A GUIDEBOOK FOR EVALUATING THE INDIRECT LAND USE AND GROWTH IMPACTS OF HIGHWAY IMPROVEMENTS

Final Report
SPR 327

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Final Report

SPR Project 327

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April 2001

Technical Report Documentation Page

Report No. FHWA-OR-RD-01-16	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle A Guidebook For Evaluating the Indirect Land Use and Growth Impacts of Highway Improvements: Final Report		5. Report Date April 2001 6. Performing Organization Code
7. Author(s) Terry Moore, ECONorthwest Tom Sanchez, Portland State University		8. Performing Organization Report No.
9. Performing Organization Name and Address Portland State University Center for Urban Studies College of Urban and Public Affairs Portland, Oregon 97207-0751 ECONorthwest Suite 400 99 W. 10th Avenue Eugene, OR 97401-3001		10. Work Unit No. (TRAIS) 11. Contract or Grant No. SPR 327
12. Sponsoring Agency Name and Address Oregon Department of Transportation Research Group 200 Hawthorne SE, Suite B-240 Salem, Oregon 97301-5192 and Federal Highway Administration Washington, D.C.		13. Type of Report and Period Covered Final Report 14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

In 1998, the Oregon Department of Transportation undertook a study of the impacts of highway capacity improvements on land uses and growth, particularly at the urban fringe. The objective was to better understand the "cause and effect" relationships among highway capacity, travel demand and development patterns. A variety of factors to resulting growth were evaluated for their ability to predict growth. Case studies of six communities provided an in-depth understanding of the pressures which drive development decisions and land use change.

This guidebook provides guidance to ODOT staff for completing environmental analysis and documentation on indirect land use impacts of highway improvements, based on findings of the study. One finding was that most highway capacity increases do not cause development to be dramatically different from local land use plan guidance, or from what would have occurred in absence of the highway improvement. In Oregon, local governments hold the tools to determine development patterns, using zoning and public utilities such as water, sewer and roads.

This guidebook is not a directive, but a compilation of recommendations for a systematic look and consistent approach to predicting the indirect land use impacts of highway improvements. Appendices A-F of this report provide background on the study findings, including the literature review, growth trends analysis and six in-depth case studies. Also included in the appendices are a discussion of population and employment forecasting issues and a summary of ODOT processes for project evaluation.

Published as two documents: Final Report and Appendices

17. Key Words environmental impacts, indirect impacts, EIS, land use, transportation, growth analysis, forecasting, development		18. Distribution Statement Copies available from NTIS	
19. Security Classif. (of this report). Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 58 + appendices	22. Price

Technical Report Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

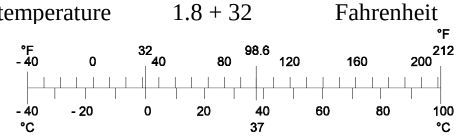
SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
In	Inches	25.4	Millimeters	Mm
Ft	Feet	0.305	Meters	M
Yd	Yards	0.914	Meters	M
Mi	Miles	1.61	Kilometers	Km
		AREA		
in^2	Square inches	645.2	millimeters	mm^2
ft^2	Square feet	0.093	meters squared	M^2
yd^2	Square yards	0.836	meters squared	M^2
Ac	Acres	0.405	Hectares	Ha
mi^2	Square miles	2.59	kilometers squared	Km^2
		VOLUME		
fl oz	Fluid ounces	29.57	Milliliters	ML
Gal	Gallons	3.785	Liters	L
ft^3	Cubic feet	0.028	meters cubed	m^3
yd^3	Cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
		MASS		
Oz	Ounces	28.35	Grams	G
Lb	Pounds	0.454	Kilograms	Kg
T	Short tons (2000 lb)	0.907	Megagrams	Mg
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5(F-32)/9	Celsius temperature	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	Millimeters	0.039	inches	in
m	Meters	3.28	feet	ft
m	Meters	1.09	yards	yd
km	Kilometers	0.621	miles	mi
		AREA		
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
ha	Hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
		VOLUME		
mL	Milliliters	0.034	fluid ounces	fl oz
L	Liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
		MASS		
g	Grams	0.035	ounces	oz
kg	Kilograms	2.205	pounds	lb
Mg	Megagrams	1.102	short tons (2000 lb)	T
		TEMPERATURE (exact)		
°C	Celsius temperature	1.8 + 32	Fahrenheit	°F



* SI is the symbol for the International System of Measurement

(4-7-94 jbp)

ACKNOWLEDGEMENTS

The Center for Urban Studies at Portland State University (PSU) was the prime contractor for the overall study. ECONorthwest, as a subcontractor to PSU, was the primary author of this guidebook. Terry Moore and Bob Parker of ECONorthwest were the authors of Chapters 1 through 4, and Appendices D, E, and F. Dr. Tom Sanchez of PSU was the primary author of Appendices B and C (with assistance from Dr. Tony Rufolo). Moore and Sanchez jointly wrote Appendix A.

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Staff at the cities of Albany, Bend, Corvallis, Grants Pass, Island City, and McMinnville contributed to the case studies, as did ODOT staff and focus group participants in each.

DISCLAIMER

A GUIDEBOOK FOR EVALUATING THE INDIRECT LAND USE AND GROWTH IMPACTS OF HIGHWAY IMPROVEMENTS

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1.0 INTRODUCTION

1.1 WHAT IS THIS DOCUMENT?

This document is a guidebook, written for a technical audience [primarily planners and environmental specialists at the Oregon Department of Transportation (ODOT)] to assist them in describing and estimating the potential indirect impacts of highway improvements on land use. This book offers guidance; it does not represent ODOT policy on evaluating indirect land use impacts. It is expected that this guidance will be tested and modified by ODOT staff to meet specific needs of different parts of the organization.

1.2 WHY THIS GUIDEBOOK?

The public's expectation for good decision making by state agencies investing public funds, coupled with federal and state requirements regarding what must be included in that decision making, require that ODOT study the impacts of possible highway improvements before building them. Many improvements include federal funding and are of a type and size that environmental impact analysis is required. Even when a formal Environmental Impact Statement (EIS) or Environmental Assessment (EA) is not required by federal law, Oregon's land use and transportation policies require some type of evaluation.

The process ODOT uses to identify, specify, and evaluate potential transportation projects has many steps. For highway projects, the process is guided by the Oregon Highway Plan and other statewide transportation planning policies. Transportation systems plans (TSPs) and management system analysis provide guidance for identifying potential projects.

Once a potential project is identified, ODOT conducts a preliminary assessment by having regional offices prepare a project prospectus that not only describes potential impacts, but also recommends a project classification (which determines the level of additional evaluation that the project requires).[1] ODOT's evaluation process is iterative: the further a project moves from conception to implementation, the greater the standards for evaluation.

Though this guidebook is aimed primarily at the most detailed level of evaluation (i.e., an evaluation of indirect land use impacts as part of an EIS), it can also be used for the more cursory analysis that occurs in a project prospectus.

The potential impacts of a transportation improvement are multiple. A project's primary benefits are transportation benefits, which are primarily the creation or maintenance of travel benefits (e.g., savings in travel time, improvements in safety). This guidebook often refers to these

[1] Appendix F describes the ODOT project selection and review process.

improvements in travel performance as increased accessibility, which means that the movement between two places has become less costly (in money or time).[2]

But there are other benefits and costs that occur during construction and operation, which include environmental, social, economic, and fiscal impacts. Moreover, all benefits and costs do not affect all individuals or groups equally: the distribution of impacts is also important for decision making. The purpose of a project assessment is to identify all the significant impacts and to quantify them where possible, to assist policymakers and the public they represent in evaluating tradeoffs and determining a preferred course of action.

Among the impacts that a highway improvement can have are those on land use. For example, land use patterns clearly changed after the construction of Interstate 5 through the Willamette Valley. Some of the traffic that previously flowed through the downtowns of Eugene and Salem moved to their edges; through-traffic in small cities on Highway 99 decreased; new interchanges in what were previously grass fields became locations for highway-related development.

The purpose of this guidebook is to help ODOT staff describe and estimate how the highway improvements could <u>indirectly</u> affect land uses.[3] The intent of this guidebook is to provide evaluation techniques that are practical to apply, given typical limitations imposed by scarce data, short deadlines, and small budgets for evaluating multiple impacts.

1.3 HOW TO USE THE GUIDEBOOK

Given the focus on practice and application, the guidebook is organized in a way that allows the user to get quickly to the recommended evaluation techniques, and puts supporting data in the background (see Appendices). Users of the guidebook may refer to the appendices that provide more detail about the research that led to the recommended techniques, variations on those techniques, and their limitations. The guidebook is organized as follows:

Chapter 2: A framework for evaluating the indirect impacts of highway improvements on land use. This chapter covers several topics that provide context for the evaluation techniques, including (1) types of questions this guidebook is trying to address, (2) definition of terms (and the ambiguity of the professional literature about some of those definitions), and (3) implications for the choice of evaluation methods in Chapter 3.

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[2] The Guidebook tries to be consistent in distinguishing the term "accessibility" from "access" and "mobility." *Access* is often used narrowly by transportation planners and engineers to mean a new road, interchange, or curb cut that gives a property a better connection to the transportation system than it had before. Better access is one of several ways to increase *accessibility*: the ability to get to a destination of interest or, more generally, to engage in an activity of interest. *Mobility* is often used by transportation planners to mean the ability to move faster or to more places, with the distinction being a subtle one: more movement does not necessarily mean that travel costs are reduced if origins and destinations become more distant.

[3] The distinction between "indirect" and "direct" impacts is explained later in the report. As a rough approximation, direct impacts are changes in land use that occur in the short run as a result of right-of-way acquisition and construction. Indirect impacts are nearby or longer term changes that result from the travel improvements a project provides when it is completed.

Chapter 3: Steps for evaluating the indirect impacts of highway improvements on land use. This chapter draws from the research conducted as part of this project to provide practical steps that ODOT can use to evaluate the indirect land use impacts of transportation improvements.

The evaluation steps recommended in Chapter 3 derive from several sources: (1) a literature review on the interaction of transportation and land use, and an evaluation of federal requirements for project evaluation and Oregon law and planning practice; (2) a statistical evaluation of 20 Oregon cities that examined observed changes in land use patterns (based on a comparison of historical and current aerial photographs; (3) case studies of six highway projects in six different Oregon cities; and (4) discussion and refinement by the Technical Advisory Committee.

Chapter 4: Sample analysis and report. This chapter presents, in two parts, an example of how an evaluation of indirect land use impacts could be conducted and reported. The first part, the Analyst's Notebook, is an example of what an analyst should do to complete the evaluation steps. The second section provides an annotated outline of a sample report generated by the analyst.

Appendix A: Overview of the project research. Appendix A provides a description of the methods and results of this project.

Appendix B: Literature review. Appendix B summarizes key articles and reports, providing an overview of how researchers believe transportation affects land use. This literature review provides a summary that can be referenced by ODOT staff when evaluating the land use impacts of highway improvements.

Appendix C: Growth Trends Report. This appendix contains the results of the Geographic Information System (GIS) based evaluation of development patterns over a 20-year period in 20 Oregon cities.

Appendix D: Case Study Report. Appendix D summarizes the six case studies (Albany, Bend, Corvallis, Grants Pass, Island City, McMinnville) conducted as part of this project.

Appendix E: Population and Employment Forecasting Issues. This appendix describes some of technical problems an analyst faces with respect to the forecasts that drive estimates of travel demand and impacts.

Appendix F: ODOT Process for Project Evaluation. Appendix F provides an overview of how ODOT identifies, specifies, and evaluates projects as they move from preliminary ideas, to serious alternatives, to implementation.

2.0 A FRAMEWORK FOR EVALUATING THE INDIRECT IMPACTS OF HIGHWAY IMPROVEMENTS ON LAND USE

There is no debate about whether highway projects in the U.S. have, at some time in some place, had impacts on land use. Appendix B summarizes some of the key sources for this conclusion. But though the literature on the effect of transportation infrastructure on the development of land is large, it reaches few definitive conclusions and provides little empirical guidance for the project-specific evaluations that ODOT planners must conduct.

2.1 TRANSPORTATION CAN HAVE IMPACTS ON LAND USE

The fact that in the past, in some places, for some type and scale of projects, highways have had impacts on land use, does not provide a basis for assessing the effects of a specific project today. Today's transportation projects are usually small improvements to part of a large and ubiquitous network of highways and streets. Fifty (or even 30) years ago one could find new highways (e.g., the interstate system) that vastly increased access to large areas of land. Now, most places in urban areas in Oregon already have paved roads, and large ODOT highway projects opening up new areas to development are rare. Typically, projects are improvements to existing highways; improvements that are usually less than a few miles long, provide marginal improvements in safety and travel time, and usually provide no new access.

Thus, any single highway project is likely to have a proportionately smaller effect on travel, congestion, and land use than a similar-sized project would have had 20 years ago. Moreover, so much transportation and land development has occurred that it is difficult to make a clear determination of what is causing what: Is land use responding to the highway network, or are current highway improvements a response to transportation problems that are a result of development and settlement patterns? In Oregon the interrelationships are, if anything, stronger than in many other places, because transportation plans must conform to local land use plans that are based on statewide planning goals.[4]

There may still be occasional projects that provide substantially improved access to large areas (such as the Western Bypass in Washington County, if it had been constructed), but they are

[4] First causes are hard to find. With respect to the issue of whether land use plans provide the direction and impetus for transportation improvements (by allowing and accommodating growth in certain locations), one could note that when local governments adopted and updated their land use plans, they looked at where roads were and where they would be able and likely to go. In that sense, the prior and expected road investments influenced the *plan* for future land development. If the plan then influenced development, as Oregon law says it should and most planners believe it does, then the logical inference is that land use in Oregon today would be different if ODOT and local governments had made different highway investments. How far back should an analyst follow the causal linkages? This guidebook recommends that analysis begins at current conditions and identifies variables that will have primary impacts on future land use. From that perspective, Oregon land use plans clearly have an influence on where transportation improvements can go and the extent of the impacts they can have on land use.

increasingly rare. There is good evidence that the "leading" role of highway improvements has diminished as interstates have been completed, urban areas have matured, and urban road networks have come to serve all parts of metropolitan areas.

In the context of this guidebook, the key points are:

- There is substantial agreement that transportation improvements *can* directly or indirectly affect land development.
- Because (1) the network of highways in urban areas is now extensive, (2) the interstate system is largely completed, and (3) ODOT projects predominantly provide improvements in safety and small improvements to overall travel time (and, thus, small improvements in accessibility), the indirect impacts on land development of many future improvements to state highways could be small.

The purpose of this guidebook is to provide methods to allow ODOT staff to make judgments about the extent of the indirect impacts on land use of different types of highway improvements.

2.2 WHAT ARE "INDIRECT" LAND USE IMPACTS?

For a transportation agency to decide whether an improvement is worth doing, it must assess the benefits and costs. A concern of agencies both in Oregon and nationally[5] is that the direct costs of highway improvements (the costs of construction, operation, and maintenance) understate, perhaps significantly, the full costs to society. For example, road construction may lead to environmental damage that is not mitigated; it may enable more driving which may increase air pollution; it may divide neighborhoods and create costs far in excess of those of acquiring land, compensating displaced businesses and building the project. It may also have countervailing benefits: for example, it may reduce air pollution by eliminating traffic bottlenecks, or may provide new opportunities to economically lagging areas. These are indirect impacts.

Any highway improvement that ODOT proposes must be justified. ODOT completes an informal or formal project assessment; for major projects the assessment is done as an Environmental Impact Statement (EIS) or Environmental Assessment (EA). In such assessments the term "environmental" is used broadly to refer to all types of project impacts (including, for example, land use, social, economic, and financial impacts), and the distribution of those impacts (who gets impacted).

2.2.1 Regulatory Definitions

The National Environmental Policy Act of 1970 (NEPA) requires an EIS evaluation to distinguish between direct impacts and indirect impacts. The distinction between direct impacts and indirect impacts is important, because this guidebook evaluates only the indirect impacts of transportation on land use.

[5] For example, Federal Highway Administration, Federal Transit Administration, Environmental Protection Agency, ODOT, Oregon Department of Environmental Quality, Oregon Department of Land Conservation and Development.

The NEPA, as amended, is the federal statute most relevant to the assessment of indirect impacts. The NEPA, however, does not include any specific references to indirect impacts. The Council on Environmental Quality (CEQ) clarified the meaning when it issued its NEPA regulation in 1978. The CEQ says direct effects "…are caused by the action and occur at the same time and place." Indirect effects "…are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." Moreover, indirect effects "…may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." The CEQ differentiates direct and indirect effects from the term cumulative impact. A cumulative impact "…is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…" *(CEQ 1986).*

Because ODOT projects often use federal funding, and must comply with federal environmental regulations, it is worth discussing aspects of CEQ definitions and requirements. First, though NEPA is based on a concern about "adverse" environmental impacts, it is clear that impacts can be either positive or negative, and that both are important for decision making. Part of the problem is that "positive" and "negative" with respect to indirect impacts are value judgments. Some people may welcome induced growth while others oppose it. This guidebook aims to help analysts describe what it possible or likely, without classifying the outcome as good or bad.

Second, the definition of indirect impacts refers to impacts that are "reasonably foreseeable." This definition is problematic because reasonably foreseeable is not clearly defined. One can reasonably foresee, based on the information provided in this guidebook, that a transportation project could have an impact on growth. The likelihood of that impact, however, for a specific project under evaluation, may be small (not probable), yet no guidance exists on determining what is reasonably foreseeable, and how the evaluation should measure impacts. If a "threshold" is not met, does that mean that there is no need to discuss the potential indirect impact?

The Federal Highway Administration (FHWA) also provides guidance on conducting an environmental review of transportation projects. That guidance refers to the need to discuss "secondary" impacts, induced development and adverse effects. It does not specifically address indirect impacts, and provides little that goes beyond CEQ definitions regarding the evaluation of indirect land use impacts. *(FHWA 2001).*

2.2.2 Guidance from Literature

The literature on defining and measuring different impacts from transportation is well summarized and evaluated in a study published by the Transportation Research Board, "Guidance for Estimating the Indirect Effects of Proposed Transportation Projects" (henceforth, TRB Report 403) *(Berger & Associates 1998).* The rest of this section draws on that report.

2.2.2.1 Direct, Indirect, and Cumulative Impacts

According to the CEQ definitions, the distinction between direct and indirect impacts is made on four dimensions: **time, space, probability, and causality**. Direct impacts of a project happen sooner, closer, and with more certainty than indirect impacts. Indirect impacts may be caused not directly by the project, but by intervening factors that are affected by the project. Indirect impacts typically occur away from transportation alignments and in the future (but they also occur along an alignment or in anticipation of a project). Indirect impacts typically occur through the action of an intermediary, usually a household or business, acting in response to anticipated or actual changes in transportation system performance.

A good example of a direct impact on land use of a highway project would be acquisition of land for right-of-way. The land use change (from, say, residential to transportation right-of-way) (a) happens at the time of the project (the project cannot be started without the land use change), (b) is close to the project (it's in the right-of-way), (c) is certain, and (d) is caused directly by the highway project.

As an example of an indirect impact, consider the assertion that a highway project that improves travel time to a central city will eventually cause a surrounding county to re-zone undeveloped land near, but not adjacent to, the project for residential development. The causal link is much more tenuous (at least not adjacent, and perhaps over a mile away) than the prior example. The purported impact is (a) not expected for many years, (b) distant from the improvement, (c) uncertain (it may happen, or not), and (d) the result of intervening forces (the highway project affects travel time, which affects land value, which may encourage property owners and developers to petition for zone changes, which would allow more residential development in outlying areas). These time, space, probability and causality characteristics are the ones that define it as an indirect impact.

These examples clarify why research that analyzes indirect impacts is difficult: the distinctions are multi-dimensional and continuous. There is no obvious point along the continuum at which an indirect impact can be predicted with certainty. Moreover, the distinction between indirect and cumulative impacts can blur as one considers longer term impacts. The literature refers to indirect impacts in a number of ways: not only as indirect, but also as external or secondary, and often (either as a synonym or subset) as induced or cumulative. Following are the conclusions of this study with respect to these terms from TRB 403*:*

- **External impacts** are described primarily by economists and are not commonly used with analysis of transportation impacts.
- **Secondary impacts** are generally synonymous with indirect impacts.
- **Induced impacts** have various definitions, depending on who is using the term. As applied to land use impacts in transportation evaluation, induced impacts are synonymous with indirect impacts: they are removed in time and space from the direct impacts of the transportation project on land use. Induced impacts are most often cited when discussing how a transportation project might contribute to population, land development, or property values growing more quickly than they would have otherwise (what CEQ regulations refer to as “growth-inducing effects”). CEQ definitions imply that induced impacts are a sub-set of indirect impacts. This guidebook does not distinguish induced impacts from indirect impacts.

- **Cumulative impacts** are not difficult to define in theory and in general, but they are hard to measure in practice. In concept, the analyst should consider not just the marginal impacts of a proposed highway transportation project, but the collective impacts of all transportation projects and other actions, public and private, that are past, present or reasonably foreseeable. The premise is that impacts can accumulate to become more than the sum of their parts; that there are thresholds which, once crossed, cause incremental impacts to be greater than a linear extrapolation would predict. Some analysts assume a broader definition; one that counts as cumulative any effects that accrue over time, even if they are linear. For example, the marginal impact on the existing transportation system of adding one new office development may be small, but if many such developments are added, the small impacts sum to a big one.[6] This guidebook does not address methods for evaluating cumulative impacts.

TRB Report 403 concludes that "…there is no clear, common definition of the term indirect effects beyond that in the CEQ regulation," which defines how federally required EIS analyses are to be conducted. Table 2.1 summarizes definitions for direct, indirect and cumulative impacts. This guidebook generally accepts these distinctions between direct and indirect impacts, and focuses on the indirect impacts.

Table 2.1: Summary of Definitions

Type of Effect	Direct	Indirect	Cumulative
Nature of effect	Typical/inevitable/ predictable	Reasonably foreseeable/ probable	Reasonably foreseeable/ probable
Cause of effect	Project	Projects direct and indirect effects	Projects direct and indirect effects, and effects of other activities
Timing of effect	Project construction and implementation	At some future time after direct effects*	At time of project construction* or in the future
Location of effect	At the project location	Within boundaries of systems affected by project	Within boundaries of systems affected by the project

Source: TRB Report 403, page 58 *(Berger & Associates)*.
* indirect and cumulative effects could potentially occur before the project is built (i.e. speculators requesting land use actions in anticipation of project construction).

[6] In practice, describing the cumulative impacts of a transportation project on land use is not only difficult, but potentially inconsistent with other parts of an evaluation. The analyst is to describe how a highway improvement could, when combined with other improvements and other public and private activities, affect land use. But if events are foreseeable, then logically they should already be incorporated into population, employment and travel demand forecasts that are the basis for assessing land use change. If that is true, then the typical procedure of describing cumulative impacts as additional is potentially a "double count." No reports that were reviewed address this issue: they implicitly assume that cumulative impacts go beyond those of the base analysis. Thorough analysis of cumulative impacts occurs only with sophisticated modeling efforts, typically beyond the work done for most EAs and EISs. The ODOT and MPO travel models attempt to evaluate these types of impacts which are not usually assessed in detail for individual projects.

2.2.3 Defining Land Use

For this guidebook to discuss indirect land use impacts, it must be clear not only about what "indirect" means, but also about the meaning of "land use." At a superficial level, the definition seems self-evident: land use impacts are changes in how land is used, that are caused directly or indirectly by a highway improvement. But land use impacts can blend with environmental and economic impacts.

Consider changes in population and employment growth. Though not land use changes per se, they are clearly drivers of land use change and development. Population and employment growth may demand new or rehabilitated space, leading to land development or redevelopment, which is a land use impact. So, if a highway project has an impact on a business by changing the performance of the transportation system, and that change in performance affects business profitability, and that change in profitability gets capitalized (to a greater or lesser degree) into property values, which then stimulates changes in land use, the analyst juggles several measures of impacts to find an overall measure of all those effects for the impact report. To some extent, these effects are described and analyzed in a project's socioeconomic analysis. The goal is to be able to describe how a highway improvement will contribute to changes in the use of land (the pattern of development) from what it would have been without the highway improvement.

In summary, this guidebook uses these definitions:

- **Direct land use impacts** occur in the short-run (usually during construction, as residences and businesses are displaced) and adjacent to transportation improvement. These impacts are typically covered in the Right-of-Way Report of an EIS or EA.
- By definition, **indirect land use impacts** are the longer-run and wider-spread changes to development patterns and comprehensive plans that are *induced* by the transportation improvement.

2.3 EVALUATION OF METHODS FOR ASSESSING LAND USE IMPACTS

As part of this study, we reviewed several reports that define methods for evaluating indirect land use impacts. Key resources are summarized in the literature review in Appendix B. In addition, the state transportation departments for Washington, Idaho, California, Nevada and Arizona were contacted to see what procedures they employ for assessing indirect land use impacts from highway improvements. All stated such assessment posed problems, but only California had implemented formal procedures/guidelines for assessment purposes. We found the most comprehensive source on methods to be TRB Report 403. The next chapter describes how we adapted the general methods described in that report for estimating all types of indirect impacts to the task of this study: estimating indirect land use.

3.0 STEPS FOR EVALUATING THE INDIRECT IMPACTS OF HIGHWAY IMPROVEMENTS ON LAND USE

This guidebook assumes that though indirect land use impacts are potentially associated with any highway improvement, they are more likely to be significant for some types of projects than for others. It provides steps that allow the analyst to reach a conclusion about the potential severity of the impacts and the corresponding appropriate level of evaluation.

This chapter gives ODOT staff guidance on the kind of information to collect, and how to proceed from that information to a conclusion about indirect land use impacts.

The analyst's overarching objectives are (1) to collect information about factors that are most likely to influence future land development patterns, and (2) to make a defensible estimate of the probable magnitude and direction of change in development patterns (i.e., of indirect land use impacts). This estimate is based on the expected changes in the factors associated with the proposed transportation improvement.

Several types of data may be useful in identifying indirect land use impacts. The case studies for this guidebook showed that, at a minimum, an evaluation of indirect impacts must provide some description of:

- Socioeconomic conditions (population, and employment by sub-area and household characteristics)
- Land use patterns (location, type and extent of land development in the study area, vacant land, building permits by type and location, development capacity)
- Transportation system characteristics [traffic volume, volume-to-capacity (v/c) ratios, planned improvements]
- Public services (primarily the availability of water and sewer connections and capacity)
- Public policy (land use plan designation and zoning, economic development, development fees, etc.)

These data will characterize existing socioeconomic conditions and land uses in the study area and the policies that govern future development.

3.1 CONTEXT FOR THE EVALUATION OF INDIRECT LAND USE IMPACTS

An evaluation of indirect land use impacts typically will be part of a larger project evaluation. In most cases, ODOT will not evaluate indirect land use impacts at the level of analysis described in this guidebook unless the ODOT project is large enough to require an EIS (or in some cases an EA).[7] There will be a lot of base data already being collected – information that the land use analyst should be able to get by coordinating with others working on the project evaluation. For example, an EIS for a transportation project will include the following elements:

- Project description
- Population and employment forecasts
- Travel demand forecasts
- Information on other types of impacts (e.g., environmental, right-of-way, economic, social, and direct land use impacts)

It is possible that not all the information listed above will be available at the time the land use analysis is being completed. The project description and alternatives provide the context for the impact analysis and will generally be substantially refined by the time work on the various technical reports begins. But because work on the technical reports typically occurs concurrently, data that may be relevant to the land use report from other technical components of the analysis may not be available.

Population, employment, and travel demand forecasts for "build" and "no-build" alternatives (actions) are critical for land use analysis. This issue is important because (1) indirect land use impacts are driven by changes in travel performance, and (2) travel performance is typically estimated on larger projects using travel demand models, and (3) travel demand models require, as basic inputs, forecasts of population and employment for different alternatives. It will be difficult to describe indirect impacts without these forecasts for the "build" and "no-build" scenarios; so a first step for the land use analyst should be to find out their status. If they are not complete, the analyst should do what is possible to move them forward, or reschedule the evaluation of indirect land use impacts until forecasts are available, at least in draft form. Coordination and consistency with those other components of the evaluation is critical to the quality of the analysis of indirect impacts and to the efficiency with which is it produced.

A related point: land use is a subset of the total project impacts that NEPA and CEQ guidelines require be evaluated. It is a relatively small component of a full project evaluation and final documentation. Moreover, indirect impacts are a subset of all land use impacts. Thus, the analysis of indirect land use impacts probably will not be more than a few pages long if the project, base data, and all types of relevant impacts are going to be described in an EIS report that is 50 to100 pages long. The analysis will be longer if the project is large enough to require a land use technical report, which would address both direct and indirect land use impacts. Such reports range in size from roughly 30 to 60 pages.[8] Most of a land use technical report describes historical data, existing conditions, and discussion of impacts under the no-build and build alternatives. The rest of this chapter provides guidance on how to do a better job of analyzing

[7] As noted earlier, a preliminary evaluation of land use impacts may occur as part of preparing a project prospectus, but that analysis would be less detailed than what is described in this chapter. Appendix F explains how the process in this chapter might be reduced for a less detailed analysis that might be used for a project prospectus.

[8] It would be hard to provide base data, forecasts, and a description of different impacts for different alternatives in less than 20 pages; more than 100 suggests too much description, and not enough synthesis and editing.

indirect impacts in a land use technical report; if the project is too small to require a separate land use report, the same ideas still apply, but the analysis is less detailed.[9]

3.2 ANALYTICAL OPTIONS

The analysis of indirect land use impacts in an EA or EIS is intended to describe how land use will be different under at least two alternatives: one with the proposed transportation improvement (build), and one without it (no-build). The analyst should investigate what happened in the past so he/she can better understand current patterns and suggest more "authoritatively" what could happen in the future.

There are two general categories of forecasting techniques:

1. Projection of a trend. One extrapolates from historical data by means that are mathematical (e.g., regression), graphic (e.g., trend lines), or descriptive (e.g., case studies). Projection need not mean that past trends are future trends: adjustments can be made for expected changes in demographics, market conditions, or public policy. All of these techniques require the collection and evaluation of local data.

2. Reliance on the findings of other studies. One can get this type of information through a formal literature review, interviews of experts, and so on.

This guidebook has used both of these techniques in an attempt to assemble information in a way that ODOT staff can use it with a minimal amount of additional research. The hope is that ODOT staff will turn to this guidebook for not only a list of factors that affect future land use patterns, but also to estimate the magnitude of effects one could expect for different values of those factors. These estimates could then be applied, with adjustment based on local conditions and professional judgment, to a specific transportation improvement.

3.3 RECOMMENDED EVALUATION STEPS

This section describes the steps recommended for an ODOT planner who might have to evaluate the indirect land use impacts of a pending ODOT project. The recommended steps could be iterative in some instances. For example, land use and transportation data gathered in Step 4 might imply a change in the study area for indirect impacts defined in Step 2.

The process is shown in Figure 3.1.

[9] See Appendix F.

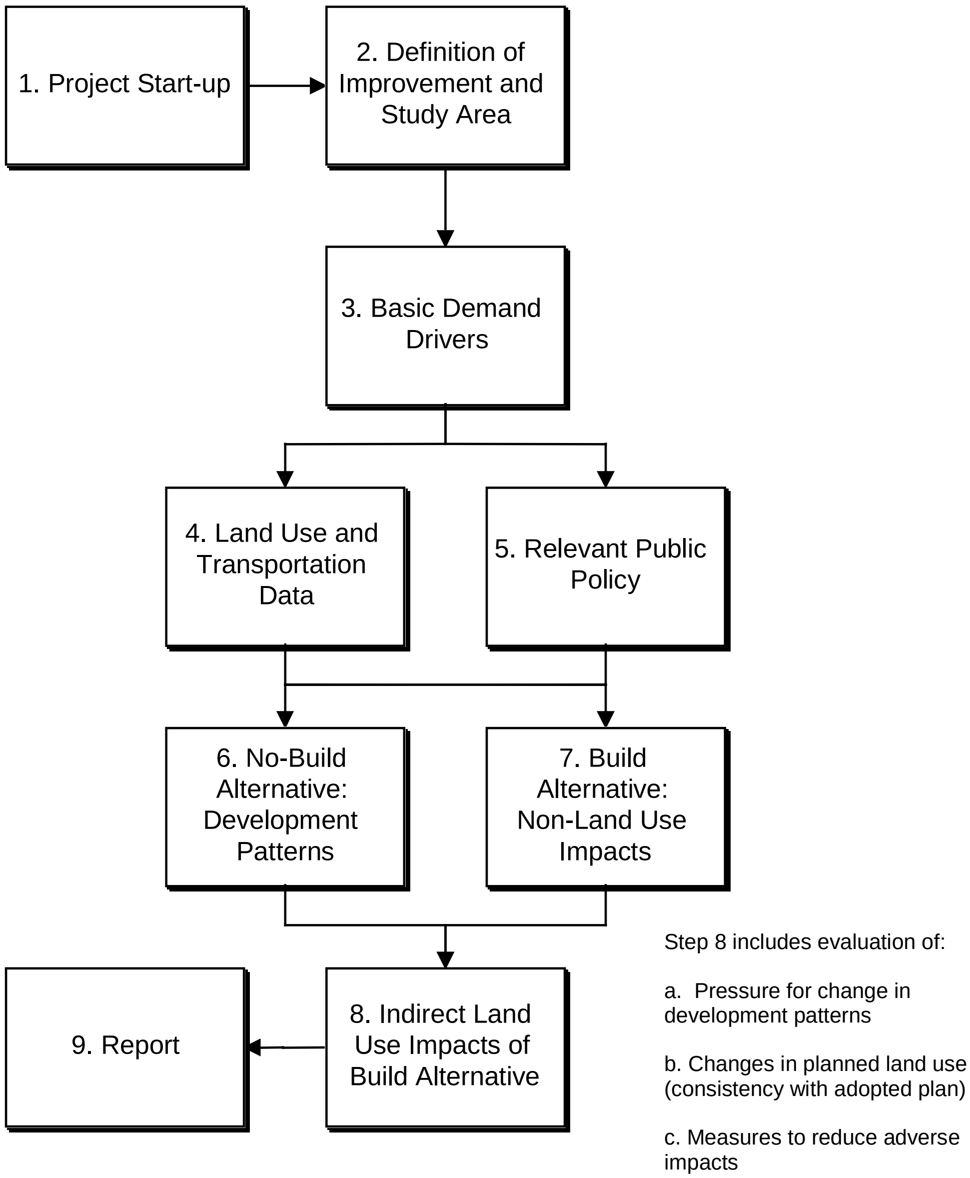

Figure 3.1: Recommended Evaluation Steps

STEP 1. GET INTEGRATED INTO THE PROJECT EVALUATION EARLY

Before a project gets to environmental review, ODOT staff complete a project prospectus form which provides a compilation of project information, including a preliminary evaluation of environmental impacts. This preliminary "scoping" stage does not explicitly include a preliminary evaluation of indirect land use impacts. If possible, getting involved in the project at this point would be beneficial if the project requires an EIS or EA. The ODOT project development and evaluation process, including a copy of ODOT's project prospectus is described in Appendix F.

If the project is big enough to warrant a detailed evaluation of indirect land use impacts, it will probably require an EIS or EA. It would be rare for a single person to do all the analysis for an EIS: it will be done by a team that may mix ODOT staff and consultants from different locations and departments. The land use analyst should get involved early to ensure that how the project is defined and the collection of data are consistent with the recommendations of this guidebook. A key part of this initial work is clarifying assumptions, data sources, and availability of population, employment, and travel demand forecasts. Some of these factors are determined in the project scoping phase which occurs prior to environmental analysis.

The analyst should clarify the scope of the analysis for indirect impacts. This guidebook and the accompanying documentation describe different things that different people might want out of this type of evaluation. At the beginning of the environmental documentation phase of the project, the analyst should make a preliminary, qualitative assessment of the following questions:[10]

- *How big is the transportation improvement?* Size matters, and it can be measured in a number of ways (project cost, length, number of vehicles affected). But, as discussed in Chapter 2, the measure that makes the most difference to land use is the aggregate change in travel time (travel time savings multiplied by number of vehicles).

- *How big are the potential indirect land use impacts?* The estimated magnitude of impacts will depend on the size, type, configuration, and location of the transportation improvement, on market forces, and on public policy (land use plans and public facility capacity). For example, it is easy to see that a big highway expansion in a developed urban area has a greater potential for indirect impacts than a signalization project at a rural crossroads where market forces, state land use law, and limited public facilities make such impacts unlikely.

- *Would the potential indirect impacts be consistent with the local land use plan and policies?* If not, then (a) these impacts are probably less likely to occur; and (b) if they do occur, they will have a greater impact. Even if potential indirect land use impacts are consistent with the plan at a general level, it may be that the improvement will have some effect on the rate of development, or its design. For example, the development may look different or occur sooner than expected.

Based on the analytical process for indirect land use impacts described in this guidebook, an abbreviated version of the process was developed for use in a preliminary assessment of these impacts. Table 3.1 (also in a sample form in Appendix F)[11] can be used to predict whether the project will increase the potential for land use change enough to warrant a detailed evaluation of indirect land use impacts. It can be used to determine the project's environmental Action Class (1 2, or 3), which defines how ODOT will evaluate the project, including its indirect land use impacts. It can be useful for anticipating impacts of small projects as well.

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[10] The analyst is encouraged to record the answers in a short memorandum (1–2 pages): this ensures the task gets done, sharpens the thinking, allows the ideas to be shared, and provides documentation.

[11] Appendix F provides guidance from Table 3.1 in a sample form for preliminary evaluation of indirect land use impacts. This form is intended to provide additional information for completing the project prospectus form.

Table 3.1: Indirect Land Use Supplement to Part 3 of Prospectus Process

<table>
<tr>
<td>Sources of Information</td>
<td>1. Field visit/evaluation of study area. Note existing land use in the corridor.
2. Amount of vacant land by plan designation within 1/2 mile of the project.
3. Capacity of vacant land in the study area in terms of population and employment.
4. Project description (Part 1 of the Prospectus) and preliminary traffic analysis.
5. Local plans and policies: land use, water and sewer, transportation.
6. Interviews with local government staff, realtors, developers and others with knowledge of the study area. Ask how they think the improvement will affect land use in the area.</td>
</tr>
<tr>
<td>How big is the transportation improvement?</td>
<td>a) Aggregate change in travel time (absolute and relative)
Little change — Considerable change
1 2 3 4 5

b) Estimated project cost
Lower — Higher
1 2 3 4 5

c) Length
Shorter, more localized — Longer
1 2 3 4 5

d) Number of vehicles/trips affected
Lower — Higher
1 2 3 4 5

e) Capacity of project relative to existing capacity in the study area. (Project may have a small relative impact in a developed downtown; at the urban fringe may have a large one)
Small percentage — Large percentage
1 2 3 4 5</td>
</tr>
<tr>
<td>What do local land use, water/sewer and transportation plans tell us?</td>
<td>a) Do the policies support the project?
No support for project — Policies expect project
1 2 3 4 5

b) Are services (water, sewer, electricity, telecommunications) available in the project area?
No services are available — All services available
1 2 3 4 5

c) Strength of market demand for development around the project
Weak — Strong
1 2 3 4 5

d) Opinions of local government staff, realtors, developers and others with knowledge of the study area regarding how the improvement will affect land use in the area.
Little impact — Considerable impact
1 2 3 4 5</td>
</tr>
<tr>
<td rowspan="2">Potential magnitude of indirect land use impacts</td>
<td>Given the responses to items above, how big are the potential indirect land use impacts? Factors include the size, type, configuration, and location of the transportation improvement, the market forces, and the public policy (land use plans and public facility capacity).
Little impact — Considerable impact
1 2 3 4 5</td>
</tr>
<tr>
<td>For a more detailed evaluation of indirect impacts, see the guidebook, particularly Table 3.2 on page 33. The answer above, by itself, is not definitive regarding how a project should be classified for environmental analysis3. That determination depends on combining the analysis of many different categories of impacts (See the worksheet for Part 3 of the Project Prospectus).</td>
</tr>
</table>

Ultimately, whether to conduct an analysis of indirect impacts, and the level of that analysis, is a judgment call. As a practical rule of thumb, if other ODOT procedures have already classified the project as one that requires an EA or EIS, then the analyst should assume that there should be a section addressing land use impacts, including the indirect ones. The size of that section and the depth of the analysis depend on the considerations above.

Step 1: Get Involved Early

1. Review project prospectus; contact staff that prepared the prospectus.
2. If an EIS or EA, meet with the project team early in the process – preferably before or during the project scoping phase.
3. If one is not included with the project prospectus, develop a preliminary analysis of indirect impacts. The form provided in Table 3.1 and Appendix F is intended for such an analysis.

STEP 2. DEFINE THE PRIMARY STUDY AREA FOR INDIRECT LAND USE IMPACTS

The definition of the improvement (the build alternative[12] or alternatives) will come from elsewhere in the project. It is not the job of the land use analyst to determine and explain why a particular alternative deserves more detailed evaluation, the improvement should already be defined in text and on a map. The reasons for the improvement should come from project proponents or evaluation managers at ODOT; justification for the improvement will usually relate to congestion relief, accident reduction, or system preservation.[13]

The primary study area for indirect impacts should be, in general, a function of travel time savings and travel volumes. After the analyst determines (from project proponents, transportation planners or engineers) why a project is being proposed, then the expected extent of project benefits should be estimated. The case studies done as research for this guidebook generally used a study area of ½-mile around the improvement as the primary area of potential effect, but this assumption should be adjusted based on local access factors and geographic or other barriers. Typically, the larger the improvement and travel time savings, the larger the primary study area.

[12] The typical EIS-type analysis distinguishes between *action* alternatives, and a *no-action* alternative, which is sometimes referred to as a base case. Since this guidebook is about highway improvements, it uses the terms *build* alternatives and *no-build* alternative.
[13] This guidebook suggests that final definition of the no-build alternative should be left until Step 6; in short, because the definition requires some of the information being collected in previous steps.

For large projects on routes with a lot of through-trips, the area of impact could be much larger. Improvements at one point on a major corridor may allow travel-time savings to distant areas. Fortunately for the analysis, the relative improvement in travel time of any given project gets smaller as the trip length gets longer, so savings to distant travelers can be assumed to have little impact. For example, a lane addition that reduces peak-hour travel time by two minutes is reducing the travel time for someone 30 miles away by only about 5%, which is probably not enough to postulate measurable changes in development patterns at that distant location. Again, larger travel time savings may imply a larger area of impact, and a larger study area.

Additionally, the analyst should consider the character of land uses surrounding the improvement and within the area of potential impact. For example, if a significant amount of vacant, serviced land is near (generally within ½ mile), but not directly adjacent to, the improvement, the study area should include that land. City limits, county lines and Urban Growth Boundaries (UGB) can help define study area borders.

As a practical matter, an analyst of indirect impacts will probably start with the project's Primary Study Area as an approximation of the area of indirect land use impacts. The advantages are (1) consistency (all impacts nominally have the same study area), and (2) leverage of data collected by other researchers working on the project (both saving time and increasing comparability). It is not typical, however, for all subject area analysis to use the same study area; it depends on where the analyst believes the project could have an effect. For example, the noise study area may be much smaller than the land use study area.

Step 2: Define Primary Study Area

1. Review project description, and purpose and need for project.
2. Conduct field visit/evaluation of proposed study area. Take a map and make annotations about existing land use patterns.
3. Review preliminary traffic analysis. Pay close attention to travel time savings and changes in access. Larger travel time savings, new transportation corridors, and significant amounts of vacant land within ½- to 1-mile of the project suggest a larger study area for indirect impacts.
4. Identify study area for indirect land use impacts.

STEP 3. GET AGREEMENT ON THE BASIC DEMAND DRIVERS (I.E., THE POPULATION AND EMPLOYMENT FORECASTS)

The population and employment forecasts may be located in different parts of a project evaluation: they have been placed under their own headings, or as part of traffic, land use, or socioeconomic analyses.[14] In Oregon, all land use and transportation planning is driven by population and employment forecasts. Sources for those forecasts are: (1) official forecasts, (2) comprehensive plan forecasts, and (3) forecasts in the traffic model. Official forecasts are consolidated by county and consistent with state population forecasts from the Department of Administrative Services as required by state law; these forecasts are available online at http://www.oea.das.state.or.us/. Forecasts in a comprehensive plan may not yet have been updated to comply with requirements for a consolidated forecast. Ideally, all these forecasts should be the same.

Of key importance is the determination of whether the project is large enough to warrant different forecasts of population and employment for the no-build and build alternatives. Because no empirical method exists to make this determination, the analyst must rely on professional judgment. The analyst might consider convening an expert panel to assist with this determination and the assessment of indirect land use impacts. A more detailed discussion of forecasting issues is presented in Appendix E.

A jurisdiction's Transportation Systems Plan may include these forecasts for sub areas. Unfortunately, for most of the large-scale transportation projects that were reviewed, the documentation of the assumptions used for forecasting was poor. Forecasts of population and employment are driven primarily by assumptions about the continuation of, or changes in, demographic and economic trends. They usually give some consideration to existing land use, land use plans, and public facility constraints and planned expansions, especially for transportation. It was often difficult to determine the extent to which the base forecasts have already considered indirect or cumulative impacts.

When the analyst believes that a build alternative will result in indirect impacts, the analyst should address whether those impacts suggest that population, employment and traffic forecasts for the build alternatives would be different from the forecasts for the no-build alternative. Moreover, the analyst must be clear about the scope of the analysis: what is the size of the sub-area for which population and growth are being forecasted? It is generally accepted by urban economists and federal transportation agency staff that most new transportation projects will not have measurable impacts on the overall regional economy. This is because (1) the new projects are usually a minor part of the regional transportation capacity, and (2) if transportation problems constrain growth in one part of a metropolitan area, that growth will occur in another part of the same region that has fewer constraints.

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[14] Our preference is to describe them as part of the socioeconomic evaluation, and then let the other analyses refer to them. The analyst need only find the forecasts.

If the population and employment forecasts are done for a large area (e.g., metropolitan area or large city), then the analyst may suggest that the project will contribute to redistribution of population and employment at a finer grain (without changing the overall regional forecasts), and that such a shift would be consistent with a finding of potential indirect land use impacts (i.e., development patterns could be different if the improvement is built). But if the forecasts of population and employment are at the relatively fine grain of a Transportation Analysis Zone (TAZ) typical of urban transportation models, then it is harder to argue that redistribution within the TAZ will occur and result in indirect land use impacts.

The analyst should make sure that any evaluation of indirect land use impacts is clear about what assumptions were made in the forecasting of traffic volumes as related to population and employment, including assumptions about changes in land use plans or development patterns. Even if there is only a single forecast of population and employment for all alternatives at the sub-area level (e.g., TAZ), there may still be variation of the distribution of population and employment, and the details of land use and design, in each sub-area.

Although a change in transportation system performance is the key way that transportation improvements affect land use, at a small scale both the highway design and its ancillary improvements (parking, auto access via turn lanes and curb cuts, bike paths, pedestrian access, signage) can contribute to changes in development patterns and the rate of development. Thus, a description of indirect land use impacts should include a description of those effects. Step 6 discusses a related point about whether the base population and employment forecasts assume a future transportation system that includes the proposed transportation improvement.

It is strongly recommended that the analyst spend some time early in the study identifying the sources of the population and employment forecasts, how they were done, and what assumptions about land use and future transportation capacity and improvements are embedded in them. That effort may pay off in Steps 6, 7, and 8, and may provide logic and internal consistency to the land use analysis.

Step 3: Agree on Basic Demand Drivers

1. Obtain official long-range county population and employment forecasts (Oregon Office of Economic Analysis, Department of Administrative Services: http://www.oea.das.state.or.us).
2. Obtain the relevant coordinated forecasts from the jurisdictions.
3. Obtain sub-area population and employment allocations. If no sub-area allocations will be developed for the project, contact the jurisdiction's transportation department; it is likely they will have TAZ-level population and employment forecasts if they have completed a TSP.
4. Review all available methodological materials for the forecasts. If not available, or if the available materials are too general, identify the individual(s) who are most familiar with the forecasts and conduct personal interviews.
5. Make and document a decision about the appropriate use and level of geography of population and employment forecasts.

STEP 4. GATHER AND ORGANIZE DATA ABOUT LAND USE AND TRANSPORTATION IN THE STUDY AREA

Once the primary study area for indirect impacts is defined, the analyst needs to gather data. Step 4 is about technical information, and Step 5 addresses policy information. Here, as elsewhere, there is overlap among steps. Step 4 focuses on data that an analyst would get from all sources prior to the draft technical reports that the project might generate. For example, the analyst might get basic transportation information from a city, county, and/or regional TSP and/or comprehensive plan in this step. Think of Steps 4 and 5 as getting the base data together, with Step 7 providing a final look at data and forecasts before doing the evaluation in Step 8.

There are several ways to organize a list of the data sources needed to complete the analysis: by type (e.g., maps, photos, electronic files), by source (e.g., city, service district, state agency), or by topic (e.g., land use, public facilities, transportation). This guidebook organizes data needs by topic and describes the types and sources of the data as a subset of each topic.

Remember: this guidebook is about impacts to land use that are indirect. Most of the information listed below will need to be gathered by analysts responsible for direct, non-land-use impacts. On a large project, that means that the analyst may be getting most of the information below from secondary sources such as drafts of other technical reports[15] or from other analysts (who can share raw information they have collected in advance of their draft technical report). A single analyst may be responsible for both the direct and indirect land use impacts, or for other topical areas; in that case, the tasks of data collection are as follows:

- *Development capacity* (from a local buildable land analysis). The starting point for any evaluation of land use or transportation planning is a base map, which the analyst should be able to get from others in the project. Maps with property boundaries are useful.

  Oregon cities and counties are required to have an evaluation of buildable lands. For larger jurisdictions that evaluation will be relatively current, and will be mapped, probably using a geographic information system (GIS). If necessary or possible, capacity data can be supplemented with data being collected from the environmental analysis, which should include a description of physical constraints (e.g., rivers, hillsides, and other physical barriers to development). Data on buildable land should be for an area larger than the primary study area (probably at the UGB level if the project is within a UGB); because part of the concern about indirect impacts is that new development will shift to areas around the new project from areas elsewhere. If a separate right-of-way analysis is being conducted, coordinate with the person doing it; he or she should have detailed maps regarding direct ROW impacts on land use.

- *Development history / development trends*. Ultimately, this information is used to describe the demand for land and buildings, and the likely land use changes under the no-build alternative. Ideally, the jurisdiction will have a current and complete Buildable Lands Analysis, Goal 10 Analysis (Housing), and Goal 9 Economic Opportunity Analysis from their comprehensive planning process. These reports will contain all the information needed, including (1) a description of historical (last 5-10 years) development trends (primarily from building permits, by type and size, and from assessment data; and secondarily from interviews); and (2) a conversion of population and employment forecasts to demand for land by type.[16] For the same reasons given above, this information should probably be collected at the UGB level.

  If the history and trend data are not complete, primary data collection will be necessary. This could occur through review of assessment records, GIS databases, building permit data, aerial photos, or field visits. Use of either primary or secondary data could (and probably should) be supplemented by interviews or focus groups with local planners and real estate experts (see Appendix D, Case Studies report, for a discussion of methods and types of questions).

- *Development forecasts.* A forecast of future development patterns for the study area should have already been completed. In fact, in Oregon, **the presumption should be that the local**

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[15] Ideally the project would move sequentially from direct to indirect impacts. It's hard to hypothesize, much less predict, what the indirect impacts (farther removed in time and distance) will be in the absence of a clear statement about the direct impacts, which are theoretically the *causes* of the indirect impacts.

[16] A variety of methods exist for calculating land needs. The analyst should first review the jurisdiction's buildable lands analysis (if one exists) and apply methods consistent with that study.

comprehensive plan is exactly that forecast of future development. By state law, a local land use plan must be updated every five years, and must consider all the factors relevant to a forecast of future development patterns: economic constraints and opportunities (Goal 9), housing and buildable land (Goal 10), transportation capacity and demand (Goal 12 and the Transportation Planning Rule), the capacity of other public facilities (Goal 11), and so on. Step 6 discusses some important implications of this point.

- *Transportation.* Information about transportation in the study area should be available from a number of sources: directly from a local TSP or regional transportation plan; indirectly from ODOT or an MPO; and, most directly, from other members of the evaluation team who have collected information on existing and forecasted future transportation conditions. Previous parts of the guidebook have described the kind of information needed and why. Recent ODOT environmental documents should be reviewed to identify whether or not traffic volume forecasts differ for build and no-build alternatives. For many projects, this may be difficult to determine because travel patterns could change with the action alternative (e.g., with a bypass). A widening project (similar to some of the case studies) may be the easiest type of project for a comparison of traffic volumes under a build and no-build alternative. For many projects, forecasted volumes will be the same for the build and no-build alternatives.

- *Other public facilities.* The case studies conducted as part of this project make it clear that, in most cases, transportation improvements alone do not induce a lot of growth: other public facilities (especially sewer, water, and other utilities) must also be available at a reasonable cost. State planning laws on Periodic Review require an updated public facility element; the Goal 9 Economic Opportunities Analysis also requires an evaluation of current and future capacity and constraints. A local jurisdiction may also have a public facilities plan and capital improvement plan. In the absence of any of these documents, a jurisdiction should have maps of facilities and lines.

Data on other development issues may also be useful for this step. The main issues are environmental constraints, most of which will already be covered at some level in the buildable lands analysis. Other issues could be second-order socioeconomic impacts or impacts to specific populations (for example, impacts on persons with disabilities). Many of these impacts will be considered in other technical reports.

A key element of this analysis is a review of the local comprehensive land use plan and any related documents. These documents provide an indication of what land use patterns are desired in the study area, and what densities or intensities of uses are expected. It will also define, in general terms, what types of land use are allowed. Some plans will be explicit on land use patterns that are not desired. For example, in the Albany case study, the City's comprehensive plan specifically discouraged new strip development along the Highway 99 corridor.

Step 4: Gather Land Use and Transportation Data

1. Gather and review relevant plans and policy documents: at a minimum, comprehensive land use plans and TSPs. Review the jurisdiction's buildable lands inventory and the parts of the Goal 9 and 10 analysis that forecast land needed for new housing and employment.

2. Work with the local jurisdiction to obtain and analyze GIS data. Of particular interest are maps and tabular summaries in the study area showing land use patterns, vacant lands and location of building permits issued in the past 10 years.

3. Review the local land use capacity analysis if one exists. If a capacity analysis does not exist, pull together related information for a "back-of-the-envelope" technique. If no base data exists, assume a land consumption rate of 100 acres per 1000 persons.

4 If possible, make estimates of development capacity in the study area. Interviews or a focus group with local realtors, developers, and bankers can help in understanding the development climate, particularly for redevelopment.

5. Evaluate the data in the context of the proposed improvement and the boundaries of the study area identified for indirect land use impacts in Step 2. Make adjustments to the study area boundaries if necessary.

STEP 5. GATHER DATA ABOUT PUBLIC POLICY, PRIMARILY ABOUT LAND USE AND PUBLIC FACILITIES

As mentioned earlier, the case studies showed the availability of other infrastructure, especially water and sewer, to be key to development. The analyst should look at existing services, Capital Improvement Programs (CIPs), and service extension policies. Long-range water and sewer master plans, regional transportation plans, economic development plans, and other relevant documents may also provide useful information.

The review should include an evaluation of plans and policies regarding the following topics. As in Step 4, for a larger project, a lot of this information should already be assembled by other analysts working on the project:

- Sewer (availability and capacity)
- Water (availability and capacity)

- Other utilities (e.g., electricity, telecommunications, etc.)
- Zoning/comp plan designations in the study and project area
- Vacant land and its zoning/designations/services (water, sewer, and others) in the study area
- Location of city limits and urban growth boundaries in the larger region
- Land capacity and estimated year of buildout (i.e., when a buildable land is developed) under current policies and growth forecasts
- Recent and anticipated economic growth in the study area and larger region
- Recent and anticipated land development in the study area and larger region
- Recent and anticipated land development along other highways/major arterials in the larger region
- Recent and anticipated transportation improvements in the study area and larger region

The last four items can also be classified as cumulative effects, but they are important for understanding indirect impacts. In writing the assessment of impacts, analysts will need to at least partly separate indirect from cumulative impacts. In some cases they may be able to discuss them together under one heading.

Step 5: Gather Policy, Land Use and Facility Data

1. Gather and evaluate other policy documents not described in Step 4: capital improvement programs, long-range water and sewer development plans, regional transportation plans, economic development plans and other relevant documents.
2. Look for factors that will potentially encourage or constrain future development in the study area.

STEP 6. DESCRIBE LIKELY DEVELOPMENT PATTERNS IN THE ABSENCE OF THE IMPROVEMENT

It is typical for the analyst responsible for indirect land use impacts to also be in charge of direct land use impacts. Thus, this section describes general procedures for predicting the no-build development pattern. The analyst of indirect impacts may be able to simply refer to other studies, or may have to conduct some or all of the following analysis. The key variables that go into such an assessment should be described in planning documents; population, employment, and land availability are the most important. Accessibility and availability of public facilities are other important factors.

It will almost certainly be the case (at least for any city of over 10,000 people) that the comprehensive planning process that created the forecast of future land use patterns will have been more extensive than the evaluation the analyst can do as part of a project evaluation. Moreover, the Transportation Planning Rule (TPR) requirement for TSPs calls for local jurisdictions to address interactions between transportation and land use, and to prepare forecasts of future volumes and realistic assessments of future needs and improvements to meet the needs. The more difficult transportation and land use issues will be addressed in the jurisdiction's TSP. The population and employment allocations used for the transportation modeling that is included with all TSPs should reflect the jurisdiction's best judgments about how land use and transportation will interact at the community or regional level. TSPs should reduce the likelihood of making forecasts that do not adequately consider land use variables.

For the no-build alternative, the analyst uses the data collected in the previous steps to make an assessment of the kind of development which could occur in the study area if the improvement is not built. In general, the presumption in Oregon is that the development would be roughly consistent with the comprehensive plan and other relevant policies, but this does not have to be the case.

A key judgment that the analyst must make is whether the forecasted development pattern (as embodied in the comprehensive plan or other planning document) assumes that the highway improvement will be built or not. In some cases, like a new bypass, the answer will be clear: the bypass is either in the plan or it isn't. In other cases, especially for smaller projects, judgment is required. For example, if a 20-year plan assumes that a collector street will become an arterial, and the proposed improvement is to expand the capacity of that collector, then one can reasonably argue that the improvement is already in the plan, and that the effect of no-build will be less consistent with the plan than the build alternative.[17] It may mean that the description of the no-build alternative calls for an adjustment to the map, tables, and text of the comprehensive plan: in other words, without the proposed project, the future land use pattern is different from the pattern assumed in the comprehensive plan.

An analyst, however, may find that the plan(s) are ambiguous. If so, it is probably more likely that the plans do not include the project’s indirect impacts in their description of future development patterns.

Determining whether or not the no-build alternative is consistent with the plans for the area may seem fussy, but ignoring its points means risking some logical inconsistencies in the analysis. Here's the logic:

- In concept, the proposed improvement either has been envisioned in the plan or it has not.
- If the plan makes no mention of the improvement in maps or text – either explicitly or implicitly (by showing, for example, that the street classification for the street with the proposed improvement has been upgraded to the level implied by the improvement) – then the official local development forecast (as reflected in the plan, plan map, or technical reports that support the plan) is a first approximation of the no-build development pattern. Moreover, the plan would need to be amended before the project could be built.

[17] This Guidebook deals with the issue of evaluating plan consistency in more detail in Step 8, below.

- If, however, the opposite is true and the plan does assume, explicitly or implicitly, that the improvement will be made – then the official local development forecast *must be adjusted* to estimate the no-build scenario.
- Whichever way the no-build alternative is analyzed in this step, the build alternative in Step 8 is estimated in the opposite way (i.e. the evaluation of indirect impacts may be additive or negative, depending on whether or not the project, and its indirect impacts, are included in the local comprehensive land use plan). That logic leads to a consistent evaluation framework, providing the development pattern *without* the improvement and the development pattern *with* the project. This is the fundamental question about indirect land use impacts.

The details of forecasting techniques for describing how development and land use will play out over a 20-year period are beyond the scope of this guidebook. Oregon jurisdictions have ample experience with 20-year planning; moreover, there are a number of examples of city and regional planning for 50 years.[18] For larger jurisdictions these types of studies, or the basic analysis in the Goal 9 and Goal 10 reports that support plan updates through Periodic Review, should give an analyst a good place to start.

As in Step 3, our recommendation here is for the analyst to be clear and consistent about assumptions. The land use analyst must understand the data and assumptions the traffic analyst has used regarding future land development and growth (assumptions about the comprehensive plan, zoning, vacant lands, service capacity, and so on), and how the traffic analyst has incorporated these data and assumptions into forecasts. The land use analyst may find things that the traffic analyst has overlooked or misinterpreted, and may help the traffic analyst make more realistic assumptions based on what is or is not in the comprehensive plan and TSP. Discussion of these issues among project analysts may lead to a revised, more realistic forecast for both the no-build and build alternatives.

The analyst needs to carefully examine the relationships between forecasts in the plan, forecasts by traffic analysts, land use patterns, economic factors, zoning/plan designations, etc. and how these interact and are interrelated. Every situation and project are different and the analyst needs to carefully look a how all or most of the factors interrelate.

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[18] See, for example, Metro Region 2040, Salem Futures, and projects now underway (Fall 2000) in Albany, Silverton, and Eugene/Springfield.

Step 6: Describe the "No-Build" Future

1. Carefully review the local land use plan, TSP and CIP to determine if the proposed transportation project is included in any or all of the plans.

2. If the plan(s) include the project, determine whether the plan explicitly considered the project in its population and employment forecasts and future development patterns. It may be useful to talk to staff that assisted in the preparation of the plans.

3. Make a determination of whether the development patterns envisioned in the plan include indirect impacts of the project. If so, then the plan envisions a future that includes and may require the build alternative. In that situation it is more logical to assume that the no-build alternative will cause land use development to be *less* than what the plan envisioned than to think that the build alternative will cause the land development to be *greater* than what the plan envisioned. Development may occur more slowly or in different areas under the no-build alternative.

4. Describe the likely development patterns in the absence of the improvement, making sure assumptions are consistent with other analysis.

STEP 7. SUMMARIZE FROM OTHER PROJECT ANALYSIS THE RELEVANT "OTHER" IMPACTS OF THE IMPROVEMENT

The text in Step 4 notes the overlap among steps. Steps 4 and 5 focus on data that an analyst would get from all sources prior to the draft technical reports that the project might generate. Those steps gather the base data, and Step 7 gives a final pass at data and forecasts before doing the evaluation in Step 8.

"Relevant other impacts" means all impacts that influence the estimate of indirect land use impacts, that are not themselves indirect land use impacts. The logic here is consistent with definitions promulgated by CEQ and adopted in this report: *indirect impacts are caused by direct impacts, typically happen after direct impacts, and (logically) cannot and should not be estimated until direct impacts have been estimated.*[19] It makes no sense to estimate the indirect land use impacts without knowing what direct impacts would occur under each alternative.

[19] The point is one that applies to all indirect impacts: they are the result of direct impacts in all areas. With respect to indirect land use impacts, they result not only from direct land use impacts, but from direct impacts in other areas (e.g., transportation) as well.

Similarly, at least provisional estimates of population, employment, and travel impacts must be available to the land use analyst. The same is true, to a lesser extent, for certain socioeconomic and environmental conditions and direct impacts.

Despite the logic of this sequencing, it is common for project analysts to do many things at once, often in response to the pressure of deadlines. Thus, an analyst may find that the description of indirect impacts is due at the same time as all other impact reports. The only way that can occur and be defensible technically is for the analyst to work with others on the project to get raw data and assessments for the factors relevant to forecasting indirect land use impacts. We divide those impacts into two main categories: travel and other.

TRAVEL

Step 6 clarified whether changes in transportation system performance are already (at least implicitly) in the local plan for future development because the transportation improvement has been included in the plan. (If the project is not in the plan, then the plan needs to be amended before the project can be built.) The analyst determines whether the plans appropriately include the indirect impacts; then the transportation forecasts need to be consistent with that decision. As noted previously, the analyst would ideally get two sets of travel performance estimates, one that reflects a system without the improvement and one with the improvement. The reality in many cases will be that, because future development patterns are assumed to be the same with the no-build as with the build alternatives, there is only one set of forecasts.

Modeled results are available in areas with Metropolitan Planning Organizations (MPOs), and in some larger cities without MPOs. Moreover, ODOT is developing a state-wide land use model, but it will probably not be applicable at the local level for anything but very large new projects (e.g., a new freeway or by-pass).[20] If modeled results are available, the analyst should describe the changes in travel time (relative to the no-build alternative) in the aggregate, by sub-area, and as a percent of average trip time[21]. If no model was used, then the analyst should use expert opinion (project planners and engineers) to draw conclusions about the magnitude (absolute and relative) of changes in system performance. Even without a model the transportation planners can estimate changes in mobility, described in volume/capacity (v/c) measures, that are expected with and without the project.[22]

[20] ODOT and the Oregon MPOs, notably Portland Metro, are developing integrated land use and transportation models that will help evaluate the effects of highway projects on land use patterns. These models will provide tools to assess changes in the distribution of population and employment arising from changes in the transportation system. ODOT's first generation model is being used to assess impacts of differing land use and transport policies in the Willamette Valley. Metro's land use allocation model is being linked with the Metro transport model to evaluate land use consequences of different sets of transportation improvements along the Columbia River.

[21] Travel time benefits are only one criterion, and maybe not the most important one, for many ODOT projects.

[22] This guidebook does not address larger issues about project evaluation: in particular, whether a highway improvement has benefits in excess of cost. Improvements in mobility (v/c) are not, by themselves, sufficient to justify a project. The benefits in travel performance depend on the number of people using the highway, and the value they place on (and would be willing to pay for) the better performance. Neither does this guidebook address the complications introduced by induced travel.

In theory, a measurement of aggregate change in travel time should capture many of the benefits of a change in access: all other factors being equal, travel time will change with a change in access (a new road, interchange, curb, or barrier). In practice, these changes may be small when measured by a model, or difficult to estimate with much precision if no model is available. For example, differences in the number of curb cuts will be below the scale of evaluation of a typical travel-demand model, but can be very important to individual property owners. Thus, localized access issues should be considered in addition to more aggregated measures of changes in travel time. Safety improvements are also a critical issue with curb cuts and related changes in access.

Travel time and traffic volumes (and perceived/real economic impact) are key transportation measures for estimating impacts to both residential and commercial development. Retailers are concerned about visibility, measured by how many people will go by their stores. Larger volumes due to highway improvements could support increased demand and higher prices for retail properties along a corridor, which in turn contributes to the potential for land use change. Key questions are (1) whether that potential is sufficient to cause property owners and developers to build faster and differently than they would have; and (2) whether the comprehensive plan would have to be changed in any significant way (e.g. zoning, comprehensive plan designations, city limits, UGBs) to allow that change in development.

In summary, the key transportation variables of interest for the land use analyst are change in travel time (per average trip, or by trip type if available), traffic volumes, and mobility. In the case of an extreme increase in accidents, improvements in safety may also affect land use patterns. Because such cases are probably rare, and because improvements in safety may in some cases be included with changes in travel time as a project objective, the land use analyst can probably ignore safety impacts: its indirect effects on land use will usually be minimal. Safety, however, is frequently a major objective of some types of access management projects.

OTHER

The two principal "other" reports that are relevant to the land use analysis are the Socioeconomic Report and the Right-of-Way (ROW) Report. The Socioeconomic Report should provide information about future household characteristics, which may suggest something about future land uses. The land use analyst should work closely with the person doing the socioeconomic evaluation, especially on population and employment trends/forecasts and market conditions.

The ROW Report will have pertinent information on direct land acquisitions, displacement of businesses, partial takings, changes in access, and assessed value. It will show the direct impacts, from which the land use analyst can begin to infer the longer run, indirect land use impacts.

The various Environmental Reports are probably less useful for analysis of indirect land use impacts in practice than they are in theory. They might show constraints on land development, but a city or county's buildable land analysis (Step 4) may already do that. The constraints they identify are normally limited to the alignment (though if indirect and cumulative environmental impacts are considered, then a wider area may be evaluated).[23] One can imagine an area's failure to meet federal air quality standards having an impact on land use (because federal funding is reduced until standards are attained, impacting employment growth), but it would take a huge transportation project in an area on the borderline of compliance to trigger that kind of effect.

In summary, the advice here is to look at the summaries of direct and indirect impacts that other discipline specialists on the project are generating, and identify if the impacts described therein could have indirect impacts on land use.

Step 7: Summarize Relevant "Other" Impacts

1. Meet with staff working on the other technical reports early in the project. Consider scheduling the indirect land use analysis at a point in the project when data and analysis from the other relevant technical reports are available, at least in draft form.

2. Obtain drafts of the transportation, right-of-way and other relevant technical reports as soon as they become available.

3. Incorporate relevant elements of the various technical reports into the indirect land use impact analysis.

STEP 8. DESCRIBE AND ESTIMATE THE INDIRECT LAND USE IMPACTS OF THE IMPROVEMENT

Steps 2-5 provide base information. Step 6 describes the development pattern under the assumption that the proposed transportation project is not built. Step 7 assembles information about how the proposed projects could change factors related to land use. Now, in Step 8, the analyst uses all this information to describe how land use and development patterns could differ from the no-build description if the project is built. That difference will include some direct land use impacts (e.g., right-of-way acquisition) that may contribute to, but must be kept separate from, the indirect land use impacts.

Step 8 has three sub-steps. First, the analyst describes the expected change in development patterns, or the factors contributing to the potential for that change to occur. Second, the analyst must make a judgment about whether those changes are consistent with the future envisioned by the comprehensive plan. Third, the analyst must discuss how those impacts could be mitigated, and what assumptions about mitigation are embedded in the description of the future development pattern.

[23] Analyst's should note that the language in the CEQ applies to all types of environmental analysis, and all technical reports (including land use) are required to assess indirect and cumulative impacts of the proposed project.

STEP 8A: Address The Issue of Increased Potential of Land Use Change

This step should correlate the expected changes in key factors that influence development patterns to the magnitude of those changes. Remember the logic presented at the beginning of this chapter:

- What does the transportation project do to highway performance (accessibility, travel-time, volume, mobility, and safety) that is different from what that performance would be without it?
- How do those changes in travel performance influence factors that help shape development patterns?
- What other factors influence development patterns?
- Given the possible changes in development patterns and other factors, the expected magnitudes of those changes, and the relative importance of those changes, what is the qualitative assessment of the indirect land use impacts of the project?

The land use reports for most EISs talk about a transportation project increasing the potential for land use change.[24] The potential for land use change has become a term of art: it is meant to convey that land use change becomes somewhat more likely, but that it is in no way inevitable. The uncertainty about the change results from the complexity of land markets and land development (which is affected by multiple factors), and the fact that public policy can have a strong effect (or not) on development. That potential may eventually manifest itself as more growth than forecasted, higher density than forecasted, or a change in land use.

For example, suppose a state highway is widened on both sides of a UGB, and that the area outside the UGB is not identified by the city as an urban reserve (in other words, city policy is that the UGB will be expanded somewhere else before it is expanded at this location). The improvement to mobility makes the land more attractive to developers, increasing the potential for land use change. But that potential can be resisted by public policy. The land outside the UGB can remain farmland if the city follows its plan and does not expand the UGB.

An analyst trying to move beyond a generic finding of "potential" to a specific finding of land use change is on a slippery slope. The finding could imply, for example, that a city, despite policies that direct future development to other areas, will perhaps succumb to the petitions of property owners and developers who want use of the new transportation capacity. To avoid such implications, most EISs limit their discussion to potential for change and possible futures.

The analyst must also be clear about what "change in land use" means. Is it a change from existing use? From the uses specified in the comprehensive plan? From some other description of expected change? The correct answer has two parts: How does the land use change (1) from what

[24] Oftentimes, this potential for change is described as “creating pressure.” Analysts should be careful not to attribute “pressures for change” to the project. The project doesn’t create the pressure, rather it’s a combination of the project along with lots of other factors (as noted in the text) that may or may not lead to development. “Pressure” comes from the developer and other interested parties, not from the project.

is expected to occur under the no-build alternative, at all time periods? and (2) from what the plan says is the desired future land use? These two may overlap substantially or completely.

In Step 8 it is important to refer back to the assumptions in Steps 3 and 6. In particular, do the population, employment, and land use forecasts presume, even if only implicitly, that the transportation improvement under study will be constructed? If so, then the build alternatives probably already include indirect land use impacts, and the job of the analyst is to show how land use would be different under the no-build alternative. Step 6 described this process in more detail.

The key variables that might contribute to measurable changes in local development patterns in response to a highway improvement are:

- *Change in accessibility*. This is the variable that most affects land use. The reasons are covered in Appendix B, Literature Review. Step 7 explains the key measures: average trip time, volumes, and mobility (v/c). For more detail, the analyst could report a matrix of changes in trip time for different origin-destination pairs (if the data are available).

- *Change in property value*. If information about travel times is hard to come by, the land use analyst may be able to get local experts to comment on likely changes in land prices. Such estimates are another count of the potential created by the travel improvement. (The improved accessibility of the transportation improvement makes the land more valuable and creates potential for it to be used more intensively.)

- *Expected growth*. A growing city experiences pressure to develop where good access and services are available. If the forecast were for no population and employment growth for a city, then the analyst should consider expected sub-area population changes: it is possible for a city to have a low growth rate in the aggregate, with most of that growth going to one sub-area, with the result that the sub-area is growing rapidly. The data may be gleaned from either planning documents or interviews with local development experts.

- *Relationship between land supply and demand*. How much vacant, buildable land is there in the study area compared to the rest of the city or larger region? What is the demand for land at the regional, city, and study area level? How does the study area buildable land compare to available land region-wide? The more limited the supply is relative to demand, the more likely improved access would increase the probability of development. This comparison, whether quantitative or qualitative, should be carried out at the most disaggregated level possible: not only by geography, but by type of land use (e.g., there may be ample vacant land in total, but a shortage of commercially zoned vacant land). Given state requirements for periodic review, and detailed analysis relative to Goals 9, 10, and 14, the mismatch between supply and demand should not be very great.

- *Availability of other services*. The case studies demonstrated that access alone was not sufficient to trigger development: other key public facilities like sewer and water had to be available at a reasonable cost. If they are, access improvements are more likely to facilitate land use change. Where water and sewer are (or will soon be) made available, it is likely that the land is inside a UGB and planned for urban use, and the improvement may do nothing more than allow the planned land uses to develop. Such development, however, might occur earlier with the project than without it, which can cause fiscal problems for a jurisdiction if it cannot accommodate this sooner-than-anticipated growth.

- *Other market factors*. Where has growth been going and where do local real estate experts expect it to go? How does the study area market compare to markets in other sub-areas? What is the extent of underbuilding relative to allowed densities? Is accessibility (travel time) a limiting condition on development in the study area?

- *Public policy*. All the previous factors are indicators of the potential for land use change; most are market driven. But for that potential to result in change it must not only be big enough, it must also be allowed. There is ample evidence of areas where land use near high capacity transportation facilities in urban areas has not changed despite changes in accessibility. A key reason is that public policy does not allow land uses to change because, for example, a park is a public trust, or a UGB is meant to protect farmland, or a neighborhood does not want its zoning changed to increase density. Public policy makers can clearly resist pressure for development. The question for the land use analyst is whether policies exist on the books to offer that resistance, and whether those policies will be enforced, bent, ignored, or changed. Answering the last part of that question is difficult, both technically and politically. An analyst can use only the scant data that exists (e.g., number of zone changes or UGB amendments), or he/she can use a more qualitative analysis (e.g., interviews of local officials or state agency personnel with local oversight responsibilities). Whatever the analyst writes should be well-supported (documented) by as much evidence and logic as possible.

Table 3.2 gives guidance on the variables: how to measure them and how to interpret them in the context of increased potential for land use change. The table is illustrative only, though many analysts may defer to the numbers in the table for lack of any others. Note, however, that there are many different ways to measure the factors of interest, and different levels of geography at which they can be measured.

Table 3.2: Assessing Indirect Land Use Impacts

Change variable	Data sources	If value is…	then potential for land use change in the study area is probably…	
Change in accessibility Measured as change in travel time or delay, if available. Otherwise, assessment of v/c or change in access	For large projects or jurisdictions: Travel demand models Otherwise: expert opinion from ODOT or consultant transportation planners or engineers working on the project	Less than 2 minutes of time savings for an average trip, or no change in v/c 2-5 minutes 5-10 minutes More than 10 minutes	None to very weak Weak to moderate Strong Very strong	Low High
Change in property value Measured in dollars	Assessment data Expert opinion	No change 0% to 20% increase 20% to 50% increase More than 50% increase	None to very weak Weak to moderate Strong Very strong	Low High
Forecasted growth Measured as population, employment, land development; for region, city, or sub-area	Official population & employment forecasts (a "coordinated" forecast per ORS, if possible). Travel demand forecasting should be driven by same population and employment forecasts	Average annual growth rate (population/employment) of less than 1% 1%-2% 2-% - 3% Over 3%	None to very weak Weak to moderate Strong Very strong	Low High
Relationship between supply and demand Measured as land supply	Planning documents, especially related to Goals 9, 10, 14 (see Step 4 re development capacity, history, trends, and forecasts) Interviews with realtors, brokers, developers, planners	More than 20-year supply of all land types, all sub-areas 10 to 20-year supply Less than 10-year supply Less than 10-year supply and specific identified problems in the study area	None to very weak Weak to moderate Strong Very strong	Low High
Availability of non-transportation services (e.g. sewer/water) Measured number of people or employees that can be served; or barriers to service provision	Local planning documents, especially Goal 11, 12; & CIPs Interviews with local planners and engineers Other reports generated as part of the highway project evaluation	Key services not available and difficult to provide Not available and can be provided Not available, easily provided and programmed Available now	None to very weak Weak to moderate Strong Very strong	Low High
Other factors that impact the market for development	Local planning documents Socioeconomic and ROW reports generated as part of the highway project evaluation Assessment data, MLS, local real estate reports Interviews with brokers, developers	Weak market for development Weak to moderate market Strong market Very strong market	None to very weak Weak to moderate Strong Very strong	Low High
Public policy	Local planning documents Interviews with local officials, local planners, reps of neighborhood or interest groups, state agency planners	Strong policy, strong record of policy enforcement and implementation Weak policy, weak enforcement No policy, weak enforcement	None to very weak Moderate to strong Very strong	Low High

Note: Table assumes that the proposed transportation improvement improves accessibility. If not, then the potential for land use change is either insignificant, or could be in the opposite direction (e.g., decreases in land values from the no-build alternative could cause land use changes). If all other measures are "strong" and the access measure "weak", the indirect land use impacts are likely to be less.

The main point of Table 3.2 is to illustrate that measurements can be made of a small number of factors, and qualitative judgments can then be made about how strongly those factors will contribute to the increased potential for land use change. Ultimately, it falls to the analyst to make those judgments, using the scale in Table 3.2 or some other one.

Other research reported in this guidebook suggest that the first two columns are the right categories of impacts to consider, and the right data sources. The underlying logic of the table leads to column four: an analyst would measure key causal variables and then make a judgment about how big an effect those variables would have on the potential for land use change. Column three is the most debatable part of the table. None of the reviewed literature attempts to go to this level of specificity, as the predictions can be complicated. Column three of Table 3.2 shows one way that measurable variables can be interpreted to get a qualitative assessment of the potential for land use change that a transportation project might create. Other variables and measurements are possible. For example, a simpler algorithm would be for an analyst to rate a transportation project as big or small, and note that bigger projects have more potential to change land use. That method would indirectly capture (albeit, crudely) the effects of travel time savings and increases in property values.

STEP 8B: Address the Issue of Changes in Planned Land Use (Consistency with Plan)

In the context of Table 3.2 above, the analyst must ask: is the increased potential for change estimated to be enough to expect land use development patterns to differ if the project is built? If so, do those differences conflict with the land use plan? The conclusion may be – as was true in several of the case studies – that the improvement simply allows the plan to be achieved.

For the build alternatives, the analyst should make a qualitative assessment of whether service and policy conditions constrain or support the achievement of the land use pattern envisioned by the comprehensive plan. In general, the presumption should be that in recently updated comprehensive plans the amount of growth is consistent with the level of services to be provided. The analyst should assess whether the comprehensive land use plan assumes, either explicitly or implicitly, that the transportation link under evaluation will be improved to support the achievement of the development patterns called for in the plan.

The project could be presumed to be implicit in the local comprehensive plan if, for example, land uses are assumed to substantially build out even though the current highway capacity could not support that level of development at a reasonable level of mobility. If so, then the forecast assumes the project in question will be built, and the no-build alternative would expect a development pattern that would have to respond to higher levels of congestion (or accidents). If not, then the forecast does not include the proposed improvement, and the build alternative would predict a growth and a development pattern that is less constrained by increases in congestion. See Step 6 for a more detailed discussion of this issue.

The reality of long-run land use planning (even in Oregon, where local governments have 25 years of experience to draw on) is that few, if any, plans are explicit about the assumptions made regarding future highway improvements. Most of them probably did not specifically address whether highway capacity and increasing congestion would cause growth forecasts, in the aggregate or by sub-area, to be different from what the official forecasts predict. Thus, the kind of detailed analysis suggested in the previous paragraph (e.g., that the comprehensive plan explicitly considers the impacts of the project) is more difficult in reality.

Probably the best an analyst can do is review the plan to make a judgment about whether the plan made any adjustments to land use designations or densities based on expected constraints on highway capacity on state highways. In most cases, the answer will be "no," which means that (1) implicitly, the plan assumed that any transportation problems would not become great enough to keep planned land use types and densities from being achieved; (2) therefore, the proposed ODOT improvement, if it is now deemed necessary to accommodate forecasted growth, is implicitly part of the forecast; and (3) not building the improvement would mean that the indirect impact on land use could be to reduce the amount of development (in contrast to the typical thinking, that building the project will increase the amount of development).

Though less important than changes to the planned land use, the analyst could also address whether the transportation improvement enabled the development envisioned in the 20-year plan to occur faster than the plan envisioned (e.g., annexations, UGB expansions, and rezonings occur sooner than anticipated) or than service providers could efficiently accommodate.

STEP 8C: Describe Policies That Could Mitigate Those Impacts

This step assumes existing policies and implementation history. For example, a city's policies and land use actions over the last 10 years may show a propensity to expand the UGB or up-zone land in response to property owner requests. An analyst would have to consider these actions and note that, in view of past actions, indirect land use impacts in response to the proposed ODOT improvement may be more likely. But the past does not dictate the future. City councils and voter preferences change. It may be that the city is willing to adopt an access management ordinance or a new specific-area plan to guide the development around the new improvement. If so, then the indirect impacts – especially those measured as inconsistencies with local plans – may be zero.

If the analysis of indirect impacts identifies probable adverse impacts (e.g., high potential for plan or zone changes, increases in property value, increases in the rate of development), then the EIS will typically describe a set of proposed measures to mitigate the adverse impact.

Oregon has been a leader in identifying, evaluating, and implementing policies that can minimize undesirable land use changes. UGBs are a prime example but many others exist. A good place to start for a list of such policies is the web pages of the Department of Land Conservation and Development (DLCD) and the Transportation Growth Management program, at http://www.lcd.state.or.us.[25] Chapter 5 of DLCD's report, "Growth and Its Impacts in Oregon" (DLCD 1999)[26] also gives a good overview of policies and references for more detail.

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[25] Useful pages on the DLCD website include: http://www.lcd.state.or.us/publicat/urban.html; http://www.lcd.state.or.us/issues/tgmweb/pub/tools.htm; http://www.lcd.state.or.us/issues/tgmweb/pub/pub.htm

[26] For copies, contact the Department of Land Conservation and Development (DLCD), (503) 378-0050.

Land use mitigation typically occurs through local jurisdiction action. In some instances, however, land use mitigation for the project could include, through outright purchase or other means, measures to control (or prevent development of) land adjoining the facility.

The FHWA's guidance for preparing and processing environmental and Section 4(f) documents is relevant to the identification and discussion of impacts and mitigation measures.[27] Among other things, the FHWA guidance document discusses adverse effects, beneficial effects, and mitigation and specifically addresses land use impacts:[28]

In summary, the analysis of indirect land use impacts must identify both beneficial and adverse impacts. If the analysis identifies adverse impacts, the analyst should work with local staff to identify appropriate mitigation measures. Some measures may require local review and adoption.

Summary of Step 8

1. Assess the potential for land use change by analyzing changes in accessibility, changes in property value, expected growth, the relationship between land supply and demand, availability of public services, market factors and public policy.

2. Complete the matrix shown in Table 3.2 using the data collected in Step 1.

3. Using the matrix, make a preliminary determination of the timing and extent of indirect land use impacts. The determination may include both beneficial and adverse impacts. A meeting with local staff may be helpful in this task.

4. If adverse impacts exist, develop a set of proposed mitigation measures. Some mitigation measures may require local review and approval. Working with local staff is important in this step.

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[27] U.S. Department of Transportation Federal Highway Administration, *Technical Advisory: Guidance For Preparing And Processing Environmental And Section 4(F) Documents*, T 6640.8A, October 30, 1987 http://www.fhwa.dot.gov//////legsregs/directive/techadvs/t664008a.htm

[28] The FHWA guidance describes how an EIS should be organized, but says little about how the individual sections (e.g., on indirect land use impacts) should be completed. Specifically it states: "This discussion should identify the current development trends and the State and/or local government plans and policies on land use and growth in the area which will be impacted by the proposed project." "These plans and policies are normally reflected in the area's comprehensive development plan, and include land use, transportation, public facilities, housing, community services, and other areas." "The land use discussion should assess the consistency of the alternatives with the comprehensive development plans adopted for the area and (if applicable) other plans used in the development of the transportation plan required by Section 134. The secondary social, economic, and environmental impacts of any substantial, foreseeable, induced development should be presented for each alternative, including adverse effects on existing communities. Where possible, the distinction between planned and unplanned growth should be identified."

STEP 9. PREPARE A FINAL REPORT

For most EAs and EISs it is unlikely that there would be a final report on indirect land use impacts – there would be a "land use report" that includes a discussion of indirect impacts. The proposed outline below is for the section of the land use report that addresses indirect impacts.

Steps 1 through 8 describe the data and analysis that must be done to make an estimate of indirect land use impacts. Those steps are not identical to the sections of a report on indirect land use impacts, however. The results, and documentation of the data and analysis that supports them, must be written in a memorandum or more formal report. The recommended organization of that report is as follows:

I. Introduction

Purpose of this report
Project description
Impacts evaluated
Methods used in this report

This information can be derived from this guidebook. Give a reference to the guidebook for full citations of literature review, case studies, and estimates of impacts.

II. Framework for evaluation

What are indirect land use impacts?
How are indirect land use impacts typically measured?

Excerpt evaluation ideas contained in Chapter 2 and 3 of this guidebook. Describe the two parts of the evaluation: (1) How likely is it that an ODOT project will be followed by some noticeable change in the land use, which would have occurred in the absence of the project or sooner than anticipated, given that in Oregon comprehensive plans and zoning tend to reduce such changes? (2) If such changes were to occur, would they be consistent with the comprehensive plan?

Show use of Table 3.2 from above, including key variables.

(An example of Sections I and II can be seen in the sample report in Chapter 4 of this guidebook).

III. Existing and forecasted conditions

Steps 2 through 7 above. Data collection tied to key variables in Table 3.2.

IV. Assessment of indirect land use impacts

A summary assessment along the lines described in Step 8.

4.0 SAMPLE ANALYSIS

Chapter 4 provides practical examples of the sometimes theoretical discussion in Chapter 3. We start with a hypothetical Oregon city: Bloomer, a mid-sized city of roughly 30,000 people. The example has two sections:

- **Analyst's Notebook:** though no searches have found an analyst who keeps such a neat log of actions, data, and assumptions, *if* such a log were kept, or created after the project, this is what it might look like. Its organization parallels the steps in Chapter 3. The intent is to show how the steps can be implemented for a realistic highway improvement.

- **Annotated Outline of Analyst's Report** shows how all the analysis gets brought together into a final product. The analysis of indirect impacts will draw from information typically presented in the existing conditions and direct impacts sections of the land use technical report. Because the analysis of indirect impacts is a subsection of the land use technical report, the sample analysis is presented as an annotated outline which can serve as a template – a starting point – for the analyst.

This sample analysis could address any number of project types. To simplify the example, we use a hypothetical highway widening at the urban fringe; an example similar to many of the case study reports (see Appendix D). This illustration is useful in that it underscores many of the subtle complexities of evaluating indirect land use impacts. For example, the project may not have separate population and employment forecasts for the build and no-build alternatives. Also, the travel time impacts may be less substantial than for other projects, making it more difficult to describe potential indirect impacts.

4.1 ANALYST'S NOTEBOOK

STEP 1. GET INTEGRATED INTO THE PROJECT EVALUATION EARLY

- Met with the project development team (PDT) to get organized. The project manager (PM) described the project and several potential alternatives. The meeting resulted in a schedule for a series of meetings with the project team to work with the project engineer to refine the alternatives.
- The PDT narrowed the project alternatives to four: a no-build alternative that includes several minor safety enhancements, and three build alternatives that include several variations on the highway widening. All three of the build alternatives include highway widening from two to four lanes with a center turn lane for 1.5 miles.
- The need for the project is defined in terms of safety enhancements and economic development.

- Met with the environmental team. The PM concluded the meeting with a discussion of the project schedule. I expressed concern with the sequencing of several of the tasks and whether the traffic analysis and other relevant data and analysis would be available for the indirect land use analysis. I spent a few minutes describing the key elements of the indirect analysis and discussing it with the team. Exchanged contact information with the various team members.

STEP 2. DEFINE THE IMPROVEMENT AND THE PRIMARY STUDY AREA FOR INDIRECT LAND USE IMPACTS

- The lead consultant distributed a draft of the project description and maps of the study area today.
- I reviewed the project description and toured the project study area. The study area doesn't quite fit with what an ideal analysis area would be for indirect impacts. It is bounded on one side by a river – a convenient physical barrier, but the study area for direct impacts is too narrow for the indirect impacts analysis.
- Used my field notes, maps, and discussions with local planners to refine the study area for indirect impacts. We considered the extent of services in the area, the existing road network, access points to the highway, UGB, city limits, and land uses. We agreed that the indirect impacts corridor should extend approximately ½-mile on each side of the highway.
- Met with the project mapping staff and had them develop a study area map for the indirect land use impacts. Circulated the map to the PDT.
- Met with the PDT today, the PDT agreed on the refined study area boundaries for the indirect land use impacts analysis. There was considerable discussion about existing land use patterns, what the comprehensive plan allows (is the project identified in the plan), its level of specificity, and what types of land uses will likely emerge if the improvements are built. While this discussion was useful, it did not result in changes to the study area.

STEP 3. GET AGREEMENT ON THE BASIC DEMAND DRIVERS (I.E., THE POPULATION AND EMPLOYMENT FORECASTS)

- Discussed the forecasts and whether the project meets TPR requirements with lead planner in Bloomer and a planner from Pantaloon County. She stated that the project is included in the TSP and that Bloomer has an acknowledged county coordinated population forecast in its plan. The forecast (Table 4.2) was adopted in 1999 and extends to 2020.
- The forecasts are not sub-area forecasts. Bloomer is too small to develop sub-area forecasts. Bloomer also does not have a traffic demand model. Thus, we are constrained to using the same population and employment forecasts for both the build and no-build alternatives. At the community level, this is probably valid: the widening of the highway is not likely to measurably change overall growth in the community.

Table 4.1: Bloomer Coordinated Population Forecast

Year	Population	Employment
Historical		
1980	12,926	6,987
1990	18,181	10,101
2000	26,540	16,000
Change 1980-00	105.3%	
AAGR 1980-00	3.7%	
Projected		
2010	32,180	18,290
2020	37,400	21,400
Change 2000-2020	40.9%	33.8%
AAGR 2000-2020	1.7%	1.5%

AAGR: Average Annual Growth Rate

- A review of the methods used to develop the population and employment forecasts revealed that a relatively simple extrapolation method was used. This method was slightly modified when the City went through the process of coordinating its forecast with the County's control totals. The methods make no explicit mention of whether infrastructure improvements or constraints were considered in developing the forecasts. It appears that the population and employment forecasts are based on an implicit assumption of "business and policy as usual." If so, and if the proposed highway widening can be assumed to meet its objective of reducing congestion, then the widening is (implicitly) assumed to occur in the forecasts. That means if it is *not* built (the no-build alternative), then population and employment growth might be lower than forecasted in the project study area.
- The Bloomer TSP includes the proposed highway improvements as a long-range project, reinforcing that the forecasts are based on the assumption that the project will be built. **This is an important point:** it appears that the population and employment forecasts may be more closely associated with the build alternatives than with the no-build alternatives. The forecasts and associated planning documents, however, are not explicit and as such it is difficult to make a determination with the information given. Moreover, the TSP does not state when the improvement is scheduled for development.

STEP 4. GATHER AND ORGANIZE DATA ABOUT LAND USE AND TRANSPORTATION IN THE STUDY AREA

- Met with Bloomer staff to get land use information. The City provided a GIS database of all land use in the city. Database includes a flag for tax lots in the study area. The City's database included information on tax lot size, plan designation, and land classification. The table below is a summary of vacant and partially-vacant land which I got from the GIS database.

Table 4.2: Summary of Total And Buildable Land (Acres)

Plan Designation	City		Study Area		Percent of total buildable land in study area
	Total Land (acres)	Buildable Land (acres)	Total Land (acres)	Buildable Land (acres)	
Residential					
High Density	545.2	234.7	241.4	95.3	41%
Low Density	2,944.3	947.0	608.3	271.2	29%
Subtotal	3,489.5	1,181.7	849.7	366.5	31%
Commercial	258.9	51.2	36.5	12.6	25%
Industrial	637.4	325.0	51.4	44.8	14%
Total	4,385.8	1,557.9	937.6	423.9	27%

- Met with the project transportation engineer. She provided the following level of service data for the build and no-build alternatives:[29]

Table 4.3: Level of Service at Selected Locations in the Project Area

Location	LOS		
	2000	2020 (no-build alt)	2020 (build alt)
Bloom Avenue	A	D	B
29th Avenue	B	C	B
34th Avenue	B	D	C
Allen Street	C	F	C
Bloomer Interchange	A	C	B

- The engineer provided the following traffic data for the build alternative:

Table 4.4: Historical And Forecast Average Daily Traffic, Build And No-Build Alternatives

Location	Average Daily Traffic			AAGR
	1990	2000	2020	
Bloom Avenue	17,200	20,000	28,600	3.0%
24th Avenue	15,500	18,500	27,400	3.4%
29th Avenue	16,500	19,600	28,900	3.4%
53rd Avenue	12,000	14,400	21,900	3.6%
1 mile north of Bloomer Interchange	9,600	11,500	17,200	3.5%

- I note that the traffic volume forecasts for the build and no-build alternative are identical, but the level of service is improved by the 2020 build alternatives compared to the 2020 no-build alternative.

[29] ODOT is now using volume/capacity ratios (v/c). Local jurisdictions, however, may still be using LOS, in which case ODOT would too if needed to work effectively with locals.

STEP 5. GATHER DATA ABOUT PUBLIC POLICY, PRIMARILY ABOUT LAND USE AND PUBLIC FACILITIES

- Made an appointment with key City of Bloomer staff. Scheduled a meeting with the city planner, transportation engineer, public works director, and economic development specialist for next week.
- Wrote to city staff requesting any plans with relevant policies to land use and public facilities in the project study area. Also requested the city's transportation system plan, water and sewer master plan, parks master plan, and economic development strategies. Because the project is at the "urban fringe," and extends to the UGB, I also visited with county planners and reviewed relevant county planning documents.
- Met with city staff, who provided all the documents I requested. They indicated that the city planned for development in the study area and has made a series of infrastructure improvements to support that development. They foresee the area developing a commercial node and becoming the next major location of residential development.

  They do not have explicit land use policies (beyond traditional zoning) that identify where the commercial development will occur. The major commercial sites, however, have a site review stipulation on them. Not all of the area is serviced by sewer and water at this time. Water and sewer trunk lines exist along the highway corridor. These lines were sized to meet anticipated development when they were upgraded 10 years ago.

STEP 6. DESCRIBE LIKELY DEVELOPMENT PATTERNS IN THE ABSENCE OF THE IMPROVEMENT

- Reviewed the population forecast and the buildable lands inventory for Bloomer. The city's GIS analyst was able to provide me with a tax-lot level database for the entire city, including the study area.
- I reviewed the city's comprehensive plan and technical reports and assigned densities to each plan designation to develop a quick estimate of the population and employment capacity of vacant land in the city and the study area. The results are show below:

Table 4.5: Estimate of Population and Employment Capacity on Buildable Land

Plan Designation	Capacity	City	Study Area	Percent in Study Area
Population Capacity (persons)				
Residential				
High Density	15 DU/GRA	6,337	2,573	41%
Low Density	5 DU/GRA	12,785	3,661	29%
Subtotal		19,121	6,234	33%
Employment Capacity (jobs)				
Commercial	20 EPA	1,024	252	25%
Industrial	15 EPA	4,875	672	14%
Total		5,899	924	16%

DU: dwelling unit, GRA: Gross residential acres, EPA: Employees per acre.

The results are interesting: they suggest that the plan intends the study area to accommodate a significant portion (1/3) of future population growth and only 1/6 of future employment. A limited amount of vacant commercial land is designated in the study area (about 12 acres). City staff expect this land to develop in uses that serve the surrounding residential areas. The plan map indicates that a substantial amount of vacant commercial land (10 acres) is adjacent to the proposed improvements.

- As a final step I compared these data to the population and employment forecasts for Bloomer. The results show a residential land capacity of more than 19,000 persons; the 20-year forecast projects population will increase by 10,680 persons. On the employment side, Bloomer has land capacity for about 5,900 additional jobs; employment growth between 2000 and 2020 is projected to be 5,400 jobs. Thus, the capacity/forecast analysis suggests the City has sufficient buildable lands of all types to accommodate expected population and employment for the next 20 years. The land supply on the employment side, however, is very closely matched to the employment forecast suggesting the City should monitor development on commercial and industrial lands.

Table 4.6: Estimate of Population and Employment Capacity on Buildable Land

	City	Study Area
Forecast (2000-2020 change)		
Population	10,860	na
Employment	5,399	na
Capacity		
Population	19,121	6,234
Employment	5,899	924
Surplus		
Population	8,261	na
Employment	500	na

STEP 7. SUMMARIZE FROM OTHER PROJECT ANALYSIS RELEVANT "OTHER" IMPACTS OF THE IMPROVEMENTS

- Met with project team today. Today was the due date for drafts of the existing conditions and direct impacts analysis for the various technical reports. Asked the project manager to e-mail copies of the following technical reports: transportation, air quality, noise, socioeconomic, 106 and 4(f), etc…
- Received the technical reports. Began to review and summarize some of the key impacts from those reports. Following is a list of observations from my review:

  The socioeconomic report presented some useful information on economic development policy. The report states that the City is trying to recruit new businesses in the study corridor and that it discourages a strip development land use pattern.

The geology report identified some constrained areas (unstable soils with landslide and slumping potential) within the study area that weren't identified in the City's database. These account for only about 5 acres of vacant land and thus won't have a significant impact on population and employment capacity in the study area.

STEP 8. DESCRIBE AND ESTIMATE THE INDIRECT LAND USE IMPACTS OF THE IMPROVEMENT

STEP 8A: Address the Issue of Pressure for Change in Development Patterns.

- Little data exist to address this issue: the population and employment forecasts are the same, and no difference exists in the build and no-build traffic forecasts.
- Met with a group of local realtors and developers to discuss the potential indirect land use impacts in the study area. They provided some useful insights. They indicated that the area is likely to build out in the next 10 years. They also indicated that they expect traffic conditions to worsen in the area without the highway widening, but that congestion would not have much of an impact on overall buildout.
- They also indicated that additional pressure for strip commercial uses may occur if the highway is widened. The increased accessibility and exposure will make commercial lands more attractive.

STEP 8B: Address the Issue of Changes in Planned Land Use (Consistency with Plan)

- The land use patterns envisioned in the comprehensive plan are so general that it is difficult to envision pressures that would lead to an inconsistent land use pattern.
- A review of the plan designation map indicates several parcels presently designated for low-density residential use at key intersections. The realtors and developers suggested that pressure may emerge to change these parcels to a higher intensity use: high density residential or commercial.

STEP 8C: Describe Policies That Could Reduce Those Impacts

- Several land use policies could minimize indirect land use impacts. The city is developing a refinement plan for the area; that plan will likely include more specific policies on the location and intensity of commercial uses and the transportation linkages between commercial and residential uses in the study area. One possibility is that further review of the project be delayed until refinement plan is done.

STEP 9. PREPARE A FINAL REPORT

- Submitted a draft technical report to the environmental team leader, technical specialist, local planner and regional planner for review.

- Received comments on technical report. Key comments included (1) a request for better documentation of population and employment forecasts – and a request for sub-area forecasts; (2) clarification on the buildable lands and capacity analysis – specifically a better inventory of vacant land and estimated development capacity for lands adjacent to the proposed improvement; and (3) a more thorough discussion of potential land use changes and proposed mitigation actions.
- Revised technical report and wrote summary sections for inclusion in Draft EIS. Resubmitted the final technical report and the Draft EIS sections.
- ODOT releases Draft EIS.

4.2 SAMPLE ANALYST'S REPORT

The report example that follows is consistent with the outline described in Step 9 in Chapter 3.

In an EA or EIS process, the evaluation of indirect land uses is a subsection of the more lengthy and detailed land use technical report. The land use technical report is summarized in the Draft EIS. The land use technical report will include a project description, discussion of existing conditions in the study area, and an evaluation of direct, indirect, and cumulative impacts. The evaluation of indirect impacts relies on some of the same data that the direct impacts analysis requires: historical trends and forecasts.

This annotated outline is intended to provide the analyst with boilerplate language for the discussion of indirect impacts and direction on how to write conclusions. It is not intended to describe how to collect or present data on existing conditions and forecasts. The example includes information relevant to the indirect impact analysis. Thus, it includes some data and discussion that may possibly fit more logically into other sections of the land use technical report. A sample project description is also provided here for context.

I. Introduction

PURPOSE OF THIS REPORT

This report presents ODOT’s evaluation of the direct, indirect and cumulative impacts of a proposed widening of the Bloomer Bloomdale Highway. This report also includes discussion of project consistency/compliance with federal, state and local plans/requirements/provisions. It is part of a larger EIS being prepared for the project.

PROJECT DESCRIPTION

The proposed project would improve a section of the Bloomer-Bloomdale Highway. The 1.5-mile project is located between Bloom Avenue and the Bloomer City Interchange at the Bloomer Urban Growth Boundary (UGB). The proposed project would create additional traffic capacity by widening the existing highway to provide a continuous left-turn refuge, additional travel lanes, new sidewalks on both sides, and a bicycle lane on the westbound lane.

IMPACTS EVALUATED

This report evaluates only a small subset of all project impacts: those that are indirect and that relate to land use. The indirect impacts of a transportation improvement on land use typically occur after the project has been built, and may occur at a distance from the project. Some indirect impacts (i.e., land acquisition and rezoning requests) may occur in anticipation of the project. The general idea is that the project, by improving travel performance, may contribute to new development different from what it would have been in the absence of the improvement. Section II, Framework, provides more detailed definitions.

METHODS USED IN THIS REPORT

This report follows the eight-step process described in the ODOT Guidebook on Indirect Land Use Impacts. See that report for full citations of literature review, case studies, and estimates of impacts. The next section, Framework for Evaluation, provides more information about the data, assumptions, and methods used.

II. Framework for evaluation

WHAT ARE INDIRECT LAND USE IMPACTS?

The federal statute most relevant to the assessment of indirect impacts is the National Environmental Policy Act (NEPA) of 1970, as amended. NEPA, however, does not include any specific references to indirect impacts. The Council on Environmental Quality (CEQ) clarified the meaning when it issued its NEPA regulation in 1978.[1] The CEQ says direct effects "…are caused by the action and occur at the same time and place." Indirect effects "…are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable". Moreover, indirect effects "…may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems." The CEQ differentiates direct and indirect effects from the term cumulative impact. A cumulative impact "…is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions…"

According to the CEQ definitions, the distinction between direct and indirect impacts is made on four dimensions: time, space, probability, and causality. Direct impacts of a project generally happen sooner, closer, and with more certainty than indirect impacts. Indirect impacts may be caused not directly by the project, but by intervening factors that the project affects. Indirect impacts typically occur away from transportation alignments and in the future, but they may also occur along an alignment and in anticipation of a project. Indirect impacts typically occur through the action of an intermediary, usually a household or business, acting in response to anticipated or actual changes in transportation system performance.

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[1] Quotes that follow are from the Council of Environmental Quality Regulations Implementing NEPA (National Environmental Policy Act), 40 CFR, Parts 1500 – 1508 (July 1986).

For an example of an indirect impact, consider the assertion that a highway project improving travel time to a central city will eventually cause a surrounding county to rezone land near, but not adjacent to, the project for residential development. The causal link is much more tenuous (because the impacts are not adjacent to the proposed project). The purported impact is (a) distant from the improvement, (b) not expected for, perhaps, many years, (c) uncertain (maybe it will happen, maybe it won't), and (d) the result of intervening forces (e.g., the highway project affects travel time, which affects land value, which may encourage property owners and developers to petition for zone changes, which would allow more residential development in outlying areas). Those characteristics are the ones that define it as an indirect impact.

Recent research on indirect impacts, published by the Transportation Research Board,[2] concludes that "…there is no clear, common definition of the term indirect effects beyond that in the CEQ [Council of Environmental Quality] regulation," which is the federal regulation that defines how federally required Environmental Impact Statements are to be conducted. Table 1 summarizes these definitions.

Table 1: Summary of Definitions for Direct, Indirect and Cumulative Impacts

	Direct	Indirect	Cumulative
Nature of effect	Typical/inevitable/ predictable	Reasonably foreseeable/ probable	Reasonably foreseeable/ probable
Cause of effect	Project	Project's direct and indirect effects	Project's direct and indirect effects, and effects of other activities
Timing of effect	Project construction and implementation	At some future time after direct effects	At time of project construction or in the future
Location of effect	At the project location	Within boundaries of systems affected by the project	Within boundaries of systems affected by the project

Source: TRB Report 403, page 58.

HOW ARE INDIRECT LAND USE IMPACTS TYPICALLY MEASURED?

The overarching objectives of an analysis of indirect land use impacts are (1) to collect information about factors that are most likely to influence future land development patterns, and (2) to make a defensible estimate (based on the estimated changes in factors that are likely to be associated with the proposed transportation improvement) of the potential changes in development patterns (i.e., of indirect land use impacts).

Several types of data may be useful in identifying indirect land use impacts. At a minimum, an evaluation of indirect impacts must provide some description of:

- Socioeconomic conditions (population, and employment by sub-area and household characteristics)

[2] Louis Berger and Associates, 1998, *Guidance for Estimating the Indirect Effects of Proposed Transportation Projects*, Report 403, National Cooperative Highway Research Program, Transportation Research Board, National Research Council, National Academy Press, Washington, D.C.

- Land use patterns (plan designation and zoning, UGB, city limits, vacant land, building permits by type and location, development capacity)
- Transportation system characteristics (traffic volume, mobility characteristics)
- Public services (primarily, the availability of water and sewer connections and capacity)
- Public policy (land use, economic development, development fees, planned improvements, etc.)

These data will characterize existing land uses in the study area and the conditions and policies that govern future development.

WHAT ASSUMPTIONS AND DATA DOES THE EVALUATION IN THIS REPORT USE?

This analysis is based on the premise that projects that improve mobility (evidenced by v/c ratios) can impact the rate of development and density of development. Safety may also be an issue, but tends to have fewer implications for indirect land use impacts. The evaluation has two parts:

1. How likely is it that this project will be followed by some noticeable change in the land use that would not have occurred in the absence of, or sooner with, the project, given that in Oregon comprehensive plans and zoning tend to control such changes?
2. If such changes did occur, would they be consistent with the comprehensive plan?

The key variables that might contribute to changes in local development patterns in response to a change in travel-time from a highway improvement are:

- Change in accessibility. Changes the rate or density of development may occur if the project is built.
- Expected growth. If the forecast is for no population and employment growth, then the highway improvement is less likely to have an indirect impact on land use city-wide. The project, however, may affect the rate or density of development in the project study area. In contrast, a growing city will demand new development: the greater the growth rate, the greater the pressure to develop where good access and services are available.
- Land supply, by sub-area, by plan designation. How does the volume of vacant, buildable land in the study area compare to the rest of the city or larger region? The more limited the supply elsewhere, the more likely that improved access will contribute to pressure for development in the study area, assuming that other factors conducive to growth are present or planned.
- Availability of other services. The case studies in this research project demonstrated that access alone was not sufficient to trigger development: other key public facilities like sewer and water had to be available to the study area at a reasonable cost. If they are, improvements in access are more likely to support land use change. If water and sewer are or will soon be made available, then it is very likely that the land is inside a UGB and planned for urban use: the improvement may do nothing more than facilitate the planned land uses to develop.

- Other market factors. Where has growth been going; where do local real estate experts expect it to go? How do their expectations correspond with plans and zoning? How does the study area market compare to markets in other sub-areas? Are access (travel time) or other factors limiting conditions on development in the study area?

The analysis of indirect land use impacts uses data from the following sources:

- Aerial photographs from 1980, 1990, and 1998.
- County property tax assessment data that allowed Bloomer GIS staff to plot development by year.
- Building permit data from 1990-2000.
- The Bloomer CIP and water and sewer master plans that identify the location and timing of water and sewer infrastructure.
- GIS maps that show the location and timing of infrastructure improvements.
- GIS maps that show floodways and wetlands that potentially constrain development.

Staff also conducted a focus group meeting to gather input on potential indirect land use impacts. A preliminary description of development patterns provided data for consideration by a focus group. The group consisted of City of Bloomer staff, county staff, council of governments staff, ODOT staff, and others with knowledge of development patterns in the Bloomer area. The purpose of the focus group session was to get comments on the preliminary conclusions made from review of secondary data sources, and to gain insights into the public policy decisions and market factors that could contribute to future development patterns.

The ODOT Guidebook on Indirect Land Use Impacts gives guidance on how to estimate the potential for indirect impacts. Table 2 summarizes that guidance.

Thus, this report attempts to gather information about the key causal variables in Table 2, and to then make judgments about their contribution to pressure for land use changes.

III. Existing and forecasted conditions

Data collection is tied to key variables in Table 2.

Most of the data in this section will go into other sections of the land use technical report. Historical data will go in the existing conditions discussion; forecasts will go in the discussion of direct land use impacts.

Table 2: Assessing Indirect Land Use Impacts

Change variable	Data sources	If value is…	then potential for land use change in the study area is probably…	
Change in accessibility Measured as change in travel time or delay, if available. Otherwise, assessment of v/c or change in access	For large projects or jurisdictions: Travel demand models Otherwise: expert opinion from ODOT or consultant transportation planners or engineers working on the project	Less than 2 minutes of time savings for an average trip, or no change in v/c	None to very weak	Low
		2-5 minutes	Weak to moderate	
		5-10 minutes	Strong	
		More than 10 minutes	Very strong	High
Change in property value Measured in dollars	Assessment data Expert opinion	No change	None to very weak	Low
		0% to 20% increase	Weak to moderate	
		20% to 50% increase	Strong	
		More than 50% increase	Very strong	High
Forecasted growth Measured as population, employment, land development; for region, city, or sub-area	Official population & employment forecasts (a "coordinated" forecast per ORS, if possible). Travel demand forecasting should be driven by same population and employment forecasts	Average annual growth rate (population/employment) of less than 1%	None to very weak	Low
		1%-2%	Weak to moderate	
		2-% - 3%	Strong	
		Over 3%	Very strong	High
Relationship between supply and demand Measured as land supply	Planning documents, especially related to Goals 9, 10, 14 (see Step 4 re development capacity, history, trends, and forecasts) Interviews with realtors, brokers, developers, planners	More than 20-year supply of all land types, all sub-areas	None to very weak	Low
		10 to 20-year supply	Weak to moderate	
		Less than 10-year supply	Strong	
		Less than 10-year supply and specific identified problems in the study area	Very strong	High
Availability of non-transportation services (e.g. sewer/water) Measured number of people or employees that can be served; or barriers to service provision	Local planning documents, especially Goal 11, 12; & CIPs Interviews with local planners and engineers Other reports generated as part of the highway project evaluation	Key services not available and difficult to provide	None to very weak	Low
		Not available and can be provided	Weak to moderate	
		Not available, easily provided and programmed	Strong	
		Available now	Very strong	High
Other factors that impact the market for development	Local planning documents Socioeconomic and ROW reports generated as part of the highway project evaluation Assessment data, MLS, local real estate reports Interviews with brokers, developers	Weak market for development	None to very weak	Low
		Weak to moderate market	Weak to moderate	
		Strong market	Strong	
		Very strong market	Very strong	High
Public policy	Local planning documents Interviews with local officials, local planners, reps of neighborhood or interest groups, state agency planners	Strong policy, strong record of policy enforcement and implementation	None to very weak	Low
		Weak policy, weak enforcement	Moderate to strong	
		No policy, weak enforcement	Very strong	High

Note: Table assumes that the proposed transportation improvement improves accessibility. If not, then the potential for land use change is either insignificant, or could be in the opposite direction (e.g., decreases in land values from the no-build alternative could cause land use changes). If all other measures are “strong” and the access measure ”weak”, the indirect land use impacts are likely to be less.

IV. Assessment of indirect land use impacts

The primary purpose of the proposed project is to accommodate future traffic increases that result from planned commercial and residential development in the project (study) area. Both of the alternatives (Build and No-Build) have the same projected traffic increases for 2020. Table 3 summarizes impacts for the key variables.

Table 3: Assessment of Indirect Land Use Impact Indicators

Change	Conditions	Potential for indirect land use change in the study area
Change in accessibility in study area	LOS consistently improved under build alternatives in study area corridor. Estimated change in travel time through corridor is 1-2 minutes	Weak to moderate
Change in property value	Commercial property values in study area increasing at the same rate as other areas of the City. Tightening commercial land supply suggests more rapid increase. Estimate 10% to 20% increase for commercial; 0% to 10% for residential under build alternatives	Weak to moderate for commercial None to very weak for residential
Forecast growth for Bloomer	Population growth rate 1.7%; employment growth 1.5% 2000-2020 No sub-area forecast	Weak to moderate
Relationship between supply and demand	Study area has capacity to accommodate about 19,000 persons and 6,000 jobs. Little remaining employment capacity in city by 2020 (less than 500); substantial remaining population capacity (more than 8,000)	Strong for retail uses None to very weak for residential uses
Availability of other services	Water and sewer services available now; sufficient capacity for full buildout	Very strong
Other market factors	Interviews with several brokers/developers suggest both strong demand for commercial growth in general, and the desire of several property owners to develop commercially with or without the project. According to developers the area is planned for substantial residential development and is now becoming ripe for commercial development.	Strong
Public policy	Discourages “strip” development in the corridor; plans for new services in the area; consistent with development pattern. City has reputation as tough place for plan or zone changes	None to very weak

Note: Table assumes that the proposed transportation improvement improves accessibility. If not, then the potential for land use change is either insignificant, or could be in the opposite direction. If all other measures are “strong” and the access measure ”weak”, the indirect land use impacts are likely to be less

The data in Table 3 suggest that the pressure for development of residential land will be weak to moderate. Bloomer has substantial excess capacity for residential; a significant amount of that capacity is outside the study area. Moreover, historical development trends show that residential growth has occurred in all areas of the City where residential development is envisioned.

The pressure for commercial development is moderate to strong. One of the impacts of the Build Alternatives would be improved accessibility to the commercial note in the study area. Local real estate experts indicate the land is desirable for development as a retail node, but no more desirable for commercial uses than other available commercial lands in Bloomer. This increased accessibility may be accompanied by an increased rate and intensity of commercial development, as other “enabling factors” are present in the study area.

Bloomer has a relatively matched supply of land available for employment (in other words, land is available in appropriate amounts for commercial, office and industrial uses). The study area, however, includes some of the largest undeveloped tracts of commercial land available in the city. A review of city policies suggests that the city has few restrictions on the type of commercial uses that could locate on those sites. Come vacant low-density residential land with good access and highway frontage is located adjacent to the large commercial tracts. Interviews with local real estate experts suggest that pressure to change those tracts to high-density residential or commercial uses will increase.

Improved access from the Build Alternatives may facilitate conversion to commercial uses in the corridor. This conversion could result in strip commercial development patterns, similar to the pattern observed at the north end of the study area. The City of Bloomer, however, has policies in its comprehensive plan and development code that discourage strip commercial development. Moreover, the City is trying to focus future commercial development in the node at the intersection of Highway 87 and 37th Street. The refinement planning process presently underway is expected to provide more detailed guidance on long-term land use patterns in the commercial node.

Because the build alternatives create additional traffic capacity, they also provide improved mobility. By the year 2020, the No-Build alternative, compared to the Build alternatives, would experience lower mobility at all of the major intersections in the project area. This suggests that development would occur more slowly with the No-Build alternative compared to the Build alternatives. Businesses dependent on good highway access could seek other locations in the City with better service. Commercial lands in the study area, however, are available and serviced. Similarly, residential owners may find their properties less desirable due to traffic congestion.

Land use change in the study area is guided by the county’s comprehensive plan, as implemented. The plan and its implementation will determine future land use patterns in the study area in a general sense. The project, as proposed, supports the land use plans of the City of Bloomer and Pantaloon County, which envisions substantial commercial and residential development in the study area. Proposals inconsistent with the city and county land use policies will require plan amendments, a process that requires local hearings and state acknowledgement.

5.0 REFERENCES

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Oregon Department of Administrative Services population forecasts are available on-line at http://www.oea.das.state.or.us/.

Oregon Department of Land Conservation and Development guidance and documents on Transportation and Growth Management can be found on-line at http://www.lcd.state.or.us/publicat/urban.html; http://www.lcd.state.or.us/issues/tgmweb/pub/tools.htm; http://www.lcd.state.or.us.issues.tgmweb/pub/pub.htm, or by calling 503-378-0050.