

Use of the Traffic Thermostat Decision Tool

The traffic thermostat decision tool is built to help guide the user through a logical, step-wise, process of examining potential changes to their Manage Lane/toll facility. The user will need to gather a great deal of information prior to making good use of this tool. The information needed to make the best use of this tool includes:

1. How is the facility currently operating? In the case of planning a future facility this would be how is it expected to operate upon opening. Issues include:
 - a) What user groups, if any, are allowed on the facility toll-free? Which are allowed if they pay a toll? What are the toll levels – do they vary or are they the same for all user groups? Which user groups never allowed?
 - b) Operational characteristics, including average travel speeds, travel time reliability, crash rates, toll revenue, and person movement on the lane.
 - c) Design characteristics, including number of lanes, number and location of entry/exit points, and enforcement locations.
2. The primary (one or two) goals of the facility.
3. How you plan to measure the lane's ability to meet the goals? What constitutes successfully meeting the goals?
4. What potential changes are possible on this facility to improve performance of the facility? How much will implementing any/all of these changes impact the operation of the facility?
5. Which user groups will be the first to be tolled or removed from the lane? In essence, which user groups will get the most preferential treatment and which will get no preferential treatment?

Once the user has collected the information outlined above, they will be able to examine multiple policy options for their facility. These options will be focused on ensuring the facility meets its operational objectives based on the goals set by policy makers. The tool is available online at <http://thermostat-dev.tti.tamu.edu/>. The paragraphs below step the user through the process of using this tool.

Screen 1: Initial Facility Type

In the first screen (see Figure 1) the user must indicate the user's name, the name of the roadway and the current (or planned opening day) type of facility. Based on answers provided in subsequent screens the facility type may change, but at this point information on how the facility is currently operating is required. There is also an option to browse and upload a project file. For all screens click **Next** once you are ready to continue. On subsequent screens there is also the option to hit **Back** to change your answers on the previous screen.

Traffic Thermostat Application

Facility Type:
HOV

Your Name :

Name of the Roadway :

What type of facility is this now?

☒ HOV (Toll-free travel for specific groups)

☐ HOT (Some groups travel toll-free, while others pay a toll)

☐ Toll (All users pay a toll)

Figure 1. Opening Screen – Choose Facility Type.

Screen 2: Project Goals

In the second screen (see Figure 2) the user must select one or two primary goals of the facility. At first glance this would appear difficult as all goals are likely important. Keep in mind that the selection of primary goals will then lead to setting specific measures of effectiveness ([Screen 3](#)) that, if not met, force a change in the operations of the facility. Keeping this in mind may help select the appropriate goals. Alternatively, the user could run the tool multiple times, selecting different goals each time. After running these multiple scenarios the user would have multiple outputs detailing the operational changes required to obtain many different goals and to achieve different measures of effectiveness.

The tool is built to warn the user when the goals may be conflicting. Unfortunately many goals have the potential to conflict with other goals and the user must keep these in mind. For example, it is possible that safe travel, high-speed travel, and reliable travel could all conflict with optimize revenue. Optimizing revenue might call for lowering tolls to increase demand to a point where demand might have a slight negative impact on safe travel, high-speed travel, and reliable travel. The user of the software is reminded to consider this when selecting goals and objectives.

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Facility Type:
HOV

Goals & MOEs:

Goal 1: Safe Travel

Goal 2: High-speed Travel

Choose one or two primary goals for this project:

GOALS	MOE
<input checked="" type="checkbox"/> Safe Travel	Number of Crashes ? Incident Clearance Time ?
<input checked="" type="checkbox"/> High-speed Travel	Average Speed ? LOS ?
<input type="checkbox"/> Reliable Travel	95th percentile travel times ? Buffer Index ?
<input type="checkbox"/> Optimize Revenue	Revenue ? Violation Rate ?
<input type="checkbox"/> Optimize Throughput	Person throughput per hour ? Persons in HOVs+Buses per Hour ?

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Next

Figure 2. Choose Facility Goals.

Screen 3: Measures of Effectiveness

Based on the goals selected in [Screen 2](#), the user must now choose how progress toward these goals will be measured. Each goal has two measures of effectiveness (MOE) associated with it. The user can select one or both MOEs for either the peak time(s), or the peak and off-peak period(s) (see [Figure 3](#)). The user must define for themselves the time of day of the peak and off-peak periods since they are facility specific.

Traffic Thermostat Application

Facility Type:
HOV

Goals & MOEs:
Goal 1: Safe Travel
Goal 2: High-speed Travel

1. Select the MOEs and times applicable for your facility.
2. Then, for those you select, please specify values.

GOAL 1 : Safe Travel

MOE : Maximum Number of Crashes ?

Peak time(s) only : ☒ 45 mph to 55 mph ?

Entire day (including peak time (s)) : ☐ ?

MOE : Incident Clearance Time ?

Peak time(s) only : ☐ ?

Entire day (including peak time (s)) : ☒ 15 minutes ?

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Next

Figure 3. Enter Measures of Effectiveness.

Each MOE needs a minimum acceptable value associated with that MOE. If this minimum acceptable value is not met then operational or pricing fixes ([Screen 5](#)) will be necessary. Some help in selecting the appropriate MOE is provided to the user when the mouse is moved over the ‘?’.

Each MOE is facility specific and left up to the user to define. For example, *Number of Crashes* could be:

- The total number of all crashes on the entire facility (Managed Lanes [ML] and General Purpose Lanes [GPL]) in a year),
- The total number of fatal crashes on the entire facility (MLs and GPLs) in a year,
- The number of severe crashes on the MLs only in a year,
- The crash rate per million vehicle miles traveled, or
- Any other definition appropriate for this facility.

Screen 4: User Groups

Next the user will be asked about the various user groups that may or may not be allowed to use the lane(s). To begin, enter the current (or planned opening day) status of each user group. If they are not allowed then select “currently not allowed” and the software then knows that group is not currently allowed on the lane (for example: trucks in Figure 4). Then rank order each user group based on its given priority level on the facility. A user group priority of 1 is the highest (i.e., transit) and thus would always have use of the lane. Lower priority user groups (2

and higher) would be priced or removed from the lane in order to achieve necessary performance objectives set by the user in Screen 3. Some groups may be of equal priority. In that case they would be given the same rank and treated identically. Groups that are never allowed on the facility are given a rank of 0 (for example, trucks in Figure 4).

Facility Type: HOV Goals & MOEs: Goal 1: Safe Travel Number of Crashes in the Peak Period Incident Clearance Time All Day Goal 2: High-speed Travel Average Speed in the Peak Period LOS All Day			Using numerals, rank user groups by preference, 1 being the highest. Enter a 0 (zero) for those that are never allowed. You may rank multiple groups the same. Then, indicate each group's current status as either currently tolled, or currently free. No checks indicates not currently allowed.		
	Rank User Groups (0=not allowed)	Current Status			
	1	Currently free			Transit
	4	Currently free			Vanpools
	8	Currently free			Other buses
	3	Currently free			HOV3+
	2	Currently free			HOV2
	7	Currently free			SOVs
	5	Currently free			Low Emissions/"green" vehicles
	6	Currently free			Fuel efficient vehicles
	10	Currently free			Motorcycles
	9	Currently free			On duty law enforcement/ambulance/fire vehicles
	11	Currently free			Off duty law enforcement/ambulance/fire vehicles
	12	Currently free			Transportation Agency Vehicles
	12	Currently free			Low income travelers
	0	Currently Not Allowed			Trucks
<input type="button" value="Previous"/> <input type="button" value="Next"/>					

Figure 4. User Groups.

Screen 5: Operational and Pricing Fixes

The next screen (see Figure 5) offers the user 10 potential items to change in order for the facility to meet the MOEs detailed in Screen 3. Additionally, the user can enter one or two additional potential fixes for this facility. In the event the facility fails to meet any of its goals then the user will be shown the selected potential fixes as measures to improve performance.

Traffic Thermostat Application

<p>Facility Type: HOV</p> <p>Goals & MOEs:</p> <p>Goal 1: Safe Travel Number of Crashes in the Peak Period Incident Clearance Time All Day</p> <p>Goal 2: High-speed Travel Average Speed in the Peak Period LOS All Day</p>	<p>Select possible operational fixes to appear in the framework along with pricing an solutions.</p> <p>Select all that apply:</p> <ul style="list-style-type: none"><input checked="" type="checkbox"/> Pricing<input checked="" type="checkbox"/> Allowed user groups<input type="checkbox"/> Increase enforcement<input type="checkbox"/> Activate shoulder hours<input type="checkbox"/> Rapid incident removal program<input type="checkbox"/> Active traffic management<input type="checkbox"/> Ramp metering<input type="checkbox"/> Improve design to increase speeds or reduce crash rates<input type="checkbox"/> Publicity about conditions or toll rates <p>Others (write in): <input type="text"/></p> <p>Others (write in): <input type="text"/></p> <p><input type="button" value="Previous"/> <input type="button" value="Next"/></p>
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Figure 5. Potential Operational and Pricing Fixes.

Note the tool does not know the exact extent of the size of the fix or what impact any of these fixes may have on the lane. For example, *increase enforcement* may mean adding one or a dozen enforcement officers, new equipment, or automated enforcement. Its impact may range from negligible to a significant improvement in the operations of the facility. Since this is site specific it is left to the user to define what is meant by the fix (such as *increase enforcement*) and determine/estimate what impact it may have.

The fix “Activate Shoulder Hours” is for a facility that has peak period charging only and during the off-peak period everyone is allowed use of the lane. In the case of the shoulder becoming congested, then restrictions must be extended beyond the peak period and into the shoulder hours.

Proceeding through the Decision Tool

With these inputs the tool now guides the user through the decision/choices that are needed for the facility (see Figure 6). A good starting point would be when the facility is meeting all of its performance objectives (or MOEs). In this case the user can proceed through each subsequent screen and answer “yes” when asked “With regards to this MOE and value, is the present situation satisfactory?” The end result will then be to make no changes to the facility.

Traffic Thermostat Application

Facility Type:
HOV

Goals & MOEs:

Goal 1: Safe Travel
Number of Crashes in the Peak Period
Incident Clearance Time All Day

Goal 2: High-speed Travel
Average Speed in the Peak Period
LOS All Day

Goal : Safe Travel
MOE : Number of Crashes in the Peak Period

Is the Number of Crashes in the Peak Period (MOE
VALUE : 45 mph to 55 mph) satisfactory ?

☒ Yes ☐ No

[Reset All Answers](#)

[Previous](#) [Next](#)

Figure 6. Decision Framework.

Next the user might examine the facility assuming a future date and increased traffic volumes. During this scenario the facility may no longer meet the minimum MOEs and operational or pricing fixes must be chosen. This second run then represents required changes in the facility as it matures over time. The user might run this future scenario several times, each time trying different operational fixes. Each output from each run then represents a potential policy option that can be presented to decision makers. In this way a governing board is shown a variety of options and can select the preferred one. That provides operational guidance, based on performance measures, for years to come.

The output includes a detailed list of the user groups, MOEs and selected operational fixes (see Figure 7). This can be printed or saved. Additionally, the project itself can be saved by selecting [Save Project](#).

Traffic Thermostat Application

Facility Type: HOV	Current Facility Type : HOV
Goals & MOEs:	Summary : No change in facility type
Goal 1: Safe Travel	GOAL : Safe Travel
Number of Crashes in the Peak Period	Chosen MOE : Number of Crashes in the Peak Period
Incident Clearance Time All Day	Currently : OK
Goal 2: High-speed Travel	Value assigned to this MOE : 45 mph to 55 mph
Average Speed in the Peak Period	Selected operational fixes for this MOE :
LOS All Day	None
	Goal : Safe Travel
	MOE : Number of Crashes in the Peak Period
	Is the Number of Crashes in the Peak Period (MOE VALUE : 45 mph to 55 mph) satisfactory ?
	Chose Yes
	Chosen MOE : Incident Clearance Time All Day
	Currently : Failing
	Value assigned to this MOE : 15 minutes
	Selected operational fixes for this MOE :
	allowed user groups
	Goal : Safe Travel
	MOE : Incident Clearance Time All Day
	Is the Incident Clearance Time All Day (MOE VALUE : 15 minutes) satisfactory ?
	Chose No
	Exclude Transportation Agency Vehicles,Low income travelers ?
	Chose Yes
	Did it fix the problem ?
	Chose Yes

Figure 7. Text Output.