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# **COMMUNITY PROCESS GUIDE**

*Forecast Module*

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## CONTENTS

	<u>Page</u>
1. Introduction	331
2. User Requirements	332
3. Organizing Sketches	333
4. Example	334

## 1. Introduction

This process guide describes ways in which DSS forecast sketches can support community planning processes. A forecast sketch is a forward-looking spatial estimate of up to 20 years of population and employment growth. Forecast sketches are designed to evaluate future outcomes from alternative combinations of land-use, transportation, and environmental elements. They are prepared using one of two options for modeling the transportation element of a forecast sketch:

- *MPO integrated transportation model (ITM).* With this option, users operate DSS in tandem with ITM. The DSS passes land-use information to ITM, which then executes transportation calculations and passes them back to DSS for reporting. This option requires CCMPO and/or CCRPC assistance and the necessity to run DSS countywide because that is the only geographic scope that ITM is capable of modeling.
- *Internal transportation submodel.* This option uses a simplified transportation demand model that is internal to DSS. It should also be used in consultation with the CCMPO and/or CCRPC, and is able to run sketches at or below the countywide level.

Important community process-related features of forecast sketches include:

- *Sketch areas.* As indicated above, sketch areas are dictated in part by which transportation modeling option is chosen. If ITM is used, then a countywide sketch is necessary because that is the only geographic area that can be modeled by ITM. Alternatively, if the DSS transportation submodel is chosen, a user may select any portion of Chittenden County where data is available to support indicator calculations. However, unlike snapshot sketches, forecast sketches are only appropriate for relatively large areas where a spatial allocation of growth can be reasonably simulated, e.g. greater than 10,000 acres.
- *Sketches.* Any number of planning scenarios or “sketches” can be modeled in a sketch area. Every forecast sketch includes a base year that can represent existing conditions. Alternative sketches can be prepared to represent different combinations of land-use, transportation, and environmental measures.
- *Indicators.* Indicators are “yardsticks” for identifying an area’s strengths and weaknesses, testing alternative courses of action, and monitoring change over time. The DSS forecast module has a menu of 80 indicators available for evaluating sketches (certain transportation indicators are unique to either ITM or the DSS submodel). From this menu, users may select those indicators that are most relevant to a given situation.

- *Interpreting indicator scores.* Indicator scores should be interpreted in the context of existing conditions and adopted goals or applicable policies. Establishing a quantitative policy gradient for indicators at the outset of the tool's use will help interpret sketch results. A key document is the Indicator Dictionary that defines what is included in each indicator, and how it is calculated. Users will need to gain experience in interpreting scores and changes in scores between sketches. It is impossible to generalize about what constitutes a significant score change because so many variables are at play in different locations and scenarios being modeled. Users should examine the direction of change (numerically increasing or decreasing) and the magnitude of change (percent difference). In most sketches, score changes of relatively small magnitude should be insignificant for purposes of a given analysis. Finally, practitioners will want to interpret scores in light of community preferences and goals, while considering trade-offs, when communicating results to the public.
- *Indicator rating and weighting.* To determine if indicator scores are favorable or unfavorable according to local norms, users may set objectives for each indicator according to the desired direction of indicator score movement, and thresholds of score desirability. For example, the objective for walk distance to parks would be a decrease in distance since shorter walks would be positive. The threshold for a desirable walk distance might be anything less than 1,000 feet. To help stakeholders evaluate and rank multiple sketches, weights of importance can also be assigned to indicators. These and the score ratings enable the calculation of a single overall weighted score for a given sketch.

## 2. User Requirements

In order to use the DSS for forecasts, it is necessary to have the following:

- *Hardware.* The minimum configuration is a 300 MHZ PC with at least 128 MB of RAM, and at least 1.5 GB of available hard disk space. Faster speed and larger memory are desirable for evaluating large study areas. Minimum screen resolution is 1024x768.
- *Data.* DSS forecasts require a variety of land-use, transportation, and environmental data in GIS format. Specific requirements depend on which indicators are being used in a given analysis.
- *GIS experience.* Users must have basic GIS familiarity and must attend a DSS training session before attempting to use the tool. Access is also needed to a "model steward" with advanced GIS skills to support certain technical functions of the model.

- *Transportation modeling experience.* Users will need access to experienced transportation modelers, such as CCMPO and/or CCRPC staff.

Because of the tool's potential to influence planning processes, its use includes the responsibility for ethical and professional representation of scenarios and results.

### **3. Organizing Sketches**

Once the DSS is installed, there are three major process-related tasks in organizing forecast sketches:

- *Select a sketch area boundary.* The selection of a sketch area boundary is an important step because of its influence on indicator scores and overall evaluation of a situation. As discussed above, use of ITM for transportation calculations necessitates a countywide sketch area, whereas use of the DSS transportation submodel allows either countywide or any portion of the County to be sketched, as long as the area is relatively large, e.g. greater than 10,000 acres, and data is available to support desired indicator calculations. Key considerations in selecting a boundary for DSS transportation submodel sketches include:
  - The boundary should be derived from a study's scope and objective, e.g. city limits of an entire municipality that is being evaluated, or an entire watershed if environmental resources are being analyzed.
  - In all sketches, care should be exercised along the boundary's outer edge to insure that important adjacent features that affect the study area are included, e.g. schools just outside the boundary of residential areas.
  - Equally important, anomalous or irrelevant features should be excluded from sketch areas so they do not adversely influence scores, e.g. removing dedicated open space from a housing study area.
- *Select indicators to calculate.* Users select those indicators that are most relevant to the subject at hand, e.g. employment-related indicators for an economic study versus housing indicators for a residential study. Occasionally, a user may select all of the indicators when a comprehensive set of measurements is desired, such as estimates for a long-range community plan. A prerequisite for selecting any indicator is availability of data to support the indicator calculation; data requirements are detailed in the forecast indicator dictionary.

- *Set indicator ratings and weights.* If weighted results are desired, users may assign weights of importance and score acceptability ratings to each indicator. This function, known as rating and weighting (RAW), can be used to apply established community standards, or to test new or modified standards. The RAW evaluation is also useful when stakeholders are evaluating and ranking multiple sketches in search of consensus on a preferred alternative. The RAW procedure includes the following general steps:
  1. *Rating.* These values are taken from the objective threshold entries made earlier by the user during the setting of indicator objectives. The model uses these values to convert actual indicator scores in their original units of measurement into a common zero-to-one rating scale.
  2. *Weighting.* Stakeholders establish weights of importance for each group of indicators (elements). The total weighting “budget” for all elements must equal 100. Each element budget is allocated to the indicators within the element. Total indicator weights for an element must equal the element’s weighting budget.
  3. *Calculation.* To calculate RAW values, the weight is multiplied by the rating for each indicator and these values are summed to obtain an overall value for each sketch. This yields an overall score for each sketch between zero and one hundred.

A hypothetical example of the RAW procedure is shown in Figure 1. Detailed instructions on using the RAW function are given in the Getting Started Guide.

## 1. Example

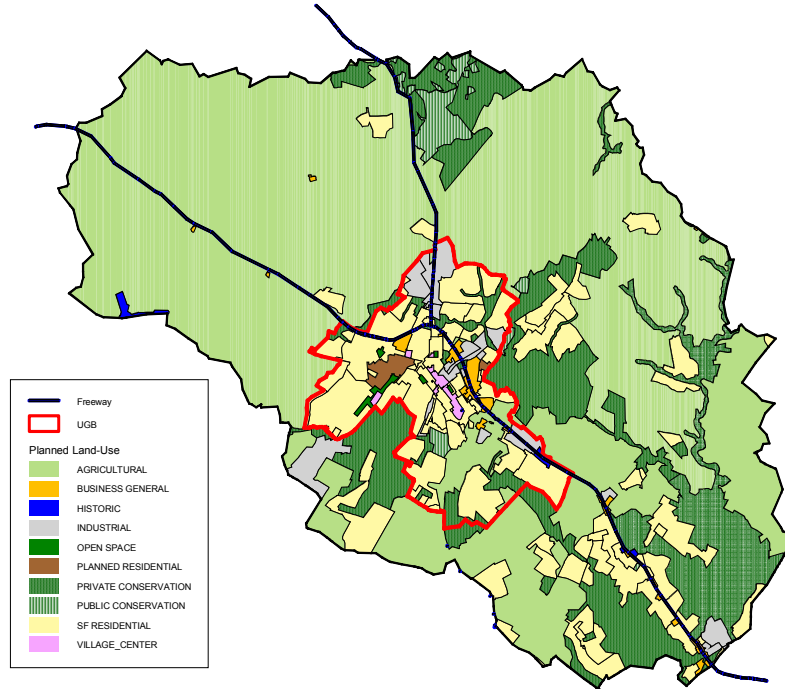
To illustrate an example forecast sketch, two alternative land-use plans are shown in Figure 2 for a hypothetical planning area of approximately 100 square miles. The area currently has a population of 35,000 persons and 19,000 jobs. It has a 20-year growth projection of an additional 17,000 persons and 10,000 jobs. One plan, entitled Compact Growth, focuses new housing and population in existing urban areas and preserves much of the surrounding agricultural land. Alternatively, the plan entitled Bypass/Corridor Growth envisions substantial suburban residential development outside of existing towns with access via a new bypass highway. The results are given in Table 1 with indicator scores giving the Compact Growth plan better marks for land consumption, resource conservation, multimodal travel, and pollutant emissions.

Figure 1  
**HYPOTHETICAL RAW EXAMPLE**

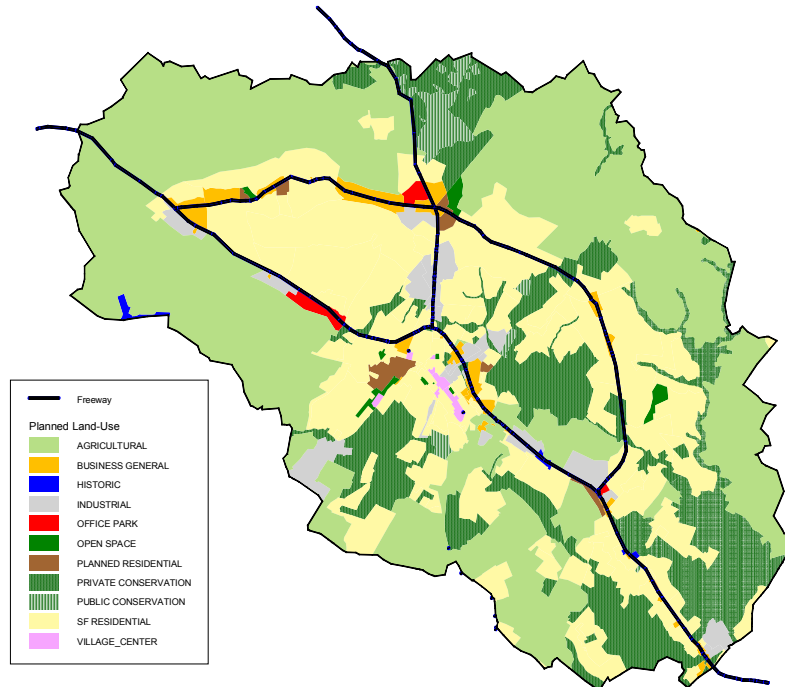
Indicator	SET UP						APPLICATION						
	Weighting		Rating				Indicator Score	→	Equivalent Rating (0 to 1)	X	Indicator Weight	=	Indicator RAW Score
	Overall Topic Importance	Allocation to Indicators	Positive Movement of Score	Worst Indicator Scores (Get 0)	Mediocre Indicator Scores (Get 0.5)	Best Indicator Scores (Get 1)							
Housing	50	---											
Dwelling Density	---	20	Up	10-	15	20+	16	→	0.6	X	20	= 12	
Distance to Transit	---	30	Down	2640+	1170	300-	1250	→	0.4	X	30	= 12	
Employment	25	---											
Employee Density	---	10	Up	20-	35	50+	37	→	0.6	X	10	= 6	
Distance to Transit	---	15	Down	2640+	1170	300-	863	→	0.2	X	15	= 4	
Parks	25	---											
Distance to Housing	---	25	Down	2640+	1170	300-	2300	→	0.9	X	25	= 21	
	100	100											
<b>Case RAW Sum</b>											<b>55</b>		

## Figure 2. ALTERNATIVE LAND-USE PLANS

### Compact Growth Plan



### Bypass/Corridor Growth Plan



**Table 1. FORECAST SKETCH INDICATOR SCORES**

Indicator	Base	Compact Plan 2022	Bypass Plan 2022	Units
Growth compactness	488	763	701	persons/sq. mi. of developable area
Population density	408	612	612	persons/sq.mi.
Incentive area use for housing	29.0	52.1	36.0	% of housing incentive area used
Incentive area use for employment	25.7	41.8	32.0	percent of employment incentive area used
Jobs/housed workers balance	1.0	0.99	0.99	jobs/workers
Housing density	0.2	0.5	0.3	dwellings/acre
Housing transit proximity	41	52	44	% of DUs w/i 1/4 mi. of a route
Residential energy use	81	82	85	MMBtu/yr/capita (housing & travel)
Residential water use	178	181	197	gal/day/capita
Employment density	5.3	9.3	6.3	employees/acre
Employment transit proximity	58	68	55	% of employees w/i 1/4 mi. of a route
Vehicle miles traveled	22.8	21.3	24.0	VMT/day/capita
Vehicle trips	4.5	4.0	4.9	VT/day/capita
Arterial vehicle hours traveled	0.2	0.1	0.2	VHT/day/capita
Freeway vehicle hours traveled	0.2	0.1	0.2	VHT/day/capita
Arterial vehicle hours delay	0.1	0.0	0.1	VHD/day/capita
Freeway vehicle hours delay	0.0	0.0	0.0	VHD/day/capita
Auto driver mode share	85.0	77.6	87.6	% of trips by auto
Auto passenger mode share	9.8	14.9	10.8	% of trips as passenger
Transit mode share	3.4	5.4	0.5	% of trips by transit
Walk/bike mode share	1.8	2.1	1.0	% of trips by bike or walk
Oxides of nitrogen (NOX)	40	39	41	lbs/yr/capita
Oxides of sulphur (SOX)	11	10	12	lbs/yr/capita
Hydrocarbon (HC)	60	57	61	lbs/yr/capita
Carbon monoxide (CO)	450	438	474	lbs/yr/capita
Particulate matter (PM)	1	1	1	lbs/yr/capita
Carbon dioxide (CO2)	7	5	6	tons/yr/capita

