Chapter 7 - Strategy evaluation and modeling results

After developing the various strategies, the study team collaborated with partners to evaluate the effectiveness of each for achieving study goals defined in Chapter 1. Because some strategies could be modeled and others could not, the study team developed two approaches for evaluating the strategies. The study team produced data from the modeled strategies that were used to measure system performance. For the strategies that could not be modeled, the study team worked with the advisory groups to develop a process that would reflect the groups' collective evaluation of each idea.

Evaluating strategies that were unable to be modeled

The study team, in collaboration with advisory groups, determined that modeling was not possible for 45 strategies. Chapter 3 covers the multiple reasons why modeling was not appropriate for these strategies. However, the team did not want to eliminate viable strategies because of modeling limitations, so they developed an alternate group scoring and review process to evaluate their potential, which included the following steps:

Step one – Screen strategies for feasibility

Some strategies were not feasible to construct or implement for various reasons, including conflicts with WSDOT policy or needing changes in state or federal rules or law. Very few strategies were screened out using this step, but examples include "charging JBLM mitigation fees for impacts to surrounding communities" and "installing emergency call boxes along I-5."

Step two – Consult relevant agencies and subject matter experts

The study team met with experts from partners and within the WSDOT to ensure that proposed strategies do not go against their plans, policies, or law. Relevant agencies generally included local or regional governments or state agencies that own facilities or land that would be directly affected by the strategy. Some strategies were screened out through this process such as "Close the truck weigh station north of Mounts Road during peak periods" and "Adding capacity to Steilacoom Rd SE between Pacific Ave and Nisqually Cutoff Rd SE."

Step three – Score strategies

The study team and advisory groups then evaluated strategies that were given the green light by relevant agencies and subject matter experts for their effectiveness by study goal area. The study team gave a high-level rating for each idea using the categories: very positive; somewhat positive; neutral; somewhat negative; and very negative. The technical advisory group then reviewed and revised the scores.

Step four – Review results with advisory group and develop recommendations.

Given the high-level nature of the evaluation for the strategies that could not be modeled, the study team and advisory groups used this process more to guide discussion than as a definitive analysis. In the same vein, recommendations around these strategies generally involved recommending or not recommending further study. Details of the results of this evaluation for all strategies that could not be modeled can be found in Appendix H.

Evaluating strategies that were modeled

The study team collaborated with advisory groups to develop a methodology for evaluating the effectiveness of the strategy scenarios described in Chapter 5. This involved several key steps.

Step one – Prioritize the study goals relative to each other

The study team used input from the technical advisory group and results from study surveys to prioritize the study goals listed in Chapter 3. The purpose of this step was to allow the stakeholder advisory groups and public to determine which study goals were most important in evaluating the effectiveness of modeled scenarios.

The study team used an exercise with the technical advisory group called "forced-choice pair comparison" (example table in Exhibit 7-1) a common tool for developing group priorities. Participating members of the technical advisory group considered each study goal against the others individually in terms of which were most important to the legislative purpose, their organization's priorities, and performance of the transportation system (as well as any other considerations they thought were important). The study team took the resulting scores from each participant and averaged them by goal area to create a group weighting. The advisory group members then reviewed the averaged results and determined that the results did a good job of capturing the groups' values. No changes were made to the result from the exercise based on the discussion.

Respondents to the public surveys also provided input on their priorities for the study goals. Both surveys asked respondents to rank study goals from most to least

Exhibit 7-1: Advisory Group members filled out a "forced-choice pair comparison" exercise to develop study goal priorities

Study Goals	Travel times & reliability	Efficiently, equitable move people & goods	Improve accessibility	Nisqually habitat	Network redundancy/ resiliency	Score
Travel times & reliability	A	B	C	A/D	E	1.5
Efficiently, equitably move people and goods		B	C	B/D	E	2.5
Improve accessibility			C	C	C/E	4.5
Nisqually habitat				D	E	2
Network redundancy/ resiliency					E	4.5

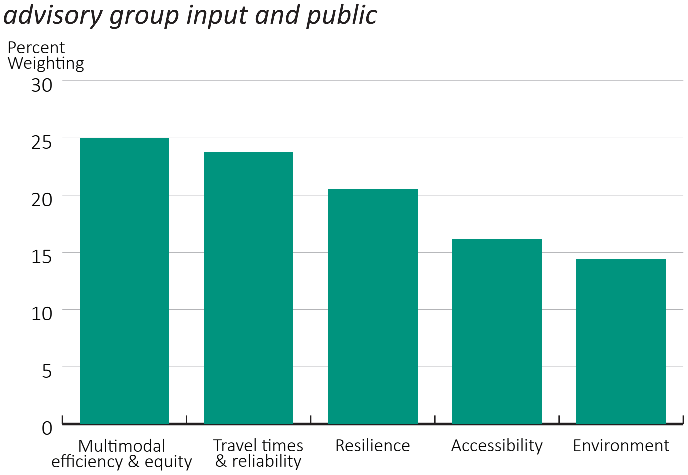
** Please note Exhibit 7-1 is an example, not an actual submission by an advisory group member.*

important. The first survey did not include the fifth study goal of network resilience, as this goal was added in response to feedback from that survey.

The study team used the rankings from the survey and averaged them for each goal area to create a group scoring, similar to the Technical Advisory Group process. As noted in Chapter 3, demographic groups were underrepresented in the survey responses (e.g. lower income households) that sometimes had different values and priorities for these study goals.

To create a final weighting that included input from both the Technical Advisory Group and general public, the study team averaged their overall results giving them equal weight to determine the final prioritization. This final weighting was presented to both advisory groups for a final opportunity to comment. Exhibit 7-2 reflects the combined rankings.

Exhibit 7-2: Overall advisory groups and public input ranked efficiency & equity highest among study goals
Study goal area by percent weighting calculated from advisory group input and public



Step two – Choose performance measures to assess scenario effectiveness

The study team developed an initial set of performance measures for each goal area. These measures, for the most part, have been used in prior WSDOT studies and reports or are currently coming into use such as the access to jobs and commercial services measures. The team also developed others specifically for this study like the traffic balance measure.

The Technical and the Executive Advisory Groups helped develop and refine the performance measures through multiple meetings. The study team presented an initial set of performance measures to the Technical Advisory Group who helped define aspects such as which roads would be used to measure travel times on alternate routes to I-5 or which populations would be considered in the environmental justice access to jobs measure. They also helped define the desired outcome and units of measure that would be used to score the effectiveness of each scenario. The study team also engaged with partners one on one as needed to refine performance measures and develop agreement with advisory group participants.

See Exhibit 7-3 on the next page for a list of performance measures. A detailed description of each measure can be found in Appendix G – Scenario and Performance Measures Report.

Exhibit 7-3: Performance measures organized by study goal area

Study goal area	Performance measures	Desired outcome
Travel Times and Reliability: Improve travel times on I-5 and make them more predictable	▪ Travel times along I-5 between SR 121 (exit 99) and Main Gate (exit 120)	Reduce travel times
	▪ Maximum throughput travel time index (MT^{3}I , average travel time divided by maximum throughput travel time) for I-5 in the study area for all traffic and HOV	Achieve an MT^{3}I of 1, this means the corridor is operating at peak efficiency for moving vehicles
Efficiency and Equity: Increase the transportation system's ability to efficiently and equitably move all people and goods	▪ Number of people moved during peak periods on I-5 for all traffic and HOV	Increase person throughput
	▪ Travel mode split in Thurston County between driving alone, carpooling, vanpooling, transit, walking, and biking	Decrease percent of trips made by driving alone
	▪ Total vehicle miles traveled in Thurston County	Decrease total vehicle miles traveled
	▪ Percent of traffic on I-5 traveling through the corridor rather than entering or exiting the highway	Increase the "through traffic" percentage on I-5
	▪ Access to jobs and commercial services for Environmental Justice[1] populations by driving alone, HOV, and transit	Increase access to jobs and commercial services for Environmental Justice populations
Accessibility: Improve access to job sites, commercial services, and industrial areas	▪ Access to jobs and commercial services by driving alone, HOV, and transit	Increase access to jobs and commercial services
	▪ Travel times on local roads that connect I-5 to industrial areas (freight access routes)	Decrease travel times on freight access routes
Environment: Protect and enhance the environment including reducing the transportation-related impact on wildlife habitat in the Nisqually River Delta.	▪ Total greenhouse gas emissions in Thurston County	Decrease greenhouse gas emissions
Resilience: Improve the transportation system's ability to operate during disruption and recover from it.	▪ Advisory group evaluation comparing which strategies "improve the availability and/or capacity of alternate routes to I-5.	Increase availability or capacity of alternate routes to I-5
	▪ Travel times on alternate routes to I-5 through the study area.	Decrease travel times on alternate routes to I-5

1 WSDOT's Environmental Manual Chapter 458.02 – Environmental Justice; https://www.wsdot.wa.gov/publications/manuals/fulltext/M31-11/458.pdf#page=3
WSDOT's Community Engagement Plan – "Environmental Justice at WSDOT"; https://www.wsdot.wa.gov/sites/default/files/2017/02/28/FinalCEP2016.pdf#page=15
The study team analyzed access to jobs and services for minority populations, households experiencing poverty, households with disabled individuals, and households with no vehicle.

WSDOT is working with Nisqually Tribe to address salmon and habitat measures

Readers may notice that there are no performance measures in the table above regarding salmon habitat or the Nisqually River delta. The study team initially proposed several measures to include with other environmental performance measures. However, based on feedback from the public, the study advisory groups, and natural resources staff from the Nisqually Indian Tribe, WSDOT will address these aspects of the legislative requirements for this study separately from transportation performance (see Chapter 5).

WSDOT expects the hydrologic study, discussed on page 33, to conclude by summer 2020. WSDOT will review the results of the hydrologic study being conducted by the Nisqually Indian Tribe and the US Geological Survey to inform development of performance measures for these environmental requirements and evaluation of the model scenarios and un-modeled strategies.

Step three – Determine how performance measures results will be scored

The study team initially developed and proposed a method for scoring the performance measure results from the modeling process. The technical advisory group reviewed and refined the initial method over multiple meetings. The final method consists of the following elements:

- For each performance measure, give the best performing scenario a score of 100 and then score all other scenarios relative to it. Basically, this calculates the score of the lower performing scenarios as a percentage of the best one. For the purposes of scoring, the study team compared performance measures for each scenario to one scenario prior in order to determine the incremental benefit of each strategy.

  The study team allowed for scenarios to have a negative score but used a “cap” of-100. This method allowed for consideration of both positive and negative tradeoffs of each scenario. For example, *Scenario Ten* (see on page 7-15) scored very positively on travel time measures but scored negatively for increasing vehicle miles traveled (VMT) and greenhouse gas emissions.
- Average each scenario’s performance measure scores within study goal areas. For example, the study goal area of “improving travel times on I-5 and making them more predictable” included three performance measures: 1) travel times on I-5; 2) the Maximum Throughput Travel Time Index for all traffic; and 3) HOV. Each scenario’s score for these three measures was averaged to create an effectiveness score for the goal.
- Apply the study goal weighting developed in Step One to the goal area effectiveness scores from the previous bullet. This yielded an overall effectiveness score.

Methods for calculating each step for each performance measure and goal area are described in detail Appendix I.

The study team and advisory groups used the effectiveness scores for study goal areas and the overall effectiveness score to compare how well each modeled scenario achieved desired outcomes. The scores informed discussions between the study team and stakeholders that led to recommendations. Other factors, such as planning-level estimates of the cost to construct and maintain projects, were also used when those data were available but were not used in scoring.

Results summary by study goal

The tables in this section provide a high-level look at the effectiveness scores for each model scenario by study goal area and overall. Further detail for each scenario is provided on the subsequent pages. The study team and stakeholder advisory groups used these results along with other factors such as planning-level cost estimates to facilitate discussions around final recommendations which are detailed in Chapter Eight of this report.

Most of the modeled scenarios included multiple improvement projects as outlined in Chapter 5 – Modeling and Strategy Development, except for *Scenario Five – Part Time Shoulder Use*. This is important to consider when looking at the planning-level cost estimates which reflect the cost for all improvements in a scenario that the study team was able to calculate. WSDOT and its partners will analyze individual improvements further in the next phase of planning called a Planning and Environmental Linkages (PEL) study. Through the PEL process, the team will determine which individual improvements provide the most system benefits and hone in on potential project design features.

Travel Times and Reliability

For the I-5 Travel Times and Reliability goal, capacity expansion type improvements on the highway or on interchanges had positive effects.

- *Scenario Ten – Widen I-5: Add General Purpose Lanes, Convert HOV Lanes to General Purpose* scored the highest when comparing performance to the prior modeled scenario.
- *Scenario Five – Part Time Shoulder Use* was a very close second. S*cenario Nine – Widen I-5: Add General Purpose Lanes, Retain HOV Lanes* also scored highly compared to other scenarios. One important thing

Some cautions about modeling results

Beyond the general cautions about models, the study team discussed several key considerations with advisory groups before developing final recommendations. These include:

- **Effectiveness scores are based on the best performing scenario, not a performance target like level of service.** So, while a score will tell us which scenario was the best at improving travel times or system efficiency, it won't answer the question of which improved those measures "enough." This is an important distinction for future cost/benefit calculations.
- **The model could not replicate congestion issues on northbound I-5 in the morning through the Nisqually Valley.** While the study team did not settle on an explanation, the issue may be seasonal changes in traffic volume as discussed in Chapter 4.
- **The Dynamic Traffic Assignment (DTA) model was very complex and sensitive to small changes.** In some cases, this could lead to "model noise," which is changes in performance due to how the model works as opposed to reflecting change due to improvements in the transportation system. The study team investigated this model noise and sometimes make judgement calls about correcting these issues. This was most common with local roadway changes, some as small as signal timing updates.

to note, particularly with *Scenario Nine*, is that each model scenario built off all the previously modeled scenarios. So, the effects of HOV lanes included in this scenario were already accounted for in *Scenario Six – HOV conversion*, when they were added to the model.

- Other approaches also showed benefit to I-5 travel times such as *Scenario Two – Sustainable Thurston Land Use* and *Scenario Four – Intercity Transit Long-Range Plan*. These two strategies allowed for travelers to either shift their trip to a different mode like transit or take shorter trips to achieve their needs which had some benefits for travel times on I-5 compared to the modeled scenarios.
- Only two scenarios exhibited negative effect on I-5 travel times and reliability measures: *Scenario Six – HOV Conversion* and *Scenario Seven – Regional Transportation Plan Local Projects.*

Scenario effectiveness score visualization scale

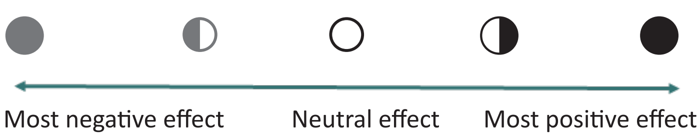


Exhibit 7-4: I-5 Travel times and reliability goal effectiveness scores

Scenario	Score
Widen I-5 – All General Purpose	●
Part Time Shoulder Use	●
Widen I-5-- Add General Purpose, Retain HOV	◕
Sustainable Thurston Land Use	◔
Interchange Improvements	◔
Intercity Transit Long-Range Plan	◔
Operations improvements	○
Transportation Demand Management	○
HOV Conversion	◔
Regional Transportation Plan - Local Projects	◐

**Scenarios listed in order of highest to lowest score*

The I-5 Travel Times and Reliability goal area score was weighted at 23.8 percent when calculating overall effectiveness scores, per input from study advisory groups and the general public discussed on page 7-4. This was the second highest weighted goal.

Efficiency and Equity goal

For the Efficiency and Equity goal, a variety of scenarios showed positive effects. This may partly be due to the goal area including a variety of measures ranging from total VMT in Thurston County to access to jobs and commercial services for environmental justice populations, as shown in Exhibit 7-3.

- *Scenario Three – Transportation Demand Management* scored the highest among all the scenarios, mainly due to improvements in person throughput, mode split, and reduced VMT.
- The next two highest scorers, *Scenario Eight – Interchange Improvements* and *Scenario Four – Intercity Transit Long-Range Plan,* had different benefits.
- *Scenario Eight – Interchange Improvements* provided benefits particularly for person throughput measures and the balance of local, regional, and through traffic on I-5. *Scenario Four – Intercity Transit Long-Range Plan,* on the other hand, scored highly for mode split and access to jobs and services for EJ populations.

Exhibit 7-5: Efficiency & Equity goal effectiveness scores

Scenario	Score
Transportation Demand Management	●
Interchange Improvements	●
Intercity Transit Long-Range Plan	◕
HOV Conversion	◑
Operations improvements	◑
Widen I-5 – Add General Purpose Lanes, Retain HOV Lanes	◑
Sustainable Thurston Land Use	◑
Widen I-5 – All General Purpose Lanes Part	◔
Time Shoulder Use	◔
Regional Transportation Plan - Local Projects	◑

**Scenarios listed in order of highest to lowest score*

Exhibit 7-6: Accessibility goal effectiveness scores

Scenario	Score
Sustainable Thurston Land Use	●
Intercity Transit Long-Range Plan	◕
HOV Conversion	◕
Regional Transportation Plan - Local Projects	◑
Widen I-5 – All General Purpose Lanes	◑
Widen I-5 – Add General Purpose Lanes, Retain HOV Lanes	◔
Part-Time Shoulder Use	◔
Interchange Improvements	○
Operations improvements	○
Transportation Demand Management	◑

**Scenarios listed in order of highest to lowest score*

These tradeoffs between individual performance measures as well as between the study goals are important considerations when looking at summary-level scores like those provided here. Detailed scoring results can be found in Appendix J.

Two scenarios showed negative effects on this goal area overall. *Scenario Five – Part-Time Shoulder Use* had a slightly negative effect due to an increase in VMT and a decrease in the proportion of thru traffic on I-5. However, the scenario had positive effects on other efficiency measures like person throughput. *Scenario Seven – Regional Transportation Plan - Local Projects* had a negative effectiveness score mainly due to reduced person throughput on I-5 and decreased thru traffic on I-5.

The Efficiency and Equity goal score was weighted at 25 percent when calculating overall effectiveness scores, per input from study advisory groups and the general public discussed on page 7-4. This was the highest weighted study goal.

Access to jobs, services, and industrial areas

Similar to Efficiency and Equity, a variety of scenarios showed positive effects for the Accessibility goal. This is because access measures, like those used for this goal area, can be improved both by making travel by given modes faster (multimodal mobility) or by making the length of trips people need to take to meet their daily needs shorter (land use.

- *Scenario Two – Sustainable Thurston Land Use* (adopted regionally in 2013) scored the highest for this goal area as it improved access to jobs and commercial services by all three modes measured (single occupant vehicle, HOV, and Transit) as well as improving travel times on local freight access routes.
- *Scenario Four – Intercity Transit Long-Range Plan* improved access to jobs and commercial services for transit users and did so by a significant percentage compared to other scenarios.
- *Scenario Six – HOV Conversion* also improved access to jobs and services for HOV and transit users, almost two times more than Scenario Four. However, a negative effect on freight access route times mitigated those positive scores.
- Only *Scenario Three – Transportation Demand Management* exhibited a negative score - due to a negative result for travel times on freight access routes calculated in the model.

The Accessibility goal score was weighted at 16.2 percent when calculating overall effectiveness scores, per input from study advisory groups and the general public discussed on page 7-4. This was the second lowest weighted goal.

Environment

The environmental goal's only performance measure for the portion of the study focused on transportation was greenhouse gas emissions in Thurston County (see Chapter 5 for information on the Nisqually River and I-5). So, scenarios that served to either reduce travel or shift travel to modes that emit less greenhouse gases tended to score well.

- *Scenario Two – Sustainable Thurston Land Use* scored the highest. It was the best scoring scenario also for reducing total VMT and scored only second to *Scenario Four – Intercity Transit Long-Range Plan* for shifting travel away from single occupant vehicles.
- *Scenario Six – HOV Conversion* and *Scenario Three – Transportation Demand Management* also scored well for the Environment goal largely due to reduced VMT in Thurston County as well as some mode shift away from SOV travel.
- Several scenarios exhibited neutral effects on this goal area. The most interesting one was *Scenario Four – Intercity Transit Long-Range Plan* which did have positive scores in other goal areas for shifting travel away from SOV to transit. However, total VMT remained flat in that scenario and transit use as a proportion of overall travel remained small so the end result was a neutral effect on total greenhouse gas emissions.
- Scenarios that included larger capacity expansion on I-5 tended to exhibit negative effects because they resulted in more VMT and more travel occurring by SOV. *Scenario Nine* and *Scenario Ten* both increased emissions by a greater percentage than *Scenario Two – Sustainable Thurston Land Use* decreased them when comparing to the prior scenario. *Scenario Five – Part Time Shoulder Use* also increased emissions but not as much.

The Environment goal score was weighted at 14.4 percent when calculating overall effectiveness scores, per input from study advisory groups and the general public discussed on page 7-4. This was the lowest weighted study goal.

Exhibit 7-7: Environment goal effectiveness scores

Scenario	Score
Sustainable Thurston Land Use	●
HOV Conversion	●
Transportation Demand Management	◕
Interchange Improvements	◔
Operations improvements	○
Intercity Transit Long-Range Plan	○
Regional Transportation Plan - Local Projects	○
Part Time Shoulder Use	◑
Widen I-5 – Add General Purpose, Retain HOV	●
Widen I-5 – All General Purpose	●

**Scenarios listed in order of highest to lowest score*

Resilience

The resilience goal had two performance measures: travel times on local alternate routes to I-5 and the technical advisory groups scoring of how well each strategy improved the availability and capacity of alternate routes as discussed in Exhibit 7-3. The advisory group scoring also used a forced-choice pair comparison to create a group score for the scenarios like the exercise discussed on page 7-2 for establishing study goal priorities.

- *Scenario One – Operations* scored the highest for the Resilience study goal due a favorable evaluation from the advisory group and showing the best improvement for travel times on local routes.
- Other scenarios that scored well such as *Scenario Seven – Regional Transportation Plan* - Local Projects or *Scenario Five – Part Time Shoulder Use* also had positive evaluations from the advisory group and a positive effect on local route travel times.
- In some cases, a very high score for one measure offset a negative score for the other such as with *Scenario Eight – Interchange improvements* which received a positive advisory group evaluation but had a slightly negative effect on local route travel times.
- Only *Scenario Six – HOV Conversion* had an overall negative score for Resilience as it received the lowest advisory group evaluation and had a negative effect on local route travel times in the model.

The Resilience goal score was weighted at 20.5 percent when calculating overall effectiveness scores, per input

Exhibit 7-8: Overall effectiveness scores

Scenario	Score
Sustainable Thurston Land Use	●
Intercity Transit Long-Range Plan	◑
Transportation Demand Management	◑
Interchange Improvements	◑
Operations improvements	◑
HOV Conversion	◑
Part Time Shoulder Use	◑
Widen I-5 – All General Purpose	◔
Widen I-5 – Add General Purpose, Retain HOV	◔
Regional Transportation Plan - Local Projects	○

**Scenarios listed in order of highest to lowest score* from study advisory groups and the general public discussed on page 7-4. This was the third highest weighted study goal.

Overall effectiveness scores

To calculate the overall effectiveness scores, each scenario's scores for the study goals were multiplied by the weighting factors developed through the advisory groups and public input described on page 7-4. The result is an overarching figure that gives a high-level understanding of how a scenario's positive and negative tradeoffs balance the study goals and stakeholder priorities for performance outcomes.

- In terms of overall effectiveness, *Scenario Two – Sustainable Thurston Land Use* was the top performer by a fairly wide margin.
- This was followed by a clustering of scenarios with similar overall effectiveness scores including, in order of effectiveness, Transit, Transportation Demand Management, Interchange Improvements, Operations, HOV Conversion, and Part-Time Shoulder Use. While these scenarios had a similar overall score, they had different tradeoffs between the study goal areas. Some had negative effects on certain study goals, noted as light gray circles in Exhibit 7-8.
- Next, the two I-5 widening scenarios had similar levels of performance that was overall positive but not as high as the prior scenarios. As stated earlier, it is important to keep in mind with *Scenario Nine* that the benefits of HOV lanes were largely accounted for in *Scenario Six* so mainly we're seeing the benefit of added auxiliary lanes and a major interchange improvement at Exit 104.

Exhibit 7-9: Resilience goal effectiveness

Scenario	Score
	●
Operations improvements	◑
Regional Transportation Plan - Local Projects	◑
Part Time Shoulder Use	◑
Transportation Demand Management	◑
Intercity Transit Long-Range Plan	◑
Sustainable Thurston Land Use	◔
Interchange Improvements	◔
Widen I-5 – All General Purpose Widen I-5 – Add General Purpose, Retain HOV	○
HOV Conversion	◔

**Scenarios listed in order of highest to lowest score*

- Finally, *Scenario Seven – Regional Transportation Plan Local Projects* had an overall neutral effect resulting from positive scores in some goal areas being offset by negative scores in others.

Results summary by modeling scenario

Scenario One – Operations

The overall effectiveness score for *Scenario One* comparing performance to the prior model scenario was 20, the fifth highest score overall, roughly tied with *Scenario Six – HOV Lane Conversion*. When comparing scenario performance changes from the 2040 Baseline, the score was 17. While this was the lowest score when comparing to the 2040 baseline, it was the second highest increase in score only after *Scenario Two – Sustainable Thurston Land Use*.

Scenario One performed best on measures of system resilience, particularly improving travel times on alternate routes through the study area. The scenario also helped improve person throughput on I-5. Based on the study team's observations of the model, this may be because the improvements on alternate routes to I-5 made them more viable options for commuters and took some demand off

Exhibit 7-10: Effectiveness scoring results for *Scenario One - Operations*

Scenario One - Operations	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**-11**	**-8**
I-5 Travel times	7	6
MT³I – All Traffic	-15	-15
MT³I – HOV	-25	-15
Efficiency & Equity	**26**	**20**
I-5 Person throughput – All Traffic	52	36
I-5 Person throughput-HOV	90	29
Mode split	0	0
Vehicle Miles Traveled	-10	-5
Traffic balance	25	61
EJ Population access to jobs and commercial services	-4	-2
Accessibility	**-4**	**-1**
Access to jobs	-5	-2
Access to commercial services	-6	-3
Freight access route travel times	0	0
Environment	**0**	**0**
Greenhouse gas emissions	0	0
System resilience	**80**	**67**
Advisory group score	60	60
Alternate route travel times	100	74
Overall Effectiveness Score	**20**	**17**

Note: All figures used to develop scores are available in Appendix J

Exhibit 7-11: Effectiveness scores by study goal area sorted from highest to lowest scoring scenario for each

I-5 Travel Times and Reliability		Efficiency and Equity		Accessibility	
Scenario	**Effectiveness**	**Scenario**	**Effectiveness**	**Scenario**	**Effectiveness**
Widen I-5 – All General Purpose	●	Transportation Demand Management	●	Sustainable Thurston Land Use	●
Part Time Shoulder Use	●	Interchange Improvements	●	Intercity Transit Long-Range Plan	●
Widen I-5 – Add General Purpose, Retain HOV	◕	Intercity Transit Long-Range Plan	◕	HOV Conversion	◕
Sustainable Thurston Land Use	◔	HOV Conversion	◑	Regional Transportation Plan - Local Projects	◕
Interchange Improvements	◔	Operations improvements	◑	Widen I-5 – All General Purpose	◑
Intercity Transit Long-Range Plan	◔	Widen I-5 – Add General Purpose, Retain HOV	◑	Widen I-5 – Add General Purpose, Retain HOV	◔
Operations improvements	○	Sustainable Thurston Land Use	◑	Part Time Shoulder Use	◔
Transportation Demand Management	○	Widen I-5 – All General Purpose	◔	Interchange Improvements	○
HOV Conversion	◔ (grey)	Part Time Shoulder Use	◔ (grey)	Operations improvements	○
Regional Transportation Plan - Local Projects	◑ (grey)	Regional Transportation Plan Local Projects	◑ (grey)	Transportation Demand Management	◑ (grey)

Environment		Resiliency		Overall (weighting applied)	
Scenario	**Effectiveness**	**Scenario**	**Effectiveness**	**Scenario**	**Effectiveness**
Sustainable Thurston Land Use	●	Operations improvements	●	Sustainable Thurston Land Use	●
HOV Conversion	●	Regional Transportation Plan - Local Projects	◑	Intercity Transit Long-Range Plan	◑
Transportation Demand Management	◕	Part Time Shoulder Use	◑	Transportation Demand Management	◑
Interchange Improvements	◔	Transportation Demand Management	◑	Interchange Improvements	◑
Operations improvements	○	Intercity Transit Long-Range Plan	◑	Operations improvements	◑
Intercity Transit Long-Range Plan	○	Sustainable Thurston Land Use	◑	HOV Conversion	◑
Regional Transportation Plan - Local Projects	○	Interchange Improvements	◔	Part Time Shoulder Use	◑
Part Time Shoulder Use	◑ (grey)	Widen I-5 – All General Purpose	◔	Widen I-5 – All General Purpose	◔
Widen I-5 – Add General Purpose, Retain HOV	● (grey)	Widen I-5 – Add General Purpose, Retain HOV	○	Widen I-5 – Add General Purpose, Retain HOV	◔
Widen I-5 – All General Purpose	● (grey)	HOV Conversion	◔ (grey)	Regional Transportation Plan Local Projects	○

Notes: Weighting was developed with input from study advisory groups and the general public through surveys as described on pages 44-45. Weight by goal area was as follows: I-5 Travel Times & Reiliability 23.8%; Efficiency & Equity 25%; Accessibility 16.2%; Environment 14.4%; Resilience 20.5%.

of I-5, allowing it to operate a little better. This is reinforced by the positive score for traffic balance which means a higher percentage of traffic on I-5 was through traffic as opposed to local traffic getting on and off in the study area.

The study team estimated the overall cost to construct improvements included in this scenario at $35.2 million. This scenario's projects are estimated to cost an additional $120,000 annually beyond current maintenance needs to keep in a state of good repair. All data from modeling used to create these scores are available in Appendix J.

Scenario Two – Sustainable Thurston Land Use

The overall effectiveness score for *Scenario Two* compared to the prior model scenario was 42 and 36 when compared to the 2040 Baseline, respectively. This was the highest score comparing to prior scenario. Additionally, *Scenario Two* the largest single increase in overall effectiveness when comparing to the 2040 Baseline.

This scenario was the best performer in terms of greenhouse gas emissions and accessibility measures. This is likely due to more dense development resulting in reduced need to travel, shorter trips, and greater ability to travel by modes besides driving alone- as borne out by scores within the efficiency and equity goal. *Scenario Two* also positively affects all other goal areas.

Exhibit 7-12: Effectiveness scoring results for *Scenario Two - Sustainable Thurston Land Use*

Scenario Two - Sustainable Thurston Land Use	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**24**	**10**
I-5 Travel times	15	18
MT³I – All Traffic	19	4
MT³I – HOV	38	7
Efficiency & Equity	**20**	**24**
I-5 Person throughput – All Traffic	-39	8
I-5 Person throughput-HOV	-52	11
Mode split	84	31
Vehicle Miles Traveled	100	45
Traffic balance	-11	34
EJ Population access to jobs and commercial services	39	15
Accessibility	**67**	**38**
Access to jobs	56	20
Access to commercial services	45	17
Freight access route travel times	100	76
Environment	**100**	**45**
Greenhouse gas emissions	100	45
System resilience	**31**	**75**
Advisory group score	90	90
Alternate route travel times	-28	61
Overall Effectiveness Score	**42**	**36**

Note: All figures used to develop scores are available in Appendix J

Some performance measures reflected a negative effect including person throughput on I-5, travel times on local alternate routes to I-5, and traffic balance on I-5. However, these were more than offset by this strategy's positive effects on travel times and reliability measures.

The study team was not able to estimate the overall cost to implement this scenario. Costs will likely be different among the city and county governments near the study area. Fully implementing this scenario will likely require local policy and code changes outside WSDOT's purview. All modeling data used to create these scores are available in Appendix J.

Scenario Three – Transportation Demand Management

The overall effectiveness score for *Scenario Three* was then compared to the prior scenario was 21 and 43 when compared to the 2040 baseline. This score comes in at the third most effective when comparing to prior scenario, nearly tying with *Scenario Eight - Interchange Improvements*. This TDM strategy performed particularly well on environmental and efficiency measures such as mode split, vehicle miles traveled, and person throughput.

Performance measures relating to travel times, on the other hand, tended to have slightly negative scores. It was unclear to the study team and technical experts from partner organizations why TDM as a strategy would have a negative effect on travel times. This may have been a case of "model noise" as described on page 7-5. Despite these negative results, TDM still performed well overall compared to other strategies.

Why are the scores comparing to the prior scenario and baseline different?

The two approaches to the overall effectiveness score show model scenarios' incremental (compared to prior scenario) and cumulative (compared to 2040 baseline) effects. The effectiveness scores for scenarios compared to the prior scenario and the 2040 baseline are different, even for *Scenario One*, because of how scoring was calculated. A scenario's score for a particular performance measure was based off the best performing scenario for that measure compared to the reference scenario (either the prior or the 2040 baseline). This results in a different set of scores that provide us with different information, both of which are useful for evaluating potential strategies.

The study team estimated the overall cost of this scenario at roughly $2 million. The cost information for this scenario reflects the funding provided for the 2019-2021 biennium (state Regional Mobility Grant- City of Olympia) and projected federal funding (STPBG TRPC 2021-2023). Projects from this scenario would also cost an estimated additional $120,000 annually beyond current maintenance needs to keep in a state of good repair. All data from modeling used to create these scores are available in Appendix J.

Exhibit 7-13: Effectiveness scoring results for *Scenario Three- Transportation Demand Management*

Scenario Three - Transportation Demand Management	Scores comparing performance changes from	
Study goal area	***Prior Scenario***	***2040 Baseline***
Travel times & reliability	**-12**	**3**
I-5 Travel times	-13	13
MT³I – All Traffic	-7	-3
MT³I – HOV	-17	-1
Efficiency & Equity	**49**	**55**
I-5 Person throughput – All Traffic	51	43
I-5 Person throughput-HOV	87	41
Mode split	71	56
Vehicle Miles Traveled	62	75
Traffic balance	27	100
EJ Population access to jobs and commercial services	-4	13
Accessibility	**-27**	**23**
Access to jobs	-7	17
Access to commercial services	-4	15
Freight access route travel times	-71	36
Environment	**64**	**76**
Greenhouse gas emissions	64	76
System resilience	**34**	**67**
Advisory group score	50	50
Alternate route travel times	18	83
Overall Effectiveness Score	**21**	**43**

Note: All figures used to develop scores are available in Appendix J

COVID-19 implications for the results of this study currently unknown

WSDOT, TRPC, and their partners conducted this study between July 2018 and January 2020. Modeling used historic data on regional population, job growth and travel behavior to project future demand. This did not account for potential impacts of major disruptions such as COVID-19. While the near- and long-term effects of the pandemic are unknown, it will likely be different from the assumptions used in this study. *Scenario Three - TDM* is a good example of this, as expanded working from home has drastically reduced demand during the "Stay home, stay healthy" order.

Scenario Four – Intercity Transit Long-Range Plan

The overall effectiveness score for *Scenario Four* comparing to the prior scenario was 26 and 53 when compared to the 2040 baseline, respectively. This made it the second most effective scenario overall when comparing to the prior scenario after *Scenario Two – Sustainable Thurston Land Use*. Among the study goals, transit as a strategy benefited access to jobs and services most. In particular, access to jobs and commercial services for transit users increased by roughly five percent each. The only scenario to benefit measures of access more was *Scenario Six – HOV Conversion*. In addition to measures of access for the general population, this scenario had similar benefits for populations disproportionally impacted by environmental justice and accessibility issues in the study area such as low-income households or people with a disability.

Scenario Four had the highest benefit to mode split among all the strategies, mainly due to the assumptions used regarding how much transit ridership would increase as a result of improvements such as Intercity Transit

Exhibit 7-14: Effectiveness scoring results for *Scenario Four- Intercity Transit Long-Range Plan*

Scenario Four - Intercity Transit Long-Range Plan	Scores comparing performance changes from	
Study goal area	***Prior Scenario***	***2040 Baseline***
Travel times & reliability	**14**	**13**
I-5 Travel times	1	11
MT³I – All Traffic	15	13
MT³I – HOV	27	15
Efficiency & Equity	**30**	**65**
I-5 Person throughput – All Traffic	10	50
I-5 Person throughput-HOV	13	46
Mode split	100	92
Vehicle Miles Traveled	0	75
Traffic balance	-6	86
EJ Population access to jobs and commercial services	62	41
Accessibility	**52**	**48**
Access to jobs	68	43
Access to commercial services	62	42
Freight access route travel times	26	60
Environment	**0**	**71**
Greenhouse gas emissions	0	71
System resilience	**33**	**77**
Advisory group score	80	80
Alternate route travel times	-15	74
Overall Effectiveness Score	**26**	**53**

Note: All figures used to develop scores are available in Appendix J

implementing a “Zero-Fare” rate structure. There were also moderate benefits for travel times on I-5 and efficiency measures. Resilience scored well, largely reflecting the advisory group forced pair comparison exercise.

While there were no overall negative scores, this scenario scored zero for the environmental goal as there was very little change in greenhouse gas emissions. This is likely due to the transit ridership being a small portion of the overall trips in the system. All data from modeling used to create these scores are available in Appendix J.

Based on information from Intercity Transit, the costs to implement their long-range plan total roughly $145 million. Of that cost, between $48 million and $55 million is capital costs (the figure shown in Exhibits ES-4 and 8-2) of building stops or buying buses and the remainder is operations costs of actually running service.

Scenario Five – Part-Time Shoulder Use

The overall effectiveness score for *Scenario Five* comparing to the prior scenario was 15, ranking seventh among the other scenarios, and 54 when compared to the 2040 Baseline. The greatest benefits of Part Time Shoulder Use were measures of travel time and reliability, scoring only second to *Scenario Ten* for this goal area (see page 7-15). The other study goal that showed benefits from this strategy was system resilience, mainly due to how the study technical advisory group scored it relative to other scenarios. There was also moderate benefit to accessibility measures.

Exhibit 7-15: Effectiveness scoring results for *Scenario Five Part-Time Shoulder Use*

Scenario Five Part-Time Shoulder Use	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**68**	**63**
I-5 Travel times	46	53
MT³I – All Traffic	57	68
MT³I – HOV	100	69
Efficiency & Equity	**-9**	**36**
I-5 Person throughput – All Traffic	40	78
I-5 Person throughput-HOV	42	59
Mode split	0	92
Vehicle Miles Traveled	-63	44
Traffic balance	-74	-97
EJ Population access to jobs and commercial services	3	42
Accessibility	**9**	**59**
Access to jobs	8	46
Access to commercial services	-3	41
Freight access route travel times	22	89
Environment	**-61**	**42**
Greenhouse gas emissions	-61	42
System resilience	**33**	**70**
Advisory group score	80	40
Alternate route travel times	-15	100
Overall Effectiveness Score	**15**	**54**

Note: All figures used to develop scores are available in Appendix J

Part time shoulder use did have negative effects, particularly to the environment goal, due to an increase in greenhouse gas emissions. There was also a slight negative score for efficiency measures like total vehicle miles traveled and the balance of through traffic versus local or regional traffic on I-5. Other efficiency measures, particularly person throughput, had a positive score.

The study team estimated the overall cost to construct improvements included in this scenario at $15.3 million. In addition, projects from this scenario would cost an estimated additional $340,000 annually beyond current maintenance needs to keep in a state of good repair. All data from modeling used to create these scores are in Appendix J.

Scenario Six – HOV Conversion

The overall effectiveness score for *Scenario Six* when comparing the prior scenario was 20, tying with *Scenario One - Operations*, and 58 when compared to the 2040 Baseline. However, HOV conversion as a strategy has different tradeoffs for performance than *Scenario One*. The strongest benefits for HOV Conversion were seen in the environment, efficiency and equity, and accessibility measures. The scenario scored the best of all strategies for multiple measures in these goal areas including HOV person throughput, access to jobs and commercial services for environmental justice populations, and access measures for the general population. These were due to the travel time benefits for transit and HOV travelers that allowed for greater access during congested periods. HOV conversion also scored second only to Land Use for improving emissions.

On the other hand, *Scenario Six* had negative effects on I-5 travel times and system resilience measures. Repurposing the left lanes for HOV use resulted in a 4- to 5-minute increase in travel times for general purpose traffic. Travel times also increased on routes providing access to industrial areas from I-5.

The study team estimated the overall cost to construct improvements included in this scenario at $35.1 million. Roughly $19.7 million of this would fund the actual lane conversion. The remaining $15.4 million would fund supporting improvements like HOV bypass lanes at on-ramps. In addition, projects from this scenario would cost an estimated additional $90,000 annually beyond current maintenance needs to keep in a state of good repair. All data from modeling used to create these scores are available in Appendix J.

Exhibit 7-16: Effectiveness scoring results for *Scenario Six- HOV Conversion*

Scenario Six - HOV Conversion	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**-18**	**44**
I-5 Travel times	-51	17
MT³I – All Traffic	-64	20
MT³I – HOV	60	97
Efficiency & Equity	**26**	**51**
I-5 Person throughput – All Traffic	*-62*	*31*
I-5 Person throughput-HOV	*100*	*96*
Mode split	*21*	*100*
Vehicle Miles Traveled	*94*	*90*
Traffic balance	*-100*	*-100*
EJ Population access to jobs and commercial services	100	91
Accessibility	**46**	**78**
Access to jobs	100	87
Access to commercial services	100	87
Freight access route travel times	-61	58
Environment	**96**	**89**
Greenhouse gas emissions	96	89
System resilience	**-19**	**45**
Advisory group score	10	10
Alternate route travel times	-48	79
Overall Effectiveness Score	**20**	**58**

Note: All figures used to develop scores are available in Appendix J

Exhibit 7-17: Effectiveness scoring results for *Scenario Seven - Regional Transportation Plan - Local Projects*

Scenario Seven - RTP Local Projects	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**-35**	**9**
I-5 Travel times	-39	-19
MT³I – All Traffic	-64	-55
MT³I – HOV	6	100
Efficiency & Equity	**-23**	**41**
I-5 Person throughput – All Traffic	-55	-8
I-5 Person throughput-HOV	-40	80
Mode split	-2	99
Vehicle Miles Traveled	-4	88
Traffic balance	-26	-100
EJ Population access to jobs and commercial services	-11	86
Accessibility	**25**	**88**
Access to jobs	-8	84
Access to commercial services	-14	81
Freight access route travel times	97	100
Environment	**0**	**87**
Greenhouse gas emissions	0	87
System resilience	**63**	**91**
Advisory group score	100	100
Alternate route travel times	-25	81
Overall Effectiveness Score	**3**	**58**

Note: All figures used to develop scores are available in Appendix J

Scenario Seven – Regional Transportation Plan - Local Projects

The overall effectiveness score for *Scenario Seven* was three when compared to the previous scenario, the lowest score among the different strategies, and 58 when compared to the 2040 baseline the same score as *Scenario Six – HOV Conversion*. The low score for this Local Network strategy is largely due to negative scores for measures in the travel times and reliability, and in the efficiency and equity study goals. Planned improvements to the local network, when implemented in the model, seemed to help traffic flow better on local roads which ultimately delivered vehicles faster to I-5 resulting in increased travel times. This affected person throughput on I-5 and increased the amount of local traffic on the highway.

The projects did have some positive effects for study performance measures. For system resilience, the scenario scored well in the advisory group scoring. For accessibility measures, travel times on freight access routes scored well while access to jobs and services were slightly negative.

These results make sense given the particular projects in local plans and their intended purposes. Most projects in this category aim to improve traffic flow and reduce crash potential related to a number of contributing factors on those roads. Based on figures from local plans, the overall cost to construct improvements included in this scenario was estimated at $433.2 million. WSDOT did not estimate annual costs to maintain these local system projects. All data from modeling used to create these scores are available in Appendix J.

Scenario Eight – Interchange Improvements

The overall effectiveness score for *Scenario Eight* when comparing to the prior scenario was 21, tying with *Scenario Three - Transportation Demand Management*, and 64 when compared to the 2040 Baseline. Improving interchanges in the study area had fairly evenly distributed benefits among the study goals with the exception of accessibility measures. The highest score for this strategy was for the efficiency and equity goal, particularly person throughput and traffic balance on I-5. Other performance measures that showed notable benefit from this scenario

Exhibit 7-18: Effectiveness scoring results for *Scenario Eight - Interchange Improvements*

Scenario Eight - Interchange Improvements	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**21**	**35**
I-5 Travel times	32	11
MT³I – All Traffic	47	0
MT³I – HOV	-16	94
Efficiency & Equity	**33**	**52**
I-5 Person throughput – All Traffic	59	30
I-5 Person throughput-HOV	39	94
Mode split	-1	99
Vehicle Miles Traveled	24	100
Traffic balance	69	-100
EJ Population access to jobs and commercial services	6	89
Accessibility	**-3**	**88**
Access to jobs	5	86
Access to commercial services	9	85
Freight access route travel times	-24	94
Environment	**26**	**100**
Greenhouse gas emissions	26	100
System resilience	**23**	**68**
Advisory group score	70	70
Alternate route travel times	-25	65
Overall Effectiveness Score	**21**	**64**

Note: All figures used to develop scores are available in Appendix J

included travel times on I-5, emissions, and the advisory group score of system resilience benefits.

Scenario Eight had a slight negative score for the accessibility goal. This was due to an increase in travel times on local routes providing access to industrial areas. Travel times on other local routes measured under the system resilience goal had a similar increase in travel times.

The study team estimated the overall cost to construct improvements included in this scenario at $186.4 million. In addition, projects from this scenario would cost an estimated additional $2.4 million annually beyond current maintenance needs to keep in a state of good repair. All data from modeling used to create these scores are available in Appendix J.

Scenario Nine – Widen I-5: Add General Purpose Lanes, Retain HOV Lanes

The overall effectiveness score for *Scenario Nine* was eight when comparing to the prior scenario, outranking only *Scenario Seven - RTP Local Projects*, and 64 when comparing to the 2040 Baseline, the same as *Scenario Eight - Interchange Improvements*. However, this relatively low score reflects the tradeoffs between different study goals. Expanding capacity while keeping HOV lanes from *Scenario Six* had relatively strong benefits for travel times and reliability particularly. The scenario also benefited efficiency and equity measures with the greatest benefits among all strategies for person throughput and traffic balance on I-5. General benefits of HOV lanes were already accounted for in *Scenario Six*, which accounts in part for this scenario's relatively low score.

On the other hand, there were negative effects of this scenario, particularly for environmental measures. *Scenario Nine* was second only to *Scenario Ten* in terms of emissions increases. The scenario scored-100, the most negative score possible. The increase of 2.1% in GHG emissions resulting from this scenario was greater than the largest decrease of-1.6% which occurred in *Scenario Two – Sustainable Thurston Land Use*. This scenario also scored -100 for increasing total vehicle miles traveled in the county.

The study team estimated the overall cost to construct improvements included in this scenario at $987.4 million. Projects from this scenario would also cost an estimated

Exhibit 7-19: Effectiveness scoring results for *Scenario Nine - Widen I-5: Add GP Lanes, Retain HOV Lanes*

Scenario Nine- Widen I-5: Add GP Lanes, Retain HOV	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**54**	**83**
I-5 Travel times	56	60
MT³I – All Traffic	90	90
MT³I – HOV	16	100
Efficiency & Equity	**21**	**59**
I-5 Person throughput – All Traffic	100	100
I-5 Person throughput-HOV	15	100
Mode split	-4	97
Vehicle Miles Traveled	-100	43
Traffic balance	100	-86
EJ Population access to jobs and commercial services	18	96
Accessibility	**15**	**89**
Access to jobs	23	95
Access to commercial services	22	95
Freight access route travel times	0	76
Environment	**-100**	**39**
Greenhouse gas emissions	-100	39
System resilience	**9**	**44**
Advisory group score	30	30
Alternate route travel times	-12	58
Overall Effectiveness Score	**8**	**64**

Note: All figures used to develop scores are available in Appendix J

additional $21.2 million annually beyond current maintenance needs to keep in a state of good repair. All data from modeling used to create these scores are available in Appendix J.

Scenario Ten – Widen I-5: Add general purpose lanes, Convert HOV lanes to general purpose

The overall effectiveness score for *Scenario Ten* when comparing to the prior scenario was 13, coming in eighth out of the ten strategies, and 63 when compared to the 2040 Baseline, one point lower than *Scenario Nine*. This scenario, while close to the previous in score, had different performance tradeoffs due to the lack of HOV lanes. Travel times and reliability metrics showed the strongest benefit, particularly for general purpose traffic. The scenario also showed benefits for some efficiency measures like overall person throughput on I-5 and traffic balance, with a higher percentage of through-traffic.

There was also some benefit to accessibility and system resilience measures. However, these benefits were offset by negative effects on HOV person throughput, increases in vehicle miles traveled, and a shift in mode split toward SOV travel resulting in a low score for efficiency.

This scenario, similar to the previous one, scored-100 for environment as emissions increased 2.7%. This was the largest increase in emissions among all of the scenarios modeled.

Construction and maintenance costs for this strategy are the same as *Scenario Nine*. All data used to create these scores are available in Appendix J.

Exhibit 7-20: Effectiveness scoring results for *Scenario Ten - Widen I-5: Add GP Lanes, Convert HOV Lanes to GP*

Scenario Ten- Widen I-5: All General Purpose Lanes	Scores comparing performance changes from	
Study goal area	*Prior Scenario*	*2040 Baseline*
Travel times & reliability	**72**	**100**
I-5 Travel times	100	100
MT^3I – All Traffic	100	100
MT^3I – HOV	16	100
Efficiency & Equity	**9**	**48**
I-5 Person throughput – All Traffic	81	86
I-5 Person throughput-HOV	-42	77
Mode split	-7	95
Vehicle Miles Traveled	-100	27
Traffic balance	94	-100
EJ Population access to jobs and commercial services	27	100
Accessibility	**24**	**88**
Access to jobs	37	100
Access to commercial services	34	100
Freight access route travel times	0	64
Environment	**-100**	**21**
Greenhouse gas emissions	-100	21
System resilience	**21**	**49**
Advisory group score	20	20
Alternate route travel times	22	77
Overall Effectiveness Score	**13**	**63**

Note: All figures used to develop scores are available in Appendix J