The Mason County Priority Array

How is a transportation improvement project identified?

A transportation improvement project can be anything within a wide variety of construction projects with a wide range of costs. At the low end, a project may be the construction of a pedestrian trail or a site improvement on an existing road. At the high end, a project may be the demolition and reconstruction of an inadequate road or the creation of an entirely new road. To best serve the needs of the taxpayers, these projects are prioritized based on greatest need to improve either the safety or capacity of the transportation system.

The need for a particular transportation improvement project is often identified due to known problems on existing roads. Usually, this is due to an unusually high collision rate or known safety hazard, which is attributed to physical problems with the road. Other improvement needs are identified in response to public requests or growth management. You will be asked to help us ensure we have been as thorough as possible in identifying these needs.

Why are transportation improvement needs prioritized?

Transportation improvement needs must be prioritized, as it is unaffordable to correct them all at the same time. In Washington State, there is a legal requirement to do this using an organized, analytical method with public input. This law is RCW 136.81.121. It requires the preparation and annual updating of a six-year, comprehensive transportation program. The County's legislative authority must adopt this Transportation Improvement Program, or TIP, each year. The TIP must include all anticipated road and bridge construction projects, capital ferry expenditures, paths and trails projects, and any other specified capital outlays for the following six-year period.

How are transportation improvement needs prioritized?

Understanding how transportation improvement needs are prioritized is key to your effective participation in this process. The Priority Array is a planning tool that is used to evaluate road projects based on several different criteria significant to the safe operation and maintenance of the road system. The array compares the overall importance and weight of these criteria amongst all projects being considered for construction. Prioritization should result in the most important needs being met in the quickest possible time frame while making the best use of tax resources.

1. The County must provide the traveling public with a safe, sufficient transportation system. The needs of the traveling public over certain routes change through time. This is usually due to heavier use due to growth coupled with a rising demand for safety. For this reason, the County does the following:

   a. Traffic volume for all roads is monitored.
   b. Known road deficiencies (such as sharp curves) are cataloged.
   c. Collision causes and histories are recorded.

This information is statistical in nature and can be analyzed in a numeric fashion. This analysis provides an objective look at the existing state of the transportation system.

2. The County must make the best use of available funds. Road construction funds come from many sources and can be aimed at specific purposes. Usually, these funds have a deadline by which they must be spent (typical for appropriated taxpayer money). For this reason, sometimes projects must be moved up and constructed in order to capture these funds.

3. The County must make the best investment possible to meet future needs. For this reason, the County and its citizens periodically analyze growth trends and try to anticipate the needs this growth will generate. This, along with analysis of known transportation problems, is what drives investment in new construction.

4. The County must respond to the needs and concerns of the voting public. This is why public input is a legally mandated requirement of the prioritization process. In the past, the County has only held the public meetings required by law to solicit public input. This year, the County Commissioners have asked us to take a more comprehensive approach to soliciting public input. This is why we have established an advisory board and a series of open houses to actively solicit input from the public at large.

The following characteristics are the specific criteria considered in the evaluation of road projects in Mason County:

Traffic Volumes	Sight Distance
Traffic Collisions	Surface Condition
Roadway Width	Funding Leveragability
Horizontal Curvature	Drainage Adequacy
Grade	Service Rating

Each of these criteria are explained in more detail below. The scoring worksheets follow the explanation. It is important to note that only those deficiencies that can be remedied are rated. If some characteristic of a given road does not allow a deficiency to be corrected, it is not be scored.

1. Traffic Volumes: This category is a simple comparison of traffic volume. The Average Daily Traffic (ADT) calculated from the most recent data is compared to the first column on the Traffic Volume & Collision Rating table and given the appropriate score.

2. Traffic Collisions: A 3-year traffic collision history for the project is tabulated. Each severity is given a weight and the resulting scores for each severity are totaled. This score is divided by 3 and divided again by the project length in miles to arrive at the equivalent collisions per mile for the road.. This final calculation is compared to the second column on the Traffic Volume & Collision Rating table and given the appropriate score.

3. Roadway Width: This rating gives a combined assessment of a roadways adequacy or inadequacy given the amount of traffic it serves. The criteria on which these scores were weighted is based on the standards provided in the Local Agency Guidelines, the WSDOT design manual, and criteria established by the County Road Administration Board. The basic theory behind the significance of adequate roadway width stems from the idea that lower traffic volumes can be adequately handled by narrower roads, but higher traffic volumes, greater than

2000 ADT, need wider lanes and shoulders to accommodate not only more vehicles but other modes of travel as well (pedestrians, bicycles, large trucks, etc.).

4. Horizontal Curvature: The advisory speed for a curve is determined by evaluating safe speeds on curves by using a ball bank meter. The ball bank device measures the centrifugal force experienced while traveling through a curve. The readings from this device give the best indication of the speed that a vehicle can safely negotiate a curve. The measured safe speed for each curve taken from ball banking is compared with the minimum allowable design speed for the given road, based on an assessment of the terrain (Table 4.1). A curve is found to be deficient if the safe or "ball bank" speed is lower than the allowable design speed. Only deficient curves are rated (curves falling within design criteria score a zero).
    1. Find the minimum allowable design speed in Table 4.1
    2. Find the corresponding Curve Deficiency number (Table 4.2) for each curve.
    3. Total the Curve Deficiency numbers for all of the curves and substitute this total for Dc in the following Equation: Hc = Dc / (3L)
        where Dc = cumulative value of all curves
        where L = Length of Project in miles
    4. Score the horizontal curvature using Table 4.3

5. Grade: Road grades are measured as a percentage of rise (or climb) divided by run (horizontal distance). For instance, a hill with a 5% grade climbs 5 feet for every 100 feet of road. For example, the first hill on Agate Road going up to Pioneer School is a 10% grade. Desirable grades on roadways are determined as a relationship of design speed (Table 5.2). The significance of a deficient or undesirable grade is scored as the percentage of slope above the desirable grade. The score from each grade on a project is rated to a maximum score of 10.
    As an example: A road with 1500 ADT crossing rolling terrain has a couple of hills. Hill 1 has an 11% grade and Hill 2 has a 7% grade. From Table 5.2, the target grade is 8%. Therefore, Hill 2 is within desirable limits, but Hill 1 is 3% over. From Table 5.3, this project would score 6 points.

    As a practical consideration, it may not be possible to reconstruct a road with flatter grades. This requires large quantities of cut and fill, which involves additional right-of-way and erosion and environmental concerns. In many cases, flattening the grade is not practical or is cost prohibitive.

6. Sight Distance: This priority array uses the amount of passing lane striping to indicate favorable sight distance conditions. This is not the method used for calculating stopping sight distance required for design. A Field measurement for investigating actual sight distance along an entire road segment are time intensive and requires a survey crew. No-pass centerline striping does relate to measured sight distance criteria and is relatively easy data to collect. This method of rating the sight distance adequacy is a good "rule of thumb" for identifying areas of possible concern.

    The percentage of passing lane striping on a given project is estimated and scored appropriately using Table 6.1. The score is also modified based on the posted speed limit on the project. Slower speeds can accommodate shorter stopping sight distances and are not scored as heavily as higher speed roads.

7. Surface Condition: Data from the Pavement Management System (PMS) is used to assess the structural condition of both the road and the roadbed. This management system produces a

score from 1 to 100, a score of 100 being a road with no significant defects. A road which scores less than 50 points under this system is assumed to be failed and will not be overlayed until the roadbed has been reconstructed. Table 7.1 is used to calculate a score from the PMS rating.

8. Funding Leveragability: Funding leveragability takes into account three factors:
    1. Whether or not a project is even eligible for outside funding
    2. Whether a project currently has outside funding obligated to it
    3. The number of years left before the county must return funds to the granting agency if there is an expiration date.

    Scoring is based on the percentage of all funding received for the project in relation to the total estimated project cost. The thresholds established for the percentage funded are based on the funding limits of state, federal, and other granting agencies.

9. Drainage Adequacy: The drainage adequacy rating is an assessment on a scale from 1 to 10 conducted by the Public Works Construction Engineer. This assessment takes into account ditching, positive (or negative) drainage conditions, typical soil types for the project area, and historical trends.

10. Service Rating: The service rating takes into account several different aspects of the community served by the road and the project. The service rating is divided into four general categories: economic; recreation; service oriented; and community oriented. There are 23 sub-categories that fit under the four main categories. Each is given a score from 1 to 10 based on the relative importance and a weighted average is calculated (see Table 10.1). In Table 10.2, the scores from each category are weighted against each other and the total of the possible 50 points is divided by 2, giving a maximum possible score of 25 points for the service rating.

Priority Array Program Worksheet

Road Name: _____ County Road No._____.

BMP Location: _____ BMP _____ EMP_____.

TOPOGRAPHY ( ) Flat ( ) Rolling ( ) Mountainous

Soil Type: _____ Surface Type: _____.

Criteria	Max Pts	Score
Traffic Volumes	10	____.
Traffic Collisions	10	____.
Roadway Width (Avg Score of Lanes & Shldr)	10	____.
Horizontal Curvature	10	____.
Grade	10	____.
Sight Distance	10	____.
Surface Condition (PMS)	25	____.
Funding Leveragability	10	____.
Drainage Adequacy	10	____.
Service Rating	25	____.
TOTAL	**130**	____.

1. Traffic Volume & Collision Rating

Average ADT	Equivalent Collisions/Mile	Rating Points
< 500	< 4	0
500-1000	4-6	2
1000-2000	7-9	4
2000-3000	10-12	6
3000-5000	13-15	8
> 5000	> 15	10

Table 1.1

Traffic Volume Rating _____.

2. Traffic Collisions

Equivalent Property Damage, Three Year Average

Year	Property Damage Only	Injury	Fatality	
19 __				
19 __				
19 __				
Subtotal				
Factor	x3	x10	x25	Total Score
Total =				

Table 2.1

_____ ÷ 3 ÷ _____ = _____ From Table Above; **Collision Rating** ____

Total Score — Length (Miles) — Equiv Coll/mile

3. Roadway Width

(Average Score of Lane Width & Shoulder Width)

	Lane Widths					Shoulder Widths							
ADT	<8'	9'	10'	11'	12'	0	1	2	3	4	5	6	8
< 400	10	5	1	0	0	8	3	1	0	0	0	0	0
400-750	10	7	1	0	0	10	6	2	0	0	0	0	0
750-1000	10	9	1	0	0	10	8	6	4	0	0	0	0
1000-2000	10	10	7	2	0	10	9	8	6	4	2	0	0
> 2000	10	10	10	5	0	10	10	9	8	6	4	2	0

Table 3.1

Lane Width Score ____.
Shoulder Width Score ____.
Roadway Score ____.
(Lane + Shldr ÷ 2)

4. Horizontal Curvature

Horizontal Alignment (10Pts Max)

1) Determine minimum design speed - Vd from the minimum Design Speed table below.

Minimum Design Speed			
ADT	<400	400-2000	> 2000
Flat	50	50	50
Rolling	40	40	50
Mountainous	30	30	40

Table 4.1

2) Horizontal Curvature Deficiency - Dc

a) Determine "Safe Speed" from Ball Bank Indicator readings for each curve.

b) Use the table below to determine the deficiency value for each curve (Dc).

Curve Deficiency Table, (Dc)								
	Safe Speed from "Ball Bank" Indicator Readings							
	15	20	25	30	35	40	45	50
30	0.500	0.333	0.166	0.000				
40	0.625	0.500	0.375	0.250	0.125	0.000		
50	0.700	0.600	0.500	0.400	0.300	0.200	0.100	0.000

Table 4.2

c) Total all Dc values and calculate the Horizontal Alignment Deficiency - Hc

$Hc = Dc / (3L)$ where Dc = cumulative value of all curves
where L = Length of Project in miles

d) Score the project for the Horizontal Deficiency using the table below.

Points	Hc	Points	Hc
1	0.001-0.050	6	0.251-0.300
2	0.051-0.100	7	.0301-0.350
3	0.101-0.150	8	0.351-0.400
4	0.151-0.200	9	0.401-0.450
5	0.201-0.250	10	0.451-0.500

Table 4.3

Horizontal Alignment Rating ____.

5. Grade

Existing Max Grade within road section = ____%

Minimum Design Speed			
ADT	<400	400-2000	> 2000
Rolling	40	40	50
Mountainous	30	30	40

Table 5.1

	DESIGN SPEED			
Terrain	30 mph	40 mph	50 mph	60 mph
Rolling	9%	8%	7%	6%
Mountainous	12%	10%	9%	8%

Table 5.2

% Over Std	0%	1%	2%	3%	4%	5% & up
Rating	0	2	4	6	8	10

Table 5.3

Grade Score ____.

6. Sight Distance

This assessment of sight distance is based on the percentage of passing allowed on the roadway segment being rated. The score is further modified based on the posted speed on the segment.

ADT	100%	90%	80%	70%	60%	50%	40%	30%	20%	10%	less
<400	0	0	0	0	0	2	4	5	6	8	10
400-2000	0	0	0	2	4	5	6	8	10	10	10
>2000			2	4	5	6	8	10	10	10	10

Table 6.1

Speed limit score adjustment

25 mph -3	40 mph 0
30 mph -2	45 mph +1
35 mph -1	50 mph +2

Sight Distance Score ____.

7. Surface Condition

(PMS)

PSC	>95	94-85	84-75	74-65	64-55	<54
Rating	0	5	10	15	20	25

Table 7.1

Surface Condition ____.

8. Funding Leveragability

Max: 10 points

No funding available 0

a) Eligible for funding

50% or less 3
up to 86% 4
86% to 100% 5

b) Funding Obligated

50% or less 5
up to 86% 6
86% to 100% 7

c) Funding Turn back

1 year +4
2 years +3
3 years +1

Eligible or Obligated + Turnback= Leveragability score

Funding Leveragability Score ____.

9.0 Drainage Adequacy

Excellent	Good	Adequate	Fair	Poor	Very Poor
0	2	4	6	8	10

Table 9.1

Drainage Adequacy Score ____.

10. Service Rating

Economy	1	2	3	4	5	6	7	8	9	10
Agriculture										
X-mas Trees										
Aquaculture										
Livestock										
Logging										
Industrial										
						Total			÷ 6	

Recreation	1	2	3	4	5	6	7	8	9	10
Hunting										
Lake/Stream Access										
Scenic										
Resort										
Camping										
Public Boat Launch										
Park Access										
						Total			÷ 7	

Service	1	2	3	4	5	6	7	8	9	10
Transit										
Commerical										
Log Haul/ Freight										
Commuter										
						Total			÷ 4	

Community	1	2	3	4	5	6	7	8	9	10
Church										
Grange/Civic Center										
School										
Fire Station										
Post Office										
						Total			÷ 5	

Table 10.1

Scoring

Criteria	Avg Rating	Weight	Sub-Totals
Economy		1.5	
Service		1.5	
Recreation		1.0	
Community		1.0	
		Total	
	Score: Total ÷ 2 (Max 25 pts)		

Table 10.2