APPENDIX G:
Additional Considerations

ADDITIONAL CONSIDERATIONS

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GREAT FALLS AREA

Long Range Transportation Plan - 2018 Update

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TABLE OF CONTENTS

List of Tables

List of Figures

ABBREVIATIONS / ACRONYMS

CSS	Context Sensitive Solutions
GRH	Guaranteed Ride Home
HOV	High Occupancy Vehicle
ITS	Intelligent Transportation Systems
LRTP	Long Range Transportation Plan
MDT	Montana Department of Transportation
MRTMA	Missoula Ravalli Transportation Management Association
NEPA	National Environmental Policy Act
PSA	Public Service Announcement
SOV	Single Occupancy Vehicle
TDM	Transportation Demand Management
TOD	Transit Oriented Development
TWLTL	Two-Way Left-Turn Lane

ADDITIONAL CONSIDERATIONS

1.0 INTRODUCTION

This memorandum addresses several topics for the Great Falls Area Long Range Transportation Plan (LRTP) that link the transportation system to broader quality of life considerations within the community. Federal regulations require the LRTP to "include both long-range and short-range program strategies/actions that lead to the development of an integrated intermodal transportation system that facilitates the efficient movement of people and goods." While this is obviously a key consideration, it must be recognized that the design, modal mix, and location of transportation infrastructure and facilities can directly affect urban form and functions and community character.

Current directions in transportation planning place importance on developing transportation systems that help reduce unnecessary travel delays and managing travel demands in ways that create balanced multimodal networks that offer multiple transportation choices. Transportation systems also need to provide facilities and services to help achieve reliable and timely access to jobs, community services, affordable housing, and schools while helping create safe streets and improving economic competitiveness, and enhancing unique community characteristics.

2.0 CORRIDOR PRESERVATION

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, high occupancy vehicle lanes, or fixed route transportation infrastructure.

The objective of corridor preservation is to enable local governments to better plan for future growth. Corridor preservation helps to assure that a transportation system will effectively and efficiently serve existing and future development within a community, region or state, and prevent costly and difficult acquisitions after the fact. Preserving right-of-way for planned transportation facilities promotes orderly and predictable development. As communities expand, land must be set aside for the transportation infrastructure needed to support development and to maintain a desired level of transportation service. The decisions made about the location and design of the transportation network will have a lasting impact on growth patterns, community design, and modal alternatives.

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.** Right-of-way costs often represent the single largest expenditure for a transportation improvement, particularly in growing urbanized areas where transportation improvement needs are the greatest. 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. Clarifying public intentions about the location, timing, and desired level of access control for roadway improvements reduces the risk associated with the timing and phasing of development projects for the private sector. Advanced notice of such intentions also enables developers to plan projects and site-related improvements in a manner that is more compatible with the planned transportation functions of the corridor.

- **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.

- **Reducing adverse social, economic, and environmental impacts on people and communities.** The social and economic costs of relocation can be high for some communities, particularly low-income, ethnic, or elderly populations and small businesses that serve such populations. In addition, where viable transportation corridors are foreclosed by development, roadways may need to be relocated into more environmentally sensitive areas, thereby increasing adverse impacts on the environment.

A variety of techniques have been applied by communities to help preserve right-of-way for future transportation corridors, ranging from setback ordinances to mandatory dedication. Although many jurisdictions have some method of right-of-way preservation in place, no single method works for all situations. Communities that have been most successful at corridor preservation are those that have assembled a variety of tools that they can mix and match to the circumstances at hand. The following are viewed as important elements of successful corridor preservation programs:

- Develop a long-range transportation plan with broad community support;
- Set clear priorities for transportation improvement projects and complete them in a timely manner;
- Identify a funding source for advance acquisition of necessary or desired rights-of-way; and
- Provide a range of mitigation measures to address potential hardship on property owners and to preserve property rights.

National experience in corridor preservation practices has also shown it is helpful to determine desired design objectives and cross-sections for transportation improvements in the community to establish a basis for future right-of-way needs. This helps to facilitate administration of and public support for the program by identifying in advance the amount of right-of-way that will be needed and why.

3.0 ACCESS MANAGEMENT

Access Management is the proactive management of vehicular access points to land parcels adjacent to all manner of roadways. Good access management promotes safe and efficient use of the transportation network. 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.

Access management encompasses a set of techniques that local governments can use to control access to highways, major arterials, and other roadways. Access management includes several techniques that are designed to increase the capacity of these roads, manage congestion, and reduce crashes. These techniques include:

- **Signal Spacing:** Increasing the distance between traffic signals improves the flow of traffic on major arterials, reduces congestion, and improves air quality for heavily traveled corridors.

- **Access and Driveway Spacing:** Fewer driveways spaced further apart allows for more orderly merging of traffic and presents fewer challenges to drivers.

- **Safe Turning Lanes:** Dedicated left- and right-turn, indirect left-turns and U-turns, and roundabouts keep through-traffic flowing. Roundabouts represent an opportunity to reduce an intersection with many conflict points or a severe crash history (T-bone crashes) to one that operates with fewer conflict points and less severe crashes (sideswipes) if they occur.

- **Median Treatments:** Two-way left-turn lanes (TWLTL) and non-traversible, raised medians are examples of some of the most effective means to regulate access and reduce crashes.

- **Service and Frontage Roads:** Helps alleviate congestion on major limited access thoroughfares by providing parallel routes which can separate local traffic from through traffic.

- **Right-of-Way Management:** As it pertains to R/W reservation for future widenings, good sight distance, access location, and other access-related issues.

State, regional, and local governments across the United States use access management policies to preserve the functionality of their roadway systems. This is often done by designating an appropriate level of access control for each of a variety of facilities. Local residential roads are allowed full access, while major highways and freeways allow very little. In between are a series of road types that require standards to help ensure the free flow of traffic and minimize crashes, while still allowing access to major businesses and other land uses along a road.

It is recommended that City and County governments 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.

4.0 TRANSPORTATION DEMAND MANAGEMENT

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 fireworks display on the 4th of July, Great Falls White Sox baseball games, 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). MRTMA offers vanpool, carpool, and guaranteed ride home programs and works with employers to tailor specific commute programs for their staff.

The Great Falls 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.

4.1. Role of Transportation Demand Management

TDM strategies are an important part of the Great Falls Area Long Range 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.

4.2. TDM Strategies and Their Effectiveness

TDM strategies, which are or have been used by other communities in the United States, are discussed in this section. 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 Great Falls 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.

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. Flextime is a TDM strategy that has a high probability of being used successfully within Great Falls.

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. An alternate work schedule is a TDM strategy that has a high probability of being used successfully within Great Falls.

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). A compressed work week is a TDM strategy that has a high probability of being used successfully within Great Falls.

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. This strategy has a high probability of being used successfully within Great Falls.

Ride Sharing (carpooling)

Carpooling is traditionally one of the most widely considered TDM strategies. The idea is to consolidate drivers of single occupancy vehicles 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 Great Falls 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. 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 Great Falls area is primarily recreational in nature, and by implementing the bikeway network improvements, 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. Bicycling is an excellent, effective TDM strategy that has a great chance for success in Great Falls.

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. As with bicycling, walking is an excellent TDM strategy that has a great chance for success in Great Falls.

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. This TDM strategy is not likely to benefit the transportation system within Great Falls.

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. This TDM strategy is not likely to benefit the transportation system within Great Falls.

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. Transit as a TDM strategy in Great Falls has a high likelihood of being successful, however funding constraints are the current limiting factor.

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”). An express bus service TDM strategy would not be applicable to Great Falls.

Installing/Increasing Intelligent Transportation Systems (ITS)

The use of ITS 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.

Installing High Occupancy Vehicle (HOV) lanes

High occupancy vehicle lanes would probably have a low cost / benefit ratio and possibly would be ignored in Great Falls. HOV lanes are generally used on very congested roadways where intersections and access control is somewhat limited. They also can be utilized on urban arterials. A HOV is typically described as having two or more persons in the vehicle during the time of travel. The benefits of a HOV lane in a congested corridor is that increased travel speeds and reliability for HOV passengers is realized. The costs include project construction, management and enforcement. Some critics also argue that HOV lanes encourage urban sprawl, contribute to poor air quality, and increase crash rates due to conflicts between vehicles in higher-speed HOV lanes and vehicles in lower speed general use lanes.

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 Great Falls 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. Traffic calming measures are discussed later in this memo.

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. A prime example would be modifying travel patterns after a Voyagers baseball game in Great Falls. 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. This TDM strategy could be successful in Great Falls, particularly as new developments occur in the future that incorporate mixed uses.

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 and may be poorly received in Great Falls.

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. In Great Falls, this could possibly be implemented within the downtown area, where parking fees are charged for the eight city-owned parking lots. This implementation strategy 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 Great Falls 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 the Great Falls Transit District 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.

4.2.1. Effectiveness of TDM Strategies

Measuring the 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 Great Falls 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 1 presents available TDM measures and ranks them by the likeliness of being accepted and implemented within the Great Falls 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 Great Falls area residents are those which allow greater flexibility in work hours, changing modes of transportation, or address specific, time-limited situations.

Those measures that would not be used in Great Falls generally address issues not present in Great Falls, such as significant commuting from a suburb. If such a problem existed, park and ride lots could be installed to address it. However, I-15 presently has less than one-third of the traffic that 10th Avenue South has and operates under free flow conditions at all times of the day. Other measures that would not be implemented in Great Falls in the foreseeable future involve "pay for parking" outside the downtown area. 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.

Table 1: TDM Measures Ranked by Anticipated Usability

Rank	Strategy
1 - Difficult to implement / not applicable at this time.	Alternating directions of travel lanes
	Car sharing
	Express bus service
	Higher parking costs for single occupant vehicles
	Installing HOV lanes
	Mandatory TDM measures for large employers
	Park & Ride Lots
	Pay for parking at work sites (outside the downtown area)
	Preferential parking for rideshare / carpool / vanpools
	Vanpooling
2 - Some difficulty being accepted or implemented.	Bicycling
	Guaranteed ride home program
	Installing/ increasing ITS
	Ramp metering
	Required densification / mixed use elements for new developments
	Ride sharing (carpooling)
	Subsidized transit by employers
	Telecommuting
	Transit-Oriented Development
	Use of Transit
	Walking
3 - High likelihood of being successfully implemented.	Alternate work schedule
	Compressed work week
	Flextime
	Identifying routes for emergencies or special events
	Linked trips
	Traffic Calming

Another way to rank TDM measures is by the long-term cost effectiveness of the measure. The following **Table 2** ranks the potential TDM strategies by cost effectiveness. Cost effectiveness is defined as the greatest impact on managing traffic demand at the lowest cost to maintain / extend the transportation system. A rank of “3” indicates a measure which is the most cost effective, a rank of “2” indicates a measure which is moderately cost effective, a rank “1” measure is not cost effective, and the cost effectiveness of a rank “0” is unknown. This ranking system is based on input from public meetings, as well as consultant knowledge and experience. It is not survey based.

Efforts merely to make the general public aware of the TDM programs are ineffective. TDM strategies only succeed when people actually change their trip-making behavior. Trip-making behaviors could be changed with incentives. Marketing programs with incentives can successfully introduce people to new ways of making trips, but keeping these same patrons in the new system then depends on additional measures or a change in mindset.

Table 2: TDM Measures Ranked by Cost Effectiveness

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

Pricing parking is among the most cost-effective alternatives. Taxes and/or charges for parking, however, are extremely unpopular with day-to-day users of the system, and are not recommended for Great Falls. However, these strategies are cost-effective since they can immediately change travel behavior and can be revenue neutral or generate revenue. In a highly congested, highly urbanized environment, this is a good option.

Another cost effective TDM alternative is using alternate modes of transportation such as transit, carpools, bicycling and walking. Many residential areas in Great Falls are within easy biking / walking distance of employment sites and shopping opportunities. Bus service is also readily available for most of Great Falls. The infrastructure for these alternatives is already in place and ready for use at any time.

Work week changes such as a compressed work week, alternate starting times, and telecommuting are among the most popular strategies with commuters, since they offer employees more time at home. They are less popular with employers since they may involve a change in the basic operating policies of the work site. Carpool and vanpool programs are less effective than changes to the work week unless there

are parking incentives and they are used consistently by employees. Additionally, managing these programs can be expensive and produce limited impact without supporting incentives and disincentives.

Improvements from transit service changes cannot be quickly realized. Transit users must adjust to the changes, and the true impacts of any changes to the transit system will not be realized for approximately one year. Therefore, these changes must be weighed carefully. They are disruptive to the users of the system, and even attempts to reinstate previous routes are disruptive from a user's standpoint.

While some early evidence suggests that transit, bicycle, or pedestrian related 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 unknown. Providing these amenities with the installation of the original infrastructure can provide an aesthetically pleasing, highly desirable development to live and work in. One study in southern California showed that employers who combined financial incentives with an "aesthetically pleasing" site, exhibited trip reduction results that were ten percent higher than those without these two critical strategies.

Applying TDM strategies to non-commute trips can be problematic. In Great Falls, as elsewhere, commute trips (home-based work trips) account for fewer than 20 percent of all travel. Trips for shopping, school, recreational, or other purposes generally have higher auto occupancy rates than home-based work trips. Using nationwide averages, home-based work trips have an average occupancy of about 1.1 people per vehicle, whereas other trip types have an average occupancy of 1.4 to 1.5 people per vehicle. Note that in Great Falls there is a high proportion of school related trips that use transit. Over 40 percent of transit users are associated with the schools. Not all TDM measures will work for non-commute trips. An example of this is bicycling to the home improvement store. Items bought at a home improvement store are usually bulky and/or heavy. This makes it difficult to get them home.

Finally, the concept of "linked trips" within an area can be an effective means of limiting traffic on the transportation system. These trips are sometimes referred to as "shared" or "internal" trips. 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. An example would be a development that incorporates residences, office space, industrial space, retail space, a health club, etc. The vehicle operator in this case may live and work in the same development, therefore reducing the need to access the transportation system outside of the immediate area. Linked trips do not represent additional trips on the surrounding transportation system. Future developments that incorporate mixed uses and travel sharing within its limits should be encouraged through the planning function. This is especially desirable given the noted change in demographics that has occurred and is expected to continue occurring over the foreseeable future in the US and Montana.

4.2.2. Event Specific TDM Strategies

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. In Great Falls there are three events which would benefit from different types of management techniques.

The first is the 4th of July fireworks display. This event draws significant numbers of people in vehicles into the transportation corridors along the Missouri River, near the fireworks display. When the fireworks display ends, all of the vehicles attempt to leave the area at the same time. This causes significant congestion until the vehicles have cleared the area. The City of Great Falls has already adopted one TDM measure to address this situation, namely, providing specialized signal timing which allows the greatest opportunity for this traffic to disperse to their destinations. A second TDM measure which could be

considered would be temporarily modifying the traffic control at certain key locations. This would involve using flaggers to direct traffic and allow vehicles to proceed through intersections at the flaggers' direction rather than using traffic control normally in place. This would allow vehicles to get through these intersections in less time than would be possible without the flaggers' help.

The second event, which has been brought forward by members of the public during the public meetings, deals with exiting the Great Falls Voyagers parking lot after a game is over. Longtime residents of Great Falls remember when this lot had a second exit point which took traffic to the east along River Drive North. This exiting option is no longer available, and these people are frustrated by having to wait at the main entrance. The primary reason for closure of this exit was due to safety related concerns over left turning traffic out of the parking lot and potential crashes with the traffic stream on River Drive North. TDM measures can be put in place to facilitate vehicles exiting this parking lot.

The simplest one is again using flaggers to temporarily modify the traffic control at the exit point. This would allow left and right turning traffic to exit the parking lot in less time than it would otherwise take. Depending upon how the exiting traffic proceeds, a flagger may also be appropriate at the intersection of 25th Street North and River Drive North. Other modifications to the transportation system may also be appropriate depending upon where the traffic actually goes.

The third item which could be addressed using TDM measures is developing detour routes for accidents or other road blockages along the 10th Avenue South corridor (which includes Country Club Boulevard and I-315). Due to the amount of traffic on 10th Avenue South, developing plans ahead of time to plan detours would help manage the demands of the transportation system. Of particular concern is the I-315/Country Club Boulevard segment which has very few route alternatives. Additionally, 10th Avenue South from 2nd Street South to 32nd Street South would also benefit by having detour plans in place.

4.3. TDM Conclusions

Many TDM options are available for use in Great Falls. Existing infrastructure is in place to use alternative modes of transportation including transit, walking and bicycling. There are several major employers in Great Falls including the medical providers, refinery, City government, County government, Montana Air National Guard and Malmstrom Air Force Base who could be approached to implement work week adjustments (flex time, alternate work hours, compressed work week) that could make a noticeable difference to congestion. Designating a couple of prime parking spots for carpooling could increase its use among employees and provide positive recognition for those who carpool.

Developing strategies to manage the demand on the system generated by specific repeatable events such as baseball games or the 4th of July fireworks display would involve a one-time use of Great Falls staff time. Adjustments to these strategies could be made after seeing how they work. Coordination with the Police Department or other departments that would help implement these plans would then be needed on an intermittent basis. Implementing these strategies in Great Falls could be done quickly and would be obvious to the traveling public. As such, it would be easy to demonstrate a successful TDM program and build approval for implementing additional TDM strategies.

4.4. Recommended TDM Strategies

Based upon this general TDM evaluation, Great Falls is poised to implement a successful TDM program. The recommended strategies are listed below. These could be implemented in any order. Since the 2009 Transportation Plan, efforts have been made to expand and improve bicyclist access to River's Edge Trail.

- Encourage employers to provide alternate work schedules to their employees.
- Implement a guaranteed ride home program for transit users.
- Provide bike racks in the downtown area for bicycling commuters.
- Increase bicyclist access to River's Edge Trail for commuting purposes.
- Encourage walking as a commute choice.
- Encourage biking as a commute choice.
- Look at ways to increase transit ridership.
- Review access to the Great Falls Voyagers ballpark and develop a plan to manage traffic into and out of the ballpark.
- Consider factors such as land use/zoning issues when approving non-rural projects in the outlying areas.
- Use Intelligent Transportation Systems methods, where appropriate, to alert motorists of disruptions to the transportation system can be highly beneficial to transportation users and effective tools for managing transportation demands.

5.0 OTHER TRANSIT CONSIDERATIONS

Building upon the conclusions of the TDP, this section of the transit summary and considerations presents planning level guidance on bus stop placement and other elements.

5.1. Bus Stop Placement

Bus stop placement is an important factor to achieving the best performing transit system possible. Below is a list of factors that should be taken into consideration when deciding on where to locate bus stops.

- Spacing along the route
- Location of passenger traffic generators
- Operational effectiveness
- Safety
- Access to the stop including pathways leading to and from the stop
- Right-of-way
- Curb clearance

Table 3 gives a list of advantages and disadvantages for the location of the bus stop at intersections. **Figures 1-3** shows the minimum recommended distances required for a bus stop based on the location relative to the intersection. These minimum recommended distances assume that either a 40-foot bus, or a 60-foot articulated bus, is being used. For Great Falls, the 40-foot bus would be considered the appropriate design vehicle.

Table 3: Bus Stop Placement Advantages and Disadvantages

Bus Stop Location	Advantages	Disadvantages	Recommended When the Following Location Conditions Exist
NEARSIDE: Located immediately before an intersection	• Less potential conflict with traffic turning onto the bus route street from a side street. • The bus boarding door is close to the crosswalk. • Bus has intersection to merge into traffic. • Bus driver can see oncoming buses with transfer passengers.	• Potential conflicts with right turning traffic due to cars cutting in front of the bus. • The stopped bus obscures the sight distance of drivers and pedestrians entering from the right. • The stopped bus may block visibility of the stop signs or traffic signals. • At signalized intersections, may result in schedule delays.	• When traffic is heavier on the farside than on the approaching side of the intersection. • When pedestrian access and existing landing area conditions on the nearside are better than on the farside. • When street crossings and other pedestrian movements are safer when the bus stops on the nearside than the farside. • When the bus route goes straight through the intersection. • When adequate sight distance can be achieved at the intersection.
FARSIDE: Located immediately after an intersection	• Does not conflict with vehicles turning right. • Appropriate after the route has made a turn. • The stopped bus does not obscure sight distance to the left for vehicles entering or crossing from the side street. • At signalized intersections, buses can more easily re-enter traffic. • The stopped bus does not obscure traffic control devices or pedestrian movements at the intersection.	• The stopped bus obscures the sight distance to the right of drivers entering from the cross street to the right of the bus. • If the bus stopping area is of inadequate length, the rear of the stopped bus will block the cross street (especially an issue for stops where more than one bus may be stopped at a time). • If the bus stops in the travel lane, it may result in queued traffic behind it blocking the intersection.	• When traffic is heavier on the nearside than on the farside of the intersection. • At intersections where heavy left or right turns occur. • When pedestrian access and existing landing area conditions on the farside are better than on the nearside. • At intersections where traffic conditions and signal patterns may cause delays • At intersections with transit signal priority treatments.
MID-BLOCK: Located 300 feet or more beyond or before an intersection	• The stopped bus does not obstruct sight distances at an intersection. • May be closer to major activity centers than the nearest intersection. • Less conflicts between waiting and walking pedestrians.	• Requires most curb clearance of the three options (unless a mid-block sidewalk extension or bus bulb is built). • Encourages mid-block jaywalking. • May increase customer walking distances if the trip generator is close to an intersection. Length of mid-block stops can vary due to depth of a turn-out and a bus' ability to maneuver in/out of traffic lanes.	• When traffic or street/sidewalk conditions at the intersection are not conducive to a near-side or far-side stop. • When the passenger traffic generator is located in the middle of a long block. • When the interval between adjacent stops exceeds stop spacing standards for the area. • When a mid-block stop is compatible with a corridor or district plan.

Source: Omnitrans: Transit Design Guidelines Final Report (March 15, 2013)

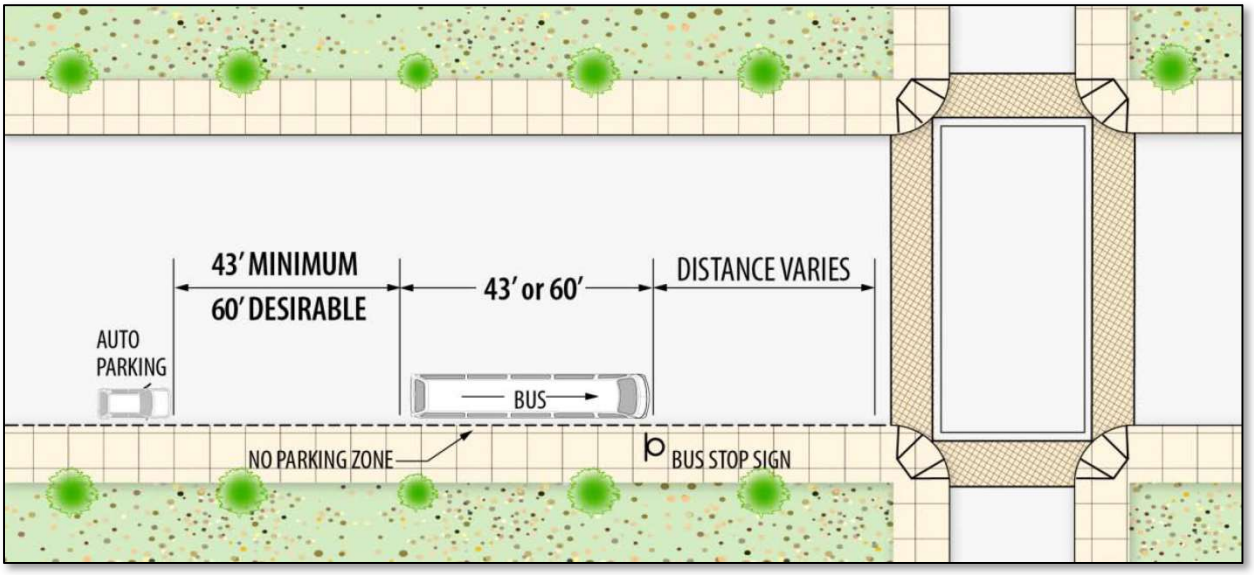

Figure 1: Suggested Bus Stop Distance for Nearside Locations

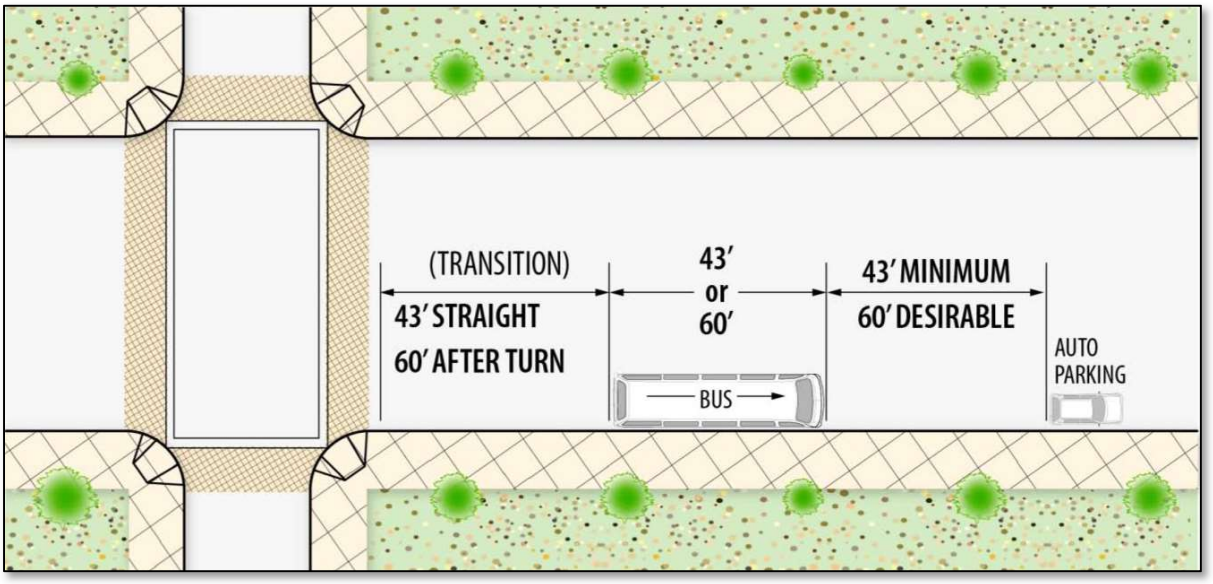

Figure 2: Suggested Bus Stop Distance for Farside Locations

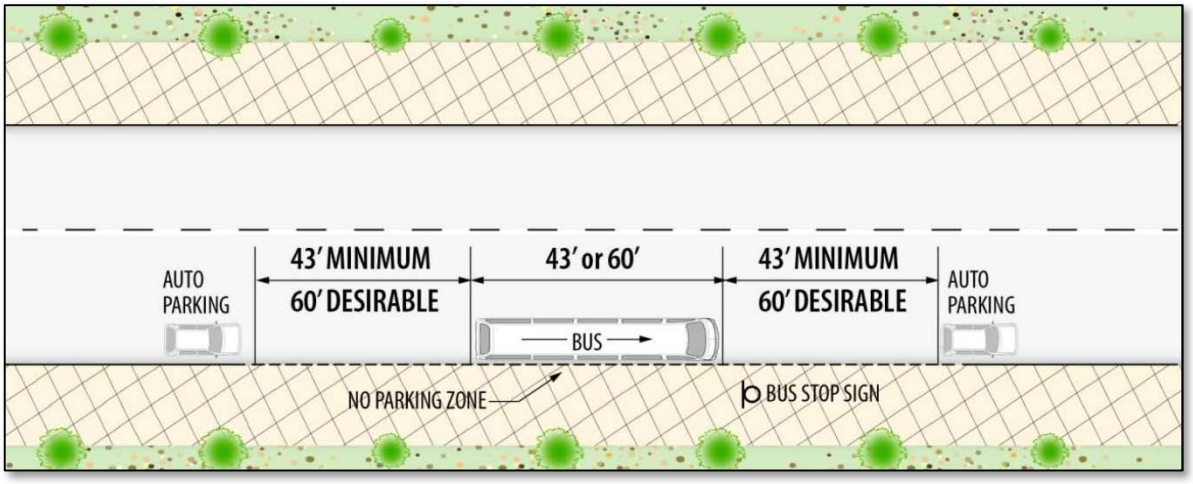

Figure 3: Suggested Bus Stop Distance for Mid-Block Locations

5.2. Bus Stop Elements

It is expected that each bus stop should incorporate a number of elements. A list of the minimum elements that each bus stop should have is listed below.

- Landing Area – The landing area must allow for lifts or ramps to be deployed on a suitable surface to permit a wheelchair to maneuver safely on and off the bus.
- Pedestrian Connections – A landing area of 5-feet wide by 8-feet long must be connected to a sidewalk of at least 4-feet wide.
- Curb Ramps – These shall be designed to conform to state and federal ADA standards.
- Signage – Appropriate signage must be used to mark the location of the bus stop. Route and schedule information should also be supplied at each bus stop.
- Safety and Security – Bus stops should not have hazardous conditions that could be potentially unsafe to users. The area should be well lit and free of obstacles.

Figures 4-6 show typical shelter characteristics at bus stops.

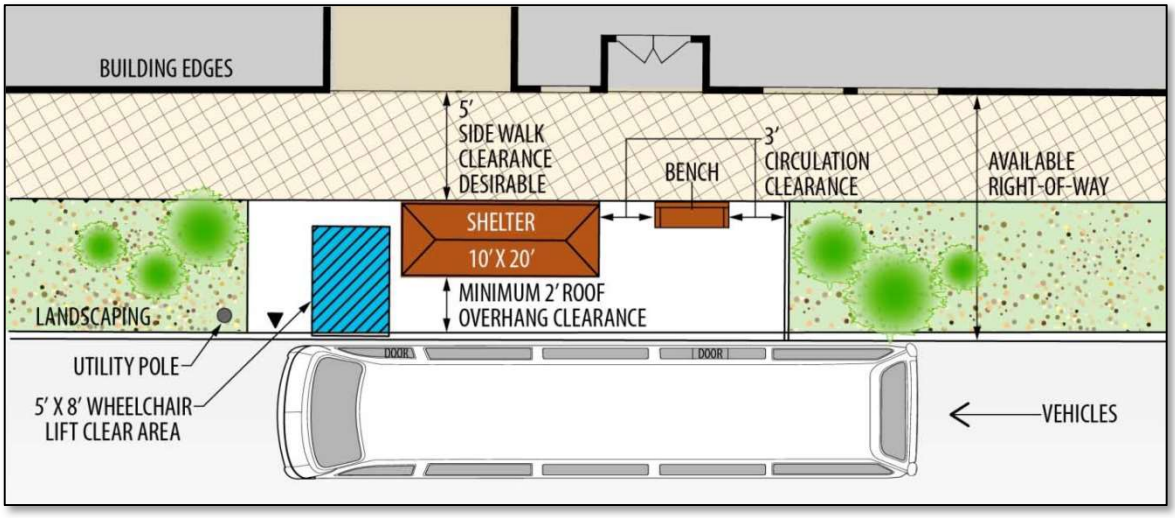

Figure 4: Typical Shelter Layout

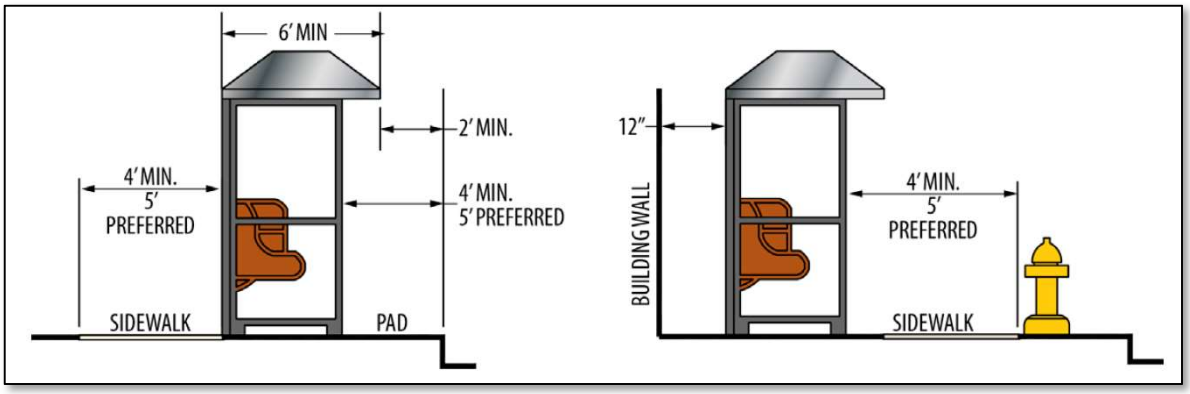

Figure 5: Typical Shelter Clearance

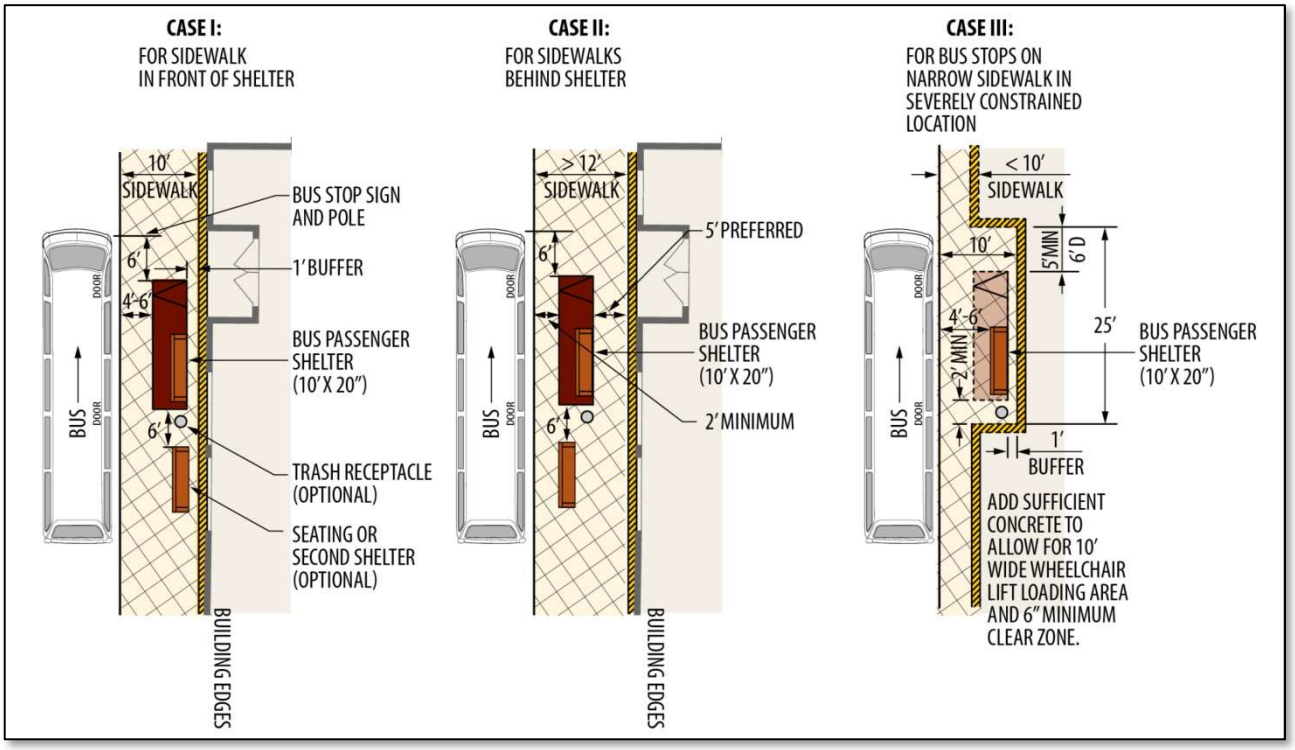

Figure 6: Typical Shelter Placement

6.0 TRAFFIC CALMING

Traffic calming refers to a number of methods used to reduce vehicle speeds, improve safety, and enhance the quality of life. In the simplest definition, it is changing the physical environment to reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for pedestrians and other non-motorized street users. Traffic-calming techniques are typically aimed at lowering vehicle speeds, decreasing truck volumes, and/or reducing the amount of cut-through traffic in a given area.

Some of the most universal goals of traffic calming are as follows:

- Reducing the frequency and severity of accidents.
- Addressing speeding or other problems on collectors or minor arterials.
- Improving the quality of life in residential areas.
- Reducing negative environmental impacts of traffic such as air and noise pollution.
- Promoting safe walking and bicycling.

Traffic calming measures can also have the following beneficial effects:

- Reduced need for police enforcement.
- Improved street environment (streetscaping/landscaping).
- Improved water infiltration into the ground.

Traffic calming techniques cannot be used with the same degree of success on all roadway facilities. Traffic calming is rarely seen on roadway facilities higher than a collector roadway functional classification. This is primarily due to roadways functionally classified higher than a collector having the

primary purpose of moving traffic, whereas for collector and local roadways the primary purpose tends to shift more towards serving adjacent land uses and infiltration into neighborhoods.

This section serves to delineate a process by which a traffic calming program can be carried out, as well as going further to discuss different traffic calming measures and their applicability to different transportation systems.

6.1. Purpose of Traffic Calming

Traffic calming is intended to reduce the negative effects of motor vehicle use, alter driver behavior, and improve conditions for non-motorized street users. It is used on local streets to discourage non-local traffic. Non-local traffic is not invested in the neighborhood, and therefore has less respect for speed limits, and the non- vehicular elements of the street environment. Certain, limited traffic calming measures are appropriate for slowing traffic on collectors or minor arterials as well.

Because traffic calming includes an educational or enforcement campaign, or an engineering study, it can result in the physical construction of traffic elements designed to reinforce the perceived need for caution by the users of the transportation system. The need for physical traffic calming devices indicates the transportation user's consistent failure to appropriately interact with the surroundings. Regardless of any traffic calming measures installed, the primary responsibility for safe use of the streets lies with the individual driver, cyclist, or pedestrian.

The success of traffic calming measures on a local street depends upon strong support by residents in the immediate area. Additionally, the traffic calming measures need to address situations that a number of residents agree should be addressed. Situations that many people agree exist and that could respond to traffic calming techniques will have more support from the neighborhood, and will better enhance the neighborhood environment. Traffic calming projects which involve installing "hard" improvements should meet several criteria before being considered for implementation, because they can be disruptive to the residents in the surrounding area, difficult to fund and maintain, and difficult to remove once installed.

Traffic calming elements can be incorporated into the initial design of subdivision, or can be retrofitted into existing subdivisions. The City of Great Falls has many streets which already contain traffic calming measures. These include street trees, on-street parking, and sidewalks separated from the street by a planting strip. Other techniques can include landscaped medians, pedestrian bulb-outs at corners, traffic circles or other intersection design techniques as well as other mid-block design techniques.

There are however, several circumstances where traffic calming becomes necessary. One of the most common circumstances is when the arterial system is congested or has turn restrictions. This set of circumstances may lead to arterial traffic detouring into an adjacent neighborhood. Local streets near a heavily used arterial can experience arterial traffic. In Great Falls, 9th Avenue South appears to experience this phenomenon due to its proximity to 10th Avenue South. To address this situation, stop signs have been installed at some locations. Installation of stop signs is one of a number of traffic calming measures, and has been used extensively by the City. Stop and yield signs are prevalent on the east/west legs of the intersections of 9th Avenue South with the various north/south streets. These serve to discourage through traffic, while still allowing local traffic and necessary circulation back to 10th Avenue South.

During street construction traffic calming issues may be raised. Detours are necessary but frustrating for residents. However, when motorists use alternate routes instead of the designated detours, concerns with congestion, speed, pollution and enforcement become real. But these issues are temporary, and

temporary measures are appropriate to address them. Some examples of temporary traffic calming measures include:

- Removable median curbs to constrict, or choke, a roadway;
- Removable median curbs placed to form a traffic circle within an intersection;
- Removable median curb placed to form forced turn diverters;
- Temporary bollards to close off traffic to a roadway; and
- Temporary speed bumps.

Very few traffic calming techniques are appropriate for use on arterials, because they interfere with an arterial's ability to move people and vehicles quickly from one place to another. The techniques which are appropriate for the arterial system are summarized later.

6.2. Types of Traffic Calming Measures

There are two forms of traffic calming, active and passive. Active measures are usually applied after a street has been constructed to correct a perceived problem with driver behavior. Passive measures are more likely to be included during the initial design of a roadway. Generally, active measures are not appropriate for the arterial network as they interfere with the purpose of arterials to move larger volumes of vehicles. However, appropriate use of passive measures may accomplish the purpose of encouraging safer driver, cyclist, or pedestrian behavior without restricting traffic flow. Arterials should be considered in any active traffic calming plan since speeding and cut-through traffic on local streets can be an indicator that the arterial network is not functioning properly. Therefore, improvements to the arterial network may be a more effective solution than active traffic calming on smaller streets.

Traffic calming measures generally fit into one of the following major categories:

- Passive measures;
- Education and enforcement;
- Signing and pavement marking;
- Deflection (either vertical deflection or horizontal deflection); and
- Diversions or restrictions.

6.2.1. Passive Measures

Passive measures are described as measures which are built into the street environment. They are not immediately obvious to the traveling public, but nevertheless produce a calming effect on traffic. Some of these measures are listed below.

- Tree-lined streets;
- Streets with boulevards separating the sidewalks;
- Streets with raised center medians (usually landscaped);
- On-street parking (including angled parking);
- Highly visible pedestrian crossings; and
- Short building set-back distances.

These elements tend to slow traffic by giving motorists the impression that the street is narrow and that extra care is required, but these elements do not restrict or interfere with traffic flow. A combination of more than one of these techniques, or these techniques combined with measures from the other categories, will produce better results.

6.2.2. Education and Enforcement

Several techniques are available to raise public awareness of traffic problems and change the behaviors contributing to problems. Some of these techniques are discussed in this section.

NEIGHBORHOOD SPEED WATCH PROGRAM

A speed monitoring program where residents themselves measure vehicle speeds with a radar unit and record license plate numbers of speeding vehicles. Follow-up action of the data can include sending letters to the registered owners of the vehicles explaining the safety concerns within the neighborhood and requesting better observance of the speed limits.

RADAR SPEED MONITORING TRAILER

A pull-behind trailer equipped with speed detection equipment, a readout of vehicle speeds, and a sign with the posted speed limit is brought to an area with speeding problems. The Great Falls Police Department currently has one of these trailers and this service can be requested by contacting the Great Falls Police Department. These trailers are usually unmanned; however better results are obtained if someone is present. Additionally, the trailer can be equipped with a camera that would record license plate information for possible follow-up.

Advantages

- Widely accepted
- Basically run themselves
- Can save data and be used to determine problem areas and times
- Works as a driver education method
- Portable

Disadvantages

- May require additional enforcement
- Can encourage speeding of some groups of drivers
- Vandalism may occur
- Limited effectiveness when not used in conjunction with additional enforcement

Special Considerations

- Signing
- Enforcement level
- Maintenance

Estimated Cost

- $10,000 to $20,000

NEIGHBORHOOD TRAFFIC SAFETY CAMPAIGN

As a part of the normal neighborhood group activities, newsletters or other materials can be produced containing educational information regarding traffic issues. These materials can be tailored to issues of specific concern to different neighborhoods. These issues can then be addressed at regularly scheduled meetings or at special meetings and recommendations can be put forward to increase neighborhood traffic safety.

TARGET ENFORCEMENT

This is a requested, time-limited addition of police enforcement within a neighborhood. Increasing the level of police enforcement on streets that are prone to speeding problems can be an effective way to reduce the number of speeding vehicles. Additional police enforcement can help to discourage drivers from breaking speed limit laws in the area. The speed reduction, however, usually is only reduced for a short period of time or as long as the enforcement is maintained. In order to have a long term effect on speeding, police enforcement must be on a repetitive non-routine basis while having signage and/or brochures in the area to indicate that enforcement will be increased in the area. There can be significant budget and manpower constraints to having continual police enforcement. Using police personnel to enforce speed limits is typically a low priority for police departments. The cost of enforcing speed limits on a continual basis can be unjustifiable.

Advantages

- Effective at slowing vehicle speeds down
- Widely accepted
- Increases safety level of the area

Disadvantages

- Requires continual enforcement
- Not of high priority to police departments
- Expensive

Special Considerations

- Signs
- Continual enforcement

Estimated Cost

- Varies

PUBLIC SERVICE ANNOUNCEMENTS (PSA'S)

The Great Falls Police Department regularly produces video public service announcements on traffic issues, mainly related to safety. These occasionally include traffic calming information, and are televised during local news programs. PSA's could be used more regularly to inform the public on traffic issues and calming techniques.

6.2.3. Signage and Pavement Marking

Traffic control signs and pavement markings can be installed as non-intrusive traffic calming measures. These techniques are already in use in the Great Falls area. The signs can include speed limit signs, dead-end street signs, and signs indicating school crossings or general pedestrian crossing. Pavement markings can include marked crosswalks, delineation of (narrow) lanes, and speed limit markings. Traffic calming techniques which specifically fall in this category include:

- **Truck Route Signing:** Signs placed on routes where trucks are allowed, plus signs placed on routes where trucks are not allowed.
- **Basket Weave Stop Sign Pattern:** Stop signs placed at every intersection in a residential neighborhood with stops alternating between east west and north south. Note: this is appropriate for local access streets only, and it disregards MUTCD warrants.
- **Speed Limit Signs:** Installing new or additional speed limit signs.
- **Edge Lines:** Painted lines on the pavement which narrow traffic lanes and/or provide for bicycle lanes or on-street parking.
- **Stop Bars:** Painted lines on the pavement that show motorists where to stop for stop signs.

DECREASED SPEED LIMITS

Decreasing speed limits in an area prone to speeding is a simple low cost approach to trying to deter drivers from breaking the speed limit. However, the posted speed limit is generally ignored by the driver. Drivers generally travel at speeds they consider reasonable and are often influenced by other drivers in the area. There is usually little to no effect on vehicle speeds by simply lowering the speed limit in the area. To have an effect on vehicles, the lower speed limits must be accompanied by other means of speed control. These other means could be increased law enforcement, speed bumps, or any other method that would help promote lower speeds in the area. Decreasing speed limits in areas such as school zones is common and does tend to have some effect on speeding. The effect can be much higher by using law enforcement to help monitor the area.

Advantages

- Low cost
- Useful when done in conjunction with other speed control methods
- Useful in areas such as school zones
- Disadvantages:
- Little to no effect on vehicle speeds when done alone
- Often times ignored
- Requires additional measures

Disadvantages

- None

Special Considerations

- Signs
- Enforcement
- Maintenance

Estimated Cost

- $4,000 to much higher depending on design

PAVEMENT MARKINGS

Pavement markings can be used for anything from on-street parking, to accentuating already existing features, to creating new features. Using pavement markings to indicate areas where on-street parking would occur creates a safer parking environment and also directs traffic in the area. A slight speed reduction may occur if the travel lanes are narrowed due to the markings. When pavement markings are used to accentuate already existing features, they can make the features look bigger and give advanced warning about them. Pavement markings can also be used to create turning lanes and to direct traffic flow without having to use expensive medians or curbs.

Pavement markings are generally not overly effective on vehicle speed reduction unless they create the impression of a narrowed roadway. While pavement markings don't force drivers to act, they do give them guidance on how to act.

Advantages

- Inexpensive
- Can accentuate already existing features
- Can help create areas of caution
- Gives guidance to the drives

Disadvantages

- Limited effect on vehicle speed reduction
- Must be maintained
- Not easily visible under snow or water

Special Considerations

- Maintenance
- Signage
- Visibility

Estimated Cost

- Varies

6.2.4. Deflection, Narrowing, Diversion, and Restriction

There is a wide variety of physical traffic calming measures which fall under the categories of vertical deflection, horizontal deflection and installation of diversions or restrictions. Each measure has both advantages and disadvantages.

Several guidelines should be considered when deciding to implement these types of measures. These include:

- Attempt less restrictive measures before considering more restrictive measures such as road closures or other route modifications.
- Space devices 300 to 500 feet apart in order to contain speeds to a 20 to 25 mile-per- hour speed range.
- Make accommodations for drainage and snow removal.
- Make accommodations for emergency vehicles.
- Consider pedestrian and bicyclist needs.
- Address landscaping or other maintenance issues.

Descriptions of a wide variety of physical traffic calming measures, as well as the advantages and disadvantages of each are presented on the following pages. A general magnitude cost range is shown for a basic installation of each measure. These costs can increase significantly with the addition of irrigation systems and street lighting, or the acquisition of right-of-way. Beautification amenities, such as brick pavers or extensive landscaping, can also dramatically impact project costs.

SPEED BUMPS, HUMPS, TABLES, AND CUSHIONS

Speed bumps, humps, tables, and cushions are all design features which are raised above the roadway. The differences between the four types are in their geometry. Speed bumps are the smallest and are generally 3 to 6 inches high and 1 to 3 feet long. They are typically used in parking lots and low speed residential areas. Speed bumps slow vehicles traveling at slow speeds down to approximately 5 miles per hour. Vehicles traveling at higher speeds may be impacted less by the bumps.

Speed humps are larger than speed bumps and range from 3 to 4 inches high and 10 to 14 feet long. They can be used on streets where a low speed limit is desired. Speed humps generally can slow vehicles down to approximately 15 miles per hour. If traveled over at higher speeds the vehicle will experience a severe jolting effect.

A speed table is a lengthened speed hump with a flat top. Speed tables are typically long enough so that the entire wheelbase of a car rests on the table. The design of speed tables allows for higher speeds than those of speed humps, but creates a smoother ride for larger vehicles. The height of speed tables is similar to speed humps, but the length can vary. A typical 22-foot long speed table has a design speed of approximately 30 miles per hour.

Speed cushions are a series of speed humps installed across the width of the roadway with spaces between them. The spaces are spaced so that emergency vehicles can pass between them without being affected by the bumps. Ordinary cars have smaller axels and will therefore need to travel over the bump with at least one side of their car. Speed cushions have about the same effect on slowing cars down as speed humps do while still allowing emergency vehicles to be unaffected by them.

These traffic calming measures can be placed at spaces ranging from 250 feet to 800 feet to gain a continuous effect on slowing vehicle speeds. If they are placed at distances greater than 800 feet, there is enough room between them for driver to speed up between the devices which will limit their effectiveness.

Advantages

- Slows traffic down
- Increases safety levels
- Decreases traffic volume
- Self-enforcing
- Relatively inexpensive

Disadvantages

- May promote speeding between them
- May increase volume on other streets
- Difficult to properly construct
- May alter storm drainage flow
- May interfere with snow and ice control measures

Special Considerations

- Emergency vehicles
- Drainage
- Signage
- Snow Removal

Estimated Cost

- $1,000 to $8,000

RAISED INTERSECTIONS

Raised intersections are flat raised areas around the intersection with ramps attaching each approach to the intersection. The ramps and/or the intersection can be made out of a textured or painted material to make them stand out visually. By raising the level of the intersection and the cross walks, the area becomes more noticeable to the driver. This creates a safer environment for pedestrians crossing at the intersection. Raised intersections are ideal in areas with heavy pedestrian traffic and on-street parking that doesn't allow for other measures to be taken.

Advantages

- Improved safety for vehicles and pedestrians
- Can be visually appealing
- They work for the entire intersection, not just one street
- Better for emergency vehicles than speed humps

Disadvantages

- Increases turning difficulty
- Increased maintenance
- Requires additional signage
- Less effective at reducing speeds than speed humps and speed tables
- Can be expensive depending on the materials used
- May alter storm drainage flow
- May interfere with snow and ice control measures

Special Considerations

- Emergency vehicles
- Drainage
- Signage
- Snow Removal

Estimated Cost

- $4,000 to $12,500 depending on materials used and size of intersection

RAISED CROSSWALKS

Raised crosswalks are simply speed tables that have crosswalk signage and markings to allow for pedestrians to cross the roadway. The raised level of the crosswalk makes it more visible to the driver and therefore safer for the pedestrians. Raised crosswalks are ideal in locations where there is heavy pedestrian traffic and high vehicle speeds. Raised crosswalks have the advantage of slowing vehicles down who drive over them and alerting vehicles to possible pedestrian traffic in the area.

Advantages

Disadvantages

- Improved safety for vehicles and pedestrians
- Can be visually appealing
- Effective at reducing vehicle speeds
- Makes the crosswalk and pedestrians more visible

- May promote speeding between them
- Difficult to properly construct
- May slow down emergency vehicles
- May alter storm drainage flow
- May interfere with snow and ice control measures

Special Considerations

- Emergency vehicles
- Drainage
- Signage
- Snow Removal

Estimated Cost

- $2,500 to $8,000

TEXTURED PAVEMENT

Textured pavement can be created by either stamping the pavement or by using an alternative material like brick or cobblestone. The purpose of both methods is to create a surface that is unpleasant to drive over at high speeds due to the uneven texture of the surface. If driven over at higher speeds the texture will cause a noticeable vibration to the car, much like a rumble strip does. The variation in the surface will also cause an audible difference when driven over. Generally, the pavement area that is textured is either painted a different color or the materials used are of a different color. The change in color makes the area standout visually and will alert the driver that caution needs to be taken in the area. Warning signs can also be used in conjunction with the textured pavement to increase their effectiveness. Textured pavement can also be used to highlight crosswalks or other areas of interest.

Advantages

- Can reduce vehicle speeds
- Can increase driver awareness
- Provide visual and physical warnings to the driver
- Can be used to highlight most areas
- Aesthetically pleasing if properly designed

Disadvantages

- May be difficult for pedestrians and bicyclists
- Can be very expensive depending on material and area covered
- Can add additional noise to the area
- Maintenance issues may arise

Special Considerations

- Emergency vehicles
- Drainage
- Signage
- Snow Removal

Estimated Cost

- Varies by design

SURFACE VALLEY GUTTERS

Valley gutters are dips in the street that can be used to carry runoff as well as cause discomfort to drivers at high speeds.

Advantages

- Effective if used in series at 300 to 500 foot intervals
- Self-enforcing
- Relatively inexpensive during initial construction

Disadvantages

- Drivers may speed up between dips
- May divert traffic and increase volumes on other streets
- Not usually appropriate for existing streets with established drainage patterns

Special Considerations

- Emergency vehicles
- Drainage
- Signage

Estimated Cost

- $1,000 to $2,000

TRANSVERSE RUMBLE STRIPS

Rumble strips are patterned sections of rough pavement in the street designed to slow traffic. The vibration caused by driving over the rumble strips is intended to cause motorists to slow down. The rumble strip provides visual and audio cues to alert drivers to areas that require special care (shopping centers, schools, entrances to residential neighborhoods). Changes in pavement color and texture (such as bricks or blocks), used in interesting and visually attractive ways, can also have the effect of rumble strips.

Advantages

- Create driver awareness
- Relatively inexpensive to install

Disadvantages

- High maintenance
- May adversely impact bicyclists
- Noisy by design, not recommended for all areas

Special Considerations

- Emergency vehicles

Estimated Cost

- $1,000 to $2,000

GATEWAY

A gateway is an entry treatment to the roadway or surrounding area that creates a sense of passage or change in traffic conditions to the area. Gateways can consist of vertical elements such as posts, trees, bushes, signs, poles, or columns. They can also be formed using curb extensions, changes in pavement color or type, or any other method that creates a sense of entry into an area. Gateways can cause a small reduction in traffic volume because they can make drivers feel uncomfortable about entering the area. A slight speed reduction can also be achieved through the use of narrowing the roadway at the gateway. Safety levels in the area may be increased as well since attention would be drawn to the area.

Advantages

- May slow vehicle speeds
- Highlights the intersection
- Increased pedestrian safety
- Aesthetically pleasing
- Does not inhibit emergency vehicles
- Possible small volume reduction

Disadvantages

- Increased maintenance
- May have limited effect
- Can increase the difficulty level to maneuver the area
- Can be very expensive

Special Considerations

- Lighting
- Signage
- Drainage
- Maintenance

Estimated Cost

- $4,000 to much higher depending on design

CHOKERS, NARROWINGS, SLOW OR ANGLE POINTS, NECKDOWNS, BULB-OUTS

Chokers are curb extensions that narrow a street, effectively creating a pinch point along the street. Chokers can be created by bringing both curbs in, or they can be done by more dramatically widening one side at a midblock location. They can also be used at intersections, creating a gateway effect when entering a street.

Chokers typically narrow the street to two narrow lanes or one lane at selected points and force motorists to slow down to maneuver between them. Curb extensions at midblock or intersection corners that narrow a street by extending the sidewalk or widening the planting strip. At midblock locations, this feature is sometimes referred to as parallel chokers, angled chokers, twisted chokers, angle or pinch points, slow points, or midblock narrowings. At intersections, the feature may be called a neckdown, bulb-out, knuckle, or corner bulge. Chokers are good for areas with substantial speed problems and no on-street parking shortage.

Advantages

- Minor inconvenience to drivers and local traffic
- May create on-street parking bays
- Shorter crossing distance for pedestrians
- Provides space for landscaping, can be aesthetically pleasing
- Can be used in multiple applications along roadway

Special Considerations

- Lighting
- Signage
- Irrigation and maintenance of landscaping
- Emergency vehicle access

Disadvantages

- May create opportunities for head-on conflicts on narrow streets
- Cost is greater that many other devices
- May lose some on-street parking near feature
- Unfriendly to bicyclists unless designed to accommodate them
- Can be very expensive

Estimated Cost

- $8,000 to $50,000 or higher depending on design

CHICANES

Chicanes are offset curb extensions that cause a deviation in the path of travel. They typically alternate from one side of the street to the other, forming S-shaped curves. Chicanes can also be created by shifting parking, either diagonal or parallel, from one side of the street and the other.

Shifting a travel lane influences speeds as long as the taper is not so gradual that motorists can maintain speeds. For traffic calming, the taper lengths should reflect the desired speed which should be posted prior to the chicane.

Advantages

- Imposes minimal inconvenience on local traffic
- Reduces pedestrian crossing distance
- Provides large area for landscaping
- Reduces speeds without significantly increasing emergency response times

Special Considerations

- Lighting
- Signage
- Irrigation and maintenance of landscaping

Disadvantages

- May create opportunities for head-on conflicts on narrow streets
- Cost is greater that many other devices
- Unfriendly to bicyclists unless designed to accommodate them

Estimated Cost

- $20,000 to $30,000

TRAFFIC CIRCLES

Traffic circles are raised circular islands placed in the center of the intersection about which drivers must navigate around. They cause vehicles to slow down through the intersection because they are forced to make turning movements. They are very effective at slowing vehicle speeds down. Pedestrian safety is also increased due to the decrease in speeds. Large vehicles may have trouble navigating around the traffic circles, especially when making left-hand turns. Traffic circles work well for low volume intersections where speeding is a common problem. Traffic circles are not to be confused with roundabouts, which exhibit large splitter islands, yield signs at each entry way, and are intended for larger intersections with higher traffic volumes.

Advantages

- Reduces crashes over stop control
- Provides space for landscaping
- Provides equal access to intersection for all drivers
- Provides good environment for bicyclists

Disadvantages

- May be restrictive for larger vehicles if designed to a low speed.
- Right-of-way may need to be purchased
- Initial safety issues as drivers adjust
- May increase volume on adjacent streets

Special Considerations

- Lighting
- Signage
- Irrigation and maintenance of landscaping

Estimated Cost

- $10,000 to $50,000 or higher depending on design and location

HALF CLOSURES

Half closures are put in place to block a single lane of traffic. They can be used to prevent vehicles from entering a road but still allow vehicles to exit the road. This is an effective means of limiting traffic on a roadway and also limiting turns off of the intersecting roadway. Half closures are generally made by extending the curb or placing a barrier to block entry. Ample signage must be put into place to alert drivers to the partial closure. Half closures are commonly used in areas where a residential road is experiencing heavy amounts of traffic due to its connection to a main road. Most of this traffic can be attributed to cut-through traffic and can be significantly decreased through the use of half closures.

Advantages

- Reduces access for residents or businesses
- May increase trip length
- Increases volumes on other streets
- Drivers may be able to drive around the barrier

Disadvantages

- Reduces access for residents or businesses
- May increase trip length
- Increases volumes on other streets
- Drivers may be able to drive around the barrier

Special Considerations

- Emergency vehicles
- Signage
- Maintenance

Estimated Cost

- $10,000 to $40,000

DIAGONAL DIVERTERS

Diagonal Diverters consist of a barrier being placed diagonally across a four-legged intersection which interrupts the traffic flow across the intersection. The traffic is diverted away from and is not allowed to drive straight through the intersection. The diverter gets rid of conflict points caused by thru traffic and turning movements within the intersection. They also discourage non-local traffic flow in the area, but still allow for local traffic. This method is effective in areas where there are problems with cut through traffic. The diverter needs to be visible enough to alert the driver to slow down and make the turn.

Advantages

- Eliminates through traffic and reduces traffic volumes
- Not a full road closure
- Provides space for landscaping
- Reduces traffic conflict points
- Increases pedestrian safety
- Can include bicycle path connection

Disadvantages

- May be an inconvenience to area businesses or residents
- May inhibit emergency vehicles
- Can be expensive if done as a retrofit
- Cause circuitous routes

Special Considerations

- Emergency vehicle access
- Lighting
- Signage
- Drainage
- Maintenance

Estimated Cost

- $10,000 to $80,000

FULL CLOSURES

Full street closures are created by placing barriers at an existing intersection. The full closures can be done to create a dead end or a cul-de-sac style road. An opening or trail can be placed to connect pedestrians and bicycles to the abutting road. The type of barrier used to create the closures can range from a bollard style to a full landscaped closure. A landscaped style is more aesthetically pleasing to the area, but is also much more expensive then placing bollards to stop vehicle traffic. Another method commonly used to create road closures is installing curb extensions to the roadway.

Road closures are very effective at lowering traffic volumes on the roadway. Cut through traffic can be greatly reduced through the use of full closure. It is common to use full closures to limit the amount of traffic on a residential street that was connected to a main street. By closing the connection to the main street, the traffic that previously used the residential street to connect to the main street would diminish thereby decreasing the overall traffic on that road. This does, however, create more traffic on other roads in the area since those vehicles would still have to access the main street via another street.

Advantages

- Eliminates through traffic
- Improves safety for all street users
- Can still have pedestrian and bicycle access
- Can be aesthetically pleasing

Disadvantages

- Reduces emergency vehicle access
- Reduces access to properties
- May increase trip lengths
- Increases volumes on other streets
- Can be expensive

Special Considerations

- Emergency vehicles
- Signage
- Drainage
- Maintenance

Estimated Cost

- $15,000 to much higher depending on design

MEDIAN BARRIERS

Median barriers are put in place in the middle of intersections to restrict cut-through movements at a cross street. They also restrict left-turns onto the cross streets from the main street. Putting a median barrier in place will reduce the number of conflict points and therefore increase the safety of the intersection. The barrier can be used as a pedestrian refuge for people wanting to cross the main street. This, along with the reduction in left-turns, increases pedestrian safety at the intersection. Median barriers also reduce traffic volumes on the side streets while increasing the traffic flow on the major street since there will no longer be vehicles sopping to take left-turns at the intersection. This type of barrier can work well in areas where the side street has turned into a popular cut-through street or in areas where there are problems with people stopping to make left-turns. The median barrier does restrict all vehicles, including emergency vehicles. However, the barrier can be designed so that emergency vehicles can travel around them if needed.

Advantages

- Lowers traffic volumes on the side street
- Provides space for landscaping
- Reduces traffic conflict points and increases safety
- Increases pedestrian safety

Disadvantages

- May be an inconvenience to area businesses or residents
- May inhibit emergency vehicles
- Require additional street width on the major street

Special Considerations

- Emergency vehicle access
- Lighting
- Signage
- Drainage
- Maintenance

Estimated Cost

- $15,000 to $20,000 per 100 feet

FORCED TURN ISLANDS

Forced turn islands are small traffic islands placed at intersections to restrict and channelize turning movements. They are generally put in place to block left-turn and through movements while still allowing for right-turn movements. This method is commonly used where smaller side streets intersect with a larger major street. Heavy left-turn or through traffic off of side streets can cause safety and traffic problems for the area. Restricting the movements from the side streets can increase the safety and traffic levels of the intersection. Forced turn islands are common place for parking lots or similar areas that have multiple entrances and exits. The islands encourage people wanting to turn left or go straight out of the area to use the designated intersections that don't have the forced turn islands; the designated intersections are generally larger safer intersections.

Advantages

- Provides space for landscaping
- Reduces traffic conflict points and increases safety
- May reduce cut through traffic
- Causes vehicles to use designated intersections

Disadvantages

- May be an inconvenience to area businesses or residents
- Driver may be able to maneuver around the island
- Diverts traffic to other roads
- May inhibit emergency vehicles

Special Considerations

- Emergency vehicle access
- Lighting
- Signage
- Maintenance

Estimated Cost

- $4,000 to $8,000

6.3. TRAFFIC CALMING PROGRAM FOR EXISTING STREETS

The method to implement a traffic calming program for existing streets is recommended in this section of the Chapter. It is important to note when examining this recommended program and its procedures that the process may be modified depending upon various factors. Some of these factors would include the severity of the problem, location of the problem (one intersection or area-wide), cause of the problem (such as a special seasonal event like the State Fair), or other circumstances which affect the situation

under consideration. Under any of these circumstances, the process may be altered at the discretion of the Public Works Department. This can include accelerating, slowing down, or terminating the process. Although some traffic calming measures are applicable to higher volume roads like collectors or in some commercial areas, the process outlined here is for local residential streets only.

To facilitate this process, the City will work closely with the Neighborhood Councils. This process would start early with the City supplying all the Neighborhood Councils with information about the traffic calming program and a number of Investigation Request Forms. With this preliminary coordination in place, the process can proceed smoothly.

PHASE I – PROBLEM IDENTIFICATION AND INVESTIGATION

Step 1: Step one can begin in two ways. First, a citizen contacts the Neighborhood Council where the traffic problem is. The Neighborhood Council listens to the circumstances, agrees there is a problem, and then completes an Investigation Request form and sends it to the Public Works Department. The responsibility to fill out the form can be delegated to the resident bringing forward the concern, or remain with the Council; or Second, the Neighborhood Council sees a need for traffic calming within their neighborhood on an area-wide basis and then completes and forwards an Investigation Request form to the Public Works Department.

The form is key to this process, because it has the information about the nature of the problem, its location, and the signatures of at least ten other neighborhood residents who agree the problem exists. Furthermore, it identifies the Neighborhood Council and interested local residents. Note the Investigation Request form requires signatures from ten residents agreeing that the situation observed exists, and this portion must be completed in order to move this process forward.

Step 2: After receiving the form, the Public Works Department would contact the neighborhood to discuss the nature of the perceived problem. This contact would include the Neighborhood Council and, if appropriate, local residents. This is an important step, since this discussion helps determine the types of studies which need to be conducted, and would help focus on potential solutions.

Step 3: The Public Works Department conducts a field review of the location, and collects the appropriate data in order to determine whether or not the perceived problem actually exists. For most requests, the accident records would be reviewed, and traffic volumes collected. Other studies that may be appropriate include a speed study, truck count, or determining the percentage of cut-through traffic.

Once this data is collected, it is reviewed in the office against baseline traffic calming criteria. These should include at least one of the following:

- Traffic volumes higher than 1,000 vehicles per day or 100 vehicles in one hour.
- Three or more accidents in a 12-month period, occurring within the last three years.
- An 85th percentile speed at least 5 mph over the speed limit.
- Truck traffic volumes exceeding five percent of the total traffic volumes.
- More than 25% cut-through traffic during any single hour of an average day.
- Pedestrian crossing volume of 25 people per hour for any single hour of an average day.
- Chronic failure of drivers to yield to pedestrian traffic at an intersection.
- Other criteria as agreed upon by the neighborhood and the Public Works Department.

After the data is collected and reviewed against the baseline criteria, the Public Works Department shares the results of the review with the Neighborhood Council and any interested local residents. If

the subject location meets the required criteria, the Public Works Department would review the Phase II process with the Neighborhood Council and interested local residents. If the location does not meet the above criteria, the Public Works Department would discuss options with the neighborhood to address the situation outside of the traffic calming program.

PHASE II – IMPLEMENTATION OF PASSIVE TRAFFIC CALMING STRATEGIES

Step 4: The Public Works Department determines the boundaries of the affected neighborhood. Neighborhood boundaries will generally follow arterial streets or other natural physical boundaries such as rivers, abrupt changes in elevation, etc. A neighborhood meeting would then be scheduled by the Public Works Department to discuss possible educational / enforcement solutions to the problem. The map prepared by the Public Works Department delineating the boundary of the affected neighborhood is given to the Neighborhood Council who is then responsible for contacting the area residents about the meeting. At the meeting, the Public Works Department would present a range of educational / enforcement or low level engineering options. These measures would emphasize the least intrusive measures which may expand beyond educational / enforcement options to only minor physical changes, such as increased signing, installing pavement marking or trimming vegetation. The purpose of this meeting is to agree on a course of action to address the situation. This step may require more than one meeting and should not be considered complete until a course of action is agreed upon.

Step 5: A member of the Neighborhood Council or interested local resident circulates a Phase II petition within the boundary of the affected neighborhood. This petition identifies the proposed education / enforcement / engineering techniques, and asks residents to indicate their approval. The petition must be signed by more than forty percent of the property owners within the boundary of the affected neighborhood for the process to proceed. If a large number of residences are not owner occupied, then neighborhood residents may sign the petition, but the required amount is raised to fifty percent. Because these measures affect residents at their homes and in their neighborhoods, substantial neighborhood support is mandatory. If the required amount of signatures are obtained, the identified measures can then be implemented. If neighborhood approval cannot be secured, no further action would be taken.

Step 6: Approximately 90 days after implementing the measures, the City would repeat the data collection process it performed in Phase I. Please note that the 90-day time frame is generally enough time for shifts in the traffic patterns to have occurred. However, this may need to be modified depending on seasonal conditions or other factors. If the data collected indicates that the problem has been alleviated, the educational and/or enforcement activities can be considered as adequate and the process a success.

PHASE III – IMPLEMENTATION OF ACTIVE TRAFFIC CALMING STRATEGIES

Step 7: If the traffic problem has not been resolved by the measures implemented during Phase II, the Public Works Department then conducts a more intensive engineering study to determine a range of appropriate physical improvements to the location. The study should consider installation of either vertical or horizontal deflection techniques before considering roadway obstruction techniques.

Step 8: The Public Works Departments schedules a neighborhood meeting to review the improvement options. Once again, the Neighborhood Council is responsible for notifying area residents about the meeting. The Public Works Department facilitates this meeting. Based on resident input, a preferred solution is selected from the range of possible solutions. If a temporary version of this traffic calming device is not practical, proceed to Step 11.

Step 9: If a temporary version of the device is feasible, the Neighborhood Council or a designated representative circulates a Phase III Petition for Temporary Measures throughout the affected neighborhood. At least fifty percent of the property owners within the affected neighborhood must sign the petition for the temporary version of the preferred traffic calming device to be installed. Once again, if the neighborhood is predominantly not owner occupied, the residents can sign the petition, but at least sixty percent of the residents must sign the petition. If less than fifty percent of the property owners or sixty percent of the residents sign the petition, the elements from Phase II may remain in place, but no additional elements would be installed.

Step 10: After one year, the City would repeat the same data collection process as completed during Phase I to determine whether or not the temporary device is effective. If it is found not to be effective, the City would notify the Neighborhood Council and remove the device. The process then can begin again at Step 7.

Step 11: If the temporary device is effective, the Public Works Department then develops a preliminary design and cost estimate for installing a permanent traffic calming device. The Public Works Department also determines the funding mechanism to finance the permanent solution. The Public Works Department would look at all possible funding sources including federal or state grants, pilot project funding, etc to lower the costs to local residents. The City would provide the Neighborhood Council with this information, and the "Petition for Installation of Permanent Measures" can be initiated.

Step 12: The Neighborhood Contact circulates the petition for Installation of Permanent Measures, which includes a copy of the preliminary design, the cost estimate and an explanation of financial responsibility to the property owners in the affected neighborhood. The petition must be signed by seventy percent of the property owners in the affected neighborhood to allow the process to move forward. If less than seventy percent of the property owner sign the petition, the process cannot continue, and the temporary measures would be removed. However, if more than seventy percent of the property owners sign the petition, the Public Works Department would bring this measure before the City Commission for their approval, complete a final design and arrange for construction of the permanent traffic calming device. Note that financial obligations by the residents would be required at this point and must be in place before construction would begin.

Note: there are numerous points during this process at which the traffic calming process can be ended due to completion of the process or lack of adequate neighborhood support. Since neighborhood sentiment can change at a later date, the process can be resumed a year later at the same step where it left off.

PROJECT COSTS

The cost sharing related to installing traffic calming measures should be based on the initial need for the measure. The need for the measures can arise from one of the following situations.

- Poor initial street design
- Inadequacies of the major street network
- Commercial and/or residential development adjacent to the neighborhood

During Phase I of the process, the nature and cause of the traffic problem would be identified. From this information, the City would proportion the project costs. It is possible that such entities as the City, the neighborhood residents, developers, or other parties would be involved in paying for the traffic calming measures.

The costs of Steps 1 through 11 would be mostly borne by the City, other than the volunteer hours worked to complete paperwork, gather petition signatures, and notify residents of traffic meetings. Permanent traffic calming measures, as proposed in Phase III (Step 12) would likely be financed by neighborhood contributions, development fees, City funds and funds from other sources. The proportion of funding from these sources will vary on a case-by-case basis.

Removal of Permanent Traffic Calming Devices

To remove a permanent traffic calming device, the Neighborhood Contact must submit a "Petition for Removal of Traffic Calming Measure". This petition must be signed by ninety percent of the property owners within the affected neighborhood. The property owners within the affected neighborhood will be fully responsible for paying the cost of removing the traffic calming devices.

6.4. Incorporating Traffic Calming in New Street Designs

Much more is known about street function and design now than was known when Great Falls was originally established and developed. As such, street function should be identified at the beginning of the project approval process, and the streets designed to accomplish the functions appropriate for them. Those designed as arterials (part of the major street network) should be designed to efficiently move traffic in a convenient and safe manner. Conversely, streets that are intended to be local access streets or collector streets should be laid out and designed to primarily provide access to adjacent land, while discouraging through traffic and the higher travel speeds that accompany it. New developments, therefore, should include inherent traffic calming features which are an integral part of their design. If designed properly, the appropriate functions of the different categories of street would be intuitively obvious to the traveling public.

Some of the techniques that could be adopted for local access streets include:

- Street layout;
- Design standards including: lane width, curve tightness, on-street parking and landscaping;
- Street connectivity;
- Pedestrian / bicycle facilities;
- Intersection treatments such as small corner radii, pedestrian bulb-outs, etc.;
- Judicious use of "T" intersections;
- Entrance treatment; and
- Roundabouts or Traffic circles.

To achieve these goals, the City could incorporate traffic calming improvements into the adopted standard street designs. These designs could include recommendations where various treatments are appropriate as well as when they could be used. Design details could also be included to provide a guideline of what would be acceptable to the City.

Traffic calming design characteristics should also be incorporated into the City's development review and annexation review processes. Proposed developments or requests to annex would be reviewed by staff to determine whether or not traffic calming elements incorporated into the development's layout are appropriate for the given location, or alternatively, what strategies are best suited, and what design details could be considered. The process should be designed to pro-actively assist developers in utilizing traffic calming strategies to improve the quality of life in their developments, while minimizing or eliminating the costs for retrofit efforts. Due to the long-term effects of original roadway layout and construction, the traffic calming program should apply to all development in the transportation study area.

The designing of new subdivisions with inherent traffic calming procedures in place will ultimately result in better neighborhoods for new residents, and better use of arterials by the traveling public.

6.5. Traffic Calming Techniques Applicable to Collectors and Minor Arterials

A few of the measures depicted on the tables on the following pages are applicable to non-local street conditions. Installation of any of these measures will be done at the discretion of City staff. These measures do not fall under the process outlined previously. The measures are restricted to horizontal deflection and include the following:

- Mid-block median;
- Curb bulb-outs / neckdown; and
- On-street parking.

These measures can be used to slow traffic where chronic speeding problems have been shown to exist, or to accommodate pedestrian traffic. The mid-block median usually is present on arterials due to another piece of infrastructure, such as a railroad track which passes over the street, or an overhead pedestrian crossing structure.

On-street parking almost always occurs in a residential area, but also can occur in retail or industrial sectors. Judicious use of on-street parking can influence the traffic flow and help regulate traffic speeds on collectors or minor arterials. Bulb-outs, also called neckdowns, can be used to create the illusion for the driver that the roadway is narrowing. This perception will cause the driver to slow down. A secondary benefit of the bulb-outs is the decreased walking distance for pedestrians at the crosswalks. Bulb outs generally are wide enough for a car to park in their “shadow”. This generally creates good separation between the parked cars and the moving traffic.

7.0 CONTEXT SENSITIVE SOLUTIONS

Context Sensitive Solutions (CSS) are an interdisciplinary approach that seeks effective, multi-modal transportation solutions by working with stakeholders to develop, build and maintain cost-effective transportation facilities which fit into and reflect the project’s surroundings – its “context.” With respect to transportation projects, context can be defined as “all elements related to the people and place where a project is located.” This includes both visible elements such as environmental or historic resources and invisible elements such as community values, traditions, and expectations.

CSS is both process and product, characterized by a number of attributes. It involves all stakeholders, including community members, elected officials, interest groups, and affected local, state, and federal agencies. It puts project needs and both agency and community values on a level playing field and considers all trade-offs in decision making. Through early, frequent, and meaningful communication with stakeholders, and a flexible and creative approach to design, the resulting projects should improve safety and mobility for the traveling public, while seeking to preserve and enhance the scenic, economic, historic, and natural qualities of the settings through which they pass.

CSS is guided by four core principles:

1. Strive towards a shared stakeholder vision to provide a basis for decisions.
2. Demonstrate a comprehensive understanding of contexts.
3. Foster continuing communication and collaboration to achieve consensus.

4. Exercise flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments.

Context sensitive designs incorporate a multidisciplinary design team. Residents, business owners, local institutions, city officials, and designers all have a part in the design and implementation of CSS. The conventional approach to design would be to approach the stakeholders at the tail end of the design phase in order to gain approval; involving these people at the beginning of the project ensures that the needs of all the stakeholders and the public are addressed from start to finish. Addressing these needs in the early stages can save valuable time and money in the development process.

Conventional designs place importance strictly on level of service and moving traffic. CSS balances safety, mobility, community, and environmental goals. The idea is to achieve a design that creates a unity for all of the users and for the area. CSS focuses not only on moving traffic, but also on pedestrians, bicycles, and aesthetic issues. Roads are built around the needs of pedestrians and bicyclists instead of just being built to handle the highest amount of traffic at the highest speeds possible. A properly constructed road will be safe for all users, regardless of their mode of travel. A CSS allows flexibility for its users when choosing their travel type.

CSS should encourage “smart growth” within the area. This refers to a type of city center growth that discourages urban sprawl by creating an area where pedestrians, bikes, transit, and vehicles can function in harmony within the network. Mixed-use development is also used in the area to allow for a variety of activities to take place. CSS creates a sense of community and unity to the area, while increasing safety levels and aesthetic value to the area.

Another purpose of CSS is to give users flexibility in the design process of transportation elements. All projects are different and should be treated as such. It is appropriate for some areas to incorporate 12-foot-wide travel lanes, for example, while others may benefit more from smaller 10-foot-wide lanes. The FHWA’s *Flexibility in Highway Design* is a guide written for highway engineers and project managers that describes the flexibility available when designing roads and illustrates successful approaches used in other highway projects.

The "Qualities that Characterize Excellence in Transportation Design", elaborated at the Thinking Beyond the Pavement in 1998, illustrate the desired end products of the CSS process:

- The project satisfies the purpose and needs as agreed to by a full range of stakeholders. This agreement is forged in the earliest phase of the project and amended as warranted as the project develops.
- The project is a safe facility for both the user and the community.
- The project is in harmony with the community, and it preserves environmental, scenic, aesthetic, historic, and natural resource values of the area, i.e., exhibits context sensitive design.
- The project exceeds the expectations of both designers and stakeholders and achieves a level of excellence in people's minds.
- The project involves efficient and effective use of the resources (time, budget, community) of all involved parties.
- The project is designed and built with minimal disruption to the community.
- The project is seen as having added lasting value to the community.

7.1. Benefits of CSS

As more organizations apply CSS principles, evidence continues to grow that measurable benefits result from this broadly informed and flexible approach to all phases of transportation decision making. Involving

stakeholders in decision making yields transportation solutions that balance environmental, engineering, community, mobility, funding, and safety needs with the minimum of delay and controversy. As an approach to transportation, CSS offers many important benefits[1]:

- CSS solves the right problem by broadening the definition of "the problem" that a project should solve, and by reaching consensus with all stakeholders before the design process begins.
- CSS conserves environmental and community resources. CSS facilitates and streamlines the process of NEPA compliance.
- CSS saves time. It shortens the project development process by gaining consensus early, and thereby minimizing litigation and redesign, and expediting permit approvals.
- CSS saves money. By shortening the project development process and eliminating obstacles, money as well as time is saved.
- CSS builds support from the public and from the regulators. By partnering and planning a project with the transportation agency, these parties bring full cooperation, and often additional resources as well.
- CSS helps prioritize and allocate scarce transportation funds in a cost-effective way, at a time when needs far exceed resources.
- Group decisions are generally better than individual decisions. Research supports the conclusion that decisions are more accepted and mutually satisfactory when made by all who must live with them.
- CSS is the right thing to do. It serves the public interest, helps build communities and leaves a better place behind.

7.2. Recommendation

It is recommended that language and themes supporting CSS be included in the LRTP. Also pertinent to the discussion would be the inherent limitations and competing factors that have to be balanced when considering CSS within the greater context of a community transportation system.

8.0 INTELLIGENT TRANSPORTATION SYSTEMS

Intelligent Transportation Systems (ITS) technologies have been used widely used throughout the country to improve safety and efficiency for the transport of people and goods. ITS advances transportation safety and mobility and enhance productivity by integrating advanced communications technologies into transportation infrastructure and into vehicles.

ITS encompasses a broad range of wireless and traditional communications-based information and electronic technologies. Some of the most common ITS technologies deployed across the country include electronic toll collection, ramp meters, red light cameras, traffic signal coordination, transit signal priority, and traveler information systems. These applications are briefly described below:

- **Electronic Toll Collection** – Electronic toll collection systems support the collection of payment at toll plazas using automated systems that increase the operational efficiency and convenience of toll collection. Systems typically consist of vehicle-mounted transponders identified by electronic readers located in dedicated or mixed-use lanes at toll plazas.
- **Ramp Meters** - Traffic signals on freeway ramp meters alternate between red and green signals to control the flow of vehicles entering the freeway. Metering rates can be altered based on freeway traffic conditions.

[1] http://contextsensitivesolutions.org/

- **Red Light Cameras** – Red light cameras detect a motor vehicle that passes over sensors in the pavement after a traffic signal has turned red. The sensors connect to computers in high-speed cameras, which take two photographs of the violation. Typically, the first photo is taken of the front of the vehicle when it enters the intersection, and the second photo is taken of the rear of the vehicle when the vehicle is in the intersection. Law enforcement officials review the photograph, and a citation is mailed to the registered owner of the vehicle.
- **Traffic Signal Coordination** – This technology provides the ability to synchronize multiple intersections to enhance the operation of one or more directional movements in a system. Some examples include arterial streets, downtown networks, and closely spaced intersections such as diamond interchanges.
- **Transit Signal Priority** – These systems give special treatment to transit vehicles at signalized intersections. TSP systems use sensors to detect approaching transit vehicles and alter signal timings to improve transit performance. For example, some systems extend the duration of green signals for public transportation vehicles when necessary.
- **Traveler Information Systems** – Traveler information systems are multimodal and support many categories of drivers and travelers. Traveler information applications use a variety of technologies, including dynamic message signs, Internet websites, telephone hotlines, and television and radio, to allow users to make informed decisions regarding trip departures, routes, and mode of travel.

MDT has been proactive in the use of ITS to promote improve the flow and efficiency of the existing transportation network in the state, most notably through upgrades to traffic signal systems and implementing traveler information systems. The use of ITS technology on traffic signal systems can have multiple benefits, including reducing congestion, reducing vehicle emissions and fuel use, improving safety at intersections, and delaying or eliminating the need to construct additional road capacity.

MDT has developed a statewide traffic signal system plan, which includes recommendations for ITS improvements to be implemented in signal systems across the state over the next decade, with a focus on Montana's urban centers. Within the Great Falls urban area, projects to upgrade controllers and communications capabilities to enhance traffic signal operations at 18 intersections long 10th Avenue South and 6 intersections along the 3rd Street NW – NW Bypass have been completed.

MDT has implemented the 511 system, using a simple 3-digit telephone number, that provides current information to travelers about road conditions, allowing for better choices of travel time, transportation mode, and route. Dynamic message signs are also employed at key locations on the road network to advise motorists of changing travel conditions.

MDT routinely considers the applicability of incorporating ITS features as part of its project development activities for improvements to the state highway system. As improvements to the state-maintained highway system are proposed within the Great Falls urban area, opportunities to implement effective ITS technologies will be considered.

9.0 LIVABILITY

Livability is a national movement with local implications that are supported within the Great Falls community. Providing transportation options to improve access to housing, jobs, businesses, services and social activities are fundamental desires of most transportation system user groups. Active transportation results in a physically fit population, minimizes auto emissions, extends the life of transportation infrastructure, and delays the needs for infrastructure improvements.

Fostering livability in transportation projects and programs will result in improved quality of life; will create a more efficient and accessible transportation network; and will serve the mobility needs of communities, families, and businesses.

9.1. What is Livability?

The concept of livability, which has evolved over the years, is often used to describe a range of initiatives aimed at improving community quality of life while supporting broader sustainability goals. Livability encompasses multi-dimensional issues relative to community design, land use, environmental protection and enhancement, mobility and accessibility, public health, and economic well-being. Incorporating livability into transportation planning, programs, and projects is not a new concept. Communities, developers, advocacy groups, businesses, and neighborhood residents have been working for generations to make places more livable through transportation initiatives, with varying degrees of support from local, regional, State, and Federal agencies. These initiatives have used a range of terms to describe an overlapping set of objectives and strategies-livability, sustainability, community impact assessment, scenario planning, land use and transportation, smart growth, walkable communities, new urbanism, healthy neighborhoods, active living, transit-oriented development, complete streets, context-sensitive solutions, and many others. The key concept behind livability in transportation: transportation planning is a process that must consider broader community goals.

Livability in transportation is about integrating the quality, location, and type of transportation facilities and services available with other more comprehensive community plans and programs to help achieve broader community goals such as access to a variety of jobs, community services, affordable housing, quality schools, and safe streets. This includes:

- Addressing road safety and capacity issues through better planning, design, and construction.
- Integrating health and community design considerations into the transportation planning process to create more livable places where residents and workers have a full range of transportation choices.
- Using TDM approaches and system management and operation strategies to maximize the efficiency of transportation investments.
- Maximizing and expanding new technologies such as ITS, green infrastructure, and quiet pavements.
- Developing fast, frequent, dependable public transportation to foster economic development and accessibility to a wide range of housing choices.
- Strategically connecting the modal pieces-bikeways, pedestrian facilities, transit services, and roadways-into a truly intermodal, interconnected system.
- Enhancing the natural environment through improved storm water mitigation, enhanced air quality, and decreased greenhouse gases.

Livability provides economic benefits to communities, businesses, and consumers. In practice, livable transportation systems accommodate a range of modes (walking, bicycling, transit, and automobiles) by creating mobility choice within more balanced multimodal transportation networks. This in turn helps support more sustainable patterns of development, whether in an urban, suburban, or rural context. Livable transportation systems can provide better access to jobs, community services, affordable housing, and schools, while helping to create safe streets, reduce energy use and emissions, reduce impacts on and enhance the natural and built environment, and support more efficient land use patterns.

9.2. Livability Principles

In June 2009, U.S. Secretary of Transportation Ray LaHood, U.S. Secretary of Housing and Urban Development Shaun Donovan, and U.S. EPA Administrator Lisa P. Jackson announced the new Interagency Partnership for Sustainable Communities to improve access to affordable housing, provide more transportation options, and lower transportation costs while protecting the environment in communities nationwide. The Partnership for Sustainable Communities works to coordinate federal housing, transportation, water, and other infrastructure investments to make neighborhoods more prosperous, allow people to live closer to jobs, save households time and money, and reduce pollution.

Because the concept of livability is place-based and context sensitive, its definition can differ depending on region and whether the community is an urban, suburban, exurban, or rural setting. However, the overall understanding of livability can be conveyed by five of the six principles established by the Sustainable Communities Partnership listed below. A livable community:

1. **Provides more transportation choices that are safe, reliable, and economical.** Develop transportation choices to decrease household transportation costs, reduce our nation's dependence on foreign oil, improve air quality, reduce greenhouse gas emissions and promote public health. This can be as simple as increasing walkability, to enable citizens to park their car once in a downtown area, and access their daily needs by foot from that location. Providing transportation to critical social services for rural residents who can't drive is another valuable livability option.

2. **Promotes equitable, affordable housing options.** Expand location- and energy-efficient housing choices for people of all ages, incomes, races and ethnicities to increase mobility and lower the combined cost of housing and transportation. This refers to an availability of location- and energy-efficient housing choices for people of all ages, incomes, races and ethnicities – like neighborhoods with mixed-use, mixed-income housing where a retired couple can live in the same community as a recent college graduate.

3. **Enhances economic competitiveness.** Through reliable and timely access to employment centers, educational opportunities, services and other basic needs, livable communities are those which have higher economic resilience and more economic opportunities. They provide expanded business access to markets – largely through increased accessibility and mobility choices.

4. **Supports and targets funding toward existing communities.** Instead of developing on new land – which can be a waste of funding and resources – livable communities target development toward such strategies as transit oriented, mixed-use development and land recycling – to increase community revitalization, improve the efficiency of public works investments, and safeguard rural landscapes.

5. **Values communities and neighborhoods.** The purpose of livability is to enhance the unique characteristics of all communities by investing in healthy, safe and walkable neighborhoods.

The Partnership's sixth principle addresses the alignment of federal policies and funding to remove barriers to collaboration, leverage funding and increase the accountability and effectiveness of all levels of government to plan for future growth, including making smart energy choices such as locally generated renewable energy.

9.3. Benefits of Livability

Incorporating livability approaches into transportation, land use, and housing policies can help improve public health and safety, lower infrastructure costs, reduce combined household transportation and housing costs, reduce vehicle miles traveled, and improve air and water quality, among many other benefits.

- **Transportation, Development, and Environment:** How we plan and develop communities and choose to travel affects environmental quality. Providing more travel options in compact, connected communities leads to fewer car trips, which improve air and water quality. Developing more compactly, and reusing existing properties, can preserve rural lands and protect natural resources. Coordinating land use and development decisions with transportation investments can produce clear results.

- **Transportation and Safety:** Over the past 50 years, most roadways have been designed primarily for safer automobile and truck travel, which can make them less safe for pedestrians, older adults, children, people with disabilities, or bicyclists. More than 4,600 pedestrians and bicyclists died on U.S. roads in 2009 and more than 108,000 were injured. People who do not drive or have access to private vehicles, such as children and older adults, are disproportionately represented. Making roads safer for all users can have the added benefits of improving access jobs and services, reducing congestion, and sparking business and neighborhood investment.

- **Transportation and Health:** Communities that make it safe and easy to get around by walking, bicycling, and taking transit can generate a number of health benefits, such as reduced obesity; reduced cases of asthma/heart disease/cancer; increased safety, and improved access to schools, parks, and recreation and community facilities.

- **Transportation and Land Use:** Communities benefit when decisions about transportation and land use are made at the same time. Deciding to build houses, schools, grocery stores, employment centers, and transit stations close to one another—while providing a well-connected street network and facilities for walking or biking—provides more transportation choices and convenient access to daily activities. It also ensures community resources and services are used efficiently.

- **Transportation and Housing Costs:** Transportation is the second largest expense for most households after housing. Households living in auto-dependent locations spend 25 percent of its income on transportation costs. Housing that is located closer to employment, shopping, restaurants and other amenities can reduce household transportation costs to 9 percent of household income.

- **Transportation Management and Operations:** Transportation system management and operations (M&O) coordinates systems to make them more efficient, more convenient, more reliable, safer, and easier to use. M&O strategies make systems work better, allowing us to do more with less - less congestion, less money, less fuel, and less frustration. They support livability by increasing travel choices and efficiency—including transit, bicycling, and walking—while reducing emissions and resource use.

- **Transportation and Economic Development:** Livability and economic development are intertwined: livability draws businesses and businesses contribute to community quality of life through investments in the built environment, culture, and philanthropy. Businesses are choosing to locate in more accessible locations that combine transportation and housing choices, good

schools, gathering places, and natural amenities. Targeted transportation investments can improve access to jobs, education, shopping, and goods movement, while providing construction and operations jobs.

- **Transportation and Rural Livability:** Livability in rural areas focuses on the towns, villages, working lands and natural resources that surround and connect them. Rural communities vary widely based on location, geography, economic and resource base, and other factors. "Rural" can describe farming, destination, gateway, resource-based, recreational, or other types of communities. Transportation investments that support rural livability also vary depending on location and context. For rural areas between towns or lands on the urban fringe, livability can mean safer highways and intersections, context-sensitive roadway design, multi-purpose trails, or rural on-demand transit and carpool information linked to smartphones. In small towns and villages, livability can mean a revitalized Main Street, sidewalks and improved crossings, a gateway entry, senior housing in walking distance to a redeveloped shopping district, or new neighborhoods built on the town's existing walkable street network.

- **Freight and Livability:** Getting goods to people and businesses is an essential part of building stronger regional economies, increasing community quality of life, and maintaining the nation's role in a global economy. While freight movement can impact livability and community quality of life, careful planning can help balance freight and livability needs. Communities can be aesthetically pleasing, safe, and walkable, while still providing efficient access for large trucks, rail lines, and other modes of transportation. The HUD-DOT-EPA livability principles call for enhancing economic competitiveness, through reliable and timely access to jobs and services, and expanded business access to markets, as well as for supporting existing communities and valuing communities and neighborhoods.

The FHWA has produced a series of fact sheets on each of the topics above which provide more detailed information and examples[2].

9.4. Livability and the LRTP

The LRTP should reflect the future transportation needs of the Great Falls area and include recommended actions, programs and projects to improve, enhance and better manage and operate the public transit and highway systems, promote alternative modes, accommodate bicyclists and pedestrians, consider other non-motorized modes of transportation, provide freight mobility and mitigate environmental impacts. In general, recommendations in the LRTP should also adhere to the livability principles established by the US DOT, HUD and EPA which are aimed at improving access to affordable housing, providing more transportation options, and lower transportation costs. By keeping these considerations in mind, transportation improvement programs and projects will not only accommodate existing travel, make the current transportation system more efficient, meet growing travel requirements and improve mobility, but also be a catalyst for enhancing the overall livability of the Great Falls community.

Livability is about linking the quality and location of transportation facilities to broader opportunities such as access to good jobs, affordable housing, quality schools, and safe streets. This includes addressing safety and capacity issues on all roads through better planning and design, making judicious decisions about improvement projects, and expanding the use of new technologies.

The LRTP continues local efforts to make the transportation network operate as efficiently and effectively as possible and promote a balanced transportation system with alternatives to the private vehicle. The

[2] http://www.fhwa.dot.gov/livability/fact_sheets/

analyses conducted for the update of the LRTP show that some components of the system operate poorly and congestion occurs daily and reaches severe conditions at some locations. However, it is important to preserve and maintain essential infrastructure and services, while making the system operate as efficiently as possible. It is also equally critical to enhance the mobility of people and goods by increasing mode choice, access and convenience, and strategically expanding transportation capacity. Although the highway system dominates movement, non-highway components are equally important and provide alternatives for other system users.

The LRTP also attempts to reinforce future local land use development objectives and economic revitalization goals. Transportation and land use planning have a similar goal: efficient use of a limited resource (land) that allows for the efficient movement of people and goods. Together, transportation and land use planning will lead to the creation of strong communities and better define quality of life and livability in Great Falls.

The City's recent Growth Policy Update (*Imagine Great Falls 2025*) recommends a concept referred to as "Healthy by Design." This is a holistic concept that promotes health, safety and neighborhood oriented considerations in land use review. Many of the goals of Healthy by Design are occurring naturally in Great Falls. This includes an emphasis on trails, safe and comfortable sidewalks, community gardens and small scale commercial and mixed-use projects.

10.0 ENVIRONMENTAL MITIGATION

Moving Ahead for Progress in the 21st Century (MAP-21) was passed by Congress and signed into law by President Obama in July 2012. The bill replaces the extensions to the Safe, Accountable, Flexible, Efficient, Transportation Equity Act, a Legacy for Users (SAFETEA-LU) federal legislation that were in place during the previous LRTP update. Section 6001 of SAFETEA-LU (Environmental Considerations in Planning) required metropolitan LRTPs to discuss environmental mitigation opportunities and required certain elements and activities to be included in the development of long-range transportation plans, including:

- Consultations with resource agencies, such as those responsible for land-use management, natural resources, environmental protection, conservation and historic preservation.
- Consultations to compare transportation plans to conservation plans, maps, and inventories of natural or historic resources.
- A discussion of potential environmental mitigation activities.
- A participation plan that identifies a process for stakeholder involvement.

These provisions originated from a desire to realize benefits for overall transportation project development by considering environmental resources early on in the transportation planning process. The early consideration of environmental resources can assist in program predictability, project decision-making, project deliverability, and mitigation decisions while responding to the desire to improve both transportation infrastructure and the environment.

While MAP-21 streamlined the environmental review process for some transportation projects, the new legislation reiterates the need, as SAFETEA-LU did, for a discussion in the planning process that addresses:

> *"… potential environmental mitigation activities and potential areas to carry out these activities, including activities that may have the greatest potential to restore and maintain the environmental*

functions affected by the plan. This discussion shall be developed in consultation with federal, state, and Tribal wildlife, land management, and regulatory agencies."

In December 2012 letter to the Environmental Quality Council, Secretary of Transportation Ray LaHood elaborated several important principles the Department of Transportation intended to follow when implementing MAP-21. Three of the principles specifically address environmental considerations in the transportation planning process and during project development activities including:

- Implementing MAP-21 in a way that uses NEPA and other Federal environmental statutes to promote better environmental outcomes, improve transparency, and support informed decision-making.
- Promoting environmental stewardship, transparency, and early inter-agency consultation and collaboration as it carries out all of the new mandates of MAP-21.
- Encouraging early collaboration among agencies, project sponsors, affected stakeholders and the public to avoid adverse impacts to communities and the environment, minimize or mitigate impacts that may occur, and avoid project delay.

10.1. Environmental Mitigation Overview

Environmental mitigation is the process of addressing damage to the human and/or natural environment caused by transportation or other public works and infrastructure projects. The human and natural environment includes such resources as neighborhoods and communities; homes and businesses; cultural resources (archaeological or historical sites); parks and recreation areas; streams and wetlands; important farmlands; wildlife and their habitats; and air and water quality.

Environmental mitigation activities, in reference to transportation planning, refers to the strategies, policies, programs, actions, and activities that, over time, will serve to avoid, minimize, or compensate for the negative effects of a transportation project on the human and/or natural environment. Actions taken to avoid or minimize environmental damage are considered the most preferable method of mitigation. Potential environmental mitigation activities may include:

- Avoiding impacts altogether;
- Altering a proposed activity or project to minimize its potential effects on environmental resources;
- Repairing or restoring impacted resources;
- Implementing precautionary and/or abatement measures to reduce construction impacts;
- Employing special features or operational management measures to reduce impacts over time; and
- Compensating for environmental impacts by providing suitable, replacement or substitute environmental resources of equal or greater value, on or off-site.

This ordered approach to mitigation—known as "sequencing"—involves understanding the affected environment and assessing the effects of transportation projects as they are developed. Effective mitigation starts at the beginning of the NEPA process, not at the end. Mitigation must be an integral part of the alternatives development and analysis process.

Federal transportation planning regulations indicate the mitigation activities described in the LRTP are to be at the policy and/or strategic level and not project specific.

10.2. Consultation and Coordination

MAP-21 reiterates the need, as SAFETEA-LU did, for continued consultations with agencies responsible for land use management, natural resources, environmental protection, conservation, and historic preservation in the development of LRTPs. Consistent with this requirement, Federal, State, and Tribal land management wildlife, and regulatory agencies were contacted in October 2013 for input regarding mitigation activities that may help alleviate the adverse effects of implementing transportation projects in the Great Falls area. Information about the Great Falls Area LRTP, a map of the LRTP study area, and an environmental mitigation matrix summarizing potential impacts and possible mitigating actions were provided to each agency. The matrix also identified readily-available maps and other information sources that can be used to help assess whether key environmental resources in the Great Falls area may be affected by transportation projects and listed agency contact information. Agencies were asked to review the matrix and provide comments about its content. The agencies contacted in October 2013 are listed below:

Federal Agencies

- Federal Highway Administration - Montana Division
  U.S. Army Corps of Engineers - Montana Regulatory Office
- Bureau of Land Management - Montana State Office
- U.S. U.S. Bureau of Land Management - Undaunted Stewardship Program
- Fish & Wildlife Service - Montana Field Office (Ecological Services)
- U.S. Environmental Protection Agency, Region 8 - Montana Office
- National Park Service - Intermountain Regional Director
- Malmstrom Air Force Base - 341st Missile Wing Public Affairs Office

State Agencies

- Montana Department of Transportation - Great Falls District Administrator
- Montana Department of Transportation - Rail, Transit, and Planning Division
- Montana Department of Transportation - Environmental Services Bureau
- Montana Department of Environmental Quality - Air Resources Protection Bureau
- Montana Department of Environmental Quality - Water Protection Bureau
- Montana Department of Environmental Quality - Wetlands Protection Program
- Montana Department of Environmental Quality - Waste and Underground Tank Management Bureau
- Montana Dept. of Natural Resources & Conservation - Trust Land Management Division
- Montana Dept. of Natural Resources & Conservation – Central Land Office
- Montana Dept. of Natural Resources & Conservation – Water Resources - Floodplain Management
- Montana Fish Wildlife & Parks - Region 4 Fisheries Manager
- Montana Fish Wildlife & Parks - Region 4 Parks Manager
- Montana Fish Wildlife & Parks - Region 4 Wildlife Manager
- Montana Historical Society - State Historic Preservation Office

Local Agencies

- Cascade County Conservation District
- Cascade County Planning Department
- Cascade County Floodplain Administrator
- Cascade County Road Department

- City of Great Falls - Public Works Department
- City of Great Falls - Park and Recreation Department
- City of Great Falls - Floodplain Administrator
- City of Great Falls - Great Falls Planning Department
- Great Falls/Cascade County Historic Preservation Office - Historic Preservation Officer
- West Great Falls Flood Control & Drainage District

NATIVE AMERICAN TRIBES

- Little Shell Tribe of Chippewa Indians of Montana
- Chippewa Cree Tribe
- Blackfeet Nation

10.3. IMPACTS OF TRANSPORTATION PROJECTS

The implementation of transportation projects may result in both positive and negative impacts on the human and natural environments and impacts may include direct, indirect, and cumulative effects. Direct effects are those impacts that are caused by the action and occur at the same time and place. Indirect impacts (also referred to as secondary impacts) are effects caused by the project, but occur at a different location or later time than the action that triggers the effect. Cumulative effects are the collective impacts on the environment that may occur when the project is considered along with other past, present, and reasonably foreseeable future actions.

Because this section of the LRTP discusses environmental mitigation, only potentially adverse or negative impacts are discussed. Environmental resources and areas within the community are generally affected by transportation projects as a result of land acquisition for new or expanded rights-of-way, construction, and the resulting effects of the project (such as increased traffic or traffic-generated noise, storm water runoff from paved surfaces, etc.). The following paragraphs discuss the types of environmental impacts that may result from the implementation of transportation projects in the Great Falls area. It should be noted that these environmental impact categories are not all inclusive and each transportation project must typically undergo Federal and State environmental compliance reviews to identify project-specific impacts, evaluate the need for mitigation activities, and determine permitting requirements.

AIR QUALITY

National ambient air quality standards (NAAQS) have been established for several major pollutants referred to as "criteria" pollutants. The six criteria pollutants are: Carbon monoxide (CO); Particulate Matter; Nitrogen dioxide (NO2); Sulfur dioxide (SO2); Ozone; and Lead (Pb). Transportation contributes to four of the six criteria pollutants: ozone, CO, particulate matter, and NO2.

Vehicle exhaust is a primary source of project-related air pollution. Increasing vehicle emissions is a potential outcome of projects that encourage additional miles of travel. Projects that are designed to reduce congestion and increase traffic flow can also encourage drivers to use such roadways more often and therefore increase CO emissions and other vehicle generated air pollutants. However, such projects often result in decreased travel times and idling times, which translates into reduced emissions. The net result is often an improvement in air quality.

The 10th Avenue South corridor was designated as a CO nonattainment area in 1980 but redesignated to an attainment area in 2002. DEQ utilizes an alternative CO monitoring method that includes an annual review of traffic volumes using data from MDT permanent automatic traffic counters (ATR) in Great Falls. Thresholds are defined based on the percent increase in consecutive, rolling 3-year ADT volumes and

correlated to presumed changes in ambient CO concentrations to demonstrate ongoing compliance with the CO NAAQS.

NOISE

Noise is most often defined as unwanted sound. Although sound can be easily measured, the perceptibility is subjective and the physical response to sound complicates the analysis of its impact on people. The environmental impact of noise is a function of the sensitivity of the land use where noise is heard. In general, land use sensitivity to noise is a function of human annoyance and community reaction rather than health and safety considerations. Noise can also interfere with nonresidential uses such as schools, libraries, churches, and hospitals.

The noise generated from new or expanded transportation facilities may have a negative impact on adjoining land uses. Traffic noise impacts must typically be investigated in areas adjacent to federally-aided highways for proposed construction of a highway on a new location or the reconstruction of an existing highway to either significantly change the horizontal or vertical alignment or increase the number of through-traffic lanes. If impacts are identified, then abatement measures must be considered and feasible and reasonable noise abatement must be incorporated into the project design.

HAZARDOUS MATERIALS

Transportation projects have the potential for encountering contaminated soils or groundwater, leaking underground storage tanks and piping, or other sources of hazardous materials in the planned work areas. These sites may occur throughout the community and sites are often found along major transportation corridors and established commercial/industrial areas.

In March 2011 EPA, with support from the MDEQ, added the Anaconda Copper Mining Co. (ACM) Smelter and Refinery site to the National Priorities List of Superfund sites. The site is a former metals refinery adjacent to the unincorporated community of Black Eagle in Cascade County.

The City of Great Falls and Cascade County also have numerous brownfields sites that could be encountered during the development of transportation projects. Brownfields are defined as real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant.

IMPORTANT FARMLANDS

Transportation projects have the potential to require new or expanded rights-of-way and it is possible that some projects outside the urban area may convert areas of important farmland to non-agricultural use. The Natural Resources Conservation Service (NRCS) has designated areas of important farmland (prime farmland, unique farmland, or farmland of statewide or local importance). The Farmland Protection Policy Act (FPPA) regulates federal actions with the potential to convert existing such farmlands to nonagricultural uses. Federally-funded transportation projects that would permanently convert designated farmland to a non-agricultural use are subject to FPPA coordination.

WILDLIFE AND HABITAT

The construction of new or improved transportation facilities could result in the disturbance, displacement, and/or minor loss of habitat for wildlife species. Transportation projects can also disrupt habitat connectivity and result in habitat fragmentation. Habitat fragmentation is mainly the result of different forms of land use change. The construction and use of transport infrastructure is one of the major agents causing this change as well as creating barriers between habitat fragments.

In accordance with the Endangered Species Act (ESA), the U.S. Fish & Wildlife Service (USFWS) maintains a listing of threatened, endangered, proposed and candidate species for Cascade County. The agency has also designated critical habitat for some species. Listed species designations may change over time.

Section 7(a)(2) of the ESA requires Federal agencies to consult with the USFWS to ensure that actions they fund, authorize, permit, or otherwise carry out will not jeopardize the continued existence of any listed species or adversely modify designated critical habitats.

The construction of new or improved transportation facilities could result in the disturbance and/or minor loss of wildlife habitat. Species can also be displaced (through loss of habitat, increased noise, and increased human activity). Loss of habitat connectivity or habitat fragmentation can be indirect effects of transportation projects.

PARKS AND RECREATION LANDS

Transportation projects typically affect parks and recreation lands through the direct acquisition of land for new or expanded rights-of-way, temporary occupancy that adversely affects the property, or by indirect effects such as noise, vibration, diminished access, or visual intrusions.

Section 4(f) of the *Department of Transportation Act of 1966*, provides protection for public parks, recreation areas, wildlife and waterfowl refuges and historic sites of national, State, or local significance. Section 4(f) generally prohibits the use of such lands unless there are no feasible and prudent alternatives and requires projects to include all possible planning to minimize harm.

Parks and recreation lands are often acquired or developed with federal funding assistance from the Land and Water Conservation Fund Act (LWCFA). This funding restricts the future use of parklands or open spaces that have been improved with funds received through the LWCFA. The conversion of lands or facilities acquired with LWCFA funds must be coordinated with the Department of Interior and replacement in kind is typically required.

CULTURAL RESOURCES

Cultural resources are any prehistoric or historic remains of past human activities including artifacts, sites, structures, landscapes or districts, and objects of importance to a culture or community for scientific, traditional, religious, or other reasons. Like parks and recreation lands, transportation projects have the potential to adversely affect cultural resource sites directly through the acquisition of land for new or expanded rights-of-way or indirectly by changing the site's surroundings or diminishing the qualities of the resource itself.

Section 106 of the National Historic Preservation Act (NHPA) requires federal agencies to take into consideration the effects of their projects on cultural resources that are on or eligible for listing in the National Register of Historic Places (NRHP).

Section 4(f) of the *Department of Transportation Act of 1966*, also provides protection for historic sites of national, State, or local significance.

ENVIRONMENTAL JUSTICE

Title VI of the US Civil Rights Act of 1964, as amended, EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* and Order DOT 5610.2, Environmental Justice require that no minority, or, by extension, low-income person shall be disproportionately adversely impacted by any project receiving federal funds.

For transportation projects, this means that no particular minority or low-income person may be disproportionately isolated, displaced, or otherwise subjected to adverse effects. Potential impacts are assessed in terms of property acquisitions or relocations, changes in access to employment areas, and other changes in low-income and minority communities/neighborhoods.

COMMUNITY IMPACTS

Transportation projects have the potential to result in effects on a community and its quality of life. Topics that fall under the Community Impact heading include: access, mobility, social isolation/splitting of neighborhoods, history of the community, new development impacts, changes in the quality of life, changes in neighborhood identification, changes in property values, separation of the neighborhood from community facilities, displacements, impacts on community centers of activity whether formal or informal, noise, urban renewal, removal of urban blight, joint land use, and disruption of the natural and human environment.

To establish potential impacts, it is necessary to determine the characteristics of the affected area, such as neighborhood boundaries, locations of residences and businesses, demographic information, economic data, the social history of communities, and identify what community based land use plans say about the area. Impacts are best analyzed in conjunction with public involvement activities for the affected neighborhood or community.

FLOODPLAINS

Transportation projects occasionally require crossing or working within delineated floodplains. Floodplain involvement (encroachment) typically requires measures to: 1) Avoid significant floodplain encroachment where practicable; 2) Minimize the impact of highway actions that adversely affect the base floodplain; or 3) be compatible with the National Flood Insurance Program of the Federal Emergency Management Agency (FEMA).

Protection of floodplains and floodways is required by Executive Order 11988, "Floodplain Management" and USDOT Order 5650.2, "Floodplain Management and Protection." The intent of these regulations is to avoid or minimize highway encroachments within the 100-year (base) floodplains, where practicable, and to avoid supporting land use development which is incompatible with floodplain values. Where encroachment is unavoidable, the regulations require appropriate measures to minimize impacts.

STREAMS, WETLANDS, AND AQUATIC RESOURCES

Transportation projects occasionally require crossing or working within perennial or intermittent streams, wetlands, and other aquatic resources. Unavoidable impacts to streams or wetlands may require a variety of permits or authorizations including:

- Nationwide or Individual Section 404 Permit from the Corps of Engineers;
- Section 10 Permit (Navigable Waters) from the Corps of Engineers;
- Stream Protection Act 124 Permit from Montana Fish Wildlife & Parks;
- Short-term Water Quality Standard for Turbidity (318 Authorization); and
- 310 Permits from the Cascade Conservation District (for actions undertaken by non-governmental agencies).

Transportation projects involving construction activities that will disturb one or more total acres including clearing, grading, and excavating also require Montana Pollutant Discharge Elimination System (MPDES) "General Permit" from the Montana Department of Environmental Quality.

10.4. Environmental Mitigation Measures

Table 4 lists possible mitigating measures to help avoid, minimize, or compensate for negative project-related impacts. The mitigation activities identified in the table are not project-specific; however, they are representative of the types of actions commonly implemented with transportation projects. Future transportation projects will be developed within the context of all applicable state and federal rules and regulations and will be subject to relevant environmental compliance and permitting requirements.

Current contact information for federal, state, and local agencies that may need to be consulted during the assessment of project-related impacts and the development of environmental mitigation measures is also provided in **Table 4**.

When developing environmental impacts and appropriate mitigation measures, it is important to be aware of the following considerations:

- Mitigation measures should be considered within the context of the proposed improvement and generally reflect the magnitude and extent of potential impacts.
- Mitigation measures are usually most effective when they occur in close proximity to the area of impact. The appropriate location for many mitigation measures is often within the existing (or expanded) right-of-way and within the limits of the proposed transportation project.
- Environmental impacts and associated mitigation measures should be holistically considered. For example, erecting a noise wall to help alleviate negative transportation noise impacts could result in negative visual impacts to adjoining properties or impede crossings of the transportation facility.
- The appropriate mitigation may include a combination of different actions or measures.
- Environmental approvals and permit authorizations may establish specific actions to mitigate the negative effects of individual projects.
- Mitigation measures must be developed in cooperation with appropriate regulatory agencies and an adequate level of public participation.
- Provisions for long-term maintenance of mitigation measures may be necessary and should be developed in cooperation with the appropriate regulatory agencies, impacted landowners, and/or the public.

Table 4: Possible Environmental Mitigation Measures and Sources

	Possible Mitigation Measures or Actions	Potential Information Sources	Agencies to Consult
Air Quality	• Implement Transportation Demand Management (TDM) measures like telecommuting, carpooling, or flexible work hours to promote off-peak commuting. • Promote alternate modes of transportation such as transit, bicycling and walking. • Expand non-motorized facilities within the community.	Nonattainment Area Maps: http://deq.mt.gov/AirQuality/Planning/AirNonattainment.mcpx	**Montana Dept. of Environmental Quality** Air Resources Protection Bureau 1520 E 6th Ave PO Box 200901 Helena, MT 59620-0901 406-444-2544 **Montana Department of Transportation** Environmental Services Bureau PO Box 200507 Helena, MT 59620-0507 406-444-7659
Noise	• Sound-dampening walls, earthen berms, and/or buffering landscaping. • Soundproofing structures at impacted noise-sensitive uses. • Low-noise pavements. • Relocation of impacted uses. • Innovative design features (depressed roadways) to reduce impacts. • Implement local land use planning measures to help avoid development of new noise sensitive uses in proximity to transportation corridors.	Federal Highway Administration – Noise Guidance: http://www.fhwa.dot.gov/environment/noise/ Montana Department of Transportation – Traffic Noise Analysis and Abatement Policy: http://www.mdt.mt.gov/business/contracting/docs/npolicy-2011.pdf	**Montana Department of Transportation** Environmental Services Bureau PO Box 200507 Helena, MT 59620-0507 406-444-7659
Hazardous Materials	A comprehensive survey within the LRTP study area was not conducted to identify existing hazardous materials or possible sources of contamination. Hazardous materials encountered during a project should be removed, treated, or otherwise addressed after consultation with appropriate regulatory agencies. Remediation measures will vary depending on type, extent, location and characteristics of the material, and proximity to adjacent land uses or underground water sources.	Natural Resource Information System (NRIS) Interactive mapping - Federal Superfund Sites, Solid Waste Facilities, Crude Oil Pipelines, EPA Toxic Release Inventory, Abandoned/Active Mines: http://maps2.nris.mt.gov/mapper/ CECRA (State Superfund Sites): http://deq.mt.gov/StateSuperfund/Cecra.mcpx MDEQ Interactive Mapping - Petroleum Tank Release Compensation Sites Remediation Response Sites, Leaking Underground Storage Tanks, Hazardous Waste Handlers: http://svc.mt.gov/deq/wmadst/ Brownfields Sites in Montana and Hazardous Substance Brownfields Registry: http://www.deq.mt.gov/Brownfields/BrownfieldsSites.mcpx	**U.S. Environmental Protection** Agency Region 8 Montana Office Federal Building 10 W. 15th Street, Suite 3200 Helena, MT 59626 406-457-5038 **Montana Dept. of Environmental Quality** 1100 North Last Chance Gulch PO Box 200901 Helena, MT 59620-0901 Remediation Division 406-841-5000 Permitting and Compliance Division Hazardous Waste Section 406-444-2876 Waste and Underground Tank Management Bureau 406-444-5300
Farmland Impacts	• Avoidance of important farmlands where practicable. • Consider alternate sites that reduce impacts on important farmlands.	Natural Resource Conservation Service – Soil maps and Farmland Classifications: http://websoilsurvey.nrcs.usda.gov/app/	**Natural Resource Conservation Service** Great Falls Field Office (serves Cascade County Conservation District) 12 3rd Street NW Great Falls, MT 59404-1991 406-727-7580

	Possible Mitigation Measures or Actions	Potential Information Sources	Agencies to Consult
Threatened and Endangered Species	Assess potential occurrences of listed species or critical habitat within the project areas and make an appropriate determination of effect (i.e. "no effect"/"may affect" and "may affect, not likely to adversely affect"/"may affect, likely to adversely affect" on listed and proposed species or "is not likely to jeopardize the continued existence of a federal proposed or candidate species") based on proposed project activities. If adverse impacts to listed species or critical habitat are unavoidable, then appropriate conservation measures would be determined through consultation procedures with the USFWS under Section 7 of the ESA.	Listed Species in Cascade County: http://www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species/countylist.pdf Montana Natural Heritage Program – Species searches for project areas: http://mtnhp.org/ Montana Fish Wildlife & Parks – Species information: http://fwp.mt.gov/fishAndWildlife/species/	**U.S. Fish & Wildlife Service** Ecological Services Montana Field Office 585 Shepard Way, Suite 1 Helena, MT 59601 406-449-5225 **Montana Fish Wildlife & Parks** FWP Region 4 Headquarters Regional Wildlife and Fisheries Managers 4600 Giant Springs Road Great Falls, MT 59405 406-454-5840
Wildlife, Fisheries and Habitat	• Wildlife crossing provisions on transportation corridors including overpass or underpasses and culverts that accommodate wildlife passage. • Create new or enhanced habitat in key areas. • Seeding disturbed areas with natural grasses or vegetation to re-establish habitat. • Restore streambanks to pre-existing or better conditions. • Fencing to direct wildlife away from roadway. • Maintain or provide fish passage with drainage facilities.	Montana Fish Wildlife & Parks – Crucial Areas Assessment mapping: http://fwp.mt.gov/fishAndWildlife/conservationInAction/crucialAreas.html Montana Fish Wildlife & Parks – GIS data and mapping: http://fwp.mt.gov/doingBusiness/reference/gisData/dataDownload.html Montana Fish Wildlife & Parks – Montana Fisheries Information System (MFISH): http://fwp.mt.gov/fishing/mFish/ Montana Natural Heritage Program – Species Searches/Species of Concern Reports: http://mtnhp.org/	**Montana Fish Wildlife & Parks** FWP Region 4 Headquarters Regional Wildlife and Fisheries Managers 4600 Giant Springs Road Great Falls, MT 59405 406-454-5840
Park and Recreation Lands	• Avoid impacts to park and recreation lands when possible. • If impacts cannot be avoided, identify and coordinate appropriate mitigation measures with officials with jurisdiction over the affected resources. • Provide improved recreational functions or values at affected lands. • Provide replacement park or recreational land of equal value, usefulness and proximity.	City of Great Falls Park and Recreation Department: http://www.greatfallsmt.net/recreation City of Great Falls Planning and Community Development: http://www.greatfallsmt.net/planning/comprehensive-planning Cascade County Planning Department: http://departments.cascadecountymt.gov/planning Montana Fish Wildlife & Parks Public Lands Searches: http://fwp.mt.gov/recreation/visitFwpSite.html LWCF Grants awarded within Cascade County: http://waso-lwcf.ncrc.nps.gov/public/index.cfm	**City of Great Falls** Park and Recreation Department P.O. Box 5021 Great Falls, MT 59403 406-771-1265 **Cascade County** Planning Department 121 4th Street North #2H-2I Great Falls, MT 59401 406-454-6905 **Montana Fish Wildlife & Parks** FWP Region 4 Headquarters Regional Parks Manager 4600 Giant Springs Road Great Falls, MT 59405 406-454-5840 **National Park Service** Intermountain Region 12795 Alameda Parkway Denver, CO 80225 303-969-2500

	Possible Mitigation Measures or Actions	Potential Information Sources	Agencies to Consult
Cultural Resources	Identify "Area of Potential Effects" (APE) which is usually limited to the footprint of the project including all existing and required rights-of-way and easements. Complete research and/or conduct a survey for historic (50 years of age or older) resources within the APE to identify all individual properties, districts, and multiple property areas that are on, in, or eligible for listing in the NRHP. This is also applicable to former lands formerly occupied by Native American Tribes and Traditional Cultural Properties. Mitigate adverse impacts by: • Design modifications to avoid or complement the property. • Preservation in place for archaeological resources. • Landscaping to reduce visual impacts. • Photo documentation. • Historic archival recording and documentation to preserve historic resource information for the public. • Develop educational materials about affected resource. • Adoption/reuse of historic bridges. • Relocation of a historic structure to avoid the loss of a resource.	Montana State Historic Preservation Office – Project area file searches: http://mhs.mt.gov/shpo/CulturalRecords.asp Montana State Historic Preservation Office – National Register sites for Cascade County: http://mhs.mt.gov/shpo/register/NRmap/NRmap.asp Montana Department of Transportation Environmental Services Bureau (Helena) Archaeologist and Historian	**Montana Historical Society** State Historic Preservation Office 1410 Eighth Avenue Helena, MT 59620 406-444-7715 **Great Falls/Cascade County** Historic Preservation Office Planning & Community Development Office PO Box 5021 Great Falls, MT 59403 406-455-8435
Environmental Justice	• Identify if Environmental Justice or disadvantaged populations exist in project area. • Engage Environmental Justice or disadvantaged populations during project development activities. • Land acquisition and residential or commercial relocations necessary for any federally-assisted transportation projects would be accomplished in accordance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Uniform Act).	U.S. Census Bureau, American Community Survey – Social, Demographic, Economic, and Housing for 1, 3, 5 year periods (Cascade County and City of Great Falls: http://ceic.mt.gov/ACS.aspx Montana Census and Economic Information Center – Demographic/economic information: http://ceic.mt.gov/	**City of Great Falls** Great Falls Planning Department Civic Center, Room 112 Great Falls, MT 59403 406-454-0495 **Cascade County** Planning Department 121 4th Street North #2H-2I Great Falls, MT 59401 406-454-6905
Community Impacts	• Community visioning. • Community impact planning studies. • Incorporate context sensitive design elements. • Streetscape enhancements (decorative lighting and pavements, pedestrian amenities, wayfinding signs, etc.). • Low impact lighting for more appropriate integration into neighborhoods. • Median landscaping. • New or improved non-motorized facilities to enhance linkages within and out of the neighborhood. • Traffic calming measures.	U.S. Census Bureau, American Community Survey – Social, Demographic, Economic, and Housing for 1, 3, 5 year periods: http://ceic.mt.gov/ACS.aspx Montana Census and Economic Information Center – Demographic/economic information: http://ceic.mt.gov/ City of Great Falls – Planning and Community Development – Growth Policy: http://www.greatfallsmt.net/planning/comprehensive-planning Cascade County Planning Department – Growth Policy: http://departments.cascadecountymt.gov/planning	**City of Great Falls** Great Falls Planning Department Civic Center, Room 112 Great Falls, MT 59403 406-454-0495 **Cascade County** Planning Department 121 4th Street North #2H-2I Great Falls, MT 59401 406-454-6905

	Possible Mitigation Measures or Actions	Potential Information Sources	Agencies to Consult
Floodplains	• Conduct location hydrology studies to establish existing hydraulic conditions and extent of encroachment, quantify potential impacts, and identify appropriate mitigating measures. • Consider alternatives which reduce impacts to the floodplain. • Design and construct transportation facilities in a cost-effective manner such that their components are excluded from the floodway.	FEMA Map Service Center- Currently Issued Flood Maps for Cascade County/City of Great Falls: https://msc.fema.gov/webapp/wcs/stores/servlet/StoreCatalogDisplay?storeId=10001&catalogId=10001&langId=-1&userType=G DNRC Water Resources – Floodplain Management: http://dnrc.mt.gov/wrd/water_op/floodplain/ City of Great Falls Growth Policy Update – Community Floodplain Graphic: http://www.greatfallsmt.net/sites/default/files/fileattachments/growth_policy_update_-_august_6_2013.pdf US Army Corps of Engineers – National Levee Database: http://nld.usace.army.mil/egis/f?p=471:1	**City of Great Falls** Floodplain Administrator Planning & Community Development Civic Center, P.O. Box 5021 Great Falls, MT 59403 406-455-8431 **Cascade County** Floodplain Administrator Cascade County Planning Office 121 4th Street North #2H-2I Great Falls, MT 59401 406- 454-6905 **US Army Corps of Engineers** Omaha District 1616 Capitol Avenue Omaha, NE 68102-4901
Wetlands and Streams	Compensatory mitigation involves actions taken to offset unavoidable adverse impacts to wetlands, stream and other aquatic resources authorized by CWA Section 404 and other COE permits. Compensatory mitigation can be achieved through four methods: restoration of a previously-existing wetland/aquatic site; enhancement of an existing aquatic site's functions; creation of a new aquatic site; or preservation of an existing aquatic site. Appropriate mitigating measures will depend on the characteristics of the affected area and may be determine in cooperation with the agencies responsible for issuing permits. Permit conditions may include: • Developing alternatives to avoidance impacts. • Incorporating design features to avoid or minimize impacts (such as bridges, fish passage provisions, and placing natural streambed materials in the bottom of culverts). Mitigation for impacts to streams must be consistent with the 2013 Montana Stream Mitigation Procedure (MTSMP) developed by the Corps of Engineers. The MTSMP describes the method for quantifying the adverse impacts (debits) and the acceptable compensatory mitigation (credits) for projects that would result in more than a minimal adverse impact to a stream. The MTSMP also discusses mitigation procedures and appropriate types of mitigation activities for stream impacts. Mitigating wetland and stream impacts through approved mitigation banks or the Montana Statewide In-Lieu Fee (ILF) Mitigation Program are other options. The ILF Mitigation Program was created through an agreement between the EPA, USFWS, MDEQ, MFWP, COE, and the not-for-profit corporation, Montana Aquatic Resources Services, Inc.	Interactive National Wetlands Inventory Maps (Riparian and Wetland Areas): http://www.fws.gov/wetlands/Data/Mapper.html U.S. Environmental Protection Agency – Wetlands Information: http://water.epa.gov/type/wetlands/ Montana Stream Permitting Guide: http://dnrc.mt.gov/Permits/StreamPermitting/Guide.asp Corps of Engineers – Jurisdictional Information: http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/juris_info.aspx Corps of Engineers – Montana Stream Mitigation Procedure: http://www.nwo.usace.army.mil/Portals/23/docs/regulatory/MT/Mitigation/MTSMP-Revised-February%202013.pdf RIBITS (Regulatory In lieu fee and Bank Information Tracking System): http://geo.usace.army.mil/ribits/index.html Montana Aquatic Resources Statewide In-Lieu Fee Program: http://montanaaquaticresources.org/programs	**U.S. Army Corps of Engineers** Montana Regulatory Office 10 West 15th Street, Suite 2200 Helena, MT 59626 406-441-1375 **Montana Fish Wildlife & Parks** FWP Region 4 Headquarters Regional Fisheries Manager 4600 Giant Springs Road Great Falls, MT 59405 406-454-5840 **Montana Department of Environmental Quality** 1520 E 6th Ave PO Box 200901 Helena, MT 59620-0901 Water Protection Bureau 406-444-3080 Wetlands Protection Program 406-444-6652

	Possible Mitigation Measures or Actions	Potential Information Sources	Agencies to Consult
Storm Sewer Discharge	The Montana Department of Environmental Quality (DEQ) Small Municipal Separate Storm Sewer System (MS4) permit is required for urban areas within the state of Montana that have storm sewer systems that serve a population of at least 10,000 people. Areas included in the permit are Billings, Missoula, Great Falls, Butte, Helena, Kalispell, and Bozeman. Cities, counties, universities, military bases, and the Montana Department of Transportation (MDT) are some of the entities required to obtain the permit for these areas. Under the permit, they are required to develop, implement, and enforce a Storm Water Management Program (SWMP) designed to reduce the discharge of pollutants from the Small MS4, to protect water quality, and to satisfy the appropriate water quality requirements of the Montana Water Quality Act. This SWMP must include the development and implementation of Best Management Practices (BMPs) and measurable goals for the following six "minimum control measures": 1. Public education and outreach on stormwater impacts; 2. Public involvement/participation; 3. Illicit discharge detection and elimination; 4. Construction site stormwater runoff control; 5. Post-construction stormwater management in new development and redevelopment; and, 6. Pollution prevention and good housekeeping for municipal operations. In some of the designated Small MS4 areas, the co-permittee (e.g. the city government) has agreed to be the lead agency with MDT providing technical or financial support, and implementing limited BMPs or portions of the shared SWMP. Generally, MDT is responsible for implementing and maintaining elements of the shared SWMPs in their own jurisdictional areas unless otherwise stipulated in the agreements between the co-permittee agencies.	U.S. Environmental Protection Agency – NPDES (MS4s) http://cfpub.epa.gov/npdes/stormwater/munic.cfm Montana Department of Environmental Quality – MPDES General Permit (MS4s): http://www.deq.mt.gov/wqinfo/MPDES/StormWater/ms4.mcpx Montana Department of Transportation – Stormwater Information (MS4 Permits): http://www.mdt.mt.gov/pubinvolve/stormwater/permits.shtml	**Department of Environmental Quality** 1520 E 6th Ave PO Box 200901 Helena, MT 59620-0901 Water Protection Bureau 406-444-3080 **Montana Department of Transportation** PO Box 201001 Helena MT 59620-1001 Statewide MS4 Program 406-444-0825

10.5. Areas to Consider for Mitigation Activities

The list of potential negative impacts discussed earlier can usually be mitigated effectively. Areas where mitigation efforts can be focused in the Great Falls area are discussed below.

Mitigation Areas for Impacts to Streams, Wetlands and Aquatic Habitat

Transportation projects along or across the Missouri and Sun Rivers could potentially affect water quality, riparian areas, fish and wildlife habitat, wetlands, and other environmentally sensitive areas. Additionally, such projects may affect public or neighborhood access to river front areas. Consequently, lands adjoining these river corridors are ideal locations for mitigating such impacts. These lands offer opportunities to: create or enhance wetlands and riparian areas; improve water quality by filtering runoff; reduce erosion of stream banks; protect development from potential flooding; and improve access to and the quality of riverfront lands. Some of the same opportunities exist in the Sand Coulee Creek, Watson Coulee, and Gibson Flats areas.

For unavoidable adverse impacts to wetlands and aquatic resources that cannot be mitigated on-site, it may be necessary to secure mitigation through the use of established mitigation banks or and in-lieu fee mitigation. The City of Great Falls and Cascade County areas within the LRTP study area lie within

Watershed #7-Missouri-Sun-Smith River Basin. Several mitigation banking opportunities exist within this watershed. MDT acquired approximately 64 acres of wetland credit from Ducks Unlimited at Little Muddy Creek Wetland Mitigation Site to mitigate for wetland impacts associated with transportation projects in the watershed. Efforts are currently underway to develop the privately-held Missouri-Sun-Smith Mitigation Bank (MSSMB) within this watershed. Once established, wetland and stream mitigation credits will be available for purchase and the credits can be used as acceptable mitigation under Section 404.

Mitigating wetland and stream impacts through the Montana Statewide In-Lieu Fee (ILF) Mitigation Program is also a possibility. The ILF Mitigation Program was created through an agreement between the EPA, USFWS, MDEQ, MFWP, COE, and the not-for-profit corporation, Montana Aquatic Resources Services, Inc. The objective of the ILF program is to mitigate for impacts to wetlands and streams by developing compensatory mitigation projects with each of the sixteen major watersheds in Montana.

Mitigation for Impacts to Archaeological and Historical Resources

Compliance with the *Historic Preservation Act* and coordination with the Montana State Historic Preservation Office will typically establish appropriate mitigation measures for impacts to cultural resources.

Area museums such as the History Center, the Lewis & Clark National Historic Trail Interpretive Center, the Charles M. Russell Museum, or the First Peoples Buffalo Jump Interpretive Center are all potential repositories for excavated artifacts or historical items.

Relocation of historic structures are most appropriate if they occur near their original locations. MDT's Adopt-A-Bridge Program provides a mechanism for the preservation and reuse of historic bridges in other locations in the community. Several historic bridges in the Great Falls area have been adopted and used in furthering the development of non-motorized transportation corridors.

Mitigation for Impacts to Parklands

If new lands are purchased, they should be in proximity to the impacted parklands and/or serve a similar function as provided by the impacted parkland. Other mitigation measures should be implemented in the immediate vicinity of the affected parkland and transportation project.

Mitigation for Neighborhood Impacts

Transportation improvement projects, especially capacity expansion projects, can separate neighborhoods, inhibit pedestrian and bicycle travel, and have negative physical impacts on adjoining properties or land uses. Considerations for pedestrian and bicyclist safety at intersections and effective arterial crossings at other key locations can help reduce adverse effects to non-motorized facility users. Incorporating landscaping, streetscape amenities and traffic calming measures into transportation projects may also help alleviate negative impacts on neighborhoods.

11.0 TRANSPORTATION INFRASTRUCTURE RESILIENCE AND RELIABILTY

Transportation infrastructure is confronted with notable vulnerabilities: an aging transportation system; increasing interdependencies between physical and electronic systems controlling the infrastructure; incidents related to the nearby production or transport of potentially hazardous materials; and flooding or wildfire threats caused by extreme weather events. Considered together, these vulnerabilities pose significant challenges for critical transportation infrastructure at the local, statewide, and national levels.

For these reasons, transportation systems must be developed with the concept of resiliency in mind. The concept of "resiliency" as it relates to transportation systems means providing a system that can better withstand and recover rapidly from disruptions like natural disasters, structural failures, or human-caused incidents. A resilient transportation system possesses three main attributes—a design capable of withstanding severe disruptions, adaptiveness so that adequate responses can be made to threats or disruptions, and appropriate response and recovery operations to mitigate the consequences of the disruptions. Resiliency helps ensure transportation infrastructure is reliable, adaptable, and survivable during and after disruptions.

The Great Falls area is not immune from the potential for significant disruptions to its transportation systems. The LRTP should include recommended actions, programs and projects that reflect the concept of resiliency by:

- Strengthening existing transportation facilities by identifying existing vulnerable transportation facilities and systems;
- Prioritizing future investment in critical facilities, corridors, systems, or routes that must remain functional during a crisis or be most rapidly restored;
- Considering infrastructure designs that are sustainable and capable of being operated within changing environmental and operational conditions;
- Strategically expanding the transportation system to create redundancies and make the system more flexible and adaptive;
- Using effective stormwater management systems and techniques to help alleviate vulnerabilities to transportation infrastructure; and
- Merging transportation and land use planning to better plan for development in vulnerable areas of the community.

With these considerations in mind, transportation improvement programs and projects will not only accommodate existing and projected travel within the community, but ensure the transportation system is adaptable enough to function reliably during disruptions due to natural disasters, structural failures, or human-caused incidents.

12.0 TRAVEL AND TOURISM

Travel and tourism, which includes travel for both business purposes and for leisure, represents a significant share of Montana's economy. The interdependence of transportation and tourism and travel is apparent since those visiting and recreating in Montana arrive via various forms of transportation and rely primarily on the road system to travel to and from cultural, historical, and recreational sites within the state. This interdependence has become more critical with the expansive growth of tourism/recreation across Montana and its associated increasing economic impact in many communities, including Great Falls.

The LRTP recognizes the benefits to the Great Falls area generated through the travel and tourism industry and supports efforts to provide an integrated transportation system. The LRTP supports actions, programs and projects that:

- Contribute to economic development in the community;
- Improve the condition, safety, and efficiency of the transportation system;
- Enhance mobility within the community and intermodal connections;
- Increase wayfinding and traveler information services for area visitors; and
- Facilitate and support the interstate and interregional transportation of passengers for tourism, commercial, and recreational activities.

These measures will help create and sustain an integrated transportation network and contribute to the overall economic vitality of Great Falls.