

4. Modeling Scenarios

One of the fundamental reasons that travel demand models are developed and used is to test alternative scenarios. These scenarios are defined by changes to model input data that reflect the conditions anticipated by each scenario. Each scenario is differentiated from other scenarios based on which inputs are changed and the nature of those changes. Changes can include edits to the transportation network representing widenings or new construction, adding households and employment, and incorporating changes to costs such as tolls or transit fares.

The nature of the changes to be made and the amount of the model subject to these changes will depend on the type and scale of the project. Project coordinators should discuss the needs of the project with stakeholders and then communicate those needs to the modeler.

Be sure to specify:

- What is being modeled in each scenario? (new highway alignments, alternative land uses, etc.)
- What is the scale of the project? (is it a regional long-range plan or is it an IAR?)

The most common types of projects involving the testing of scenarios include:

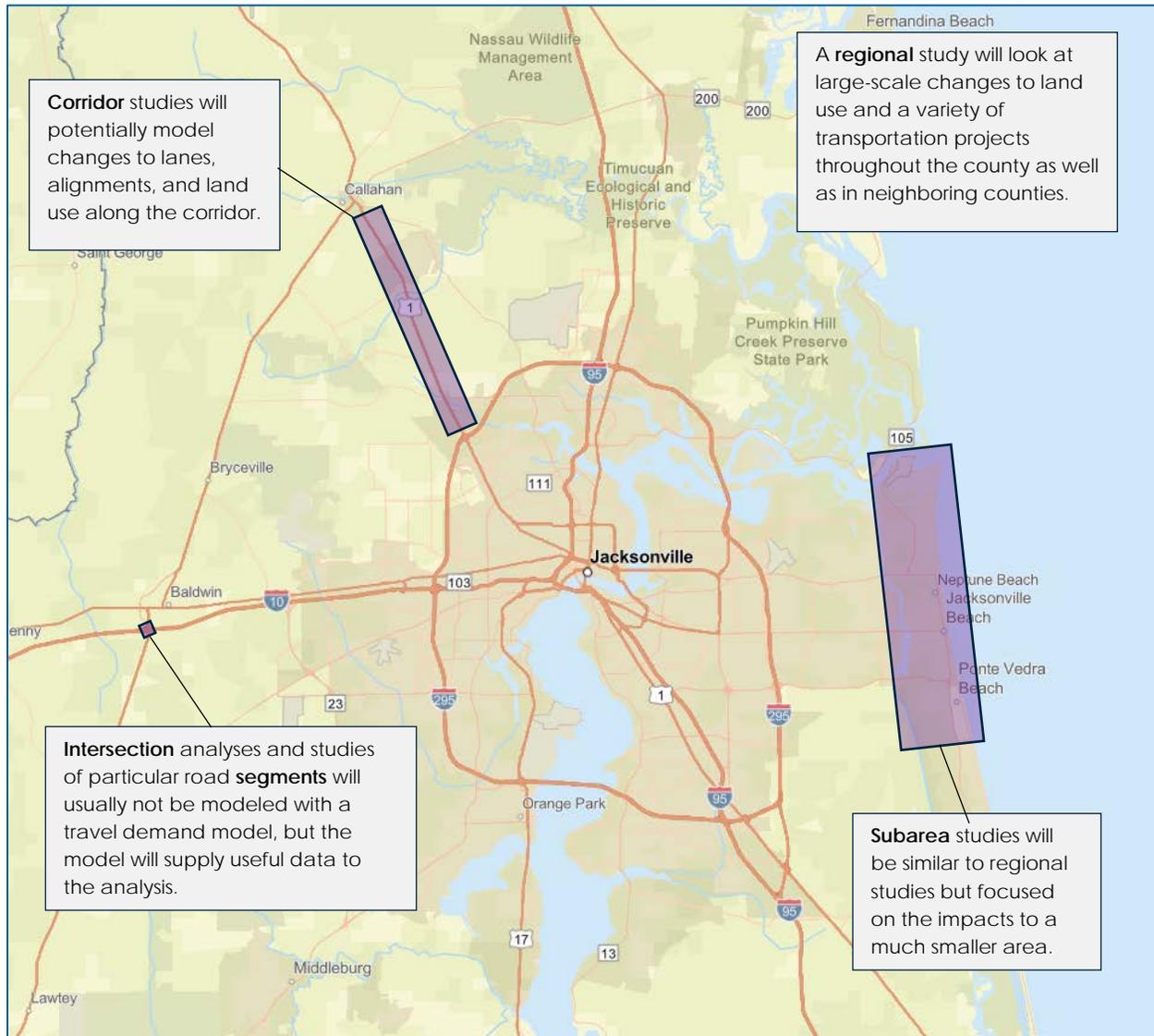
Scenario-based Planning	These scenarios involve the testing of alternative socioeconomic growth and development patterns to measure their impacts to a study area's transportation system.
Systems Planning	These scenarios involve testing alternative transportation projects or sets of transportation projects to see which projects best address the future needs of the community.
Alternatives Analysis	These scenarios involve testing alternative alignments for a given transportation project to identify impacts.
Site Impact	These scenarios involve testing the inclusion of a specific land development project to measure impacts to traffic.
Policy Evaluation	These scenarios involve testing the impact of policies (e.g., toll pricing, transit incentives) to travel behavior.
Traffic Forecasting	These scenarios involve preparing future-year design hour traffic to support roadway design projects.
Interchange Access Request	These scenarios involve assessing the amount of demand on freeways and near-by arterials to determine whether there is enough traffic to warrant a new interchange or modification to an existing interchange.



Scenario Modeling

1. Create scenario specific inputs.
2. Set up scenarios in model.
3. Review setup to confirm scenarios are prepared correctly.
4. Run model scenarios.
5. Post-process model outputs.
6. Create required tables, charts, and graphs.
7. Deliver the results to the project coordinator for review.

Four general scales of modeling projects exist. These are:



Scale	Description
Region	Projects at the regional scale are typically concerned with measuring multiple transportation projects simultaneously as part of a plan or program. The most common use of a model for regional projects is in support of a long-range transportation plan.
Subarea	Subareas are smaller areas within a region. A subarea might focus on a particular town, neighborhood, or other area of particular interest. This includes supporting sector plans and special studies.
Corridor	Corridors are on a primary transportation facility and the surrounding land uses and supporting network. This includes corridor studies, alternatives analysis for NEPA, and traffic forecasts.
Intersection / Segment	These are small scale projects on specific intersections or city block faces and use modeled volumes to inform capacity analyses.

Baseline Scenario

The first scenario modeled for a given project is typically the baseline scenario. This section discusses how to prepare a baseline scenario and the considerations when running and documenting the scenario. Establishing a baseline is important for applying travel demand models for project purposes.

Why is Running a Baseline Important?

For most projects, a baseline model run establishes the basis for comparative analysis. Other scenarios will be compared against the baseline. Depending on the type of project, this could be known as the “no-build” scenario. It is important to distinguish the project baseline from the model’s base year.

- The model’s **base year** represents an observed condition from the recent past that was used to validate the model.
- The project **baseline** is a scenario that specifically omits the particular network or land use condition represented by the project. It can include other conditions in common with other project scenarios such as planned or committed projects (other than the project being tested), population, employment, etc.

If the baseline is based in the recent past, it can also be used to determine the model’s accuracy by using data collected for the study area and validating the model for the study area. This could indicate whether the model requires additional refinement prior to use for project modeling.

Preparing a Baseline Run

After establishing model replication, the baseline run must be prepared. This begins with identifying and collecting the relevant reference data as the basis of the baseline.

1. Identify the year that the baseline will represent.



This will depend on the nature of the project. A traffic forecast may use a project’s opening year for a no-build baseline. A scenario planning exercise may select the same horizon year as the alternative scenarios as a baseline. Remember, the baseline is not necessarily the same as a base year. The year should be selected in consultation with the stakeholders and in a manner that will result in an appropriate baseline. The baseline will serve as the basis for comparing and measuring other scenarios.



Site Impact Analysis?

Modeling done to support a site impact analysis is the general exception to preparing and running a baseline scenario. Site impact model runs are only used to calculate the distribution of site traffic along the network and are not part of a comparative analysis. For more information on how to use models for site impact, refer to the [Multimodal Transportation Site Impact Handbook](#).

2. Gather all required information and data.



This includes not just model-related data but also supporting information. Such data and information may include:

- Long Range Transportation Plans/Metropolitan Transportation Plans.
- Transportation Improvement Programs.
- Recent traffic counts.
- Origin-destination data.
- Population data.
- Employment data.
- Other land use data.
- Project descriptions/design drawings/concept maps.

This information is intended to assist in preparing the baseline scenario and have the necessary information at hand for later preparation of the comparative scenarios. Data should be acquired for the baseline year and comparative scenario years if these are different. The exact nature of the data required is dictated by the project needs. This should be explored during scoping discussions when preparing to begin work.

3. Determine if the baseline year comes standard with the model.



In some cases, the year desired for the baseline will not come standard with the model selected to conduct the study. In such cases, it will be necessary to decide how to address this inconsistency. Two general options are available:

- **Option 1:** Use a model year provided with the model. This year can be used directly as a surrogate (e.g., run 2025 and say it will be used to represent 2027), or the results from this year can be adjusted to represent the desired year (e.g., run 2025 and apply a 2% growth rate to adjust the resulting traffic to represent 2027).
- **Option 2:** Create a new interim model year to represent the desired year. This requires adjusting the model land use data, external model, transportation network, and possibly other input data to fully represent the new interim year.

Network Preparation

Once the baseline year has been determined and the relevant data and information have been acquired, it is time to set the baseline network conditions. This step has three components: verifying the network conditions, reviewing the network, and assessing network detail.

• Verify network conditions

This involves establishing the network for the baseline. This is not the same as confirming the network coding. Verifying the network condition determines which facilities should be included in the network and the typical sections for those facilities. This checks against existing data or planned documents to create an understanding of what the model network should look like.

The network should represent the...



Past	Present	Future
<p>The modeler will need to coordinate with FDOT District staff to determine when particular projects in the recent past were opened to traffic. If the study area is in a densely populated part of the state, frequent aerial imagery may be available that can be used to determine whether a project was opened prior to the baseline condition.</p>	<p>The network should include all transportation projects existing on the ground and open to traffic as of the current year. This is known as the existing network. The modeler can verify this using recent aerial imagery or by touring the study area and visually confirming the network condition.</p>	<p>The project coordinator will need to reach a consensus with stakeholders on which projects are committed to construction. Project commitments are typically based on which stage of development a project is funded for in the TIP. These committed projects as well as all existing projects open to traffic will be part of the baseline network.</p>

• **Review network**

This is specifically for the model network database being used for the baseline. This review aims to ensure that the model network corresponds with the baseline network conditions specified during the verification of the network condition. The modeler should address the following questions:

- Are the baseline facilities in the network?
- Are the facility alignments correct?
- Are there any network connectivity issues that could result in bad assignments?
- Are attributes, such as number of lanes, properly coded?

• **Assess network detail**

The modeler should undertake this for the study area. If more details are required in the network, they should be added to the model network now. This may include adding additional roads and local streets. If so, the model TAZs may need to be split with additional centroids and centroid connectors added to the network to support these splits.



The goal is for the model's transportation network to be consistent with the verified network conditions. The baseline network database must be edited until the coded network matches the verified network conditions. This is particularly important in the part of the network corresponding to the study area.

Input Data Preparation



In addition to preparing the baseline network, other input data sets must be reviewed to determine if further modifications are required. These modifications would be required if the model input data sets do not adequately represent the baseline condition.

- **Check model's data**

Land use data, such as population and employment, have a direct impact on trip generation and distribution, which ultimately impacts how trips are assigned in the network. Travel behavior data is not modified when using a model for specific projects, although in certain cases, specific behavioral data may need to be incorporated. For example, this could include new mode choice coefficients if modeling a new mode of transportation or updated cost coefficients for traffic and revenue studies.

- **Verify data reflect baseline year conditions**

Even if the baseline year is an existing scenario in the model when the modeler received it, it is possible the assumed conditions at the time the scenario was created may have changed. Even if the baseline year happens to be the same as the model base year, the modeler should verify the input data has no errors that may have been overlooked during validation. Other than errors in the original datasets, the following considerations should be kept in mind while reviewing the input data:

- Recent trends in development patterns may be different than what is assumed in the model.
- Focus on development patterns in the study area.
- Knowledge of recent and planned developments can be obtained by communicating with county and city planning departments.
- Regionally significant developments, such as the gain or loss of a major employer or a new large subdivision, should be accounted for even if they are occurring outside of the study area.
- If necessary, confer with the model owner to determine whether the model's input data sets already account for specific developments.

- **Make necessary modifications to the input data**

After verifying the proper baseline data, the relevant model input files need to be edited to capture the changes necessary to represent the baseline condition. Note that if additional detail was added to the network, splitting TAZs in the same area may be necessary to better support traffic assignment. If TAZ splits are necessary, these should be done now, and input data based on TAZs should be reallocated accordingly.

Running the Baseline

When the baseline scenario is fully prepared, it can be run. When running the baseline scenario, be sure to follow these steps:



Pre-Modeling

1. Set up the baseline scenario

After the baseline scenario input data have been prepared and formatted for the model, the scenario must be set up in the model's interface. Familiarity with the software used to run the model is required to set up a new scenario. The scenario should be clearly and distinctively named so there is no confusion as to which scenario is the baseline. All scenario inputs should be appropriately referenced in the model interface. This may involve moving or copying input data files into specific folders as specified in the model documentation. The baseline scenario should be set up on one of the computers used to establish replication.



Modeling

2. Run the model for the baseline scenario

The baseline scenario should be executed following the scenario setup. Running the model should be monitored. Longer model runtimes should rely on periodic monitoring, checking in with the model approximately once per hour. Regular monitoring of the scenario run will reduce time lost if the model crashes, stalls out, or finishes earlier than expected. Waiting to check on the model's progress until the model is expected to finish can result in lost time. This lost time is compounded if the model crashed or stalled since additional time will be required to correct the error and restart the model.

3. Ensure the model ran completely and correctly

A proper and complete run of the model should yield no fatal error messages, and all model outputs should have been generated. If the model terminated prematurely, it is important to understand where the model failed and to correct the issue. If the model ran successfully during model replication, then the source of the model crash should be with the baseline scenario itself. Two general sources of error can be expected.

- a. First, there may be a problem with how the scenario was set up in the interface. Ensure all input files are referenced correctly, and the input files are placed in the appropriate locations on the computer.
- b. Second, there may be a problem with the input files. This could include missing or illegal values that cause the model to crash when trying to run calculations using those values. Recheck the input data files to ensure all required values are entered correctly. The most common error is a missing value that can cause a divide-by-zero error. Rechecking the input data files should focus on the files that function as direct inputs to the model step that crashed. If such files show no errors, it is necessary to look at input files used earlier in the model process, as the error may have been introduced at an earlier step but did not result in a crash until later.



Post-Modeling

4. Review the model results

Baseline scenario results should be checked for reasonableness. This can be established by comparing the baseline scenario results to the base year model run.

- a. The results should show differences relative to the changes between the baseline scenario inputs and the base year inputs. Changes to traffic assignment and travel demand should be generally consistent with changes to the input network and the socioeconomic data:
 - i. Increases in population should also result in increases in traffic. Traffic increases should be correlated to areas where the population increased.
 - ii. Changes to the highway network, including incorporating new or altered alignments, should show a diversion of traffic consistent with the availability of new capacity.
 - iii. The amount of the change in output should also be consistent with input data changes. For example, significant changes to the population should anticipate correspondingly large changes to the traffic volumes on the network.

Counterintuitive changes warrant further investigation, such as an increase in population resulting in a decrease in traffic or additional capacity causing traffic to avoid a new / widened road. Also, changes in results out of proportion to the changes in inputs, such as significant increases in population resulting in minor increases in traffic, need to be examined more closely. The modeler must determine if these counterintuitive results are valid findings of the model or the result of model error. Any errors must be identified and corrected, and the scenario rerun. If the counterintuitive result is determined to be a finding and not the product of an error, the modeler must defend the result to stakeholders. Since stakeholders will need to defend these results to their constituencies, the defense of model results must be communicated in plain language and supported with reasonable explanations for why the result is valid.

- b. Additionally, the study area traffic assignments should be reviewed to ensure that traffic loaded properly. Links in the study area portion of the network with zero traffic volumes may point to an error in the model's input data. This can include broken network connectivity, invalid attribute values, or a problem generating trip assignment tables. Path-building analyses can usually identify broken network connectivity. Make sure to use the same cost values as the model is using for path building and assignment. Even if there is no connectivity issue, other data errors may result in unexpectedly high or low-cost values that prevent trips from adequately using the impacted portions of the model network.

Baseline Run Documentation

After successfully running the baseline, it should be documented. This documentation can take several forms depending on what was agreed to during project scoping. When documenting the baseline scenario, the following should be covered:

- Identify the rationale for the baseline model run.
- Assert the suitability of the model for the project. Determining a model's suitability is a matter of professional judgment. It considers issues such as what features are possessed by the model, how well-validated the model is, and how sensitive the model is to input changes.
 - Model suitability should be apparent while preparing the baseline scenario. If the model is unsuitable, this should be communicated to the relevant stakeholders and addressed as soon as this issue is realized.
 - If the issues are addressed, document all remedies used to make the model suitable.
- Document any changes to input data required for the baseline condition and the reasons for them.
- Document any complications that arose during the preparation and running of the baseline model.
- Document baseline model outputs and results. The baseline results are usually the reference point for comparison for all alternatives and scenarios run in the future as part of the project.



The project coordinator should review the baseline run documentation. When reviewing the document note the following:

- Was the approach taken consistent with the scope?
- Do the results of the baseline make intuitive sense?
- If the results do not make sense, is this adequately explained and is the explanation defensible?

You should be engaged with the modeler in regular progress meetings throughout the baseline model run process. As such, nothing in the document should come as a surprise. Do not wait until the document is submitted to check in on the modeling. It may be too late at that point to address any issues.



When preparing the baseline run documentation, it is important to remember that the document may be read by individuals without a thorough technical understanding of modeling. This could include the project coordinator and / or the stakeholders. While you should document the technical aspects of the run and any changes made to the model for the baseline, be sure to also include a summary as well as some narrative that explains the results and changes in plain language.

Land Use Data

Typically, models will come with some available future year scenarios based on the acceptance of the most recent Metropolitan Transportation Plans developed by the MPOs represented in the model. If the model scenario years match years already provided with the model and if the project scenarios do not consider changes to the land use conditions anticipated by the MPOs, then adjusting the land use data may not be necessary. If, on the other hand, a novel horizon year needs to be added to the model, the project in question requires additional refinement of that land use detail in the study area, or the project itself concerns the question of the impacts due to changes in land use data, then these data will need to be adjusted.



When adjusting land use data, make sure to account for the following steps:

1. **Identify** the area you will be adjusting. This will depend on the project study area.
2. **Acquire** the data that will inform the land use adjustments from reputable sources.
3. **Calculate** control totals, growth factors, and other land use characteristics.
4. **Split** TAZs if necessary.
5. **Allocate** the data in units (households, population, employment, etc.) to individual TAZs.
6. **Verify** that they data are entered correctly by checking the final dataset.

General land use data recommendations from Chapter 3 Preparing Model Data from Developing a Travel Demand Model apply, but there are additional considerations when adjusting land use for project scenarios.

Land Use Data Sources

Data Type	Horizon	Source
Occupancy Permits	Short	City / County

Occupancy permits provide data on when specific sites were allowed to house occupants. While this does not guarantee that the site in question is in fact occupied, understanding where new occupancy has been permitted can assist the modeler in allocating control growth values by indicating where a portion of that growth can go. This is particularly suited for shorter term horizons, updating a base year condition to the current year, and as part of an incremental process of allocating long-term growth that start by accounting for recent growth first before allocating later anticipated growth.

Data Type	Horizon	Source
Zoning Data	Short	City / County

Zoning maps indicate the allowable land uses in a given area within a planning jurisdiction. Zoning data only provides information on existing zoning and is thus most suited for use with short-term horizons. Information on pending zoning amendment applications can often be acquired as well, thus providing an indication of how land use might change in the very near future. Zoning data can help identify where short-term growth can be allocated in the absence of more detailed data from occupancy permits and site plans.

Data Type	Horizon	Source
Site Plans	Medium	City / County

Site plans provide details on the proposed land use and intensity of development for a site. Site plans typically will specify the number of proposed dwelling units for residential development. For non-residential development, information on square footage is provided instead. Local planning agencies at the city and county level may have identified specific rates to use to convert this information to population and employment depending on the type of development. If locally specific rates are not available, generally applicable rates are provided in *Table 9 | Land Use Conversion Rates for Traffic Impacts Assessments* in the [Multimodal Transportation Site Impact Handbook](#). Site plans may be available for larger multi-phase developments. It may not be reasonable to assume 100% build out by the scenario's horizon. An appropriate build out assumption should be reached in consultation with the stakeholders.

Data Type	Horizon	Source
Population Projections	Long	Bureau of Economic and Business Research, UF (BEBR)

BEBR provides population projections at the county-level for various growth scenarios throughout the state. The use of BEBR medium growth population projections for establishing future year county population control totals is typical. BEBR projections should be used when benchmarking future year scenarios for when desired future years are not in the model. Consult with the model owner to determine if exceptions to the use of BEBR data were made.

Data Type	Horizon	Source
Future Land Use Maps	Long	City / County

Future land use maps indicate how local governments intend to shape growth and development within their communities. These maps guide the development and zoning process going into the future. While not as precise as zoning maps, future land use maps can help the modeler determine how to allocate land use data for future decades.

Data Type	Horizon	Source
Employment Projections	Long	Florida Commerce / private vendors

Employment projections are available by industry from Florida Commerce for the state, MSAs, large counties, workforce regions, and 3 additional areas meant to capture the balance of the state. The projections are only 8-year projections. Private vendors are available that provide similar projections at the county-level and for decades into the future. As with population projections, employment projections are best used as control totals for future year growth with other data (such as future land use maps for the long term and site plans and applications for the shorter term) used to inform allocations within given geographies.

Land Use Data Checking

Data representing conditions for the current year or earlier represent observations of actual conditions. Checking such data should follow the same basic principles followed when developing a model's base year as discussed in the Developing a Travel Demand Model. For future year land use data, observations are not available, and data checking must rely on making sure that the adjustments made to the data are reasonable and were made as intended.



Land use data checking for future year data falls under two general categories:

<i>Intentionality</i>	The data were entered into the model the way the modeler intended. Data checks focus on making sure that individual components properly sum to established control totals and that data were allocated to the desired TAZs.
<i>Reasonableness</i>	The future year data represent reasonable growth spatially and in intensity. Data checks focus on calculating growth rates from the updated data and measuring where growth is occurring. Care should be given to make sure that growth was not allocated to restricted areas such as fully built-out locations or locations where development is restricted.

Check the data and correct any errors discovered. Note that errors may be with the data themselves and not necessarily with how the data were entered in the model. Prior to running any scenarios, confirm that all land use data adjustments are correct for each scenario.

TAZ Geometry

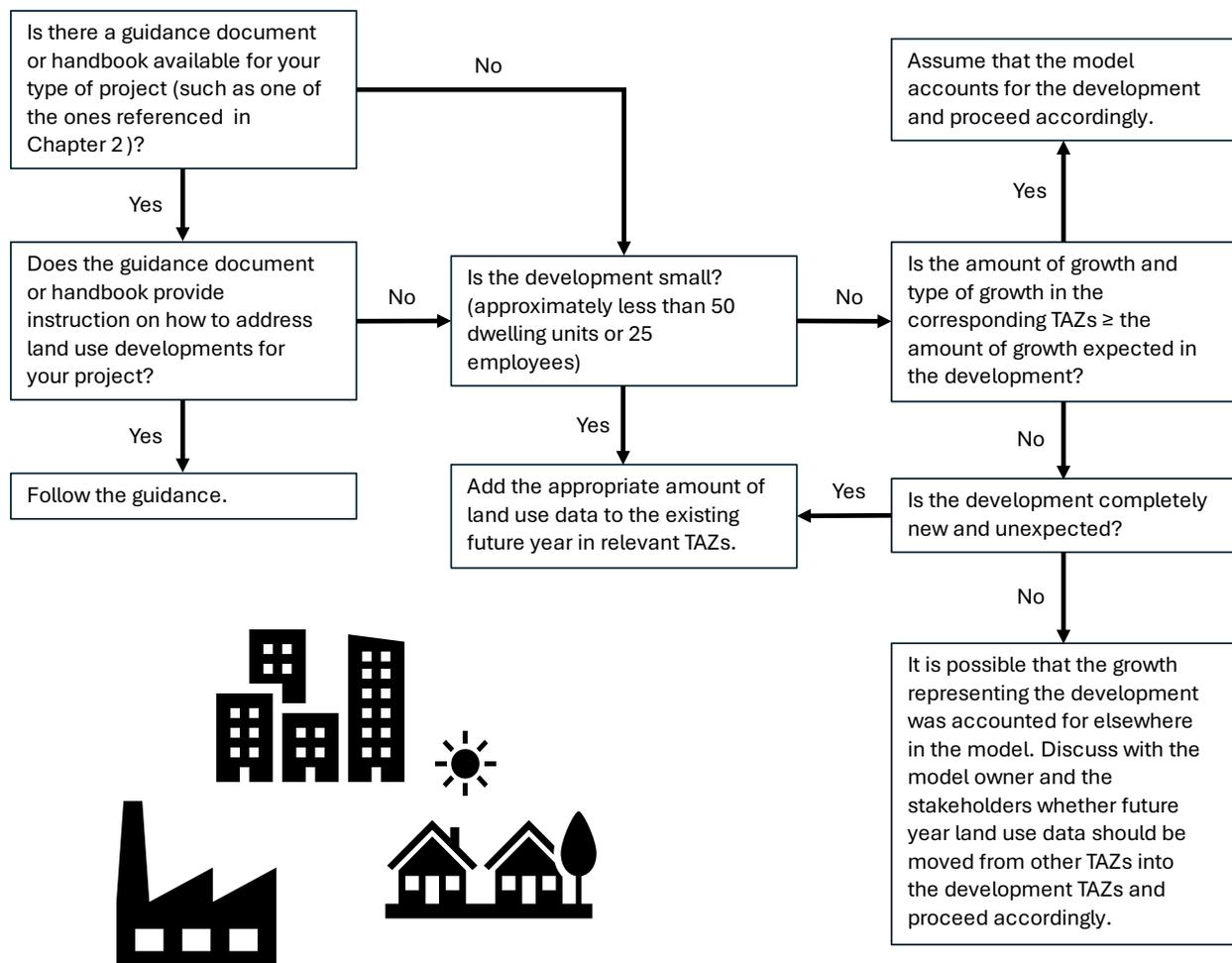
Accommodating changes to the land use data may require changes to TAZ geometries. This may be true if TAZs in the study area are particularly large and significant amounts of development are being coded into the TAZ. Changes to TAZs may also be required if refining the detail to the study area is desired. TAZs may be split to better accommodate additional transportation network detail. When splitting TAZs, consider the following:

- TAZs vary in size based on the needs of the transportation network.
 - Network links should not bisect TAZs.
 - TAZs should be bounded by network links or impassible terrain such as rivers, railroads without crossings, etc.
- When TAZs are split, centroids and centroid connectors need to be added to the network (the Network Updates section below has more information).
- Land use data will need to be disaggregated to split TAZs. Common approaches include:
 - Use of geographic point data (e.g., for employment) and sometimes parcel data.
 - Use of Census Blocks for demographics.
 - Counting “rooftops” (i.e., looking at aerial imagery and noting how many structures fall into each TAZ portion).
 - Spatial proportions of each TAZ portion to the whole applied to the land use data.

Accounting for Future Developments

Often, the question may arise whether a particular development is already included as part of the land use data in the model. There is not always a straightforward answer to this as models are developed with regional aggregate growth in mind and many smaller development projects may be implicit in the general demographic and economic projections for the region. This is most likely true for individual sites such as a free-standing store or a small apartment building. If the development in question is larger, such as a new proposed regional employer, then the development may have been explicitly accounted for in the data. This is only likely if the certainty of the development is high, it enjoys strong local support, and/or is already under construction. The model documentation or model owner may provide more clarity.

If there is uncertainty whether a required development is already accounted for in the model, consider the following:



Network Updates

It is unlikely that the modeler will need to code an entire regional network for the project. If so, follow the guidance provided in Developing a Travel Demand Model for developing model networks. More likely, network updates will be limited to adding specific projects or project alternatives for each scenario being modeled. The exact extent of the edits to the network will depend on the needs of the project.

The modeler should expect to:

- Add network links, delete network links, and alter network link attributes.
- Interpret network data and source documents to understand how the network should be coded.
- Be familiar with the modeling software used to run the model and understand how to use that software's network editing tools to make the necessary changes to the network.



When updating the model network, make sure to account for the following steps:

1. **Identify** the facilities that you will be coding.
2. **Acquire** the data that will inform the characteristics of the network segments to be coded.
3. **Edit** the network to reflect the needs of the project.
4. **Verify** that the changes to the network were properly coded and reflect the needs of each scenario.

Sources of Network Coding Data

Data Type	Horizon	Source
Design Plans	Short	FDOT District

Design plans are a good source for very precise network coding characteristics. While the level of detail provided are usually beyond the needs of most modeling projects, they can clarify network characteristics such as number of lanes, turn prohibitions, and complex interchange connections. Design plans are usually available for projects fairly close to letting or under construction, making them typically suitable for coding network projects expected to be open to traffic in the near future.

Data Type	Horizon	Source
Public Involvement Map	Short	FDOT District

Public involvement maps and diagrams are designed to convey the overall characteristics and spatial impacts of a project to members of the general public. As such, they are usually easier to interpret for individuals not well-versed in engineering. While they do not possess the same level of detail as a design plan, these maps clearly display many of the network characteristics relevant to travel demand modeling. As a planning tool, they can be available earlier than design plans, but are subject to change depending on where the planning and design process is for the related project.

Data Type	Horizon	Source
GIS Data and Maps	Varies	FDOT / MPO

Online maps and GIS data can be used to identify the location of and, in some cases, general alignments for transportation projects in Florida. [FDOT's GIS Open Data Hub](#) makes many of these data accessible. MPOs may have similar data sets available related to their transportation planning efforts.

Data Type	Horizon	Source
Work Programs / TIPs	Medium	FDOT / MPO

Work programs and TIPs can provide information on project development for short and medium-term projects. These documents indicate anticipated costs by project phase and fiscal year. Typically, a project description is included, but depending on how early in the development process the project is, the description may be vague.

Data Type	Horizon	Source
Long Range Plans	Long	MPO

Metropolitan Transportation plans are an excellent source for identifying cost feasible transportation projects in the long-term. Details concerning project characteristics and alignments will vary depending on the nature of the project. Cost feasible projects should be available in the travel demand model future year network consistent with the most recently adopted long range plan.

Data Type	Horizon	Source
Scoping Documents	Varies	Project Specific

In some cases, the project being modeled is new and has not previously been modeled or studied. In other cases, while the project may not be new, its exact configuration is uncertain, and the modeler is expected to test alternative configurations and alignments. In these cases, the understanding of what the project is and how to code it will be discussed with the project coordinator and the stakeholders and recorded in the scoping documents guiding the modeling effort.

Types of Network Editing

Type	Purpose	Activities
Updating an Existing Alignment	<ul style="list-style-type: none"> Road widenings Road diets Upgrading facilities Change in land use context 	<ul style="list-style-type: none"> Alter attributes such as number of lanes, facility type, context classification, etc. Editing turn prohibitors (if needed)
Adding a New Alignment	<ul style="list-style-type: none"> New road Roadway re-alignment (adding the new alignment) New / reconfigured interchange Enhancing the network detail in the study area 	<ul style="list-style-type: none"> Digitize network links corresponding to the alignment Add appropriate attributes such as number lanes, facility type, context classification, etc. Create turn prohibitors (if needed) Split existing links to provide connection points for new alignment (if needed) Test network connectivity to ensure proper traffic loading
Removing an Existing Alignment	<ul style="list-style-type: none"> Road closure Roadway re-alignment (removing the old alignment) 	<ul style="list-style-type: none"> Delete network links corresponding to the alignment Test network connectivity to ensure proper traffic loading

Special Considerations



Centroid Connectors

- **Reassess** centroid connectors in light of new network coding.
- **New roads** coded into the network may require that nearby centroids be connected directly to them. This is especially true if the new road is intended to improve local access.
- **Split TAZs** will result in new centroids that will need to connect to the network.
- **Changes to land use** may require new centroid connectors to represent connectivity to the network that did not previously exist.
- **Do not** connect centroid connectors directly to intersections. It is sometimes the case that a centroid connector represents a major driveway or local street that functions as an approach to an intersection. In such cases, it is preferable to add a small link to function as the intersection approach and then attach the centroid connector to that.

Transit

- **Splitting or deleting** roadway links can result in a broken transit network.
- Edit highway networks with **transit networks visible** so that disruptions can be anticipated.
- **Transit network coding** is its own special process that deals with additional data types and network elements such as:
 - Transit lines.
 - Transit stops & stations.
 - Non-transit segments such as drive access and walk access links.
 - Operator characteristics.
 - Fares.
 - Etc.
- A **modeler coding** a transit network or transit project should be familiar both with the basic principles of transit modeling and the transit network editing tools of the model software being used.

Running Model Scenarios

When running the model scenarios there are four basic steps that must take place. The order of these steps may change slightly based on whether one's scenarios are assignment-based or demand-based. The differences between these are discussed later in this section. The four steps are:

- **Prepare Scenarios**—This step involves adding the scenarios to the model and ensuring that the proper input files are being referenced for each scenario.
- **Calculate Demand**—This step involves running the model to generate the demand related outputs, especially the vehicle trip tables. These include running the model's trip generation, distribution, and mode choice components. If the model includes a feedback loop, then assignment will be run as well to create the congested skims for feedback.
- **Assignment**—This step involves running the model's trip assignment to create the loaded network. For models with feedback loops, this may also be referred to as the final assignment.
- **Compare Results**—This step involves reviewing the model's outputs for each scenario, comparing the results between the scenarios, and analyzing the differences to draw conclusions concerning the impacts of each scenario. This is discussed more in Chapter 5 of this document.

Modelers are responsible for knowing how to run the model being used for the project. Information on running any particular model should be available from that model's user's guide. If the user's guide was not provided with the model, contact the model owner and request the user's guide.

Parameters Should Not Change Between Scenarios

<div data-bbox="511 1096 570 1163" data-label="Image"> </div> <p>While scenarios require that certain inputs be changed to reflect the intended conditions of the scenario, there are certain aspects of the model that should not be changed. These are the model parameters. Parameters set the behavioral elements of the model and are estimated and calibrated from observed data. Parameters may be adjusted for the model if new data become available, and a recalibration effort is undertaken.</p> <p>Once the parameter values have been established, you must not change them.* All scenarios should use the same parameters. Editing a model's parameters for a particular scenario can yield very misleading results.</p>	<div data-bbox="1015 1094 1304 1163" data-label="Section-Header"> <h3>Examples of Inputs (Change as Needed)</h3> </div> <ul style="list-style-type: none"> • Population. • Employment. • Number of lanes. • Road alignment. • Transit routes and stops. • Tolls, fares, etc. <div data-bbox="998 1413 1320 1482" data-label="Section-Header"> <h3>Examples of Parameters (Do Not Change)</h3> </div> <ul style="list-style-type: none"> • Trip rates. • Model constants and coefficients. • Friction factors. • Speed curves. • Auto occupancy rates. • Volume-delay curves. • Value-of-time.
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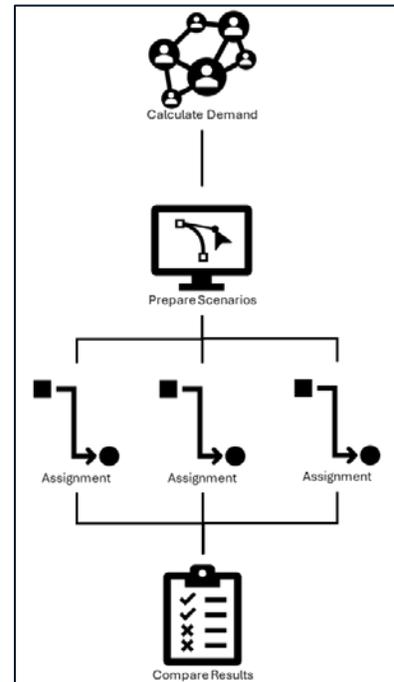
* Some projects may focus on testing "what if" scenarios. These scenarios may want to consider what would happen if travel behavior were to change in unexpected ways. In this case, certain parameters might be changed to reflect these conditions. If this is the case, be sure to clearly document what was changed and why.

Assignment-based Scenarios

Assignment-based scenarios are those that focus on analyzing the **impacts to traffic** from changes to the transportation network. There are projects where the expectation is that while people might alter their routing to get to their destinations, they are not expected to alter their destinations or their likelihood of making a trip. These include projects focused on comparing alternative alignments for a single transportation project or assessing competing transportation projects on an individual basis. If that is the case, then recalculating demand can obscure the relative merits of each scenario. By running an assignment-based scenario, the model analysis can focus solely on the benefits due to the routing choices made for the different alternatives.

When running assignment-based scenarios, the modeler should:

1. Calculate demand up to developing the trip tables for assignment from the baseline.
2. Prepare scenario inputs and set up each scenario.
3. Execute the trip assignment for each scenario using the same trip tables.
4. Compare the results between scenarios.

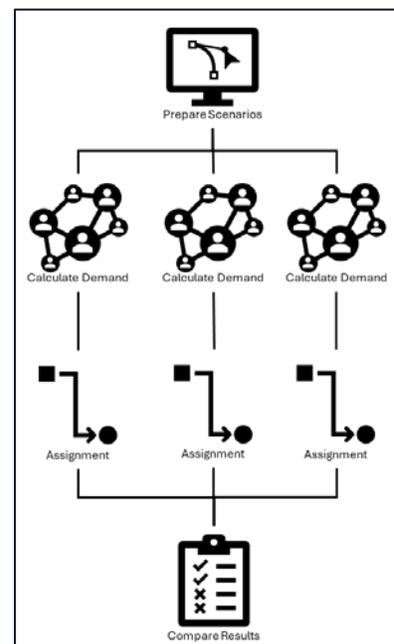


Demand-based Scenarios

Demand-based scenarios are those that focus on analyzing **demand impacts** from changes to the transportation network, land use, or other inputs. There are projects where the expectation is that people will alter their travel making behavior due to the influence of these changes. This typically focuses on changes to the destinations of their trips. More sophisticated models, such as activity-based models, may even allow for changes to the frequency, timing, and purpose of trips being made. In addition to scenarios that are measuring the impacts of changes to land use, policy-oriented scenarios (i.e., those that affect travel costs) and network scenarios that make entirely new travel sheds possible (e.g., building a new river crossing) are also suitable demand-based scenarios.

When running demand-based scenarios, the modeler should:

1. Prepare scenario inputs and set up each scenario.
2. Run the model for each scenario, including:
 - Calculate demand.
 - Execute the trip assignment.
3. Compare the results between scenarios.



Documentation of Methods

Scenario documentation from the perspective of modeling has two basic objectives:

- Document the methodologies used to model the scenarios.
- Communicate the results of each scenario to stakeholders so that they can draw meaningful conclusions and make rational decisions.

Communicating the results of the scenarios will be discussed further in Chapters 5 of this document.

When documenting methods, be sure to document every modification made to the model. Note any errors that you discovered, either with the base model coding or scenario assumptions, and describe how these were corrected. Record all edits made to the network, TAZs, land use data, or any other inputs to reflect the scenario conditions. Describe how these edits reflect the scenario conditions and note any special considerations or stakeholder feedback that may have encouraged that the edits be made a certain way.

The main reason for documenting all changes made when running scenarios is to maintain a high degree of transparency. Stakeholders and other reviewers will need to have confidence that the scenario modeling was done correctly. This means knowing that the results from the scenarios are specifically tied to the changes made to the model and that the changes made to the model reflect only what was necessary to represent the scenarios defined in the project scope. *Failure to properly document all changes made for each scenario can lead to confusion and mistrust with respect to the modeling effort and can undermine the project coordinator's ability to defend the modeling.*

Documentation should be reviewed thoroughly and shared with stakeholders once ready. Specific modeling efforts tied to other guidance may have particular reporting requirements that must be followed. Be sure to familiarize yourself with the reporting requirements and standards relevant to your project such as those represented by the FDOT guidance documents mentioned in Chapter 2.



When preparing the scenario documentation, it is important to remember that the document may be read by individuals without an understanding of modeling. While you should document the technical aspects of the run and any changes made to the model for the scenarios, be sure to also include a summary as well as some narrative that explains the changes in plain language.



The project coordinator should review the scenario model run documentation. When reviewing the document note the following:

- Was the approach taken consistent with the scope?
- Were the changes to the model reasonable and well documented?
- Do the edits made to the model inputs make sense in terms of the scenarios they represent?

*The information provided and explanations given in the documentation should make sense to you even if you do not possess a background in modeling. If something is unclear or does not make sense, ask your modeler to clarify it in the documentation. **If you do not understand it, chances are the stakeholders will not either.***