enhanced transportation system performance.

These changes allow the same amount of transportation infrastructure to effectively serve more people. They acknowledge and work within the mode and route choices which motorists are willing to make, and can encourage a sense of community. Certain measures can also increase the physical activity of people getting from one place to another.

Such things as alerting the traveling public to disruptions in the transportation system caused by construction or vehicle crashes can manage demand and provide a valuable service to the traveling public.

Overall, congestion can be avoided or managed on a long-term basis through the use of an integrated system of TDM strategies.

### 10.4.2 List of TDM Strategies

TDM strategies, which are or have been used by other communities in the United States, include:

**Flextime**

When provided by employers, flextime allows workers to adjust their commuting time away from the peak periods. This means that employees are allowed some flexibility in their daily work schedules. For example, rather than all employees working 8:00 to 4:30, some might work 7:30 to 4:00, and others 9:00 to 5:30. This provides the workers with a less stressful commute, allows flexibility for family activities and lowers the number of vehicles using the transportation system during peak times. This in turn can translate into reduced traffic congestion, support for ridesharing and public transit use, and benefits to employees. Flextime allows commuters to match their work schedules with transit and rideshare schedules, which can significantly increase the feasibility of using these modes. Costs for implementing this type of TDM strategy can include increased administrative and management responsibilities for the employer, and more difficulty in evaluating an employee's productivity.

**Alternate Work Schedule**

A related but more expansive strategy is to provide an alternate work schedule. This strategy involves using alternate work hours for all employees. It would entail having the beginning of the normal workday start at a time other than 8:00 a.m. For example, starting the workday at 7:30 a.m. would allow all employees to reach the work site in advance of the peak commute time. Additionally, since they will be leaving work at 4:30 p.m., they will be home before the peak commute time, and have more time in the evening to participate in family or community activities. This can be a very desirable side benefit for the employees. This has a similar effect on traffic as flextime, but does not give individual employees as much control over their schedules.

**Compressed Work Week**

A compressed work week is different from offering "flextime" or the "alternate work schedule" in that the work week is actually reduced from the standard "five-days-a-week" work schedule. A good example would be employers giving their workers the opportunity to work four (4) ten-hour days a week. A compressed work week reduces commute travel (although this reduction may be modest if employees take additional car trips during non-work days or move farther from worksites). Costs for implementing this type of TDM strategy may be a reduction in productivity (employees become less productive at the end of a long day), a reduction in total hours worked, and it may be perceived as wasteful by the public (for example, if staffing at public agencies is low on Fridays).

## Telecommuting

Telecommuting in the work place offers a good chance to reduce the dependence to travel to work via car or bus. This is especially true in technical positions and some fields in the medical industry (such as medical transcription). Additionally, opportunities for distance learning, shopping via computers, basic health care services and recreation also exist and can serve to reduce vehicular travel on the transportation system. Telecommuting is usually implemented in response to an employee request, more so than instigated by the employer. Since telecommuting reduces commute trips, it can significantly reduce congestion and parking costs. It is highly valued by many employees and tends to increase their productivity and job satisfaction. Costs associated with this TDM strategy include increased administrative and management responsibilities, and more difficult evaluation of employee productivity. Some employees find telecommuting difficult and isolating. Telecommuting also may reduce staff coverage and interaction, and make meetings difficult to schedule. Many employers in Montana have tried and currently allow some form of telecommuting.

## Ride Sharing (carpooling)

Carpooling is traditionally one of the most widely considered TDM strategies. The idea is to consolidate drivers of single occupancy vehicles (SOV's) into fewer vehicles, with the result being a reduction in congestion. Carpooling is generally limited to those persons whose schedules are rigid and not flexible in nature. Studies have shown that carpooling is most effective for longer trips greater than ten miles in each direction. Aside for the initial administrative cost of set-up and marketing, ridesharing also may encourage urban sprawl by making longer-distance commutes more affordable.

Transit agencies sometimes consider rideshare as competition that reduces transit ridership. Ridesharing is a strategy that would work within the Bozeman area, especially if set up through the larger employers. An extensive public awareness campaign describing the benefits of this program would help in selling it to the general public.

## Vanpooling

Vanpooling is a strategy that encourages employees to utilize a larger vehicle than the traditional standard automobile to arrive at work. Vans typically hold twelve or more persons. Vanpooling generally does not require high levels of subsidy usually associated with a fixed-route or demand-responsive transit service. They can often times be designed to be self-sufficient. The van is typically provided by the employer, or a vanpool brokerage agency, which provides the insurance. The costs of a vanpooling program are very similar to those of ridesharing.

## Bicycling

Bicycling can substitute directly for automobile trips. Communities that improve cycling conditions often experience significant increases in bicycle travel and related reductions in vehicle travel. Even a one percent shift in travel modes from vehicle trips to bicycle trips can be viewed as a positive step in the Bozeman community.

Although this may not be a measurable statistic pertinent to reducing congesting, providing increased bicycling opportunities can help and can also contribute to quality of life issues. Bicycling characteristics within the Bozeman area is primarily recreational in nature, and by implementing the bikeway network improvements as described in **Chapter 5**, a gradual shift to bicycling as a commuter mode of travel should be realized. Incentives to increase bicycle usage as a TDM strategy include: construction improvements to bike paths and bike lanes; correcting specific roadway hazards (potholes, cracks, narrow lanes, etc.); development of a more connected bikeway street network; development of safety education, law enforcement and encouragement programs; and the solicitation and addressing of bicycling security/safety concerns. Potential costs of this TDM strategy are expenses associated with creating and maintaining the bikeway network, potential liability and accident risks (in some cases), and increased stress to drivers.

## Walking

Walking as a TDM strategy has the ability to substitute directly for automobile trips. A relatively short non-motorized trip often substitutes for a longer car trip. For example, a shopper might choose between walking to a small local store versus driving a longer distance to shop at a supermarket. Incentives to encourage walking in a community can include: making improvements to sidewalks, crosswalks and paths by designing transportation systems that accommodate special needs (including people using wheelchairs, walkers, strollers and hand carts); providing covered walkways, loading and waiting areas; improving pedestrian accessibility by creating location-efficient, clustered, mixed land use patterns; and soliciting and addressing pedestrian security/safety concerns. Costs are similar to that of bicycling and are generally associated with program expenses and facility improvements.

## Park & Ride Lots

Park and ride lots are effective for communities with substantial suburb to downtown commute patterns. Park and ride consists of parking facilities at transit stations, bus stops and highway on ramps, particularly at the urban fringe, to facilitate transit and rideshare use. Parking is generally free or significantly less expensive than in urban centers. Costs are primarily associated with facility construction and operation.

## Car Sharing

Car sharing is a demand reducing technique that allows families within a neighborhood to reduce the number of cars they own and share a vehicle for the limited times when an additional vehicle is absolutely essential. Costs are primarily related to creation, startup and administrative costs of a car sharing organization.

## Traditional Transit

Traditional transit service is an effective TDM strategy, especially in a highly urban environment. Several methods to increase transit usage within the community are to improve overall transit service (including more service, faster service and more comfortable service), reduce fares and offer discounts (such as lower rates for off-peak travel times, or for certain groups), and improved rider information and marketing programs. The costs of providing transit depend on many factors,

including the type of transit service, traffic conditions and ridership. Transit service is generally subsidized, but these subsidies decline with increased ridership because transit services tend to experience economies of scale (a 10% increase in capacity generally increases costs by less than 10%). TDM strategies that encourage increased ridership can be very cost effective. These strategies may include offering bicycle carrying components on the transit vehicle, changing schedules to complement adjacent industries, etc.

**Express Bus Service**

Express bus service as a TDM strategy has been used by larger cities in the nation as a means to change driver vehicle characteristics. The use of an express bus service is founded on the idea that service between two points of travel can either be done faster or equal to the private automobile (or a conventional bus service that is not "express").

**Installing/Increasing Intelligent Transportation Systems (ITS)**

The use of ITS (Intelligent Transportation System) methods to alert motorists of disruptions to the transportation system will be well received by the transportation users, and are highly effective tools for managing transportation demands.

**Ramp Metering**

Ramp metering has been used by some communities and consists of providing a modified traffic signal at on ramps to interstate highway facilities. The use of this TDM strategy would not be applicable to the Bozeman area.

**Traffic Calming**

Traffic Calming (also called Traffic Management) refers to various design features and strategies intended to reduce vehicle traffic speeds and volumes on a particular roadway. Traffic Calming projects can range from minor modifications of an individual street to comprehensive redesign of a road network. Traffic Calming can be an effective TDM strategy in that its use can alter and/or deter driver characteristics by forcing the driver to either use a different route or to use an alternative type of transportation (such as transit, bicycling, walking, etc.). Costs of this TDM strategy include construction expenses, problems for emergency and service vehicles, potential increase in drivers' effort and frustration, and potential problems for bicyclists and visually impaired pedestrians. Refer to **Chapter 8** for a discussion on traffic calming measures.

**Identifying and Using Special Routes and Detours for Emergencies or Special Events**

This type of TDM strategy centers around modifications to driver patterns during special events or emergencies. They can typically be completed with intensive temporary signing or traffic control personnel. Temporary traffic control via signs and flaggers could be implemented to provide a swift and safe exit after applicable events.

## Linked Trips

This strategy entails combining trips into a logical sequence that reduces the total miles driven on the surrounding transportation system. These trips are generated by associated facilities within a mixed-use development or within an area of the community where adjacent land uses are varied and offer services that would limit the need to travel large distances on the transportation system.

## Pay for Parking at Work Sites (outside the downtown area)

TDM measures involving "paying for parking" outside the downtown area or at employers or paying more for single occupant vehicles can be regarded by those impacted as Draconian.

## Higher Parking Costs for Single Occupant Vehicles (SOV)

Intuitively, free parking provided by employers is a tremendous incentive for driving alone. If the driver of a SOV is not penalized in some form, there is no perceived reason not to drive to the workplace. One way to counter this reality is to charge a higher price for parking for the SOV user. This implementation is not likely to have much of an impact to the frequency of SOV users on the transportation system.

## Preferential Parking for Rideshare/Carpool/Vanpools

This concept ties into the discussion above regarding parking of the SOV user. Preferential parking, such as delineating spaces closer to an office for riders sharing their commute or reduced/free parking, can be an effective TDM strategy.

## Subsidized Transit by Employers

A subsidized transit program, typically offered by employers to their employees, consists of the employer either reimbursing or paying for transit services in full as a benefit to the employee. This usually comes in the form of a monthly or annual transit pass. Studies show that once a pass is received by an employee, the tendency to use the system rises dramatically.

## Guaranteed Ride Home (GRH) Programs for Transit Riders

The guaranteeing of a ride home for transit users is a wise choice for all transit systems, since it gives the users a measure of calm knowing that they will be able to get home. A GRH program provides an occasional subsidized ride to commuters who use alternative modes, for example, if a bus rider must return home in an emergency, or a car pooler must stay at work later than expected. This addresses a common objection to the use of alternative modes. GRH programs may use taxies, company vehicles or rental cars. GRH trips may be free or they may require a modest co-payment. The cost of offering this service tends to be low because it is seldom actually used.

## Mandatory TDM Measures for Large Employers

Some communities encourage large employers (typically with at least 50 to 100 employees) to mandate TDM strategies for their employees. This is a control that can be required by local governments on developers, employers, or building managers.

The regulatory agencies often times provide incentives for large employers to make TDM strategies more appealing, such as reduced transit fares, preferred parking, etc.

**Required Densification / Mixed Use Elements for New Developments**

Requiring new developments to be dense and contain mixed-use elements will ensure that these developments are urban in character and have some services that can be reached by biking, walking or using other non-automobile methods. This also relates to the concept of "linked" or "shared" trips presented later in this chapter. As new developments are proposed, local and regional planners have the opportunity to dictate responsible and effective land use to encourage "shared" trips and reduce impacts to the surrounding transportation system.

**Transit Oriented Development (TOD)**

Transit Oriented Development (TOD) refers to residential and commercial areas designed to maximize access by transit and non-motorized transportation, and with other features to encourage transit ridership. A TOD usually consists of a neighborhood with a rail or bus station, surrounded by relatively high-density development, with progressively lower-density spreading outwards. Transit Oriented Development generally requires about seven residential units per acre in residential areas and twenty-five employees per acre in commercial centers to adequately justify transit ridership. Transit ridership is also affected by factors such as employment density and clustering, demographic mix (students, seniors and lower-income people tend to be heavy transit users), transit pricing and rider subsidies, and the quality of transit service. This type of development could potentially work well within Bozeman and its outlying areas as development occurs. Features could be built into a given development to encourage transit use from the start, and at the same time could be incorporated into the funding source available to Streamline to help offset costs associated with new service.

**Alternating Directions of Travel Lanes**

This method of TDM is similar to that of Traffic Calming in that it strives to change driver characteristics and possibly enable users of the system to try different modes of travel. It also can serve to relieve a corridor during particularly heavy times of the day.

By capitalizing on the use of these options, the existing vehicular infrastructure can be made to function at acceptable levels of service for a longer period of time. Ultimately, this will result in lower per year costs for infrastructure replacement and expansion projects, not to mention less disruption to the users of the transportation system.

While some of these options may work well in the Bozeman area, it is clear that some may be inappropriate. Additionally, some of these options are more effective than others. To provide a TDM system that is effective in managing demand, a combination of these methods will be necessary.

### 10.4.3 Effectiveness of TDM Strategies

The measure of effectiveness of TDM strategies can be done using several different methods such as cost, usage, or those listed below:

- Reduced traffic during commute times;
- Reduced or stable peak hour traffic volumes;
- Increased commuter traffic at off peak times;
- Increased use of modes other than single occupant vehicles;
- Increased use of designated routes during emergencies or special events;
- Eased use of the transportation system by tourists or others unfamiliar with the system;
- Reduced travel time during peak hours; and/or
- Fewer crashes during peak hours.

In order to provide a TDM system that will address the needs of the Bozeman area, the elements of the system must be acceptable to the general population. If elements are proposed which are not acceptable, the TDM system goals will not be reached. However, it is also important to keep in mind the cost of implementing TDM measures.

**Table 10-3** presents available TDM measures and ranks them by the likeliness of being accepted and implemented within the Bozeman area. A rank of "3" indicates that the measure has a high likelihood of being successfully implemented, a rank of "2" indicates that the measure would have more difficulty being accepted or implemented and a rank of "1" indicates that this measure would either be difficult to implement, or is inappropriate for the community at this time. This ranking system is based on input from public meetings, as well as consultant knowledge and experience. It is not survey based.

The measures which could best be adopted and accepted by area residents are those which allow greater flexibility in work hours, changing modes of transportation, or address specific, time-limited situations. Note that is envisioned that the most successful programs are "employer based", which necessitates a great deal of cooperation amongst the area employers most affected by modified work schedules and other potential TDM programs.

Those measures that would not be used in the planning area generally address issues not present in our community, such as significant commuting from a suburb. If such a problem existed, park and ride lots could be installed to address it. Travel characteristics in Montana are heavily dependent on population densities, distances to services (retail, medical, etc.), and locations of major employment centers. Often times travel distances are longer than what would be encountered in a larger urban area. Due to this nature of travel in Montana, private automobiles are unlikely to be replaced by other modes of travel until a change in technology occurs which allows travel by a mode that has the same flexibility of the automobile.

TDM strategies can be applied to specific events. If an event occurs on a regular basis which can be planned for, steps can be taken to manage the demands made on the transportation system.

**Table 10-3**
**TDM Measures Ranked by Anticipated Usability**

| Strategy | Rank |
|---|---|
| Alternating directions of travel lanes | 1 |
| Alternate work schedule | 3 |
| Bicycling | 2 |
| Car sharing | 1 |
| Compressed work week | 3 |
| Express bus service | 1 |
| Flextime | 3 |
| Guaranteed ride home program | 2 |
| Higher parking costs for single occupant vehicles | 1 |
| Identifying routes for emergencies or special events | 3 |
| Installing / increasing Intelligent Transportation Systems (ITS) | 2 |
| Linked trips | 3 |
| Mandatory TDM measures for large employers | 1 |
| Park & Ride Lots | 1 |
| Pay for parking at work sites (outside the downtown area) | 1 |
| Preferential parking for rideshare/carpool/vanpools | 1 |
| Ramp metering | 1 |
| Required densification / mixed use elements for new developments | 2 |
| Ride sharing (carpooling) | 2 |
| Subsidized transit by employers | 2 |
| Telecommuting | 2 |
| Traffic Calming | 3 |
| Transit Oriented Development | 2 |
| Use of Streamline (Transit) | 2 |
| Vanpooling | 1 |
| Walking | 2 |

A combination of methods is the most effective in reducing demand. The next step in the process is to prioritize these strategies to determine community preferences, and begin to develop packages of TDM strategies. These preferences and strategies can be analyzed to determine their impact on reducing trips. In order to prioritize the strategies, several questions must be answered relating to applicability, cost effectiveness, and community support. Using national experience as a basis, the strategies are classified according to their cost effectiveness as follows:

## The Most Cost Effective TDM Strategies

- Financial Incentives (commuter subsidies for not driving alone)
- Financial Disincentives (e.g., parking tax or charges)
- Bicycle and Walking Programs, Facilities and Subsidies
- Parking Management (i.e., reducing the supply of available parking)

Thus, pricing, parking and provision of non-motorized options are among the most cost effective (greatest trip reduction impact at the lowest cost) alternatives. Taxes and/or charges for parking are among the least popular strategies, but most effective

and cost-effective because they can immediately change travel behavior, and can be revenue neutral or even generate revenue to fund improved travel alternatives.

**Moderately Cost Effective TDM Strategies**

- Compressed Work Weeks (e.g., 4/40 schedules)
- Telecommuting
- Car Pool and Van Pool Programs

Compressed workweeks and telecommuting are among the most popular strategies with commuters because they offer employees more time at home. However, these strategies can be costly to employers because they involve a change in the basic operating policies of the work site. Car pool and van pool programs are also less cost effective because they generally only involve improved information on these travel alternatives (e.g., ride-matching computer systems, marketing campaigns, etc.). These programs can be expensive to manage and produce limited impact without supportive incentives or disincentives.

**Cost Ineffective TDM Strategies**

- TDM Marketing Programs (without incentives)
- Shuttles (for commuters, lunchtime travelers, etc.)
- Transit Service Improvements (without incentives)

Shuttles that connect employment sites to retail areas are often cited as necessary to allow ride sharers to get around midday without their cars. However, most shuttle programs of this type exhibit very low ridership and very high per rider cost. That is not to say all shuttles, such as student/campus shuttles, are ineffective. Likewise, transit service improvements can be very expensive and ineffective if incentives are not in place.

**Cost Effectiveness Unknown**

- TDM Friendly Land Use Policies
- TDM Strategies Applied to Non-Commute Travel

While some early evidence suggests that transit-oriented, bicycle-oriented, and pedestrian-oriented developments are effective in increasing the use of these modes at new residential, commercial and office sites, the cost effectiveness of these strategies is still somewhat unknown. One study in southern California showed that employers who combined financial incentives with an aesthetically pleasing work site exhibited trip reduction results 10 percent higher than those without these two critical strategies.

Finally, the application of TDM strategies to non-commute trips is somewhat problematic. In the Bozeman area, commute (home-base work) trips account for most all of the travel in the region. On the one hand, school, shopping, recreational and other trips most likely exhibit higher auto occupancy rates. This makes sense when one considers the amount of natural car pooling that occurs to schools, to the store, to restaurants, etc. However, many TDM strategies cannot be applied to these other travel markets. For example, one cannot really

telecommute to the store. Other TDM strategies, such as parking taxes and bicycle improvements, can influence all travel markets.

**Employer and Area-wide TDM Strategies** - A range of employer-based and area-wide strategies can be considered. These strategies include the following:

- **Minimal Voluntary Ride-sharing Program**: assuming voluntary participation among employers (a low proportion of whom are implementing programs), this program includes support of car pools, van pools and transit, as well as preferential parking for car pools and van pools.

- **Maximum Voluntary Ride-sharing Program**: still assuming low participation among employers, this program includes additional support, such as significant alternative work arrangements (compressed workweeks and telecommuting), preferential parking, and direct financial subsidies to car poolers, van poolers, and transit riders ($0.50 per day).

- **Voluntary Alternative Work Arrangement Program**: again assuming voluntary participation among the region's employers, this program involves offering 30 percent of all employees compressed work weeks and giving another 25 percent the option of telecommuting (acknowledging that only about 20 percent of eligible employees will choose to do so).

- **Trip Reduction Ordinance**: this type of employer-based program would mandate all employers to implement the maximum ride-sharing program outlined above.

- **Voluntary Ride-sharing plus Transit Service Improvements**: a voluntary ride-sharing program for employers with area-wide improvements to transit service such as frequency and coverage increases, and preferential treatment to expedite bus run times.

- **Voluntary Ride-sharing plus Transit Improvements and a Parking Tax**: a voluntary employer program and transit service improvements with a $1 per day parking tax on all public and private parking spaces (non-residential).

- **Developer-based Ride-sharing Requirements**: new developments would be required to implement a moderate ride-sharing program (moderate support, preferential parking, alternative work arrangements, and subsidies), and site design improvements that are conducive to TDM (such as transit shelters, bicycle storage, etc.).

### 10.4.4 Conclusions Based on Preliminary TDM evaluation for the Bozeman Area

The object of this analysis is to provide the planners and policy-makers in the greater Bozeman area with a range of TDM programs, strategies and estimated impacts in terms of reducing traffic. The intent of the information provided is to assist in facilitating a consensus on the preferred TDM program to be included in the Plan update. The following overall conclusions are offered:

- **Employer-based programs will have limited long-term impacts.** Alone, these programs do not sufficiently reduce regional traffic volumes. This is because the Bozeman area is comprised of relatively small employers that are generally less effective in facilitating commute alternatives. The exception to this is MSU, which would likely realize a greater impact from employer-based strategies given its control over key travel variables, notably parking.

- **Employer programs should be considered as an interim step.** Even though employer programs are less effective due to the employment composition of the Bozeman area, a voluntary program, focused on the downtown and MSU should be considered. A demonstration program would provide local planners and policy-makers with valuable information on the specific strategies and marketing techniques to encourage commute alternatives. Unlike efforts aimed at the general population, the program should target large employers and work through appointed and dedicated coordinators. The program should be launched by local government (City and County) employers, and might involve the formation of a Transportation Management Association (TMA). Flextime among large employers and MSU should also be tested.

- **Transit service improvements would have limited impacts.** The transit service improvements (increased coverage and frequency, faster running times, etc.), will not likely yield significant trip reduction impacts on a regional basis. However, when applied to the downtown and MSU areas, with heavier concentrations of commuter and student trips, the results may be more encouraging.

- **Land use and non-motorized TDM strategies can be effective.** The implementation of land use policies that are TDM-friendly, combined with improvements to bicycle and pedestrian facilities, can impact all types of travel. The potential impact of these strategies may be greater in the long run than traditional employer-based TDM measures. These measures, considered alone, could reduce vehicle trips and vehicle miles traveled (VMT), although the impacts may be somewhat weather-dependent.

- **Area-wide pricing strategies are the most effective strategy.** While politically among the least popular measures, the fact remains that financial incentives and disincentives, especially area-wide parking pricing strategies, are the most effective techniques for reducing trips and encouraging travelers to use alternative modes of transportation and times of day. A regional parking tax could significantly reduce trips and VMT.

- **A range of regional impacts is possible from TDM.** The impacts presented here range from a low reduction in trips (for a voluntary ride-sharing program), to a theoretical maximum trip reduction of 25 percent (for a combination of all strategies). However, the results possible in the Bozeman area are highly dependent on the community support for changing travel behavior. The maximum impact is based on a combination of programs that has not, to date, been implemented anywhere in the U.S.

The steps in incorporating TDM into the Transportation Plan involve the selection of a preferred set of TDM strategies, and then the specification of a recommended short- and long- run TDM program for the Bozeman area. The choices for the preferred TDM program generally involved the following elements, alone or in combination:

- developer requirements (new employment);
- trip reduction ordinance (all employers);
- transit service improvements;
- voluntary employer program;
- parking fees or taxes;
- TDM-friendly land use policies; and
- bicycle and pedestrian facility and program improvements.

It is recommended that the preferred TDM program consists of four principle TDM program elements:

1) a voluntary employer program;
2) an enhanced bicycle and pedestrian program;
3) an improved transit system; and
4) modified land use policies to encourage TDM.

Each is discussed in more detail in the next subsection. It is believed that the non-motorized strategies offer the potential for reducing a significant number of trips in a cost-effective manner, and that a voluntary employer program is a good short-term objective. The belief is that the land use policy initiative would address necessary long-term measures.

It is also believed that several TDM strategies should be rejected outright as being infeasible or unacceptable. These include parking pricing and any type of mandatory requirements on employers and developers. The Montana Department of Transportation has developed a Montana specific "TDM Toolbox". In evaluating local options for TDM it is suggested to look for programs and alternatives that have been successfully implemented in Montana.

### 10.4.5 Recommended TDM Program

Based on the preferred TDM strategies described above, a short- and long-range TDM program can be outlined for the Bozeman area. This program description is not intended as a fully articulated plan for implementing TDM strategies over the next 20 years; rather it is intended as a framework from which to develop such a plan. As mentioned above, the plan

should have at least two distinct time frames, or perhaps three: a short-range plan (1 to 3 years); a medium-range plan (5 to 10 years); and possibly a long-range plan (10 to 20 years).

## Short-Range TDM Program: Maximize Volunteerism (1 to 3 years)

A program could be developed with the following components:

- **Voluntary Employer Cooperative Program**: With the assistance of the City, County, MSU, and a select group of other major employers, form a business cooperative to explore the implementation of TDM programs within each organization. This might involve a pilot program, whereby the City would work with several existing and new employer programs to test and evaluate employee acceptance and the effectiveness of various TDM strategies. The impetus for business involvement should not only be traffic congestion and air quality; rather TDM should be sold as a good business practice that benefits participants by solving site access problems, assisting with employee recruitment or retention, and providing additional employee benefits.

- **Small Employer TDM Program**: The Bozeman area has a very large proportion of employers with less than 50 employees, most of which with less than ten employees. This clearly affects the ability to group employees into car pools, but does not preclude the use of transit, bicycling, walking, or even alternative work arrangements (e.g., 4/40 schedules and telecommuting). While the small employer market has been a difficult one for the TDM profession to tackle, some techniques, including multi-tenant-building campaigns, can be effective.

- **Education on Smart Trip-making**: Since the employer elements of the program only effect commute trips and some student trips, an aggressive educational campaign to combine or avoid other types of trips could be implemented. This would be designed to reduce VMT and cold starts by encouraging residents to combine trips (e.g., to drop off school children and shop at the grocery store), or to avoid trips by using the telephone, computer or televisions to access information and services.

- **Flex-time and Staggered Shifts at Largest Employment Sites**: Changing the arrival and departure times of commuters and students can be a very effective way to alleviate peak period, localized traffic congestion. While these strategies do not reduce trips or VMT (and therefore, do not have an air quality benefit), they tend to be very effective in University communities. While many employers in the greater Bozeman area already have informal flexible schedules, the formalization of flex-time and staggered hours among employers, at places like MSU, and the City and County, could go a long way to reduce congestion around these sites and on heavily congested corridors.

- **Enhanced Bicycle/Pedestrian Program**: Given that the greatest TDM impacts are anticipated to be derived from the enhanced non-motorized program,

implementation of three related program elements should be initiated. First, a bicycle and pedestrian system improvement program should be implemented on an aggressive schedule. Second, non-motorized information should be produced and distributed to reflect these new facilities on an ongoing basis. As the bicycle and pedestrian systems are improved and connectivity enhanced, marketing of the program should reflect the ease at which travelers can get around on foot or by pedal. Finally, as part of the employer pilot programs, financial subsidies for non-motorized modes should be encouraged.

## Medium-Range TDM Program: Land Use and Non-Motorized (5 to 10 years)

The TDM program for the medium-range future--five to ten years from now--should build upon the short-range program, and initiate strategies that have a longer-range impact, such as land use policies. These strategies include:

- **Expansion of Employer Cooperative Program into TMA**: Based on the experience of the trial period of the business cooperative program, additional employers and organizations should be recruited to participate in the program. If the cooperative program is successful (demonstrating the interest and commitment of the involved organizations), the effort could be expanded into a Transportation Management Association (TMA). The TMA could relieve the City from the day-to-day responsibilities of operating the program, and provide additional focus and resolve to the efforts.

- **Continued Implementation of the Bicycle/Pedestrian/Transit Program**: Those projects programmed for implementation in five to ten years should be completed. Then the supporting information and incentive elements, as developed, could be continued to assure that maximum use and benefits are derived from the capital investment.

- **Land Use Policies and Practices Supportive of TDM**: The relationship between land use policies and travel behavior cannot be overstated. Modifying existing land use policies and practices, to be more TDM-friendly, could be very effective as a long-term solution. Supportive land use policies include:

    - **Parking maximums** - reduced parking requirements to encourage the implementation of TDM measures and parking supply management.
    - **Shared parking** - allowing two different and adjacent land uses (e.g., office building and movie theaters), to build and manage shared parking that is less than that required of each site.
    - **Density bonuses** - in certain areas, densification and mixed uses can reduce overall trip generation rates, and make shared ride and transit options more effective.
    - **In-filling** - by allowing residential development close to downtown and major employment areas, the ability of residents to bicycle, walk,

or use transit to commute is enhanced. Other growth management techniques, as suggested in the new growth management plan, could also be supportive of TDM.

- **Site design guidelines** - as described below, a number of TDM-friendly site design practices can be incorporated into the development review process, as either a comprehensive policy or on a case-by-case basis for zoning variances.

- **TDM-friendly Site Design Features**: As mentioned above, site design features that are supportive of TDM programs can be incorporated into site plans, and required or negotiated as part of the review process. This is a very common practice throughout the U.S. and has already been used on a limited basis in Montana. Such features should be considered for growing areas. An illustrative list of some site design features includes:

  - provision for bus shelters and information kiosks;
  - allowance for van pools in any downtown or MSU parking lots;
  - secure and safe bicycle storage at employment, school and retail locations;
  - showers and lockers for bicyclist and walkers at large employment sites; and
  - pedestrian system connectivity with adjacent sites and other paths.

**Long-Range TDM Program: Contingency Measures (10 to 20 years)**

The final element of the Bozeman area TDM program should be long-range contingency measures to address traffic problems (e.g., congestion, accessibility, mobility or air quality), become untenable. Should air quality or traffic congestion levels reach intolerable levels, the Bozeman area could revisit the analyses made as part of the 20-year plan. This would include investigating the need to implement more stringent, but less popular measures, such as parking pricing and mandatory TDM programs. While not a recommendation of this Plan, the possibility of needing more aggressive TDM measures, should the short- and medium-range programs fall short of expectations, should not be totally ignored.

Clearly TDM has an important place in the *Greater Bozeman Area Transportation Plan (2007 Update)*. However, the voluntary employer programs, bicycle/pedestrian improvements, transit system development and land use strategies are insufficient to completely avoid the need for key roadway capacity expansion projects, but may help defer the need for construction for a period of time. The highest priority should be the implementation of the non-motorized improvements; but even a modest reduction in vehicle trips during certain times of the year would avoid the need for certain capacity enhancements. Supportive of congestion relief, air quality improvement and regional mobility goals, TDM should be implemented on an incremental basis to test and evaluate the effectiveness and acceptability of the strategies analyzed in this Plan. Several short-term TDM program elements have been suggested that are relatively low-cost and readily available. The Bozeman area should strive to build more local experience with TDM programs by developing a detailed short-range plan and pilot program, and then revisiting that plan in three to five years.

## 10.5 TRAFFIC IMPACT STUDY (TIS) PREPARATION GUIDELINES

The following guidelines describe the elements required (at a minimum) for preparing a Traffic Impact Study and provide for the consistent preparation of these studies throughout the community. The purpose of a Traffic Impact Study is to: ensure that the proposed developments do not adversely affect the transportation network; identify any traffic problems related to the development; to develop solutions to the potential problems; and present improvements to be included in the proposed development.

### 1.0 INTRODUCTION

This section of the Traffic Impact Study should include the location of the development site and a detailed description of the proposed development. The description should include the existing and proposed uses of the site, size of the proposed development, general terrain features, access to the site, and anticipated completion date of the development (including phasing). This will include the square footage of each use or number of units proposed.

### 2.0 EXISTING CONDITIONS

This section of the Traffic Impact Study should include discussion about the existing roadways, traffic data collected for the development, and a level of service analysis.

#### 2.1 EXISTING TRANSPORTATION SYSTEM

The Traffic Impact Study must identify existing conditions in the vicinity of the proposed development. This should include the geometric data (number of lanes, intersection configurations, etc.), traffic controls, and traffic volumes for the impacted roadways. The study area should include all roadways that are expected to be impacted by the development.

#### 2.2 TRAFFIC DATA COLLECTION

In order to determine the existing traffic demands within the study area, average daily traffic count data and manual turning movement count data should be collected. If possible, speed data and vehicle classification data should be collected as well.

Manual turning movement counts should be collected at the study area intersections during peak hours (7:00 a.m. – 9:00 a.m. and 4:00 p.m. – 6:00 p.m.) on a Tuesday, Wednesday, or Thursday during weeks which have no holidays. Off-peak time periods may be analyzed based on the proposed development type (school, shopping centers, theaters, etc.).

### 2.3 EXISTING LEVEL OF SERVICE ANALYSIS

Based on the traffic data collected, the level of service for these intersections should be determined according to the procedures outlined in the Transportation Research Boards' Highway Capacity Manual (HCM) and the Highway Capacity Software (HCS). Level of Service provides a means for identifying intersections that are experiencing operational difficulties, as well as providing a scale to compare intersections with each other. The level of service scale represents the full range of operating conditions. The scale is based on the ability of an intersection to accommodate the amount of traffic using it. The scale ranges from "A" which indicates little, if any, vehicle delay, to "F" which indicates significant vehicle delay and traffic congestion.

This section should analyze the current traffic conditions in the study area and should identify any mitigation measures necessary prior to the development to achieve proper LOS and function of the transportation system.

Figures to be included in this section include:

- Vicinity Map
- Existing AM peak hour volumes
- Existing PM peak hour volumes
- Existing AADT traffic volumes

## 3.0 FUTURE CONDITIONS

An analysis of the study area should be conducted using anticipated (future) traffic volumes without the proposed development. Future daily and peak hour traffic volumes should be developed for the study area. The method and assumptions should be documented clearly so calculations are easy to follow and replicated if necessary. Any known future developments expected to affect the study area should also be addressed in this section.

Figures to be included in this section include:

- Development site plan
- Future AM peak hour volumes (without development)
- Future PM peak hour volumes (without development)
- Future AADT traffic volumes (without development)

## 4.0 PROPOSED DEVELOPMENT

This section discusses the proposed development characteristics and determines the number of additional trips and distribution that are expected to occur as a result of the development.

### 4.1 TRIP GENERATION CHARACTERISTICS

A trip generation analysis should be performed to determine future traffic volumes attributable to the proposed development in the study area using the Institute of

Transportation Engineers (ITE) Trip Generation Manual. This analysis establishes the number of trip rates generated by the proposed development.

### 4.2 TRIP DISTRIBUTION AND ASSIGNMENT

Traffic generated by the proposed development must be distributed and assigned to the roadway network. This distribution will determine the extent of the development's impacts on the surrounding roadways.

Figures to be included in this section include:

- Trip distribution percentages on the surrounding network
- Estimated AM peak hour volumes generated by the development
- Estimated PM peak hour volumes generated by the development

## 5.0 TRAFFIC IMPACTS WITH DEVELOPMENT

This section looks at the potential impact that the development will have on the transportation system. Using the trip generation and distribution rates determined in **Section 4.0** and applying those trips to the future network discussed in **Section 3.0**, the future conditions of the transportation system can be analyzed. An intersection and corridor analysis should be completed to determine the future LOS and to determine if any mitigation measure are necessary.

Any mitigation measures that may be required due to the additional trips from development should be discussed. An analysis of the mitigated transportation system should then be completed to show how the system is expected to perform after the mitigation measures have been put in place.

Figures to be included in this section include:

- Future AM peak hour volumes (with development)
- Future PM peak hour volumes (with development)
- Future AADT traffic volumes (with development)

## 6.0 RECOMMENDATIONS

Recommendations for improvements needed to remedy deficiencies in the network caused by the proposed development should be discussed in detail. These recommendations should be provided to help ensure that the proposed development functions with the surrounding area.

## 7.0 CONCLUSIONS

The conclusion of a Traffic Impact Study should be a clear description of the study findings including a reiteration of any recommendations being made as part of the study.