

Alternatives and Scenario Analysis Procedure

Description

The purpose of this procedure is to provide a consistent methodology for completing and documenting alternative and scenario analysis in comprehensive transportation and long range planning.

Responsibility

*It is the responsibility of the **Project Engineer (PE)** to:*

- *Conduct Alternative and Scenario Analysis*
- *Document the information collected and used to complete the process, the results of the analysis, and the decisions made*

*It is the responsibility of the **MPO, RPO, or local planner** to:*

- *Identify potential transportation solutions*
- *Evaluate alternatives and scenarios*

Scheduling and Time Constraints


As part of the CTP study, the PE will work with the MPO, RPO, and/or local representatives to identify potential transportation solutions based on the land use data and projections, or the agreed upon land use scenarios if multiple scenarios are going to be evaluated. During analysis of these solutions and scenarios, revision to the potential solutions and land use scenario(s) may occur. Further, when certain potential transportation solutions are selected for more detailed alternative analysis, multiple options are studied further. The number of land use scenarios to be evaluated (if applicable) and the number of alternatives studied for particular potential transportation solutions could extend the amount of time needed to complete alternative and scenario analysis.


Procedure



The PE uses the following procedures to conduct Alternative and Scenario Analysis. Refer also to the 'CTP/ MTP Alternative and Scenario Analysis' flowchart for depiction of these steps. Note that documentation of the analysis should occur throughout the process at each step. Indirect and cumulative effects (ICE) may also be part of the decision-making process on land use scenarios and alternatives- refer to the procedures for ICE screening in long range planning for more information.

 = a decision point in the Alternative and Scenario Analysis process

Step	Action
1	<p>Develop potential transportation solutions to address the transportation deficiencies identified previously in the CTP process. These potential solutions are developed for a transportation system that may include all modes (including highway, transit, bicycle, and pedestrian), as appropriate. The solutions may be conceptual in nature initially, and then those that merit further consideration are developed more specifically. They are developed in coordination with local representatives and are based on the agreed upon community vision, knowledge of the transportation needs, known environmental features, and identified constraints/ key priorities (refer to the 'Identify and Evaluate Constraints/ Key Priorities'</p>

	<p>procedure). If multiple land use scenarios have been identified, problems (deficiencies) have been identified for each scenario and potential transportation solutions are developed for each scenario. Document all potential solutions with a minimum of a written narrative description and mapping. Also document reasons why certain transportation solutions were not developed (for instance, no roads were proposed in a certain area due to a particular natural resource or community feature).</p>
<p>2</p> 	<p>Screen the potential transportation solutions, considering the corresponding land use scenario(s), refining each as needed. This screening is conducted based on community vision, knowledge of the transportation needs, and known environmental features, including identified constraints/ key priorities. Document the findings from this screening of the potential solutions, adding to and modifying the documentation from Step 1 as appropriate. If multiple land use scenarios are being studied, ensure the documentation is clear for each land use scenario and the accompanying potential transportation solutions.</p> <p>Consider whether each potential transportation solution is reasonable based on the information from this screening. Following is the “Unreasonableness Criteria” to be used at this stage, as well as later in the evaluation process. With input from local representatives (particularly concerning the community’s vision), decide which potential solutions can be determined to be ‘unreasonable’ to study further and document these decisions.</p> <p><u>“Unreasonableness Criteria”</u> <i>It is Unreasonable if it:</i></p> <ul style="list-style-type: none"> -Fails to meet the community’s vision, -Fails to address the transportation deficiency, OR -Has an unacceptable level of impacts to the natural or human environment. <p>For each potential solution that is determined to be unreasonable, document the criteria that it failed to meet and it does not need to be studied further. Note that there should be a ‘high bar’ for labeling a solution ‘unreasonable’, especially during early stages of analysis. In other words, the solutions determined to be unreasonable should clearly fail at least one of the criteria. While it is not necessary to study further solutions that obviously will not work, it is also important not to eliminate concepts that may be valid. The solutions that are not determined to be unreasonable at this stage carry forward to the next step in the analysis process.</p>
<p>3</p>	<p>Analyze potential solutions and land use scenario(s), modifying and re-evaluating as needed. The travel demand model, or another analysis tool, is typically used at this stage to study the effects of the transportation solutions, given the associated land use scenario(s). The potential solutions and land use scenario(s) are evaluated based on community vision, goals/objectives, MOEs, constraints/key priorities, the transportation deficiencies, and resources identified on the environmental features map. If multiple land use scenarios are being studied, a focus of this stage of the analysis is to evaluate each land use scenario with its associated potential transportation solutions in order to generate sufficient information for the local decision-makers to select a land use scenario (see Step 4).</p> <p>This evaluation process may involve some iteration, with the land use scenario(s) and/or potential transportation solutions being modified and re-evaluated as needed. This iteration may be triggered by information generated from the analysis and/or</p>

	<p>discussion with the local decision-makers, as mentioned in Step 4 below. The land use scenarios and associated potential transportation solutions can be evaluated compared. Document the results of this analysis, using the template for 'Appendix I: Alternatives and Scenarios Studied' in the Minimum CTP Standard Report template.</p> <p>Note: Refer to the following procedures for the development of information used to evaluate potential solutions 'Guidance for Crafting Vision Statements, Goals, Objectives, and MOEs', 'Identify and Evaluate Constraints/ Key Priorities', 'Identify Existing/ Future Deficiencies', and 'Collection and Presentation of Environmental Data' (for the environmental features map development).</p>
<p>4</p> 	<p>Select the draft Land Use Scenario. <i>*Note: This step only applies if multiple land use scenarios are being studied. Otherwise, proceed to Step 5.</i> The draft Land Use Scenario should be selected prior to conducting analysis of the potential transportation solutions in more detail. The information from the scenario analysis in Step 3 is shared with the local decision-makers, either the MPO TAC or the local governing bodies for non-MPO areas. Based on discussion with the local decision-makers, there may be a need to modify the Land Use Scenarios and/or the potential transportation solutions and re-evaluate. However, only major changes should trigger further analysis- it should be explained that the analysis tools are not sensitive enough to produce significantly different findings for minor changes.</p> <p>The decision to select a draft Land Use Scenario should be documented in written form (meeting minutes at a minimum). The documentation should include why the particular Land Use Scenario was selected (and why the others were not chosen). The Land Use Scenario becomes finalized only with the adoption of the CTP, but the expectation is that the selected scenario would be carried forward to adoption. On occasion it may be necessary to modify the land use scenario after this step or re-evaluate it, but only if warranted based on new information or decisions about transportation solutions. For example, if the model runs conducted for the Land Use Scenario decision assumed that a certain major new location facility would be located on one side of a town, but further analysis indicates it should be located somewhere significantly different, such as the other side of town, then the future land use distribution may need to be revised.</p> <p>Note: If the selected draft Land Use Scenario differs from the current locally adopted land development plans there should be a discussion with each local jurisdiction's policy board to ensure there is a consensus to move forward with the draft Land Use Scenario. For non-MPO areas, local land development plans will have to be modified to match the newly agreed upon land use assumptions prior to the CTP being adopted by NCDOT.</p> <p><u>Documentation</u></p> <p>'Appendix I: Alternatives and Scenarios Studied' of the CTP Report should be used to document the scenario analysis. The information included should be sufficient to fully describe which land use scenarios were studied, what data/ information was considered, what potential transportation solutions were associated with each scenario, and why the particular land use scenario was selected for the CTP. Any differences between the selected land use scenario and current land use plans should be described and how they have been resolved.</p>
<p>5</p>	<p>Consider again whether each solution is reasonable and determine for which potential transportation solutions alternative analysis will be conducted. At this point consider again whether each potential solution is still reasonable based on the</p>

 	<p>additional information generated from Step 3. Use the “Unreasonableness Criteria” (listed in Step 2) to decide which solutions, if any, can be determined to be ‘unreasonable’ to study further and document these decisions.</p> <p>Determine for which potential solutions a detailed alternative analysis will be conducted. The following criteria may be used to select potential solutions for detailed study, based on available time and staff.</p> <p><u>Criteria to Select Potential Solutions for Alternative Analysis</u> <i>Based on available resources, solutions should be selected that are:</i></p> <ul style="list-style-type: none"> -Closest to being implemented/funded; -Largest in scope (highway new location & multi-lane widening, and other non-highway major proposals); -Likely to have controversy, is in an environmentally-sensitive area, or may need special study for other reasons.
6	<p>Conduct alternative analysis for each solution selected for detailed study and document findings and decisions. Alternative analysis begins with identifying a broad range of alternatives for each individual potential solution being studied. Development of potential alternatives should consider the possible appropriateness of all modes (highway, transit, bicycle, and pedestrian), be done in coordination with local representatives, and be based on the agreed upon community vision, goals/objectives, MOEs (measures of effectiveness), constraints/key priorities and the resources identified on the environmental features map.</p> <p>The range of alternatives developed should cover varied possible ways to meet the transportation need, but those to be studied in detail should be significantly different in order to limit the total number studied and to get meaningful results from the analysis. In other words, it is not useful to study minor variations on the same alternative. It is reasonable to limit the number of alternatives to be studied to 3 to 6 or so for a given potential solution. Each alternative to be studied should be assigned a unique identifier that corresponds with the Local ID for that potential solution. The unique identifier should not change throughout the CTP/ MTP.</p> <p>For example, for a proposed solution with a Local ID of HARN0001-H, alternatives may be designated as Alternatives A, B, C, etc.</p> <p>Develop an alternatives map to show each alternative for a given potential transportation solution in visual form. Once alternatives to be studied are developed, conduct traffic analysis for each alternative (utilizing the travel demand model or another analysis tool as appropriate).</p> <p>Complete an environmental screening of these alternatives based on the environmental features map(s) previously developed (refer to the ‘Collection and Presentation of Environmental Data’ procedure), including constraints/ key priorities (refer to the ‘Identify and Evaluate Constraints and Key Priorities’). Note that in the CTP GIS Data Layers Spreadsheet, ‘primary’ and ‘secondary’ are designations given to environmental resource GIS layers to indicate a general priority in terms of avoidance and minimization. However, this will vary depending on the area, based on uniqueness and quality of the resources, priorities of local features, and other factors. If there are questions or additional guidance is needed concerning issues related to any specific human and/or natural environmental concerns, the TPB Project Engineer will find the agency contacts identified in the ‘Interagency Coordination Protocol,’ which is the procedure ensuring proper engagement of resource agencies in CTP studies.</p>

Identify and enter the environmental impacts for each alternative in the 'CTP Alternatives Full Impacts Table' tab in the 'CTP Alternatives Impacts Table.xlsx' spreadsheet. This will automatically fill in the 'CTP Summary Alternatives Impacts' tab in the same spreadsheet, to be used in the CTP Report.

In evaluating the alternatives, the 'CTP Alternatives Evaluation Table' can be used to compare options. This matrix shows the following information for each alternative: if the alternative meets the Identified problem(s), if the level of human and natural environmental impacts are unacceptable for each alternative, and whether each alternative meets the community vision and goals

Once the relevant information has been gathered for the alternatives, they are compared and evaluated by the CTP Team (the team conducting the CTP process that is made up of technical staff from various agencies/ governments). This process of evaluation may involve some iteration, during which alternatives may be added or modified and studied further. The CTP Team will help determine which alternatives are recommended as 'unreasonable' and which is recommended to be selected as the 'CTP/ MTP Project Proposal.' These recommendations ultimately are presented to the decision-makers as the Draft CTP is identified and agreed upon (by the TAC in MPO areas, and the local jurisdictions and RPOs in non-MPO areas; refer to the 'CTP Guidance Manual').



To determine which alternatives are 'unreasonable', Use the information from the alternative analysis and coordinate with the CTP Team to evaluate each alternative using the "Unreasonableness Criteria" (listed in Step 2).



Next, coordinate with the CTP Team to determine which alternative should be selected as the recommendation to show on the CTP/ MTP map(s) as the 'CTP/ MTP Project Proposal'. Based on the information from the alternative analysis, the following criteria are used to select an alternative for the CTP/ MTP.

Criteria to Select Alternatives for the CTP/ MTP

The alternative selected as the 'CTP/ MTP Project Proposal' should be the one that best balances:

- Meeting the community's vision,
- Addressing the transportation deficiency, AND
- Minimizing impacts to the natural and human environment.

Documentation

The analysis of alternatives should be documented in 'Appendix I: Alternatives and Scenarios Studied' of the CTP Report, including a map of the alternatives studied, the 'CTP Alternatives Summary Impacts Table' and the 'CTP Alternatives Evaluation Table'. Appendix I should be used to document the alternatives considered, making it clear which alternative was selected as the 'CTP/ MTP Project Proposal,' which are 'Other Alternatives Studied,' and which are determined to be 'Unreasonable Solutions,' or 'Unreasonable Alternatives.' The information about the alternatives should be grouped in these categories (using subheadings to label them) and listed in the following order for each potential solution studied in detail. For example, the Local ID # would be listed followed by subheadings 'CTP/ MTP Project Proposal,' 'Other Alternatives Studied,' 'Unreasonable Solutions,' 'Unreasonable Alternatives.' Following is information about how each of these types of solutions/ alternatives is documented in Appendix I and elsewhere in the CTP Report.

	<p><u>'CTP/ MTP Project Proposal'</u> is the solution/ alternative selected as the recommendation to be shown on the CTP/ MTP map(s). Project proposals are documented in the CTP Report in Problem Statements, the 'CTP Resource Inventory Table', and the 'CTP Inventory and Recommendations Table' (Appendix C). Additionally, the information studied about the proposals is documented in 'Appendix I: Alternatives and Scenarios Studied', including the 'CTP Alternatives Summary Impacts Table' and the 'CTP Alternatives Evaluation Table'. In Appendix I, it should be clearly stated that the alternative was selected to be the one included in the CTP/ MTP and why. (For example, the following type of statement may be used 'Alternative A was selected for inclusion in the CTP as the CTP Project Proposal,' adding the reasoning for the decision.)</p> <p><u>'Other Alternatives Studied'</u> are those alternatives from the alternative analysis not selected as the Project Proposal, but may be considered further in future studies. They are documented in Appendix I, including in the 'CTP Alternatives Summary Impacts Table' and the 'CTP Alternatives Evaluation Table'. Ensure that it is clear that these alternatives may warrant further consideration in future CTP updates and/ or when the project is funded and the NEPA process is initiated. (For example, 'There were no issues identified with Alternative B that made it an unreasonable solution. This alternative may be considered in future studies.')</p> <p><u>'Unreasonable Solutions'</u> are those options considered but recommended for elimination from further study. They are documented Appendix I. For solutions not studied in detail, this documentation may be as simple as describing the type of solution and why it was not considered further. For example, 'No solutions were proposed in a certain area due to a particular natural resource or community feature.'</p> <p><u>'Unreasonable Alternatives'</u> are those options studied as part of alternatives analysis but recommended for elimination from further study. They are documented Appendix I. For these alternatives (studied in more detail than solutions), include all the information that was considered, which may include the 'CTP Alternatives Summary Impacts Table' and the 'CTP Alternatives Evaluation Table'.</p> <p>Ensure that the documentation is clear on why each solution/ alternative is considered unreasonable, citing specific information for at least one of the categories in the 'Unreasonableness Criteria'. (For example, 'Alternative C was determined to be an unreasonable solution during the CTP process due to [fill in information from one of the unreasonableness criteria].')</p> <p>(See also Step 8 for completing documentation).</p>
7	<p>Complete analysis of the potential transportation solutions that were not selected for detailed study and document results. For those potential solutions that did not undergo detailed alternative analysis, use the selected Land Use Scenario to complete the analysis. This analysis may involve modifications to the potential transportation solutions and running the travel demand model, or using another analysis tool, to produce more detailed information on the proposals. Although these potential solutions are not studied in as much detail as those selected for alternative analysis, ensure that the analysis conducted is sufficient to appropriately describe the proposal and provide information about its benefits and impacts. The final model runs should include the alternatives selected as the 'CTP/ MTP Project Proposals' from the alternative analysis process described in Step 6, in order to generate projected traffic for all project proposals. An environmental screening should be done on all project proposals and the 'CTP Resource Inventory Table' completed.</p>

	<p><u>Documentation</u></p> <p>Document the findings from this analysis of the potential solutions, adding to and modifying the documentation from earlier in the process as appropriate. The solutions are documented as 'CTP/ MTP Project Proposals' including Problem Statements for each proposal. Refer to the 'Problem Statement' procedure and 'Problem Statement Guidance' for more information on how to develop Problem Statements. Transportation benefits and other data are also documented in 'Appendix C: CTP Inventory and Recommendations Table' and potential impacts are captured in the 'CTP Resource Inventory Table'. (See also Step 8 for completing documentation of all CTP/ MTP Project Proposals).</p>
8	<p>Complete documentation. Although documentation occurs throughout the alternative and scenario analysis process, after the analysis is complete the documentation should be finalized. Ensure the documentation is thorough and clearly conveys what options were studied, what data/ information was considered, what decisions were made, and why.</p> <p>As mentioned in the previous steps, the following are used to document the Alternatives and Scenario Analysis in the CTP Report (refer also to the 'CTP Standard Minimum Report Template' and the resources listed under the 'Resources and Tools' section of this procedure):</p> <p><u>CTP Report</u></p> <p>Chapter 1 - CTP Resource Inventory Table</p> <p>Chapter 2 - Problem Statements</p> <p>'Appendix I: Alternatives and Scenarios Studied' includes information about the scenarios studied, a map of the alternatives studied, the 'CTP Alternatives Summary Impacts Table,' and the 'CTP Alternatives Evaluation Table'</p> <p>Further documentation may be in the CTP Project File, such as the 'CTP Alternatives Full Impacts Table', and additional mapping or other information. All the CTP/ MTP Project Proposals, combined, form the Draft CTP/ MTP. Refer to the 'CTP Maps – Develop' procedure for direction in creating the Draft CTP Maps.</p>

Policy, Regulatory, and Legal Requirements

National Environmental Policy Act (NEPA)

State Environmental Policy Act for North Carolina (SEPA)

Resources

- Interagency Coordination Protocol
- Minimum CTP Standard Report Template- Appendix I: Alternatives and Scenarios Studied
- Problem Statement Procedure and Problem Statement Guidance
- CTP GIS Data Layers spreadsheet (S:/Shared/TPB Reference/Comprehensive Transportation Plan/CTP GIS Data Layers.xls)
- CTP Resource Inventory Table
- CTP Alternatives Impacts Table (Full and Summary)
- CTP Alternatives Evaluation Table

Approved: _____

Revised: _____

Version X

Background

Prior to alternative and scenario analysis, the community vision, goals and objectives, and measures of effectiveness have been developed and documented for the planning area. The environmental features map has been developed and the area's transportation deficiencies have been identified. If multiple land use scenarios are going to be evaluated, the land use scenarios to be tested have also already been developed. As part of alternative and scenario analysis, conceptual transportation solutions will first be identified. If multiple land use scenarios are being studied, these potential solutions will be studied in combination with the possible land use scenarios in order to select a draft land use scenario. Alternative analysis will then be conducted on specific solutions identified for further study. These draft solutions and alternatives, combined with the draft land use scenario, become the Draft CTP.

Record of Revision

The information contained in this procedure is deemed accurate and complete when posted. Content may change at any time without notice. We cannot guarantee the accuracy or completeness of printed copies. Please refer to the online procedure for the most current version.

Version	Section Affected	Description	Effective Date