



**DRAWING THE BIG PICTURE:
MOVING TOWARD REGIONAL THINKING
THROUGH CUMULATIVE IMPACT ASSESSMENT**

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1.0 Introduction

In December 2006, at the direction of the Regional Planning Governing Board (RPGB), Truckee Meadows Regional Planning Agency (TMRPA) staff prepared a report examining issues including the role, structure, or function of the program of regional planning in Washoe County. This report summarized feedback from workshops with the Regional Planning Commission (RPC) and the Planning Directors and Interim Director of the TMRPA regarding options for the future of the program of regional planning. This report noted,

Much energy goes into evaluating land use changes that bump up against the decision making jurisdiction of local planning entities... as opposed to understanding the ... cumulative impact of many changes on the overall planning system. More energy should be placed on the coordination function and less on the perceived oversight of local piecemeal land-use decisions.

Further, the report states,

There is no agreed, accessible or visual scorecard with which to track progress or the cumulative impact of successive decisions. Agencies use different statistical figures, mapping systems, forecasts, projections and planning strategies. **There is no shared vision for what the region**

should strive for nor how we track progress toward it.¹

Regional Planning staff presented this report to the RPGB at its December 2006 meeting. Following discussion, the Board directed staff to prepare a timeline and critical path to address the topic of evaluating and reporting on the efforts of other communities to address cumulative impacts associated with planning and development decisions.

Regional planning agencies in other metropolitan areas of the United States have similar needs for acknowledging, tracking, and evaluating cumulative impacts of development on a regionwide basis. The purpose of this study was to conduct research into examples of cumulative impact evaluation as conducted by several such agencies in other regions, in order to compare methods, procedures, and principles with those of the TMRPA. This report describes several approaches for obtaining data on cumulative impacts and provides an assessment of these processes, identifying elements that contribute to or hinder the success of the process in other jurisdictions.

The report includes discussion of ways cumulative development impacts may be categorized, which impacts are most readily evaluated, how impacts are being measured and quantified in other communities, and how this information is used to inform planning and development decisions and policies. Case studies were

¹ Bold added for emphasis.

conducted of regional agencies with relevant or exemplary programs. This report describes these cases and summarizes key findings from the case study analysis that may apply in the regional planning context of the Truckee Meadows.

The report is organized as follows. Section 2.0 describes the methodology used in preparing this report. Section 3.0 presents study findings and discussion, including a framework for considering cumulative impacts, a survey of approaches for evaluating cumulative impacts, six case studies, case study lessons, options for the Truckee Meadows region. Section 4.0 provides references.

2.0 Methodology

At project initiation, the consultant conducted a review of the planning literature and other information sources to obtain background information. Readily accessible planning literature and internet sources were consulted to identify organizations/communities that are providing leadership in this area, technical issues associated with cumulative impacts assessment, proposed or actual solutions to these technical issues, and any discussion of how the quantification of cumulative impacts is used to inform policies and planning decisions.

In September and October 2007, the consultant met with the Community Development Directors for the Cities of Reno and Sparks and Washoe County and the Interim Director of the TMRPA, along with senior staff members from these organizations, to discuss preliminary findings of this project and to refine research directions for the remainder of the study. The focus of these discussions was on the applicability and usefulness of cumulative impacts research to the Truckee Meadows region, particularly at the regional planning level. It was determined that the most promising roles for TMRPA in the evaluation of cumulative impacts regionally include:

- Measuring the region's progress toward meeting the goals of the Regional Plan, and
- Examining alternative long-term growth and development scenarios in preparation for the five-year update of the Regional Plan.

Consequently, project research and interviews with planners from other regional agencies emphasized these two broad areas of cumulative impacts assessment. The consultant interviewed planning staff and surveyed material describing cumulative or regional impact assessment for approximately ten agencies responsible for regional planning efforts. Based on this initial review, six agencies were selected for case study evaluation. The purpose of this evaluation was to identify approaches used elsewhere that could be utilized or adapted by the TMRPA in establishing its own approach to cumulative or regional impact assessment. Published plans and policies, as well as other materials providing guidance on the planning and impact evaluation process, were evaluated. In each case, one or more planners or program directors familiar with the local process was interviewed for each agency studied.

In addition to this methodology, articles and reports published by a number of local jurisdictions and federal agencies, as well as by academic researchers, were reviewed and key concepts included in report discussion.

3.0 Findings and Discussion

3.1 A Framework for Considering Cumulative Impacts

In this section, we briefly review the concept of cumulative impact assessment as it has been used in the contexts of planning and environmental policy. By examining the range of possibilities for applying cumulative impact assessment and the challenges inherent in doing so, we will see how important it is to build a consensus around the goals and uses of impact assessment to guide any regionally-based effort.

The term “cumulative impacts” encompasses a broad spectrum of impacts, including effects on ecological resources, water quality, air quality, traffic/congestion, open space systems, human health, recreation, aesthetics, cultural and historical resources, quality of life measures, and other issues. In a regional planning context, these impacts are likely to result indirectly from planning policies and decisions. In other words, they depend on the consequent private and public sector actions that are not always predictable. Further, cumulative impacts are also influenced by other activities, such as past or future actions, that also affect the community.

Exhibit 1 depicts the relationships among planning and development decisions, private/public sector actions, and cumulative impacts. Note that these impacts occur within the broad context of community outcomes. It is these community outcomes that are generally the true concern; measurable indicators

that are used in impact assessment tend to be proxies for these broader issues and goals (e.g., providing options for access and mobility, achieving regional coordination of land use planning across jurisdictions, maintaining a safe and cohesive community).

Federal guidance, experience, and precedents. The practice and techniques of cumulative impact assessment are rooted in federal regulatory policy. The wealth of experience and guidance on cumulative impact analysis provided by federal agencies was reviewed for its application in the regional planning arena and is summarized in this section.²

Under the National Environmental Policy Act (NEPA), project sponsors are required to identify and avoid, minimize, or compensate for direct project impacts. While the NEPA legislation does not mention indirect or cumulative impacts, the President’s Council on Environmental Quality (CEQ) established federal agency responsibility for identifying, analyzing, and documenting direct, indirect, and cumulative impacts in its “Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act (40 CFR §§ 1500 - 1508).” CEQ regulations direct that the environmental consequences section of an Environmental Impact Statement or Environmental Assessment include a discussion of

² Because the term “cumulative impacts” has such a strong association with environmental policy, the term “regional impacts” is at times used in this report to describe efforts to track or predict the impacts of planning or development decisions by a regional planning organization.

adverse impacts that cannot be avoided, including direct and indirect impacts.

Numerous other federal statutory and regulatory mandates include indirect and/or cumulative impact requirements as well. These include the Endangered Species Act, Section 404 of the Clean Water Act, Section 106 of the National Historic Preservation Act, Executive Order 12898 on Environmental Justice, Federal Emergency Management Agency (FEMA) Regulations on Floodplain Management and Protection of Wetlands, Farmland Protection and Policy Act implementing regulations regarding Federal or Federally assisted projects that may convert farmland, Federal Highway Administration Standards, and the Coastal Barrier Resources Act.

The CEQ issued guidance on cumulative impact analysis, also termed “cumulative effects analysis,” in 1997; this guidance is widely cited in numerous contexts, not just NEPA review. Exhibit 2 summarizes the principles of cumulative effects analysis, as presented in the report, *Considering Cumulative Effects Under the National Environmental Policy Act* (Council on Environmental Quality, 1997). While the scope of that report was limited to environmental effects, the principles are useful for consideration of broader regional impacts analysis.

The CEQ guidance provides the following useful definition:

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 regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR § 1508.7) ... Cumulative impacts may also include the effects of natural processes and events, depending on the specific resource in question.

Exhibit 3 illustrates the relationship between direct, indirect, and cumulative effects.

Management goals of cumulative impact assessment. Cumulative impact assessment is a valuable exercise only when it aids decision making. It is necessary to identify **management goals** for use of cumulative impact information. How is the information likely to be used? Given the scope and role of the agency, which types of impacts are crucial for decision making?

Operationally, once the management goals of cumulative impact assessment have been established, the potential for accurately quantifying the right impacts must be examined.

In interpreting cumulative impacts, decision makers should ask:

- Do the indicators chosen accurately represent the impacts of concern?
- Can a cause-and-effect relationship be clearly established between public sector decisions and measurable changes?
- Do the measured outputs in a cumulative impact assessment truly indicate *outcomes* in the context of the community and its values?

As observed by University of Wisconsin economist Steven Deller, there is a “broader performance measurement discussion that is occurring within the field of public administration. Specifically the widely discussed distinctions between inputs, outputs and outcomes. Inputs and outputs are easily identified and measured, but outcomes are an entirely different matter... The outcomes are values and not as easily measured: a stronger sense of community, enhanced economic opportunity and perhaps a stronger business climate.” (Deller 2005) Again, the importance of keeping management goals in mind while diligently tracking cumulative impacts cannot be overstated. As argued by policy analyst Robert Behn of Harvard University, “The leaders of a public agency should not go looking for their one magic performance measure. Instead, they should begin by deciding on the managerial purposes to which performance measurement may contribute. Only then can they select a collection of performance measures with the characteristics necessary to help them (directly and indirectly) achieve these purposes.” (Behn 2003)

The same may be said of cumulative impact assessment in a regional planning context: the assessment program must be designed to assist the public and community leaders in thinking regionally and in moving the affected communities toward a regional vision.

Exhibit 1: Relationships Among Decisions, Actions, and Impacts

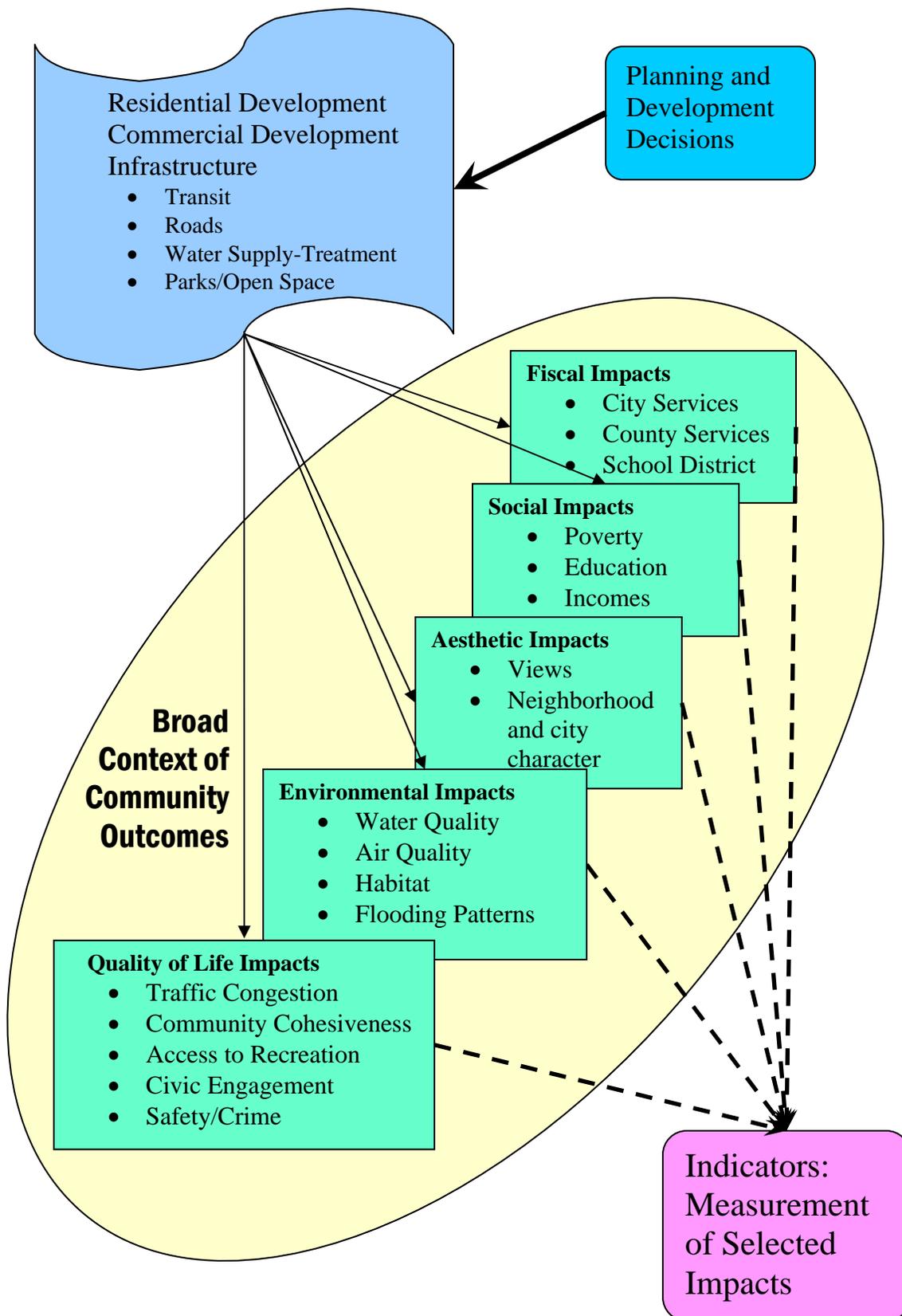
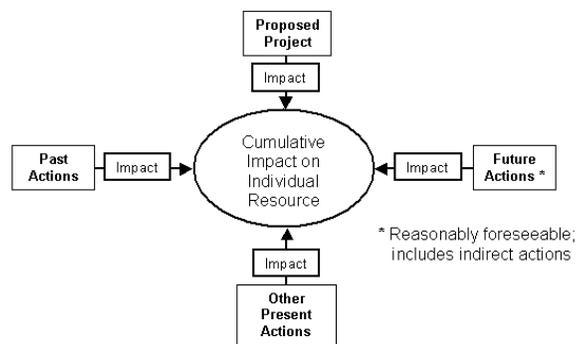


Exhibit 2 Principles of Cumulative Effects Analysis

- ✓ Cumulative effects are caused by the aggregate of past, present, and reasonably foreseeable future actions.
- ✓ Cumulative effects are the total effect, including both direct and indirect effects, on a given resource, ecosystem, and human community of all actions taken, no matter who (federal, nonfederal, or private) has taken the actions.
- ✓ Cumulative effects need to be analyzed in terms of the specific resource, ecosystem, and human community being affected.
- ✓ It is not practical to analyze the cumulative effects of an action on the universe; the list of environmental effects must focus on those that are truly meaningful.
- ✓ Cumulative effects on a given resource, ecosystem, and human community are rarely aligned with political or administrative boundaries.
- ✓ Cumulative effects may result from the accumulation of similar effects or the synergistic interaction of different effects.
- ✓ Cumulative effects may last for many years beyond the life of the action that caused the effects.
- ✓ Each affected resource, ecosystem, and human community must be analyzed in terms of its capacity to accommodate additional effects, based on its own time and space parameters.

Excerpted from *Considering Cumulative Effects Under the National Environmental Policy Act*. Council on Environmental Quality, Executive Office of the President. 1997. Wash., D.C.

Exhibit 3 Cumulative Impacts Diagram



Source: Federal Highway Administration, *Questions and Answers: FHWA's Interim Guidance on Indirect and Cumulative Impacts*, May 2003

3.2 Survey of Approaches for Evaluating Cumulative Impacts

The 1997 CEQ Guidance on considering cumulative effects notes that most methods for impact analysis take one of two basic approaches: 1) the **impact assessment approach**, which evaluates the cumulative effects of combined actions relative to thresholds of concern for resources or ecosystems. This type of analysis is largely an extension of environmental impact assessment, and 2) the **planning approach**, which optimizes the allocation of cumulative stresses on the resources or ecosystems within a region. This approach regards cumulative effects analysis as a correlate of regional or comprehensive planning.

The approaches discussed below include both of these components. They are categorized according to the management use for which they are designed. This type of analysis can take two forms:

- *Ex post* approaches, focusing on **impact measurement** (Benchmarks and Indicators, Informational Mapping and Surveys), and
- *Ex ante* approaches, focusing on **impact prediction or forecasting** (Scenario Planning and Trends Analysis, Quantified Impact Assessment: Other Approaches).

As can be observed in the case study discussions to follow, most comprehensive approaches include elements of both.

Analysis of Past Performance: Benchmarks and Indicators

Indicators have become quite popular for showing the linkages between local public sector programs and community results. Typically, they have not been focused on land use changes or regional policies. Increasingly, however, programs of regional planning are utilizing indicators or benchmarking studies to assess progress toward regional planning goals. (The use of government performance measures or standards is related to this type of effort, but tends to focus on the actual inputs and outputs of public sector programs and less on measurable community outcomes.) In this section, the relevance of indicator projects is discussed, followed by an overview of regional benchmarking studies.

Local indicator projects are typically managed by independent non-governmental organizations, and their focus is on achieving community goals. Traditional indicator categories include measures of social, economic, and environmental well-being. Sustainability indicators are also now being used.

One reason regional planners often do not rely on indicator efforts is that indicator projects generally are comprehensive in nature and therefore include many elements, such as educational achievement, that arguably are unrelated to land planning issues. However, such efforts often may quantify relevant information as part of the overall package. For example, the *Sacramento Region Quality-of-Life Report* was issued by the civic organization Valley Vision in 2004.

Valley Vision was closely involved with the Sacramento Council of Governments (SACOG) in development of its Preferred Blueprint Scenario for 2050, the region's first attempt to guide regional growth over the next 50 years. The *Quality-of-Life Report* contains a significant section (approximately 20 pages of maps, tables, and interpretation) on issues surrounding "Place." Topics include: Urbanization and Farmland Conversion, Jobs and Housing Balance, Housing Development, Home Ownership Opportunities, Housing Affordability, Rental Affordability, Traffic Congestion, Work and Non-work Travel Trips, Public Transit, Health of Rivers and Streams, State of the Sacramento Valley Flood Control System, Urban Forest and Parks, Air Quality, and Protected Lands.

As the Sacramento indicators report illustrates, one of the contributions to be made by such efforts is in making land use and growth-related data accessible to the public in a format that is meaningful. For example, for each indicator, the report explains:

- What is the indicator?
- Why is it important?
- How are we doing?

Many indicator projects exist throughout the country. A few selected examples of excellent projects include Truckee Meadows Tomorrow here in our own area, Alaska 2020, the Santa Cruz County Community Assessment Project, CitiStat (City of Baltimore, Maryland), the Community Report Card (Osceola County, Florida), the Boston Indicators Project, Virginia Performs, the Yampa Valley Community Indicators Project, and, as a statewide example, the 2007

California Regional Progress Report, managed by the California Center for Regional Leadership.

Regional benchmarking projects have been initiated by regional planning agencies and Metropolitan Planning Organizations (MPOs) as long-range plans have been adopted and move into implementation phases. Examples discussed in some detail in the Case Studies section of this report include the Twin Cities Metropolitan Council's program and a relatively new program conducted by the Community Planning Association (COMPASS, the Boise area's MPO) in Idaho. In both of these cases, data are to be obtained on an annual basis and relate directly to goals stated in the regional plan or regional transportation plan.

Tracking of Land Use Impacts: Informational Mapping and Surveys

Many regional agencies provide mapping and survey information as a service to their members. Cumulative impacts to land within the region from development, infrastructure construction, and other changes are tracked and mapped in a database accessible to member communities and agencies. Examples include:

- **Aerial survey/mapping.** The Southeastern Wisconsin Regional Planning Commission (SEWRPC); serves the seven counties of the greater Milwaukee area. SEWRPC conducts a five-year aerial survey of the planning region. It uses this survey to update its land use maps. As part of a range of services provided, it

serves in an advisory capacity to the member counties and municipalities in meeting regional planning goals and provides technical assistance for GIS and related needs.

- **Regional geospatial data.** One program of the Metropolitan Council of the Twin Cities in Minnesota is MetroGIS DataFinder. DataFinder provides regionwide access to geospatial data pertaining to the seven county Minneapolis-St. Paul Metropolitan Area. Its primary function is to facilitate sharing of GIS data among organizations serving the Twin Cities Metropolitan Area. DataFinder provides metadata (data that describe a dataset to allow others to find and evaluate it) describing GIS data sets, many of which can be directly downloaded or used via map services.

Projection of Future Impacts: Scenario Planning and Trends Analysis

Scenario planning focuses on exploring the future. Scenario planning exercises involve identifying trends and exploring the implications of projecting them forward. As different trends are chosen and forecasts of different impacts are combined, a wide spectrum of future possibilities can be identified.

In regional planning, scenario planning efforts usually look 20-50 years out and usually entail GIS-based modeling. When possible, regional scenario-planning efforts now attempt to include GIS-enhanced visualization of impacts and development results.

Scenario planning efforts are described in some detail in most of the case studies in Section 3.3 of this report. In this section, several of the tools most commonly used for these efforts are reviewed. Brief examples of ways scenario planning can be employed are also presented.

Exhibit 4 presents several software programs capable of assisting with regionwide scenario planning.

Exhibit 4

Examples of Selected Software Programs for Scenario Planning

- ❖ **CommunityViz.** This software program that builds on Arcview (GIS) software lets planners plug in various alternative development scenarios, envision them in a three-dimensional format, and then measure and compare the quantifiable effects of each development scenario on quality of life and natural resource indicators. Some examples of impacts that can be quantified include auto emissions, jobs, population, vehicle trips per day, school population, commercial energy use, residential energy use, jobs to housing ratio, and water use. Locations comparable in size to the Truckee Meadows region that are using CommunityViz: 1) Pittsburgh/Allegheny County, 2) Calgary, Canada, 3) Colorado Springs (This project involves the COG, the Colorado Natural Heritage Program, and funding from the Federal Highway Administration. An ongoing impacts evaluation program will be established.).
- ❖ **PLACE³S.** This is an analytical and community involvement program that is organized around energy use and its effects (costs, environmental quality, community livability, etc.). It is a project of the State Energy Offices of Oregon, Washington, and California. PLACE³S is an acronym for **PL**anning for **C**ommunity **E**nergy, **E**conomic and **E**nvironmental **S**ustainability. According to the California Energy Commission website, it is "an innovative planning method that fully integrates focused public participation, community development and design, and computer-assisted quantification tools (GIS)." Its stated purpose is to help communities produce plans that save energy, attract jobs and development, reduce pollution and traffic congestion and conserve open space. One goal of PLACE³S is to create an information base that functions as a common yardstick, empowering a community to compare plan components and make informed trade-offs.
- ❖ **INDEX.** This modeling software uses GIS mapping to track a wide variety of livability indicators at the neighborhood, community, or regional scale. It can track over 85 specific performance indicators; a few examples include infill (amount of existing contiguous development), pedestrian safety, access to grocery stores, access to bus stops, street tree cover, land use diversity, land form alteration, water demands, impacts to local water system carrying capacity, wind buffering, and bicycle network connectivity. Outputs include indicator scores in numeric and spatial form; comparative charting of multiple case results; and documentation of all input parameters. Optionally, scenarios can be visualized using 3-D modeling, photography, video, and drawings. INDEX is distributed by Criterion Planners of Portland, OR.
- ❖ **What if?.** This is also a software program designed for scenario planning and impact analysis. According to its website, "What if? is an easy-to-use GIS-based system that can be used to explore alternate futures for a community and prepare long-term land use, population, housing and employment projections for enumeration districts, political jurisdictions, and user-defined areas such as school districts, and traffic analysis zones." The package can be customized to the user's GIS data and policy issues.

While for some agencies scenario planning may occur on a five- or ten-year basis, in some cases it is conducted on a more regular basis, but perhaps at a level that is less data-intensive. In Santa Barbara County, California, the Strategic Scan is conducted by the Long Range Planning Division annually or biannually. The Strategic Scan is an **overview of emerging trends** and their projected impacts in the county. It is felt that the Strategic Scan process, combined with cumulative impacts analysis under CEQA, provides a good assessment of the regional effects of planning and development decisions in the county.

In 2005, the Strategic Scan incorporated scenario planning to shape discussion of possible futures available to the county. Scenarios focused on alternative approaches to growth and development and included Status Quo/Incremental, Resource Preservation/Eco-zone, Urban Villages, and a Capital Intensive Approach. The scan projected impacts of the alternative scenarios, but also included a recommended approach based on the trends analysis (in this case, an Urban Villages vision).

Scenario planning can be used very effectively in **generating extensive public input and involvement**. Three examples include the following:

- In Verona, Wisconsin, University of Wisconsin Land Information and Computer Graphics Facility researchers used the CommunityViz quantitative analysis component to conduct growth impact analyses in which they selected parcels, allocated land use, and predicted growth 5-20

years out. They calculated changes in population, traffic, natural resources, dwelling units and student population. They used SiteBuilder 3D (companion software to CommunityViz) to develop a model of Verona township and a model of a proposed subdivision. They then used SmartBoard, a 60-inch diagonal touchscreen mounted horizontally, to allow participants to gather around, view data, and edit information.

- In the Boston area, the Metropolitan Area Planning Council has graphic depictions of long-term growth alternatives available on its website. These visualizations can be viewed in a few minutes by interested members of the public simply by accessing the website. They examine real settings in the Boston area under alternative scenarios for residential, commercial, and transportation development.
- Techniques refined by John Fregonese of Fregonese Calthorpe Associates have used GIS modeling, impact analysis, and visualization to greatly enhance the community process. This firm has focused on distributing regional planning information in ways to engage the broadest audience. Projects include the Portland 2040 Plan and Envision Utah's work in the Salt Lake City area, both of which are described in the case studies section of this document. Techniques emphasize using a range of graphic formats that are understandable to both citizens and professional planners to examine growth scenarios. They make extensive use of media and public surveys to educate and obtain public participation.

Quantified Impact Assessment: Other Approaches

Cumulative impact analysis used in other arenas, such as the environmental field, utilizes certain techniques that apply equally well to the regional planning context. These include establishing criteria for identifying which resources to evaluate and use of thresholds in interpreting the severity of impacts. These ideas, plus concepts described in the *Community Guide to Development Impact Analysis* (Edwards, 2000), are summarized in this section.

An EPA guidance document, *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (U.S. EPA Office of Federal Activities, 1999) suggests the following criteria for identifying which resources are cumulatively affected:

1. whether the resource is especially vulnerable to incremental effects;
2. whether the proposed action is one of several similar actions in the same geographic area;
3. whether other activities in the area have similar effects on the resource;
4. whether these effects have been historically significant for this resource; and
5. whether other analyses in the area have identified a cumulative effects concern.

Thresholds can be used to determine if the cumulative impacts of an action will be significant and if the resource will be degraded to unacceptable levels. They are discussed in detail in the U.S. EPA 1999 guidance, but can be applied in social, economic, and fiscal contexts, as well as in

environmental analysis. As noted in the EPA guidance, they should be practical, scientifically defensible, and fit the scale of the analysis. Thresholds may be set for specific numerical standards (e.g., dissolved oxygen content to assess water quality), qualitative standards that consider biological components of an ecosystem (e.g., riparian condition and presence of particular biophysical attributes), or desired management goals (e.g., open space or unaltered habitat). Change is then evaluated in terms of both the total threshold beyond which the resource degrades to unacceptable levels and the incremental contribution of the proposed action to reaching that threshold. Exhibit 5 presents examples of thresholds.

A **worksheet approach**, as demonstrated in the *Community Guide to Development Impact Analysis* (Edwards, 2000) breaks cumulative impact analysis into functional components that can be made transparent to the policy analyst and decision maker.

This methodology can be conducted through use of a software program, *Assessing the Impacts of Development*, a printed guide with attached worksheets, or an online guide. It includes: 1) fiscal impact analysis, 2) traffic impact analysis, 3) socio-economic impact analysis, and 4) environmental impact analysis, as well as sections on “Putting It All Together” and a cost of community services approach.

Exhibit 5
Selected Examples of Thresholds

- ❖ **Total change in land cover.** A simple indicator of biotic integrity. Thresholds for areas with high alterations would generally be lower than areas that are not as degraded. If open space or pristine areas are a management goal then the threshold would be a small percentage change in land cover.
- ❖ **Patch size distribution and distances between patches.** Important indicators of species change and level of disturbance. Thresholds would be set to determine the characteristics of an area needed to support a given plant or animal species.
- ❖ **Estimates of fragmentation and connectivity.** Can reveal the magnitude of disturbance, ability of species to survive in an area, and ecological integrity. Threshold would indicate a decrease in cover pattern, loss of connectivity, or amount of fragmentation that would significantly degrade an area.
- ❖ **Indicators of water quality and watershed integrity.** Specific concentration and levels of nitrogen, phosphorous, turbidity, dissolved oxygen, and temperature can be used.
- ❖ **Size of riparian buffer zones.** Condition of riparian zones and changes in percent of buffer areas can indicate a decline in water quality due to soil erosion, sediment loading, and contaminant runoff.
- ❖ The **integrity of historical districts** is an example of a threshold that is goal related. Viewed in isolation, demolition of an individual structure does not significantly diminish the character of the district and indeed may be beneficial to the overall stability of the district. But the cumulative effect of a whole series of such demolitions can significantly erode the district. Continued loss of historic structures can reach a point where the visual integrity of the district is lost.

Source: *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (U.S. EPA Office of Federal Activities, 1999)

This guide is primarily designed, however, for analysis of individual developments. Cumulative impacts are addressed qualitatively; use of the “threshold” method of evaluating cumulative fiscal and environmental impacts is encouraged. This guide suggests the following methods (several of which are explored elsewhere in this report) for evaluating cumulative effects:

- **Geographic Information System Analysis** assesses the spatial relationship between activities and potential environmental effects and may be used to explore development alternatives.
- **Questionnaires, interviews, and panels** to gather information about the range of proposed developments and natural resources potentially impacted by development.
- **Checklists** are useful for identifying potential cumulative effects by providing a list of common or likely effects and actions which may cause the effects.
- **Matrices** can be used to quantify the interactions between human activities and resources of concern.
- **Networks and System Diagrams** provide a method for identifying the cause-effect relationships which result in cumulative effects.
- **Modeling** is another method for quantifying cause-effect relationships which result in cumulative effects.
- **Trends Analysis** assesses the status of a resource or community over time and changes in the occurrence or intensity of stressors over the same time period. It can also be used

to establish acceptable environmental baselines and/or estimate future cumulative effects (Edwards, 2000).

3.3 Case Studies

Of the regions, programs, and approaches studied, six regional planning programs were selected for in-depth review and are presented here as case studies. They were selected because the work they are doing is applicable to the Truckee Meadows region, particularly at the regional planning level.

In meetings with community and regional planning leaders in our area, it was determined that the most promising roles for TMRPA in the evaluation of cumulative impacts regionally include:

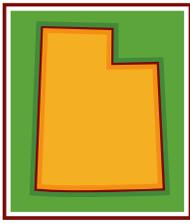
- Measuring the region's progress toward meeting the goals of the Regional Plan, and
- Examining alternative long-term growth and development scenarios in preparation for the five-year update of the Regional Plan.

Each case study region has program components addressing these two points. Additionally, several of the case study regions have geographic, demographic, or economic similarities to our region and consequently were felt to be especially relevant in considering what might be undertaken in the Truckee Meadows.

Case studies include:

- Salt Lake City, Utah Region
- Washington County, Utah Region
- Boise, Idaho Region
- Minneapolis-St. Paul, Minnesota Region
- Portland, Oregon Region
- Sacramento, California Region.

Salt Lake City, Utah Region



The Salt Lake City region is known locally as the Greater Wasatch Area and includes 10 counties, 88 cities and towns, and 1.7 million residents.

Although not comparable in size to the Truckee Meadows region, it was studied due to its geographic proximity, climatic and topographic similarity, and leadership in the area of regional impact assessment. Through a joint effort of the civic organization Envision Utah and the two MPOs working in this region, a 2040 plan and a Quality Growth Strategy were released in 2002. Development of the plans involved extensive use of regionwide scenario analysis. Prior to adopting the plans, five years of scenarios analysis, research and public involvement helped Envision Utah and the MPOs bring the topic of planning and preparing for growth to the forefront of public awareness.

Scenario Planning: Envision Utah's Quality Growth Strategy. The Governor's Office of Planning and Budget coordinated a technical committee, called Quality Growth Efficiency Tools (QGET), that provided critical technical information to help analyze the impacts of growth on transportation, air quality, land use, water supply/demand, and infrastructure costs. Through extensive involvement of the public, local and state elected officials, and other stakeholders, Envision Utah gathered information about what area residents valued and how they thought growth should be

accommodated. Based on this information, Envision Utah identified six primary goals to be addressed in the Greater Wasatch Area:

- enhance air quality;
- increase mobility and transportation choices;
- preserve critical lands, including agricultural, sensitive and strategic open lands;
- conserve and maintain availability of water resources;
- provide housing opportunities for a range of family and income types; and
- maximize efficiency in public and infrastructure investments to promote other goals.

With the use of the state's technical tools and analysis of public input, Envision Utah developed four alternative growth scenarios showing possible development patterns that could result if various growth strategies are implemented during the next 20 to 50 years. An extensive analysis of these alternative scenarios was conducted to determine and demonstrate the relative costs and impacts of each strategy on population, infrastructure costs, air quality, water, open space and recreation preservation, traffic congestion, affordable housing, business patterns and other significant topics. The alternatives ranged from a very auto-oriented, sprawl scenario, to significant increases in densities and extensive transit systems.

Quantified analysis was presented for the four scenarios, with key impacts including: transportation choices, infrastructure costs, water demand, walkable communities, air quality,

average residential lot size, amount of land consumed, and agricultural lands consumed.

The impact analysis process occurred in several stages. Transportation modeling took place first and was conducted by the two Metropolitan Planning Organizations (MPOs). They modeled how far residents would need to drive and the use of public transportation to generate projected Vehicle Miles of Travel (VMT) and transit ridership. This information was then given to analysts at the Division of Air Quality where they used VMT and average speed data to determine the amount of vehicle emissions in relationship to population densities. Then they ran the data through very extensive computerized air quality models that analyze projected environmental and atmospheric conditions to determine total emissions and their proximity to future population centers.

Next, the Governor's Office of Planning and Budget used VMT and information about major infrastructure projects to generate an infrastructure cost model. The engineering firm PSOMAS contributed to this stage of the process, helping to develop a model to determine the municipal and developer costs of local infrastructure.

In 1999, Envision Utah launched a massive public awareness campaign to educate residents about the effort and to involve them in the decision-making process. Strategies included a press conference, press tour, newspaper inserts, and radio and television ads. Ultimately, nearly 17,500 residents completed an

Envision Utah growth survey either online or through a mail-in survey.

The Quality Growth Strategy reflects both the scenario planning process and the exhaustive public workshops that accompanied it. The public workshops were integral to the scenario-building process. Additionally, graphics illustrating concepts such as transit-oriented development and public transportation options were very important in helping community leaders and the public to establish a vision of what the alternative futures might look like (T. Watkins, pers. comm.). After development of the scenarios, nearly 2,000 residents attended one of 50 town meetings.

Scenario Planning: Wasatch Choices 2040 Vision. This year, the Wasatch Front Regional Council (WFRC), which is the MPO for the greater Salt Lake City region, issued a new Regional Transportation Plan. The WFRC, in partnership with the Mountainland Association of Governments (also a regional MPO) and Envision Utah, engaged in a visioning process for growth and development in the urban area. After an elaborate public involvement process, several growth scenarios were prepared and evaluated for cost effectiveness, environmental impacts, and other factors. This led to regionwide adoption of the Wasatch Choices 2040 "Vision."

Several elements of cumulative impact analysis were used in developing the Wasatch Choices 2040 Vision. In 2004 and 2005, 13 workshops throughout the region were held, attended by more than 1,000

people. Based on priorities and locational preferences learned from these workshops, four distinct growth scenarios were developed and examined. The four 2040 scenarios, when compared to each other, incorporated the same total population and employment figures. While each scenario highlighted different transportation choices, the cost for each approach was largely the same. By eliminating differences in population, employment, and transportation expenses, benefits of different growth and transportation scenarios could be more easily compared. The scenarios were: Business as Usual, Transit Station Villages, Interconnected Network of Complete Streets, and Centers of Employment. The scenarios quantified such impacts as driving distances and times, congestion, choice of transportation, expansion of developed land area, percent growth through land re-use, and housing choices available.

The impacts of implementing the vision were shown graphically through the use of computer simulated street scenes. For example, a street corner showing existing conditions is contrasted with a simulation of the first phase of transit oriented development (streetscape alterations and the addition of buses) and the second phase of transit oriented development (streetscape alterations, buses, and new commercial/residential development).

The resulting Vision Scenario reflects desired elements from this scenario planning, as well as themes from the 13 public workshops and solutions that are plausible given current development in the region.

Assessment of Regional Progress.

Extensive benchmarking or *ex post* impact analysis has not been a major emphasis for Envision Utah since release of the Quality Growth Strategy (T. Watkins, pers. comm.). Four years ago, however, Envision Utah undertook an effort to measure progress toward meeting the goals of the Quality Growth Strategy, primarily using demographic and economic data from the Governor's Office of Planning and Budget. A report was issued in 2003 (*2003 Baseline Analysis*, Governor's Office of Planning and Budget University of Utah, Envision Utah, City and County Planning and Zoning Survey, Wirthlin Worldwide) to address questions such as:

- Are growth patterns changing?
- Are we implementing the public's goals?
- What are the challenges?
- Where do we go from here?

The report provided data on air quality trends, trends in water demand and supply, trends in water conservation measures taken by households, growth's impact on business, economic development, and tourism, vehicle miles traveled, transit use, opinions about transit and highway projects and walkable neighborhoods, housing supply, demand, and affordability, housing options, and opinions about public efforts to preserve critical lands. It also examined public and agency awareness of the Quality Growth Strategy and found extremely high rates and an increase in local planning capacities.

In addition to these quantified regional impacts, notes Senior Planner Tim

Watkins, there are important factors that cannot be quantified which have resulted from the scenario planning and visioning effort begun ten years ago. Key among these are the dialogue that continues to this day and the increasing ability of the region's two MPOs to tie land use planning to transportation planning. As transportation networks build on existing community land use plans, the development of a shared regional vision across jurisdictions and agencies allows for much better integration of land use and transportation planning.

Washington County, Utah Region



St. George, Utah is located in the southern part of the state and is the county seat of Washington County. This area, known as Utah's Dixie, has a population of over 140,000. The county's population has nearly doubled in each of the past three decades. Snow Canyon State Park and Zion National Park are located here. This region was selected as a case study because it has recently completed a visioning process based upon scenario planning using the GIS-based impact assessment program CommunityViz. The large size of county land area (2,430 square miles) and the county's situation as one of the fastest-growing counties of the U.S. are other factors of interest.

In response to this rapid growth, the Washington County Commission sponsored Vision Dixie, described as a county-wide "conversation" designed to provide opportunities for the public to make informed recommendations for the future. Working with Envision Utah as a facilitator, the county brought in the planning firm Winston Associates of Boulder, Colorado to develop alternative growth scenarios for evaluation. Each scenario could be linked to dozens of indicators through CommunityViz, and the program's 3D capabilities allowed for graphic presentations that made the scenarios more visually accessible to residents. For example, a bird's-eye view of a valley graphically depicts the scene under existing conditions, then growth

scenarios using 5-acre lots, clustering, and village concepts are depicted to illustrate how much land may be affected and in what patterns. While use of the CommunityViz program on a large, county-wide scale required significant set-up time, it was less data-intensive than other GIS-based software often used by planning agencies and allowed for better interaction in the public workshop phase of the project (P. Glasgow, pers. comm.).

Vision Dixie hosted a series of workshops throughout the county open to all interested parties. Participants were divided into small groups to express their preferences for future development and conservation through a facilitated mapping exercise. The workshops were "brainstorming" sessions used to generate ideas to be tested through scenario evaluation.

Using the selected growth scenarios, impacts were estimated for key measures of quality of life, such as critical lands, housing affordability, air quality, relative development densities, traffic congestion, etc.

The public input process was extensive for this project. Opportunities for engagement included 13 workshops attended by 1,200 people, Dixie Dialogue Meetings attended by 515 residents, an online survey complete by 843 individuals, and a survey conducted by Dan Jones completed by 400 residents. A total of 3,000 people are believed to have participated in the process thus far.

Taking selected elements from the scenarios, and steered by public

preferences, Vision Dixie is now in the process of creating a Washington County Vision. The Vision will be based on planning principles embodied in the publicly supported features of the scenarios. It will include a county map suggesting preferred land use patterns and a set of guiding principles that can serve as a foundation for general plan amendments, as well as guidance and local input for consideration by federal and state land managers.

Boise, Idaho Region



The Boise, Idaho region was included in this review in part due to its similarities to the Truckee Meadows as a fast-growing, mid-sized city in the intermountain West. This area, known as the Treasure Valley, has recently engaged in two major activities that include regional impact assessment. The first activity was broad scenario planning for development of two long-term plans, the Blueprint for Good Growth (BGG, focused on land planning) and Communities in Motion (CIM, the area's long-range transportation plan). The second activity of note is the annual monitoring report used to assess progress in implementing CIM.

Scenario planning and regional impact assessment. The Blueprint for Good Growth is an intergovernmental agreement executed by the six cities comprising the central Boise area, Ada County, the Ada County Highway Department, and the Idaho Transportation Department. It reflects the desire of its members to address growth, land use, and transportation issues in a coordinated manner and aims to limit sprawl, increase transportation choices, and protect natural resources. The BGG was developed in coordination with the CIM long-range transportation plan. This transportation plan is developed and implemented by the Community Planning Association (COMPASS, the Boise area's MPO).

The CIM plan evaluated several alternative growth scenarios. These scenarios, and the quantified impacts associated with them, were discussed at a number of Community Cafes, public meetings held throughout the greater Boise area. Scenarios were accompanied by low-tech, static images to aid the public in visualizing change; these aids were very helpful (T. Schorzman, pers. comm.). These workshops were attended by hundreds of area residents.

Assessing progress toward plan goals. To determine how jurisdictions are implementing the CIM plan, COMPASS has begun monitoring key elements of the "Community Choices" scenario that forms the backbone of the plan. This fall, an *Annual Performance Monitoring Report* is being issued by COMPASS. This report also summarizes progress toward achieving alternative transportation and desired land use objectives. The report is designed to provide information relevant to determining the need to amend or update the plan.

The report examines the regional effects of plan implementation through review of a wide range of measures. The measures are organized around the five major goals of the plan:

- Balance between jobs and housing
- Choices in housing
- Choices in transportation
- Connectivity
- Preservation of open space and farmland.

For each goal, several measures are presented to provide a benchmark for assessing progress toward plan goals. For

example, under “Balance between jobs and housing,” the jobs to housing ratio is shown graphically for 14 municipalities, plus two counties. Additionally, maps indicating 2006 major employment regions, the weighted center of employment in 2006, and population densities for 2000 and 2006 are shown. Tables showing travel times between various communities during congested and non-congested hours are presented. All of this information is interpreted in the text of the report, along with discussions of why the planning goal is important, what the region should look like in 20 years if CIM is followed, and a summary of what was learned through the monitoring effort.

The monitoring report provides a relatively comprehensive analysis of regionwide progress toward plan goals. It required significant staff time to prepare, and data collection was conducted over a period of months (T. Schorzman, pers. comm.). A number of communities in the planning region failed to provide data for this report. However, this was the first year of comprehensive monitoring and reporting, so it is hoped that the process will become smoother and more efficient in future cycles.

Minneapolis-St. Paul Region



The Metropolitan Council is the regional planning agency serving the Twin Cities seven-county metropolitan area. It serves as MPO and provides a number of services to the region. These include coordinating communities and the public in planning for growth, providing population forecasts, providing affordable housing opportunities, managing the regional system of parks and trails, operation of the regional bus system, and wastewater treatment. The Council also provides a framework for decision making and implementation for a number of regional systems including aviation, transportation, parks and open space, water quality, and water management.

The Regional Council's 2030 Regional Development Framework was adopted in 2004. The Framework serves as the overall growth and development plan for the region. Since adoption, the Council has developed updated policy plans to implement the *Framework* and guide the expansion of four regional systems: transportation, aviation, water resources (including wastewater collection and treatment), and regional parks and open space. Under the Metropolitan Land Planning Act, approximately 190 local communities must prepare and submit to the Council local comprehensive plans that are consistent with the Council's regional system plans. The new or updated local comprehensive plans will be due in 2008.

Two aspects of the Metropolitan Council's program were of interest for this case study: 1) the Regional Framework's benchmarking program, and 2) the Council's role as a portal for GIS data throughout the metropolitan area. According to Todd Graham, Research Manager for the Metropolitan Council, there is not a great deal of long-range scenario planning occurring at the Council due to the stage they are at in the planning cycle (the 2040 plan will be released in 2013 or 2014; currently, consistency review of local comprehensive plans is the agency's top priority).

Benchmarking program. The Regional Council produces a document annually that briefly assesses benchmarks related to the goals of the Framework, called *Regional Framework Benchmarks: Measuring Our Progress*. The purpose of this effort is to measure the progress of the region toward achieving the Framework goals.

The Framework's strategies are organized around four policies:

1. Accommodating growth in a flexible, connected, and efficient manner.
2. Slowing the growth in traffic congestion and improving mobility.
3. Encouraging expanded choices in housing locations and types.
4. Working to conserve, protect, and enhance the region's vital natural resources.

The Benchmarks report shows the following data for each indicator:

- 2000 Baseline
- 2030 Target
- Annual Indicator (number of units needed each year in order to meet the 2030 target)
- Data for each year from 2001 through 2006.

Indicators reviewed in the report include housing unit production, housing unit location – 2030 growth targets (data provided for units in Developed Area, Developing Area, Rural Centers, and Remaining Rural Area), regional employment growth, regional distribution – 2030 growth targets, highway capacity, roadway congestion, daily roadway usage, transit service, transit ridership, peak hour transit capacity, MSP airport runway congestion, single-family housing units, townhouse/multi-family units, affordable housing, housing affordability index, water quality (total phosphorus, total nitrogen, total suspended solids), water use per capita, air quality, and air quality index. The report is brief (13 pages for the 2007 report) and does not include extensive interpretation.

While the Benchmarks report is a concise source of data, some indicators are not strongly correlated with Council activities (e.g., employment growth and distribution). The Council’s Research Manager points out that, while such indicators may be important, it can be methodologically difficult to find indicators that can be linked clearly to the regional planning program (T. Graham, pers. comm.).

Regional geospatial data. Another service that the Council provides pertaining to regional impacts is its regional GIS database, called MetroGIS Datafinder. Its goal is to facilitate the sharing of information across boundaries among the range of organizations serving the Twin Cities Metropolitan area. Datafinder contains geospatial data pertaining to the seven county area that includes Minneapolis and St. Paul. Metropolitan Area. DataFinder provides metadata (data that describe a dataset to allow others to find and evaluate it) describing GIS data sets. Many of these datasets can be directly downloaded or used via map services.

Portland, Oregon Region



The Portland, Oregon area has led the nation in regionally-based planning for more than 30 years.

Its regional planning agency, Portland Metro, is the only elected regional government in the nation and makes binding policy decisions regarding development within a region-wide urban growth boundary covering 27 jurisdictions.

Since the development of Metro's 2040 Plan in the mid-1990s, there have been several major activities involving cumulative impact assessment. These include: 1) extensive scenario planning during development of the 2040 Plan, 2) evaluation of progress toward meeting the goals of the plan, as shown in the *2004 Performance Measures Report*, 3) ongoing use of a set of performance measures related to expected outcomes from plan implementation, and 4) currently under development, a system of high, medium, and low level indicators that will directly relate to goals established in the past two years by the Regional Council. In reviewing Portland Metro's history, we see several different uses of regional impact analysis; these uses have evolved in response to the changing needs of the Regional Council and the public.

With a regional population of around 2 million people, Portland is the most populous case study region reviewed. Accordingly, it should be noted that Portland Metro is also a comparatively

large agency. Portland Metro serves as the regional MPO, and also runs the regional planning program, open space programs, parks programs, and solid waste and recycling. The agency has 500-600 employees, with about 50 or 60 in the land use planning division (G. Uba, pers. comm.).

Scenario planning for long-range land use and transportation plans.

Scenario planning was done in initial work for Metro's 2040 Plan in the mid-1990s. Computer modeling revealed that more than 120,000 additional acres of land would be required to absorb growth if current population and land development trends continued through to 2040. Modeling also indicated that the costs to extend public services from cities, counties, and special districts to these new areas would be extremely high. Additionally, projected levels of highway congestion were unacceptable.

Based on this effort, the basic decision about whether to grow up or out was made, and a different pattern of land use within the region's Urban Growth Boundary (UGB) has been implemented since that time.

To achieve this, development analysis tools and forecasting technologies were used to study different growth management strategies. Four growth concepts were studied for their effects on land consumption, travel times and distances, open spaces and air quality, and various urban landscapes. The four growth concepts were: Base Case – continuing pattern, Growing Out (UGB expansion), Growing Up (no UGB

expansion), and Neighboring Cities (moderate UGB expansion; growth focused on centers, corridors and neighboring cities).

A period of extensive public involvement followed this scenario planning, including dozens of open houses, workshops and forums, as well as a survey that was returned by 17,000 residents. The resulting 2040 Growth Concept drew from the best features of the different approaches. It received unanimous support from local government partners on the Metro Policy Advisory Committee and was adopted in 1995.

Benchmarks and performance measures.

The 2040 Growth Concept resulted in an Urban Growth Management Functional Plan, which contains specific requirements that local governments must implement. The Functional Plan indicates, for each jurisdiction, such things as how many housing units they must accommodate and how much land must be zoned to meet projected employment growth. In order to monitor progress, Metro has established performance measures related to the expected outcome resulting from plan implementation. The performance standards measure such things, by jurisdiction, as:

- Amount of land converted from vacant to other uses;
- Number and types of housing constructed, their location, density, and costs,
- Number of new jobs created,
- Amount of development of both jobs and housing that occurred as redevelopment or infill,

- Amount of land that is environmentally sensitive that is permanently protected, and the amount that is developed,
- Cost of land based on lot prices,
- Average vacancy rate for all residential units.

In 2004, Metro issued a Performance Measures Report: An Evaluation of 2040 Growth Management Policies and Implementation. This report summarized the quantitative data needed to assess the implementation of the 2040 Plan and the degree that policies are achieving the 2040 Growth Concept goals. The report is organized around the eight fundamental goals of the Functional Plan: addressing a strong economy, efficient use of land, protection of the natural environment, maintaining a separation between the Urban Growth Boundary and neighboring cities, providing a balanced transportation system, encouraging a physical sense of place, providing a diversity of housing options, and making the region a vibrant place to live and work. It provides quantified findings for each of these fundamental goals and also identifies any policy elements that are not measured for each goal.

Portland Metro's benchmarking/performance measurement program is now being refined. In the past, the Regional Framework Plan has had 8 fundamental values for the region; now they are moving from these values to a new approach, in which the Regional Council has developed its own goals. Therefore, Metro will soon be replacing the 2040 Plan fundamental values with the goals established by the Regional

Council. Additionally, there are objectives associated with each of the Council's goals. Metro is now working toward identifying objectives that cut across different programs.

This effort is yielding results indicating the conditions that must be met for any of these objectives to be achieved. As a next step, Metro will identify indicators to determine which objectives can be measured. This will lead to extensive data gathering, then analysis of regional progress in relation to the objectives, and finally, linking results to the Portland Metro budget. By the end of 2008, Metro plans to have data available on high, medium, and low level indicators.

Sacramento, California Region



In the Sacramento region, a Preferred Blueprint Scenario for 2050, addressing land use, growth, and transportation concerns, was

approved by the Sacramento Area Council of Governments (SACOG) in late 2004. The SACOG Board of Directors initiated the project after it viewed regional computer modeling results showing that current growth patterns and transportation investment priorities would result in significant increases in congestion. The Blueprint Project is a joint project of SACOG, the area's MPO, and Valley Vision, a civic organization. It is the region's first attempt to guide regional growth over the next 50 years.

Scenario planning. In 2003, SACOG and Valley vision held 37 workshops throughout the region, plus two Regional Forums, reaching more than 5,000 participants. These participants were able to use the project's interactive modeling software, PLACE³S, to examine how the region could look under different land use scenarios. Topics that were reviewed in this exercise included issues such as employment, land uses, density, and vehicle trips and vehicle miles traveled per household. A Senior Planner with SACOG noted that, while the workshops likely could have been successfully conducted without using the modeling software, its use helped to make them more interactive, thereby greatly facilitating the extensive public input that

was obtained during this process (Lizon, pers. comm.).

PLACE³S is currently used by SACOG for land use modeling, a regional travel model, and an air quality model. The goal is to further develop the PLACE³S database in-house so that land use and transportation modeling can be done interactively. This will require further development and may be possible in the coming year, after SACOG's new Metropolitan Transportation Plan 2035 has been finalized in early 2008. Once this occurs, the agency's ability to track or predict cumulative impacts, such as transportation-induced development, should be strengthened.

Input from the initial public workshops led to the creation of four growth scenarios, including a Base Case that shows how the region would look if growth patterns of the recent past continue. At a Regional Forum hosting nearly 1,400 people, participants strongly rejected the Base Case. The preferred alternative provided for a greater range of housing choices, reinvestment in already developed areas, and closer integration of jobs and housing.

Following the Forum event, several more activities were conducted to engage the public. A telephone poll was conducted in which 1,313 residents were asked questions about regional growth, a newspaper/internet poll was conducted and yielded 3,849 responses, and city and county elected officials attended a Regional Summit. In all cases, there was strong support for the growth principles in the Blueprint.

Now SACOG and Valley Vision will be promoting adoption of the Blueprint principles, which are advisory in nature, as well as providing technical assistance and support for the Blueprint.

Benchmarking program. SACOG and Valley Vision will also be engaged in evaluating cumulative impacts of local and regional actions through establishment of a benchmarking system. This benchmarking effort will occur on a regular basis to track progress toward Blueprint principles and goals, and to evaluate the extent to which regional growth is improving the transportation system and air quality. Benchmarking topics will include:

- Transportation system performance (e.g., congestion, travel times, trip distances, types of trips)
- Type and amount of housing constructed
- Air emissions
- Mix of land uses
- Amount of new land devoted to urbanization.

According to Kacey Lizon, Blueprint Project Coordinator at SACOG, “At this time, the benchmarking system is still a plan and not yet implemented. It would be a GIS for tracking development activity. One of the ways we've been (able to) quantify progress is by looking at housing market data for planned and recently built residential developments... looking at the types of housing being built. But on a lot of other indicators (redevelopment and infill, mixing of uses, for example), there's still a lot of work to

be done to get a monitoring system in place. In the meantime, our observations are mostly anecdotal.”

Another recent regionwide assessment effort was the *Sacramento Region Quality-of-Life Report*, issued by Valley Vision in 2004. The *Quality-of-Life Report* contains a significant section (approximately 20 pages of maps, tables, and interpretation) on issues pertaining to regional land use, planning, and growth. Topics include: Urbanization and Farmland Conversion, Jobs and Housing Balance, Housing Development, Home Ownership Opportunities, Housing Affordability, Rental Affordability, Traffic Congestion, Work and Non-work Travel Trips, Public Transit, Health of Rivers and Streams, State of the Sacramento Valley Flood Control System, Urban Forest and Parks, Air Quality, and Protected Lands.

For each indicator, the report explains:

- What is the indicator?
- Why is it important?
- How are we doing?

With attractive graphics and plenty of interpretive discussion, the *Quality-of-Life Report* helps make land use and growth-related data accessible to the public in a format that is meaningful.

SACOG has received a number of awards for its regional planning work, including the Environmental Protection Agency's 2004 *National Award for Smart Growth Achievement*, the American Institute of Architects Presidential Citation, the Federal Highway Administration/Federal Transit Administration *Transportation Planning Excellence Award*, the Association

of Metropolitan Planning Organizations
*National Award for Outstanding
Achievement*, and the Harvard University
Innovations in American Government
Top 50 Programs.

Case Study Cost Information

Cost information that is specifically tied to cumulative impact analysis (scenario building, benchmarking, and related efforts) is challenging to pinpoint. First, because this work is often part of a broader project, it is difficult to disaggregate from related but separate tasks. Raw data is often collected by multiple agencies or jurisdictions for a variety of purposes, then compiled and analyzed by a regional entity. Second, it is the general case that the regional planning agency also serves as the MPO. Consequently, certain aspects of cumulative impact assessment (e.g., air quality information, transportation analysis) may have been an integral part of the transportation planning program for years, and data are used for multiple purposes. (Additionally, in these cases, federal highway and transit funds are available to support data collection and analysis.) Third, efforts such as scenario analysis are frequently part of a much broader plan development process that integrates different activities so closely that the analytical component is difficult to break out as a budget line item. For example, in several of the case studies, scenarios were developed and refined through an intense public involvement process; the two activities were so closely linked that disaggregation of the modeling component is difficult.

While recognizing these limitations, this section presents a brief overview of costs associated with scenario building and benchmarking efforts conducted by case study agencies.

Salt Lake City, Utah Region. The development of the Quality Growth Strategy, as described in the case study above, was an extensive, region-wide program conducted over a multi-year period. Activities included detailed scenario building and impact analysis, cost modeling, a massive public awareness campaign with extensive media coverage, and many public workshops. Total costs for developing the Quality Growth Strategy are estimated at \$1 million to \$1.5 million (T. Knowlton, pers. comm.). The high costs for this project are due in part to the fact that many tools (e.g., GIS and other software) were not well developed at the time this project was conducted; much effort went into developing these sorts of applications. This cost estimate includes the value of significant in-kind support from state agencies and price discounting from media outlets. Outside funders included the Surdna Foundation, the David and Lucile Packard Foundation, and the William and Flora Hewlett Foundation.

The more-current Wasatch Choices 2040 Vision cost approximately \$450,000 to develop (T. Knowlton, T. Watkins, pers. comm.). Additionally, the Wasatch Front Regional Council conducted all transportation modeling, a value of approximately \$150,000 (T. Knowlton, pers. comm.). Consultants played a smaller role in this project than they played in the developing the Quality Growth Strategy. This is one reason costs are lower. Instead, Envision Utah conducted much of the mapping, modeling, forecasting, and coordination,

while all three organizations (Envision Utah, WFRC, and MAG) facilitated workshops and provided other functions. Funders for this project included FHWA (\$100,000 in discretionary funds), local funds from corporations and foundations, the state Department of Transportation, the two MPOs, and the Utah Transit Authority.

Washington County, Utah Region. The Vision Dixie project cost approximately \$400,000 (T. Watkins, pers. comm.). Funding sources included a Nature Conservancy grant (\$100,000) and commitments from local municipalities (T. Knowlton, pers. comm.). These costs include scenario building and modeling, public involvement, transportation analysis, and public/agency coordination to produce the plan. Factors driving costs up included the very labor intensive nature of the “chip game,” the facilitated mapping exercise conducted at public workshops, as well as travel costs for both out-of-state consultants and Envision Utah staff from the Salt Lake City region.

Boise, Idaho Region. In the Boise area, the COMPASS budget for FY 2007-08 includes several items related to cumulative impact assessment. Development of the *Performance Monitoring Report* is part of a program to collect, analyze and report on growth and transportation patterns related to goals in the regional transportation plan. The Performance Monitoring Report is the major document among several documents to be produced.

In FY 2007-08, this program is allocated 171 work days, plus minor direct

expenditures (\$1,000), for a total cost of \$79,123.³ Funding for this work will include \$73,315 from FHWA/FTA and \$5,808 in local funding.

In the area of scenario planning, COMPASS has budgeted funds to assist in predicting regional growth, travel demand forecasting, and testing UrbanSim for land use modeling. This project will include three components: 1) a follow-up evaluation of factors that drive regional growth and location decisions; 2) an evaluation of different forecasting methods – economic, trend, national demographic patterns, futurist, etc., and; 3) use and development of GIS-based land use modeling software to support regional planning.

³ This includes the following milestones: 1) Report on Growth and Transportation Patterns – compile building permits collected from local governments, update preliminary plat information on a monthly or bi-monthly basis, issue monthly map and database of preliminary plats, complete Quarterly Development Monitoring Report (Feb.), complete 2007 Development Monitoring Report, inventory housing stock by type, affordability, and proximity to key services, compile reports on the region’s household vacancy rates by household type, review current comprehensive plans based on key indicators, evaluate amendments to comprehensive plans during previous 12 months, evaluate development data to assess growth patterns by TAZ, area of impact and within service area for proposed transit routes, evaluate development data to assess density, complete Quarterly Development Monitoring Report (Jun/July), committee review of draft Performance Monitoring Report, board review draft Performance Monitoring Report, seek Board endorsement of final Performance Monitoring Report, and 2) Population Estimates – receive complete building permit inventory for 2007, allocate building permits by highway district in Canyon County, update 2000 Census population by current corporate limits for cities within Ada and Canyon counties, prepare estimate and submit to COMPASS Board for approval, post estimates on COMPASS websites.

For FY 2007-08, this work is allocated 137 work days, for a total labor cost of \$70,628. Direct costs of professional services (\$9,690) and travel/education (\$1,000) are added for a total cost of \$81,318. Funding for this work will include \$75,349 from FHWA/FTA and \$5,969 in local funding.

Because communications and public awareness has been an integral part of the scenario planning and benchmarking work at COMPASS, the FY 2007-08 budget for these activities was also examined. In the current budget year, external communications, public relations, public involvement, public education, and ongoing Board education will include labor and direct costs that total \$139,692. Of this total, \$129,439 is from FHWA/FTA and \$10,253 is from local sources (COMPASS 2007).

Minneapolis-St. Paul Region. The Metropolitan Council of the Twin Cities produces *Regional Framework Benchmarks: Measuring Our Progress* on an annual basis. It is a brief report, presented to the Council yearly and posted on the Metropolitan Council's website for public accessibility.

The report's brevity allows staff preparation time to be limited in scope; however, the effort is conducted within the context of a comprehensive research program. The Metropolitan Council's research and GIS programs draw from considerable resources. For example, in 2006, the GIS Department budget totaled \$1,240,366, and the Research Department budget totaled \$959,247 (Metropolitan Council of the Twin Cities, 2007).

Direct staff time for document preparation and a presentation of the findings to the Council are estimated to be at least 100 work hours, possibly significantly more (R. Carlson, pers. comm.) This includes staff time for two researchers to obtain and compile data and prepare the document, staff time for the Research Manager to prepare and conduct a Council presentation on the topic, and staff time for fielding questions about the report.

This estimate does not include staff time to develop the underlying data that is presented in the report. Underlying data is generated by several different work units. Water quality benchmarks are obtained from the Environmental Services Division of the Metropolitan Council. They are based on extensive, continuous water quality monitoring conducted by the Water Quality group within this division to comply with federal and state requirements. Additional staff time to develop information to be used in the Benchmarks report is estimated at one person-week (R. Carlson, pers. comm.). Similarly, transportation data is provided by the Metropolitan Council's Transportation Services Division, as well as the state Transportation Department. Specific measurements used in the report are generated as part of the broader context of transportation planning and monitoring. For example, the airport congestion measure that is provided in the Benchmarks report is provided by a staff member specializing in airport planning. The time required for him to use specific methodology required for the Benchmark measure is estimated at three

person-days (R. Carlson, pers. comm.), but also should reflect his ongoing work in that topic area.

Other benchmarks are generated within the Research work unit, but staff time to prepare them is difficult to estimate because they are part of the unit's general research program. These include topics such as where new development is occurring, how much new development is occurring, population estimates, household estimates, and estimates of job growth.

In past years, the Metropolitan Council has used an indicators process that was much more extensive than its current Benchmarks report. This more comprehensive process required extensive involvement from a number of staff members and was consequently a more costly undertaking (R. Carlson, pers. comm.).

Portland, Oregon Region. For the Portland Metro region, specific costs associated with cumulative impact assessment were not broken out. Instead, a broad budgetary context for planning and assessment is presented (Portland Metro, 2007).

For FY 2007-08, the Planning Department is budgeted for 81 FTEs. This department includes five divisions: Regional Planning, Transportation Implementation, Development Program division, Research and Modeling Services, and Administration. Activities related to benchmarking and scenario planning would take place within the Long Range Planning section of the Regional Planning

Division, with support from Research and Modeling Services.

Within Long Range Planning, activities to support the update and compliance of the Regional Framework Plan and Function Plan include cumulative impact assessment. This program is on-going. It reviews and recommends changes to regional policies contained in the Regional Framework Plan and the Urban Growth Management Functional Plan, reviews local compliance with the Functional Plan, and provides technical assistance to local governments. For FY 2007-08, this program is budgeted to have total program outlays of \$492,617. Program FTEs are projected at 2.99 for this year. This program is funded through an excise tax. (A related planning program, New Look at Regional Choices, is budgeted for 8.81 FTEs in the current fiscal year. It, too, is funded largely through an excise tax.)

Within Research and Modeling Services, the Data Resource Center provides state-of-the-art mapping and spatial analysis, regional economic and demographic forecasting, land use and vacant land studies, and urban economic analysis. For FY 2007-08, the Data Resource Center is budgeted to have total program outlays of \$2,468,806. Program FTEs are projected at 12.68 for this year. This program is funded through \$1,966,675 in Program Resources (Enterprise, Grants and Donations, Governmental Resources, and Fund Balance) and \$499,048 in Non-Programmatic Resources (Excise Tax).

Sacramento, California Region. In FY 2007-08, the SACOG budget includes \$370,304 for regional land use monitoring

(a portion of which would be used in developing regional benchmarks). This includes \$201,924 in FHWA funds and \$168,380 in current year local revenues. Development of the software PLACE³S for improved use in Land Use and Housing Planning is allocated \$196,684 in this fiscal year. This includes \$110,503 in FHWA funds and \$86,181 in current year local revenues.

Other programs in the FY 2007-08 budget that support cumulative impact assessment (as well as conducting other functions) include SACOG's Regional Information Center and the Geographic Information Systems Collaborative. This year's budget for the Regional Information Center is \$214,094 (funded largely by FHWA monies and supplemented by current year local revenues). This year's budget for the Geographic Information Systems Collaborative is \$253,322 and is funded by GIS partners (SACOG, 2007).

3.4 Case Study Lessons

Case study research emphasized finding cumulative impact assessment efforts that are relevant and useful within the regional planning context of the Truckee Meadows. The goal was to find programs in other areas that are having success in:

- Measuring progress toward meeting regional planning goals, and
- Examining alternative long-term growth and development scenarios in order to develop or revise long-range regional plans.

Several key lessons or findings emerged.

- ✳ **Lesson 1: The most compelling analyses are driven by management goals. They are used to inform specific planning and policy decisions.**

As one of the earliest regional scenario planning efforts, the Portland Metro analysis demonstrates the power of a decision-oriented modeling program. Based on the extensive public review of alternative growth scenarios, the Metro Council was able to make the basic decision about whether to grow up or out, and a different pattern of land use has been implemented in the region since that time.

As a more recent illustration of this point, the extensive scenario planning that occurred in the Sacramento area in 2003-04 led to the decision to adopt significant new growth strategies. In late 2004, the SACOG Board of Directors adopted the Preferred Blueprint Scenario, which promotes compact, mixed-use

development and greater transit choices. Its adoption will also directly affect transportation policy, as the Preferred Blueprint Scenario is part of SACOG's Metropolitan Transportation Plan for 2035.

- ✳ **Lesson 2: Cumulative impact assessments in the case study regions cross political boundaries. They generally include the entire region, as defined by metropolitan population and logical geographical scope.**

In all of the case studies but one, work is conducted on a multi-county basis. The Boise area's Communities in Motion plan encompasses two counties, and its Blueprint for Good Growth includes six counties. The Metropolitan Council of the Twin Cities' scope includes seven counties and 190 local units of government. In the Sacramento region, SACOG's planning area covers six counties and 22 cities. In Utah, the Wasatch Choices 2040 plan includes two MPOs and four counties. Portland Metro includes three counties and 25 cities. The one exception, Vision Dixie in the St. George, Utah region, is limited to one county; however, it is in a more rural area and nevertheless includes more than a dozen local communities.

- ✳ **Lesson 3: The most dynamic and useful impact assessment efforts have been closely tied to extensive public involvement campaigns.**

Planning efforts in the Salt Lake City, St. George, Portland, Sacramento, and Boise regions stand out for both their extensive outreach to the public and their

responsiveness to educated public input. Planning and GIS consultant Paul Glasgow, who worked extensively on the Vision Dixie project, commented that “in any regional planning effort, public input, the modeling technique, and political/stakeholder ‘hand holding’ deserve equal attention.”

Several of these agencies were able to observe greatly increased public knowledge of, and support for, regionally-coordinated growth planning. These major changes in public attitudes occurred after intensive efforts were made to include broad segments of the public in scenario planning and visioning activities.

Ted Knowlton, Assistant Executive Director of Envision Utah, suggests that the region should “Go big,” if a scenario planning program commences. He suggests that a successful scenario planning exercise rests upon a broadly educated public and professional community. This entails outreach, public workshops, use of local media, and community leadership.

✱ **Lesson 4: It is becoming increasingly possible to envision the linkages between land-use and transportation policy through regionwide scenario planning. Effective modeling efforts are becoming more accessible to mid-size agencies through technical and software innovations.**

The modeling of impacts and land use-transportation relationships has become increasingly sophisticated in recent years due largely to breakthroughs in the capabilities of GIS-based software. For

example, PLACE³S is currently used by SACOG in the Sacramento region for land use modeling, regional travel modeling, and air quality modeling. In the coming year, SACOG plans to further develop the PLACE³S database in-house so that land use and transportation modeling can be done interactively. This capability will strengthen the agency’s ability to track or predict cumulative impacts, such as transportation-induced development.

As the number and range of GIS-based scenario-building programs increase, intensive scenario planning is becoming more accessible to small and mid-size regional agencies (e.g., COMPASS in Idaho, Vision Dixie in Utah).

✱ **Lesson 5: Depending on the planning cycle, different types of cumulative impact analysis may be used sequentially over a period of years.**

Different approaches are most effective at different times. For example, Portland Metro has employed several techniques over the years, including: 1) extensive scenario planning in the early 1990s during development of its Growth Concept, 2) quantified evaluation of progress toward meeting the goals of the plan, as shown in the *2004 Performance Measures Report*, 3) ongoing use of a set of performance measures related to expected outcomes from plan implementation, and 4) a planned system of high, medium, and low level indicators that will relate to newly-established regional goals. The agency’s uses of regional impact analysis have evolved in response to the changing needs of the Regional Council and the public.

As a second illustration, COMPASS in the Boise region has shifted its focus from scenario analysis to its extensive benchmarking effort to assess plan implementation.

(As a caveat to this lesson, certain approaches such as benchmarking assessments will tend to grow in value over time as data accumulates and trends begin to surface. For example, in the Twin Cities, benchmarks have now been measured for six years and emerging trends are becoming increasingly evident.)

3.5 Options for the Truckee Meadows Region

Elements of several approaches discussed in this report can be adapted for use in our area, with the aim of moving toward our accepted goals for the region. Throughout the Truckee Meadows region, residents use the same roads, share water resources, and breathe the same air. We all share a regional context for work, shopping, and recreation. The goal of any cumulative impact assessment program is to build tools and knowledge that help us to better design our future as a single region.

Below are several options that would allow the Truckee Meadows Regional Planning Agency to begin a program of cumulative impact assessment. Some options (Option 1 alternatives) look to the past to assess actual measured changes in the region, while another (Option 2) looks to the future to forecast how the region will grow based upon choices made in the near term. The purpose of outlining these options is to generate thought and discussion regarding which approach might be most beneficial to the region and feasible to undertake. The preferred program might be a combination of options, or it may be a new option generated through discussion of our own region-specific needs.

Option 1: Benchmarking

Under this option, the TMRPA could establish an assessment program by establishing benchmarks, indicators, or performance measures with clear links to

the goals of the Regional Plan. In relevant case study examples, a set of indicators typically would be organized under each major goal or objective of the regional plan.

The purpose of a benchmarking program would be to inform the RPGB, the RPC, the county, cities, and the public on how and whether the region is meeting the basic goals of the Regional Plan. Because it would focus on tracking and measuring changes (e.g., actual development patterns, transit ridership, per capita water use), results could be used primarily to inform two types of decisions:

- 1) whether the manner in which the plan is implemented requires adjustment, and
- 2) whether additional measures, strategies, or policies should be adopted that reinforce regional plan goals.

To explore a possible benchmarking program, the set of possible indicators and monitoring categories must be reviewed, and priorities for monitoring and assessment must be set. Once consensus is reached on key priorities, TMRPA staff could, in the following months, develop a workplan indicating the type and level of staff time, data collection, and analysis that would be needed. Significant cooperation and assistance from the cities, the county, and other affected agencies would be required for a successful benchmarking effort, as much of the data needed is generated within those organizations.

The value of a benchmarking assessment program will grow over time, for the importance of the data grows as it is

tracked across years. As data accumulates, monitoring results will more clearly portray how the region is moving forward with respect to the Regional Plan. Hence, a benchmarking program is best viewed as an ongoing undertaking.

The following three alternatives present three possible ways to implement a benchmark-based assessment program:

Alternative 1: Establish a new benchmarking program as an additional monitoring effort. Make no changes to existing TMRPA activities.

Alternative 2: Establish a new benchmarking program to replace the current annual reporting mechanism.

The Nevada Revised Statutes require local governments and affected entities to submit annual reports to the RPC and RRGB. The goal of the annual reporting process is to provide a usable and meaningful summary of activities conducted to implement the Regional Plan. If an annual benchmark-based assessment program were to replace the existing system, the focus would shift from activities conducted to measured results. While such a shift in focus would entail more staff time, data, and analysis, the information generated might provide a clearer indication of true regional progress.

Alternative 3: Establish a new benchmarking program that encompasses our broader region by reviewing activity both within and beyond Washoe County. The nature of growth and development in neighboring counties has a great impact on land use,

transportation, the economy, and the environment within Washoe County. To accurately track our development as a region, it may be necessary to expand our view beyond the Truckee Meadows. Challenges include the lack of compatible GIS-based data and the problems inherent in crossing jurisdictions. A few high priority indicators, however, could be selected for monitoring on this broader regional basis. For example, available satellite imagery could be used in tracking land use changes, and qualitative observations could be added to compensate in part for data gaps.

Option 2: Scenario Planning

Under this option, the TMRPA could initiate scenario planning efforts geared toward the 2012 Regional Plan update. The objective of such a program would be to apply sound data and analytical methods to a base case and other alternative growth scenarios for the region in order to demonstrate how different growth patterns would affect quality-of-life issues such as traffic congestion, air pollution, recreational opportunities, open space, etc. Scenario analysis is best used to inform and facilitate the dialogue among community leaders, planners, and the public about the long-range vision for the region. It also helps to portray the long-range context for local land-use decision-making.

Because a scenario analysis program would focus on forecasting future patterns and impacts, results could be used to inform two types of decisions: 1) whether additional strategies,

measures, or policies should be adopted to reinforce regional plan goals, and 2) whether the goals and policies in the next plan update should be altered in order to achieve the desired regional vision.

To explore a possible scenario analysis program, direction would be needed on the scope of the analysis and key priorities for impact assessment. Should it cross jurisdictions? What are the boundaries of the region we need to plan for? What investment in software and technical expertise should be used to aid in this process? Are there areas in which TMRPA and RTC can collaborate in order to integrate transportation-related impacts into the regional planning process? How extensive will the scenario planning exercise be? How will public education and involvement be conducted?

Once consensus is reached on key priorities, TMRPA staff could, in the following months, develop a workplan indicating the type and level of staff time, software development, data collection, and analysis that would be needed.

A scenario planning project would likely be a multi-year effort from project scoping through completion. However, it need not be an ongoing program but rather could be envisioned as a cyclical effort geared toward five-year plan updates. Other regions have found that, once the community awareness and engagement fostered by scenario planning occurs, the level of dialogue and participation is perpetually improved.

Option 3: Combination of Benchmark Assessments and Scenario Planning

The two programs outlined under Options 1 and 2 are related in that the current benchmarks help to provide a baseline for scenario planning. If elements of both options were conducted, some economies of scale might be achieved through a sharing of staff expertise, data, and software. However, the case studies demonstrate that these are generally discreet activities, each carrying significant costs.

If this option were pursued, it should be tightly focused in order to capitalize on any synergies between the two areas rather than establishing two disparate projects.

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