Sample TRIP97 Evaluation Methodology

The purpose of this section is to provide an overview of an example application of the TRIP97 evaluation methodology. The TRIP97 report presents the concepts and overall framework, this section provides additional details on the technical aspects of the methodology and its application.

Performance Measure Evaluation

Tables 1 and 2 detail specifics of the performance measures used in the TRIP97 evaluation process, including the tools applied and the outputs for each metric. TRIP97 is not recommending specific analytical tools and as better evaluation tools become available the information in the table might change. What is listed represents the best information and tools available at the present time.

Table 1. Summary of Corridor Performance Measure Analysis Methods and Outputs.

Performance Measure	Sample Evaluation Tool	Output for Analysis	Comments
Corridor Measures			
Average Travel Time	HCM2010 Urban Streets Method/SHRP 2 L08 Reliability Engine	Directional Travel Time (minutes)	Average travel time is based on a distribution of travels times produced by the reliability application of the HCM2010 Urban Streets methodology.
Travel Time Reliability	HCM2010 Urban Streets Method/SHRP 2 L08 Reliability Engine	Directional Travel Time Standard Deviation (minutes)	The standard deviation of average travel time is based on the same distribution of travel time used to compute Average Travel Time.
Change in Job Potential	Calculated using an iterative process to determine how many additional trips on US 97 could be accommodated before bringing overall b/c ratio back to the base case.	# of through trips accommodated	This metric is provided alongside the overall corridor benefit/cost ratio calculated with the other corridor metrics but is not included in that calculation. It is intended to be for informational purposes and supplement to the overall corridor benefit/cost ratio.
Expected Crash Frequency	Highway Safety Manual	Expected crashes by severity	This metric focuses on expected crashes which are informed by predicted and observed crashes. Crash severity (severe injury/fatal and property damage only further influence this metric.
CO_2 Emissions	GreenStep or Emme2 output	CO_2 equivalents (CO_{2eq})	Could be approximated using a variety of software programs if more detailed analysis methods are not available.

Table 2. Summary of Segment Performance Measure Analysis Methods and Outputs.

Performance Measure	Sample Evaluation Tool	Output for Analysis	Comments
Segment Measures			
Average Travel Time	HCM2010 Urban Streets Method/SHRP 2 L08 Reliability Engine	Directional Travel Time (minutes)	Calculated as part of corridor metrics.
Travel Time Reliability	HCM2010 Urban Streets Method/SHRP 2 L08 Reliability Engine	Directional Travel Time Standard Deviation (minutes)	Calculated as part of corridor metrics.
Side-Street Delay	HCM2010 Intersection Analysis Methods	Weighted Average Delay (seconds)	The result of this analysis is a weighted sum of side-street delay based on total side-street delay and side-street volume. The result is a singular delay number.
Expected Crash Frequency	Highway Safety Manual	Expected crashes by severity	This metric focuses on expected crashes which are informed by predicted and observed crashes. Crash severity (severe injury/fatal and property damage only further influence this metric.
Turning Movement Opportunities per Mile	Turning Movement Index Approach (described previously)	Turning Movement Index Score	The method presented for calculating this metric is intended to provide an evaluation of the public street connectivity to US 97.
Percent of N-S Traffic on US 97	Travel Demand Model	Percent travel on US 97	This method is designed to determine how the highway is being utilized for regional or local travel. If local alternatives are available, more travel will likely occur on the local street network for north-south movements.
Pedestrian, Bicycle, and Transit LOS	HCM2010	MMLOS Index Score for each of the pedestrian, bicycle and transit modes.	These methods are consistent with the HCM2010

With the information from Tables 1 and 2 in mind, the following sections describe how one would apply the TRIP97 evaluation process for a Tier III analysis as outlined in the overall evaluation approach. Specific calculation methods are not included since evaluation tools likely to be used are externally available products.

Evaluation Areas

The TRIP97 evaluation approach categorizes the performance measure into evaluation areas. This is done for two reasons. 1) Ensuring the performance measures address the key areas of concerns related to highway performance. 2) Allowing the jurisdictions to weight highway priorities based on the evaluation areas.

The following subsections describe how the specific performance measures relate to the evaluation areas and how each performance measure could be calculated.

Mobility Evaluation

A key aspect of the TRIP97 evaluation is to determine how the mobility of US 97 is affected by a particular action. Three performance measures have been included assist the analyst in reporting these effects. These are:

- Average Travel Time
- Travel Time Reliability
- Side-street Delay

The travel time performance measures are produced as outputs from the HCM 2010 Urban Streets method in combination with the SHRP2 L08 "Incorporating Reliability into the HCM" tools. Within these tools, the analyst will determine the following:

- Northbound average travel time by segment (in minutes)
- Southbound average travel time by segment (in minutes)
- Northbound travel time variability by segment (in minutes)
- Southbound travel time variability by segment (in minutes)

For all scenarios these values should be determined for the period of 3:00 p.m. to 6:00 p.m., Monday through Friday for an entire year.

Also included in the mobility evaluation is the calculation of Side-street Delay. This metric is intended to evaluate the "barrier" function of the highway for east-west travel. Existing evaluation methods, such as HCM methodologies, should be used for calculation purposes. The output of this metric is a singular value of:

- Weighted side-street delay (in seconds)

The weighted side-street delay value can be determined by evaluating each intersection that provides or controls a crossing of US 97 within the study segment. These include:

- Signalized at-grade intersections
- Unsignalized ramp terminal intersections
- Signalized ramp terminal intersections

- Other at-grade intersections (non-driveway locations) determined to represent east-west crossing delay

The results of the delay calculations at these locations should be combined together by weighting the side-street delay at each location by the volume of vehicles making the movement. Current methods only allow side-street delay to be calculated for a singular hour. As such, 30^{th} highest hour conditions should be used for this analysis until more robust analysis methods are available.

Safety Evaluation

The safety evaluation is based on predicted crash frequency, further defined by the crash severity. As such, the following should be reported:

- Predicted occurrence of annual crashes by severity

While historical crashes may be useful in calibrating HSM methodologies, these existing incidents may not be relevant in considering predicted crashes. This metric should reflect the difference in predicted crashes given a set of differing roadway scenarios. The HSM should be used in this evaluation.

It should be noted that the safety analysis is not limited to crashes that occur during the evening commute period. The TRIP97 mobility metrics are focused on this period to better distinguish alternatives that would otherwise be diluted by the low delays experienced during off-peak hours.

Accessibility Evaluation

The accessibility evaluation is intended to evaluate the overall vehicular connectivity of the public street network to US 97. This evaluation is not intended to replace or supersede access spacing guidelines. Rather, the evaluation will provide additional information to decision-makers that is not currently considered. The method for evaluation was described generally previously in this report and is stated in more detail here.

Public street turning movement opportunities per mile should be determined by counting the side-street movements at each public street connection with US 97. Ten such turning movements are possible at a conventional intersection configuration:

- Eastbound left, Eastbound through, Eastbound right
- Westbound left, Westbound through, Westbound right
- Northbound left, Northbound right
- Southbound left, Southbound right

The presence of each of these movements should be counted as 1 public street turning movement opportunity.

Since accessibility is a product of the presence of a movement and intersection control, a weighting based on intersection control type is also included in the evaluation measure. These weightings are listed below:

- Unsignalized intersection: 1
- Signalized intersection: 3
- Grade separated movement: 5

These factors should be applied to the presence of turning movement opportunities. For example, a signalized intersection with full turning movements available would have an index score of 30 (10 turning movement opportunities, signal weighting of 3, providing 10 movements x 3 signal weighting = 30).

The results of this analysis will be:

- Weighted public street turning movement opportunities per miles (west and east side of US 97)

Redundancy Evaluation

The redundancy evaluation is intended to assess whether or not local alternatives to US 97 are available and being used. The measure calculates a simple percentage based on the number of vehicles using US 97 for north-south travel compared to that of vehicles using local roadways. Under existing conditions, this metric can be collected based on existing roadway volume counts. For future conditions, or in cases where local traffic count information is not available, a travel demand model can be used.

For consistency in evaluations, a screen line should be established for each segment that identifies where the north-south percentage should be calculated. This screen line should note which roadways are determined to represent local alternatives to US 97, where traffic volumes on these facilities should be observed, and where volumes should be observed on US 97.

The results of this analysis will be:

- Percent of N/S travel on US 97

Alternate Modes

The alternate modes evaluation considers how well pedestrians, bicycle, and transit users are served along the length of the corridor. The current evaluation methodology is based on the urban street methods within the Highway Capacity Manual. The product of those methods is an index score for the performance of each mode by direction. As such, the outputs that should be considered for the TRIP97 evaluation are:

- Northbound Pedestrian Index Score
- Southbound Pedestrian Index Score
- Northbound Bicycle Index Score
- Southbound Bicycle Index Score
- Northbound Transit Index Score
- Southbound Transit Index Score

The multimodal level of service accounts for a variety of factors such as private driveways, facility dimensions (sidewalks, bicycle lanes, planter strips, on-street parking, travel lanes, etc.), travel volume and speeds in outer lane, pavement conditions (for cyclists), sidewalk connectivity to transit stops, transit frequency and on-time performance. The multimodal methodology is described with lower values for better performance (less than 2.0 is LOS "A") and higher values for poorer performance (greater than 5.0 is LOS "F").

Example Project Evaluation

For visualization purposes, the following projects along the US 97 corridor will be considered within the context of a TRIP97 Tier III analysis. The specific results shown are for demonstration purposes only and are not based on calibrated analysis.

The projects considered are:

- US 97/1st Street/Reed Road Signalized Intersection Installation, La Pine
- US 97/Murphy Road Overcrossing Phase 1, Bend

Overview of Evaluation Approach

A key aspect of the TRIP97 evaluation process is the comparison of alternatives. The TRIP97 evaluation process does not set specific operational or performance thresholds for each metric (as is done today for the volume-to-capacity ratio metric), rather, the evaluation approach compares how the performance measures change between two or more scenarios. Often this will be "with" a project or action and "without" a project or action or "with" a specific land use change to "without" that change (i.e., a base case), although other scenarios could exist (such as "with" an alternative or modified project). These scenarios would apply to both a segment level and corridor level evaluation.

For demonstration purposes, a segment level analysis of the projects identified is shown on the following pages. A high level overview of a corridor level evaluation follows.

Segment Level Evaluation

The first step of conducting a segment level evaluation is to determine the performance measure results for the two evaluation scenarios being considered, as shown in Exhibit 1. Red highlighting indicates segment results that change based on projects being evaluated. Table 3 summarizes why these metrics are changing.

Table 3. Qualitative Summary of Performance Measures.

Performance Measure	Reason for Change
Mobility	Increased travel time in La Pine due to new control delay on US 97, also decreased reliability as motorists may or may not have to stop at a red light. This is offset by side-street delay savings from having a protected turning movement onto the highway. In Bend, removing a traffic signal and providing a grade-separated interchange has an overall positive impact. Through travel is improved, reliability is improved, and delay for side-street motorists is also reduced.
Safety	The safety of adding a new traffic signal in La Pine is likely to result in more rear-end crashes, particularly within the rural to urban transition area. While a higher number of crashes may result, these are likely to be lower severity than the angle crashes more prevalent at an unsignalized intersection. The breakdown of crashes by severity (not provided in this sample) would better highlight this distinction. The reduction in conflict points with the Murphy overcrossing will have a safety benefit within the Bend segment.
Accessibility	Accessibility in La Pine is improved. While all movements are retained, the traffic signal weighting highlights the improved access to US 97. In Bend, the net effect of the Murphy Crossing project is roughly 0 in terms of accessibility, with a slight negative shown. This is a product of the new interchange being constructed weighted against the closing of existing access locations like 3rd Street and Pinebrook Blvd.
Redundancy	Related to each project, the improvements are expected to make the existing location street transportation system more accessible for users and, as a result, slightly reducing the reliance of the highway for vehicular travel.
Alternate Modes	Multimodal LOS values are showing an improvement across all categories in La Pine owing to the protected pedestrian crossing along the segment. Similarly, the Murphy overcrossing is showing an improvement in multimodal service levels.

	Future Year No Build Conditions														
	Mobility					Safety	Accessibility		Redundancy	Alternate Modes					
	Travel Time (min)		*Reliability (+/- min)*		*Side-Street Delay (s)*	*Annual Crash Frequency*			*Percent N/S on US 97*	*Ped LOS*		*Bike LOS*		*Transit LOS*	
	Northbound	*Southbound*	*Northbound*	*Southbound*			*Westbound*	*Eastbound*		*NB*	*SB*	*NB*	*SB*	*NB*	*SB*
La Pine	5.2	5.2	0.90	0.10	200	10	36	32	67%	3.69	3.87	3.53	3.57	5.00	5.00
La Pine to Bend	24.4	25.7	0.36	0.70	50	57	84	78	100%	n/a					
Bend	13.2	21.8	0.90	6.20	180	98	246	252	79%	4.48	4.00	4.73	3.82	4.00	4.00
Bend to Redmond	13.5	14.1	0.21	0.21	50	37	56	35	90%	n/a					
Redmond	5.2	4.4	2.64	1.19	200	34	83	55	72%	3.75	3.85	3.25	3.30	4.25	4.25
Redmond to Terrebonne	4.9	4.7	0.12	0.06	40	9	19	19	77%	n/a					
Terrebonne	1.4	1.3	0.05	0.02	200	8	24	27	95%	3.85	3.50	3.39	3.39	5.75	5.75
Madras to Terrebonne	22.2	21.6	1.47	0.65	30	27	82	82	100%	n/a					
Madras	4.7	4.5	0.13	0.08	180	29	95	105	60%	3.56	3.21	3.55	3.45	4.50	4.50

	Future Year with Projects														
	Mobility					Safety	Accessibility		Redundancy	Alternate Modes					
	Travel Time (min)		*Reliability (+/- min)*		*Side-Street Delay (s)*	*Annual Crash Frequency*			*Percent N/S on US 97*	*Ped LOS*		*Bike LOS*		*Transit LOS*	
	Northbound	*Southbound*	*Northbound*	*Southbound*			*Westbound*	*Eastbound*		*NB*	*SB*	*NB*	*SB*	*NB*	*SB*
La Pine	5.3	5.4	0.94	0.14	150	11	46	42	65%	3.44	3.62	3.28	3.32	4.75	4.75
La Pine to Bend	24.4	25.7	0.36	0.70	50	57	84	78	100%	n/a					
Bend	12.7	13.0	0.57	0.30	140	80	251	245	75%	4.35	3.87	4.60	3.70	3.90	3.90
Bend to Redmond	13.5	14.1	0.21	0.21	50	37	56	35	90%	n/a					
Redmond	5.2	4.4	2.64	1.19	200	34	83	55	72%	3.75	3.85	3.25	3.30	4.25	4.25
Redmond to Terrebonne	4.9	4.7	0.12	0.06	40	9	19	19	77%	n/a					
Terrebonne	1.4	1.3	0.05	0.02	200	8	24	27	95%	3.85	3.50	3.39	3.39	5.75	5.75
Madras to Terrebonne	22.2	21.6	1.47	0.65	30	27	82	82	100%	n/a					
Madras	4.7	4.5	0.13	0.08	180	29	95	105	60%	3.56	3.21	3.55	3.45	4.50	4.50

Exhibit 1 **Performance Measure Evaluation Comparison Between Scenarios.**

Once results for each of the performance measures have been calculated for each evaluation scenario, the values need to be normalized into a single unit for comparison. This is accomplished by comparing the results to the pre-established baseline values (as shown in Table 4), calculating a percent change from the baseline value (as shown in Table 5), which can then be referenced to a numeric score ("change value") ranging between +3 and -3. The results of the hypothetical evaluation are shown in Exhibit 2.

Table 4. Baseline Values.

Performance Metric	Urban Value	Rural Value
Average Travel Time	35 mph	50 mph
Travel Time Variability	Average Variability in Travel Time Along US 97 Corridor	Average Variability in Travel Time Along US 97 Corridor
Side-street Delay	60 seconds	30 seconds
Expected Crash Frequency	Average Statewide Crash Rate for Similar Facilities	Average Statewide Crash Rate for Similar Facilities
Turning Movement Opportunities per mile	Index score: 80/mile	Index score: 40/mile
Percent of N-S traffic on US 97	75 percent	90 percent
Pedestrian LOS	Index Score: 3.0	n/a
Bicycle LOS	Index Score: 3.0	n/a
Transit LOS	Index Score: 3.0	n/a

Table 5. Thresholds for Change Value.

Change from Nominal Value	Change Value	Change relative to "Baseline Values:
Major Degradation	-3	>-10%
Moderate Degradation	-2	-5 to -10%
Minor Degradation	-1	<-5%
No Change	0	-
Minor Improvement	1	<+5%
Moderate Improvement	2	+5 to +10%
Major Improvement	3	>+10%

	Percent Change													
	Mobility					Safety		Redundancy	Alternate Modes					
	Travel Time (min)		*Reliability (+/- min)*		*Side-Street Delay (s)*	*Annual Crash Frequency*	Accessibility	*Percent N/S on US 97*	*Ped LOS*		*Bike LOS*		*Transit LOS*	
	Northbound	*Southbound*	*Northbound*	*Southbound*					*NB*	*SB*	*NB*	*SB*	*NB*	*SB*
La Pine	-2.00	-2.94	-4.50	-4.50	83	-3.42	6.22	-3.16	8.33	8.33	8.33	8.33	8.33	8.33
La Pine to Bend	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	n/a					
Bend	3.06	58.49	36.59	663.77	67	6.71	-0.28	-5.19	4.17	4.17	4.17	4.17	3.33	3.33
Bend to Redmond	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	n/a					
Redmond	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Redmond to Terrebonne	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	n/a					
Terrebonne	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Madras to Terrebonne	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	n/a					
Madras	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	Change Value													
	Mobility					Safety		Redundancy	Alternate Modes					
	Travel Time (min)		*Reliability (+/- min)*		*Side-Street Delay (s)*	*Annual Crash Frequency*	Accessibility	*Percent N/S on US 97*	*Ped LOS*		*Bike LOS*		*Transit LOS*	
	Northbound	*Southbound*	*Northbound*	*Southbound*					*NB*	*SB*	*NB*	*SB*	*NB*	*SB*
La Pine	-1	-1	-1	-1	3	-1	2	1	2	2	2	2	2	2
La Pine to Bend	0	0	0	0	0	0	0	0	0					
Bend	-1	-3	3	3	3	2	-1	-2	2	2	2	2	1	1
Bend to Redmond	0	0	0	0	0	0	0	0	0					
Redmond: South City Limits to Evergreen	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Redmond to Terrebonne	0	0	0	0	0	0	0	0	0					
Terrebonne	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Madras to Terrebonne	0	0	0	0	0	0	0	0	0					
Madras	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Exhibit 2 **Percent Change and Change Values Based on Calculated Change.**

Following completion of the change values, each performance measure is then assigned its relative importance within the segment based on pre-established agency weighting factors. This provides a single score that can then be used to compare between alternatives. It should be noted that where multiple change values exist for an evaluation area (Mobility & Alternate Modes), the change values should be averaged to develop a singular value prior to weighting.

The results of the weighting process for the hypothetical scenario being considered are shown in Exhibit 3. As shown, this sample shows that the result of the La Pine and Bend projects provide a net benefit to the transportation system considering the importance (weighting) agencies have provided to the individual metrics within these segments. A reviewer can determine this overall benefit to each segment by noting that the score is greater than 0.

Corridor Level Evaluation

The intent of a corridor level evaluation is to determine the net effect of project or action on the entire length of the corridor. For many of these metrics, the corridor level value can be determined by simply adding together the results of the segment level analysis. Specifically, this can be done for the following metrics:

- Average Travel Time
- Travel Time Reliability
- Expected Crash Frequency

CO_2 Emission results are not calculated as part of the segment level evaluation. As such, the results of the performance metric should be calculated based on the methods previously outlined.

As previously described, each of these values should be calculated for both of the scenarios being considered. If the analysis results of a particular segment can reasonably be assumed to not change as the result of a project or action then results need not be calculated for that segment.

Similar to the segment level analysis, the TRIP97 evaluation considers the difference between the results of the scenarios evaluated. As such, Table 6 below shows the difference in these values from a corridor level. In addition, an example of the monetized value of this change has also been included.

	Weighting							
	Mobility	Safety	Accessibility	Redundancy	Alternate Modes	Total		Aggregated Weighted Score
La Pine	32.50	37.50	10.00	12.50	7.50	100.00		0.04
La Pine to Bend	30.00	52.50	5.00	7.50	5.00	100.00		0.00
Bend	30.00	30.00	10.00	17.50	12.50	100.00		0.66
Bend to Redmond	36.67	41.67	8.33	8.33	5.00	100.00		0.00
Redmond	28.33	28.33	15.00	16.67	11.67	100.00		0.00
Redmond to Terrebonne	37.50	37.50	12.50	7.50	5.00	100.00		0.00
Terrebonne	35.00	29.17	14.17	13.33	8.33	100.00		0.00
Madras to Terrebonne	40.00	38.33	10.00	6.67	5.00	100.00		0.00
Madras	33.33	24.17	14.17	18.33	10.00	100.00		0.00
Aggregated Total Segment Score								**0.69**

Exhibit 3 **Sample Segment Weightings and Aggregated Weighted Score**

Table 6. Corridor Metrics.

Performance Measure	Annual Monetized Value
Average Travel Time	$7,345,146 in savings
Travel Time Reliability	$5,103,091 in savings
Expected Crash Frequency	$6,045,000 in savings
CO_2 Emissions	$40,061 in savings

Note: Total construction cost estimated at $41,000,000 for both projects

Based on the results shown in Table 6, and accounting for 20 years of savings, the resulting benefit/cost ratio is 6.4, which indicates a net benefit to the transportation system as a result of the construction of the projects.

Qualitative Development Review Example

The intent of TRIP97 is to allow small-scale development or planned growth to occur in compliance with the legislatively completed plan. The Tier 1/Tier 2 process is intended to establish a "bright line" for these types of development to proceed with respect to US 97 impacts, though it may require some form of contribution toward pre-established mitigation needs.

The Tier 3 process is intended to capture development that is significant and inconsistent with the land use or infrastructure assumptions of the adopted TRIP97 plan. For example, a new development proposing to add a traffic signal to US 97 or a major rezone project. Similar to the Transportation Planning Rule Amendment (OAR 660-12-0060) process, these types of projects would need to show how they are compliant with the adopted TRIP97 plan, or what additional mitigation needs would be needed to bring the project into compliance.

Segment Level Evaluation

Tier 3 projects would be required to conduct a scoping process that would identify affected US 97 segments. An analysis would then be required for each affected segment based on the revised population, employment, and infrastructure information.

Table 7. Qualitative Development Review Sample

Performance Measure	Reason for Change	
	Infrastructure Change	Population/Employment Change
Mobility	Projects proposing traffic control changes, road modifications, or new access points would need to consider how the infrastructure (and users of that new feature) affect reliability, travel time, and side street delays. Generally, mobility will decrease with new traffic control on the highway. This effect may be lessened if the new infrastructure replaces obsolete intersection control.	Additional population or employment will add trips to US 97 and generally highlight decreased mobility.
Safety	Safety could vary depending on the traffic control device proposed and the infrastructure being replaced.	The predictive safety equations consider traffic volume, so the addition of trips on the system is likely to degrade roadway safety.
Accessibility	Traffic control changes such as signals or interchanges will generally show better access to US 97.	Changes to population and employment alone are not going to affect accessibility. However, this could be paired with new access points or infrastructure that would create an effect.
Redundancy	Infrastructure changes on US 97 may influence accessibility to the facility, which could in turn affect the split of traffic using the highway or parallel routes.	Changes in population and employment could significantly affect redundancy. Development along US 97 may increase highway reliance, whereas development along parallel local facilities may decrease the highway reliance.
Alternate Modes	New highway infrastructure could improve multimodal travel with streetscape projects, signalized crossings, or overcrossings. New highway access points could also degrade the multimodal system.	Population and employment changes associated with most development projects will have limited impact on alternate mode scoring. While this has some impact from the additional trips, this factor will be more affected by highway infrastructure changes.

As summarized in Table 7, the impact of development projects will generally be degradation to the highway performance as defined by the performance metrics. Additional population and employment will place more users on the system, and new highway control delay will degrade facility performance.

Analysis of the corridor metrics will be similar to the results shown for segment metrics, but will include emissions. Corridor metrics are monetized instead of weighted, and the system review will reflect a more diluted impact to the overall system as compared to analysis of the most affected segments.

The primary benefit of the TRIP97 process is the opportunities and options provided to mitigate this impact. The overall TRIP97 framework allows a wide variety of mitigation measures that, to mitigate their impact on the affected segment, could consider broader and higher priority segment needs. Similar to recent revisions to the Transportation Planning Rule, this allows investment in multimodal improvements (to improve alternate modes scoring), off-highway infrastructure (to improve redundancy scoring), safety improvements, or more conventional roadway projects that will improve mobility or accessibility.

While it would require approval from the TRIP97 Partnership, amendments to the TRIP97 plan could also be provided as mitigation. This may include the addition of infrastructure projects that may be too large for a single development to construct, but that could be identified by an applicant for some type of proportional funding contribution.

Essentially, the burden placed on unplanned development would be to amend the adopted plan. This construct is consistent with the Transportation Planning Rule, but expands the definition of “significant affect” beyond the volume-to-capacity metric by default, and provides a more defined process for assessing mitigation.

Senate Bill 1544 Sample Application

The City of Redmond recently approved adoption of a Memorandum of Understanding with ODOT to rezone 465 acres of land from *Open Space* to a mix of employment designations (light and heavy industrial with supporting retail).

The original rezone analysis was prepared for the site in conformance with the Transportation Planning Rule. This analysis followed the recent adoption of an updated Transportation System Plan, but major system projects that were identified to mitigate long-term congestion were not considered “reasonably likely” to be funded. Without these system projects the original analysis recommended that Phase 2 of the Redmond Reroute be constructed to support any development beyond 10 new weekday p.m. peak hour trips in order to mitigate volume-to-capacity deficiencies at signalized intersections on US 97 in central Redmond.

The revised transportation analysis approach followed the construct of the Transportation Planning Rule Amendment process, but considered the system deficiencies based on what the existing transportation system needs are without relying on planned projects. The analysis identified a series of supporting improvements that will provide a continuous parallel route to

US 97 along the Airport Way – 9th Street alignment, allowing trips to route to the northern and southern portions of the City where capacity is available long-term. Safety monitoring and alternative volume-to-capacity performance measures will be applied to the US 97 corridor to maintain an adequate level of safety while congestion increases.

The primary difficulty with the Senate Bill 1544 analysis approach was the lack of quantifiable methods to show that the alternative mitigation measures would be adequate. Lacking a TRIP97 analysis framework, the outcome of the analysis was a negotiation between the property owners, City, and ODOT to manage the opportunities and risks.

Table 8 summarizes how this analysis would have been better assessed within the TRIP97 framework. Essentially, the framework would have provided a value to each of these measures and a way to compare the tradeoffs in the same “currency”. The primary distinction between these two methodologies is that the qualitative analysis for the Senate Bill lands weighed infrastructure tradeoffs with job creation, whereas TRIP97 would have provided a higher priority toward maintaining an equivalent overall infrastructure performance.

Table 8. Redmond Senate Bill Relative to TRIP97

Performance Measure	Senate Bill 1544 Analysis Relative to TRIP97 Framework
Mobility	Travel time, travel time reliability, and side street delays will all show degradation from the additional trips.
Safety	Increasing traffic on the highway will show higher potential for crashes. Crash types will remain unchanged as no infrastructure changes are proposed on the highway. Roadway Safety Audits and monitoring efforts will seek to minimize the degradation in safety.
Accessibility	No new access to US 97 is proposed, nor are changes to traffic control at the existing US 97 approaches. The analysis does highlight the need for improved east-west connectivity to be developed as part of future TSP updates, which would improve accessibility.
Redundancy	Connection of 9th Street and Airport Way completes a parallel and continuous north-south route that connects Veteran’s Way to Maple Avenue. This parallel infrastructure, and proposed changes to improve north-south travel on this route, will reduce reliance on US 97 for surrounding lands in east Redmond.
Alternate Modes	New multimodal infrastructure is not proposed along US 97, but will be provided on 9th Street. Broad implementation of TDM measures on the Senate Bill lands may lessen mobility impacts or provide citywide benefits not specifically identified.

Reporting Format

The additional information provided by the TRIP97 evaluation framework addresses a broader range of goals, but can be more difficult for non-technical members of the public, elected officials, or decision makers to fully understand. Exhibit 4 shows an example reporting format to help simplify the results into a graphical summary format.

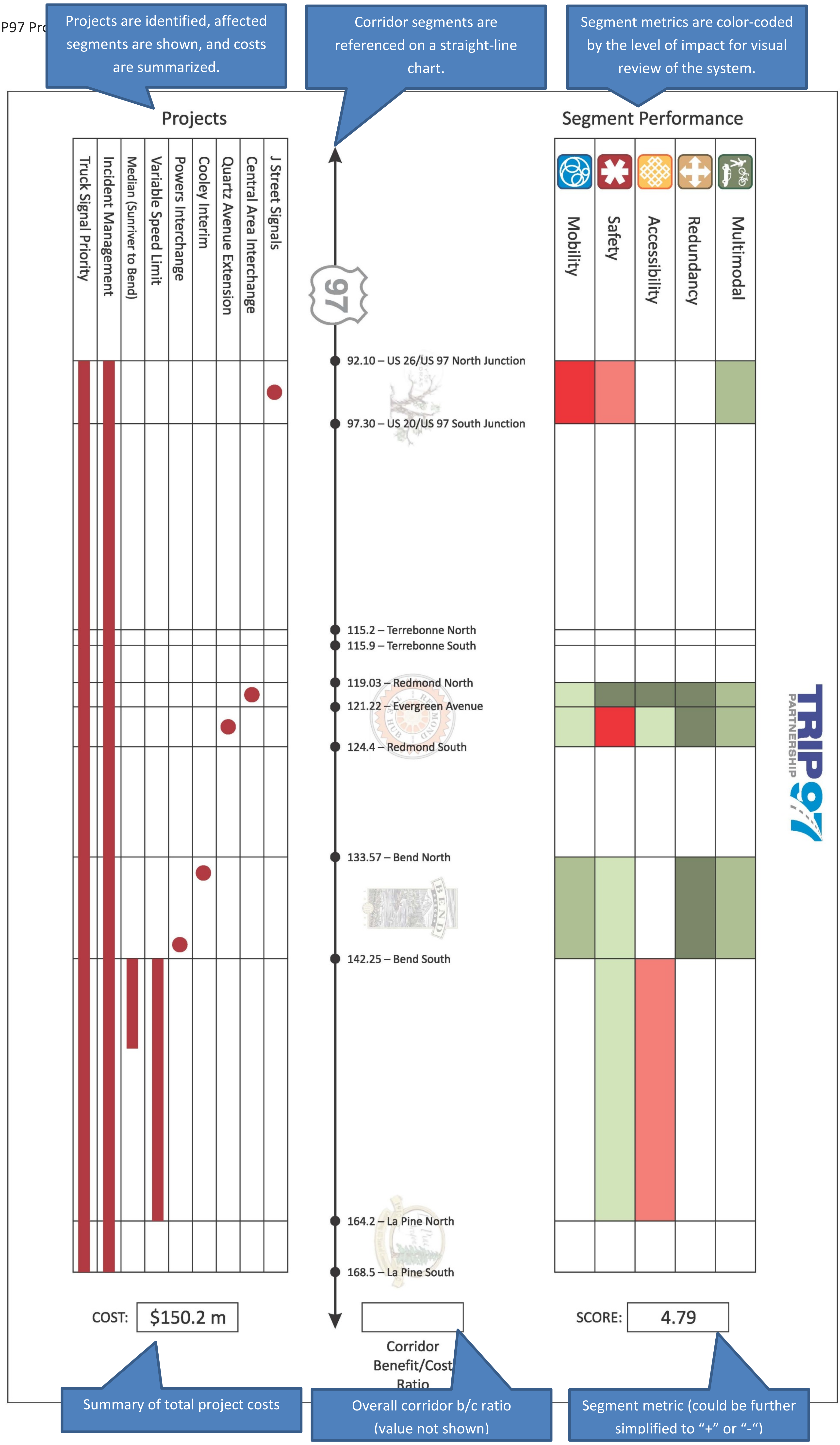

Exhibit 4 **Sample TRIP97 results display**