# Northeast Utah Valley Transportation Study

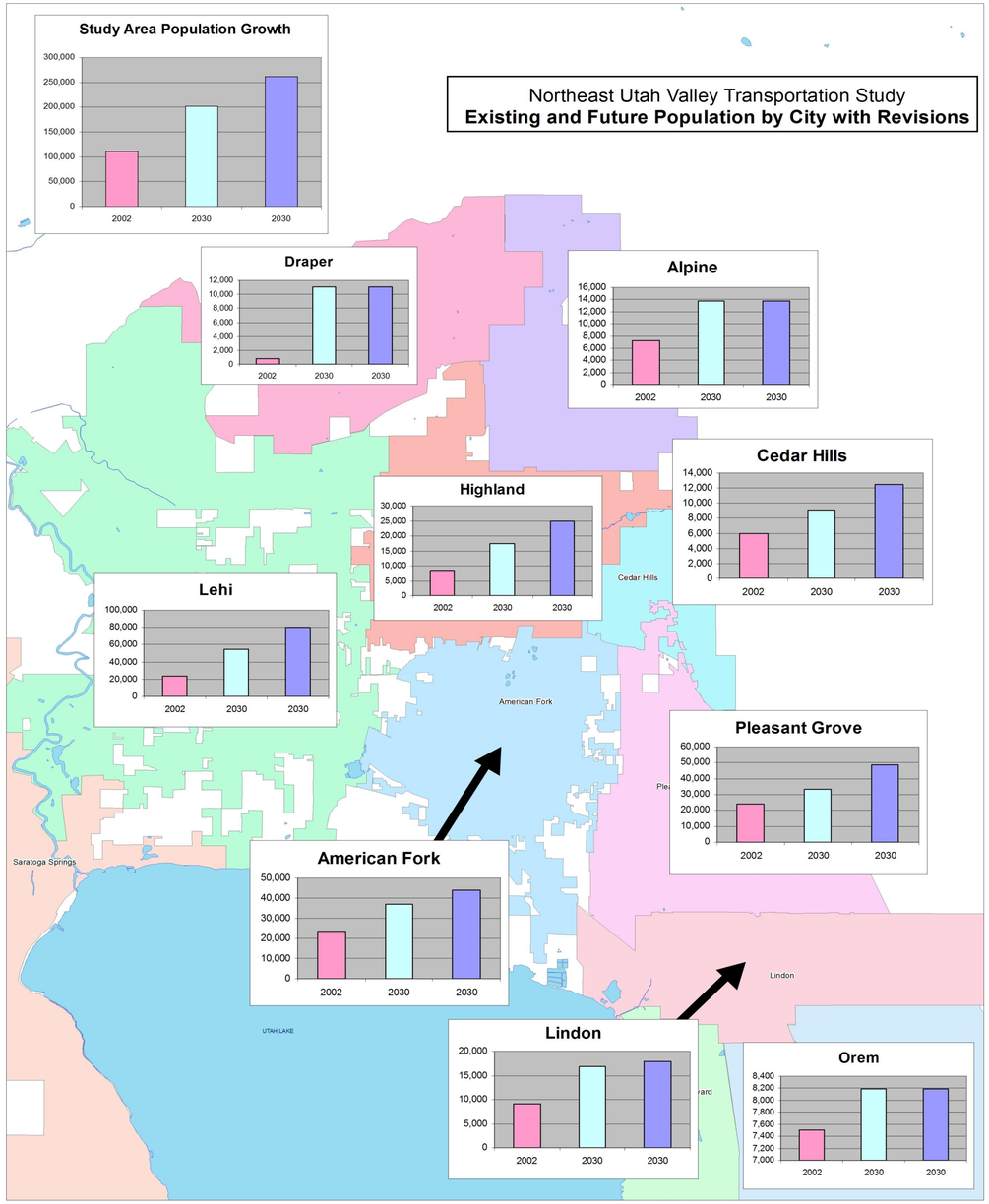
1. Transportation Issues and Problems

2. Alternatives Considered

3. Recommendations
   - 2015
   - 2030

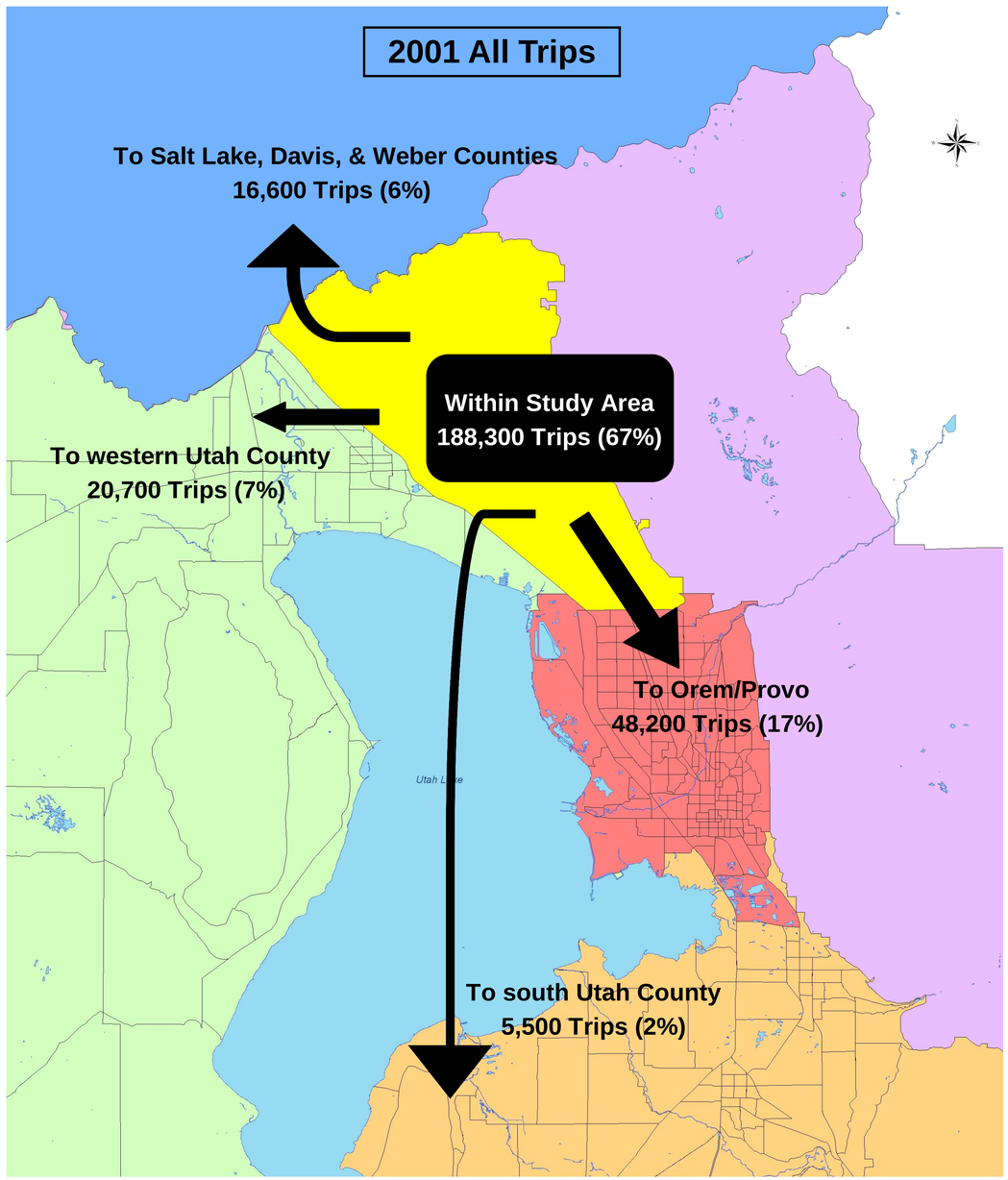
# Study Area Population Growth: 2002-2030

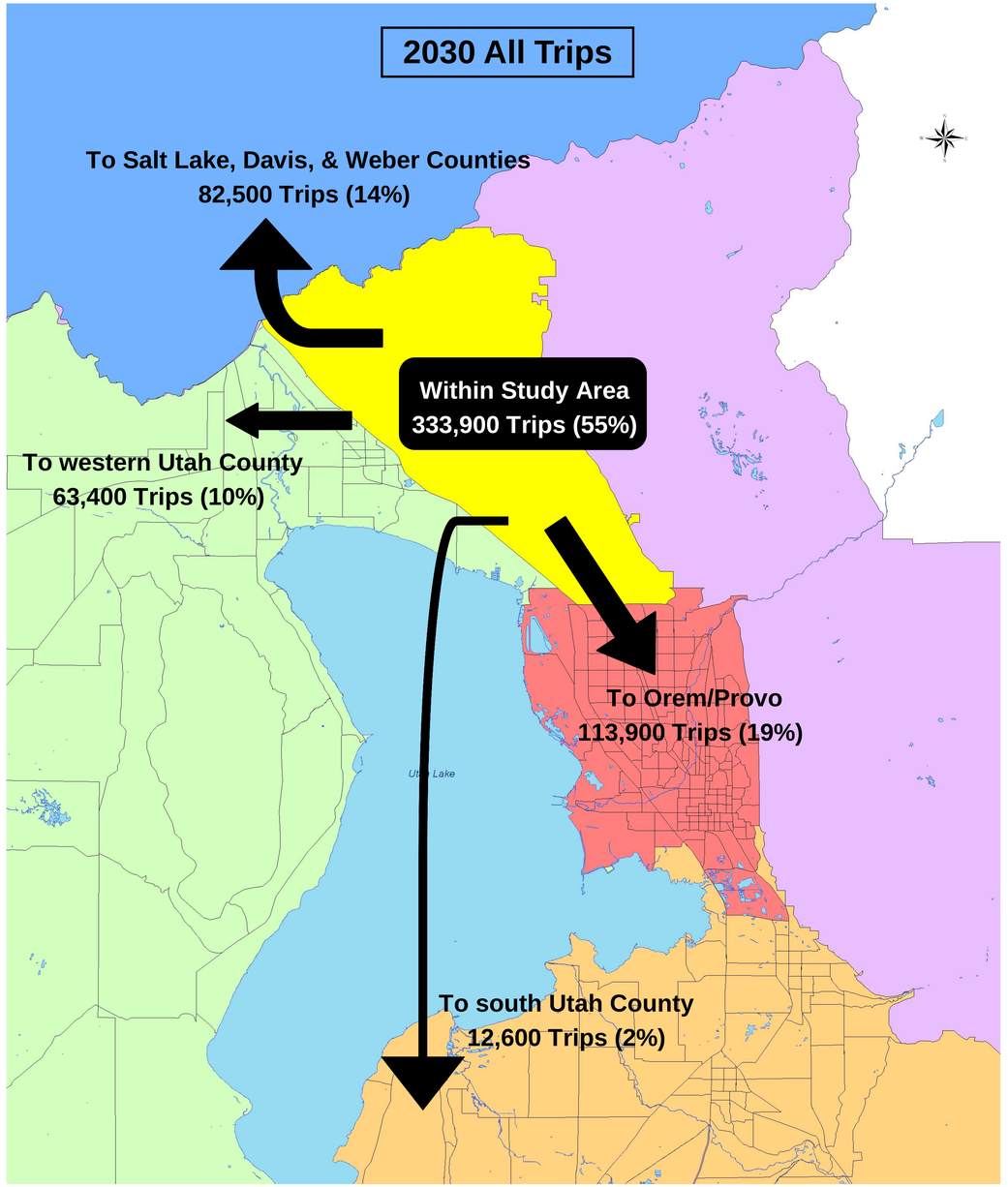
- Initial projections put study area population growth at about 83% by 2030.
- Revised city-projections show that population is expected to increase by more than 137% in that time.



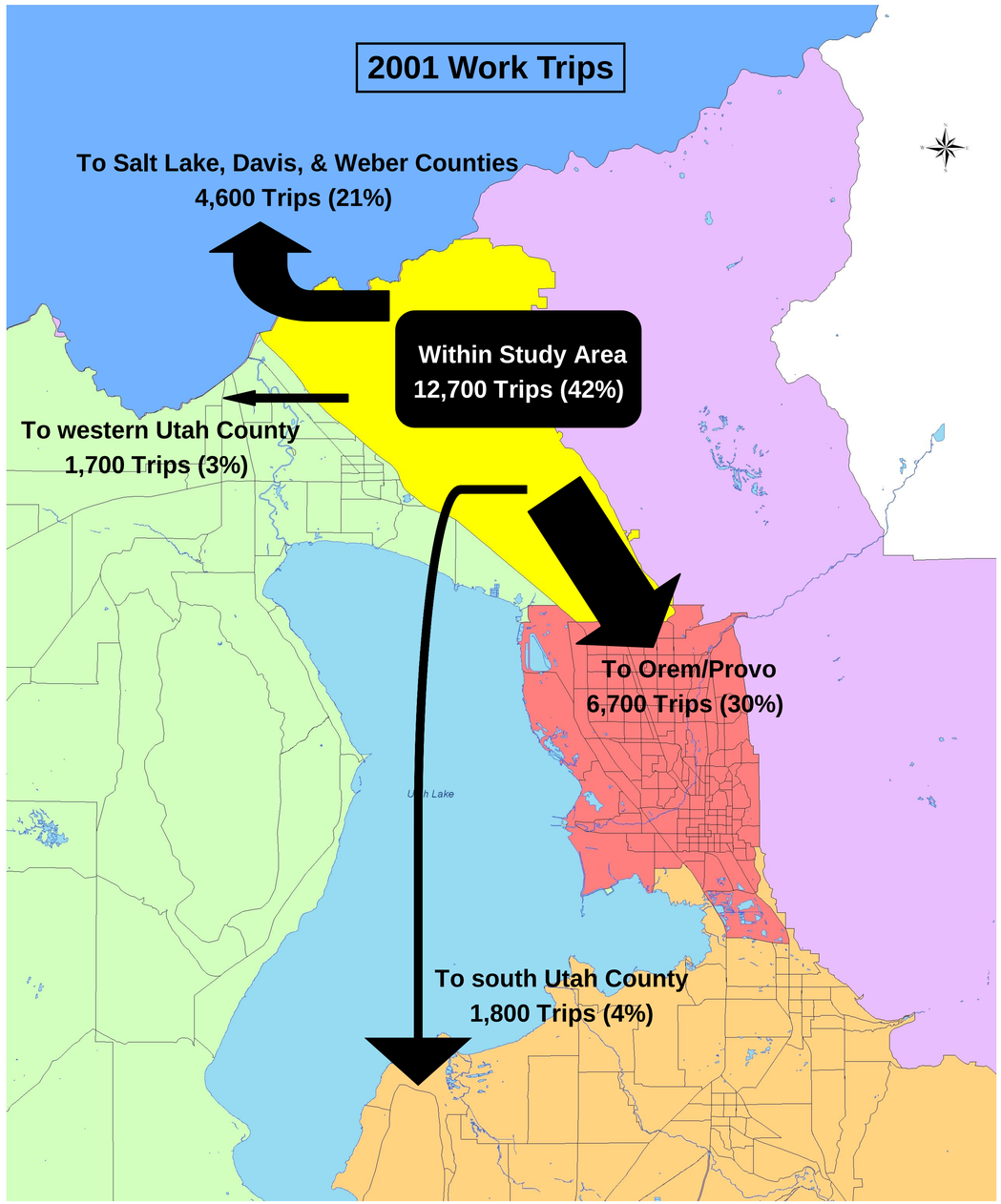

Source: GOPB/MAG population projections and city revisions.

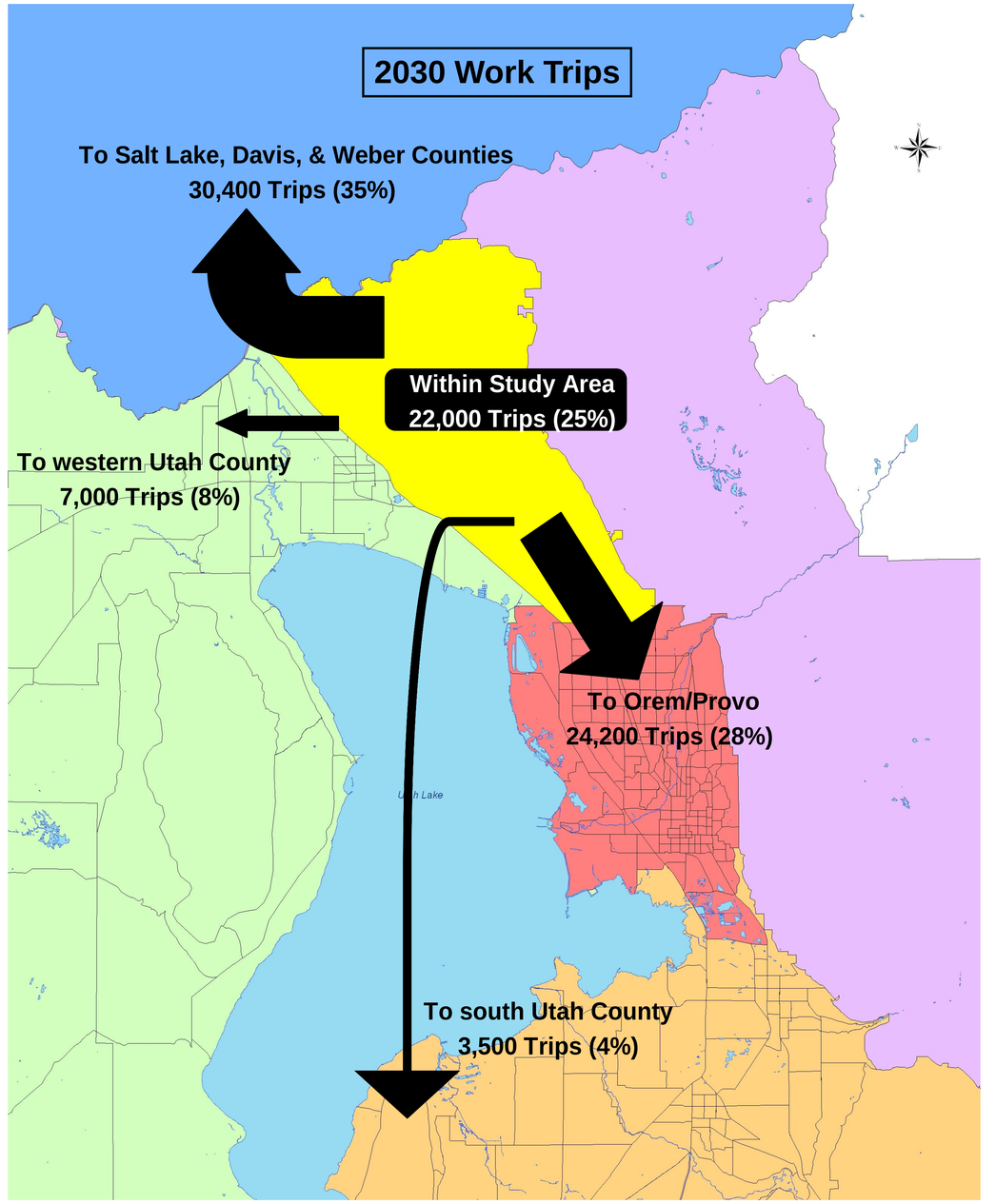
# All Trip Destinations



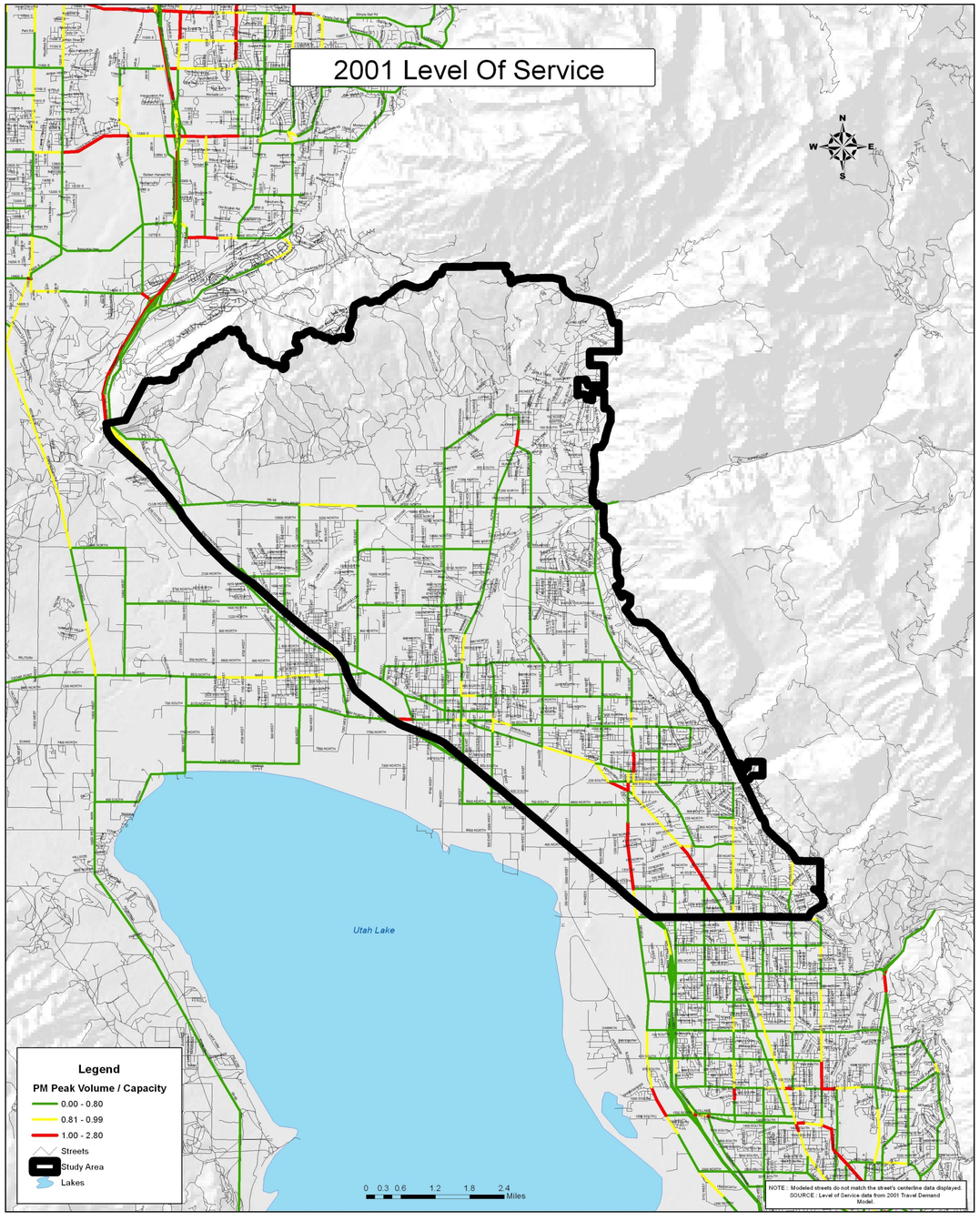
# Work Trip Destinations



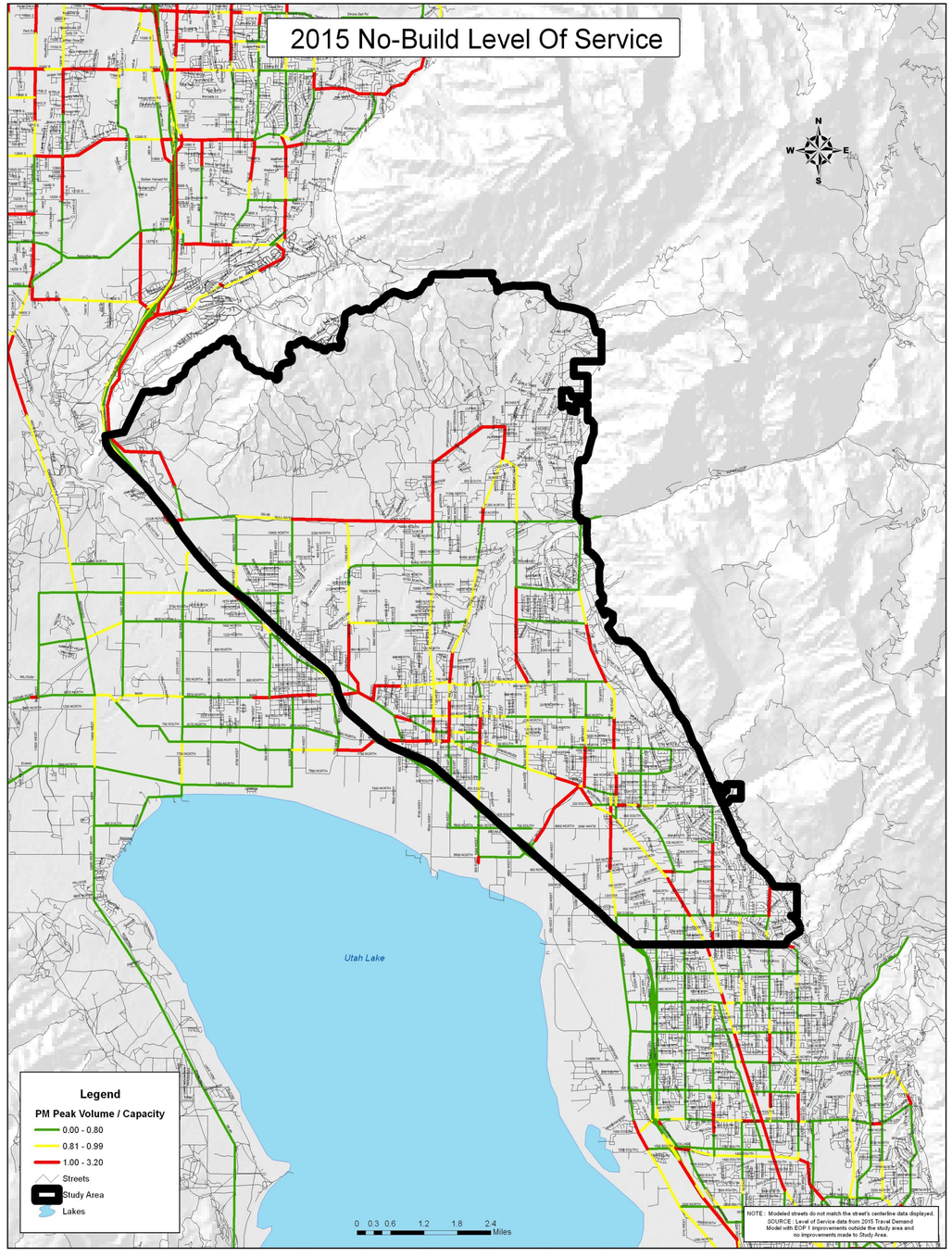
# 2001 Level of Service

- TTI = 1.06
- Population and employment numbers are based on MAG model input.
- Modeled LOS provides a simulation of reality, not necessarily an exact replication.



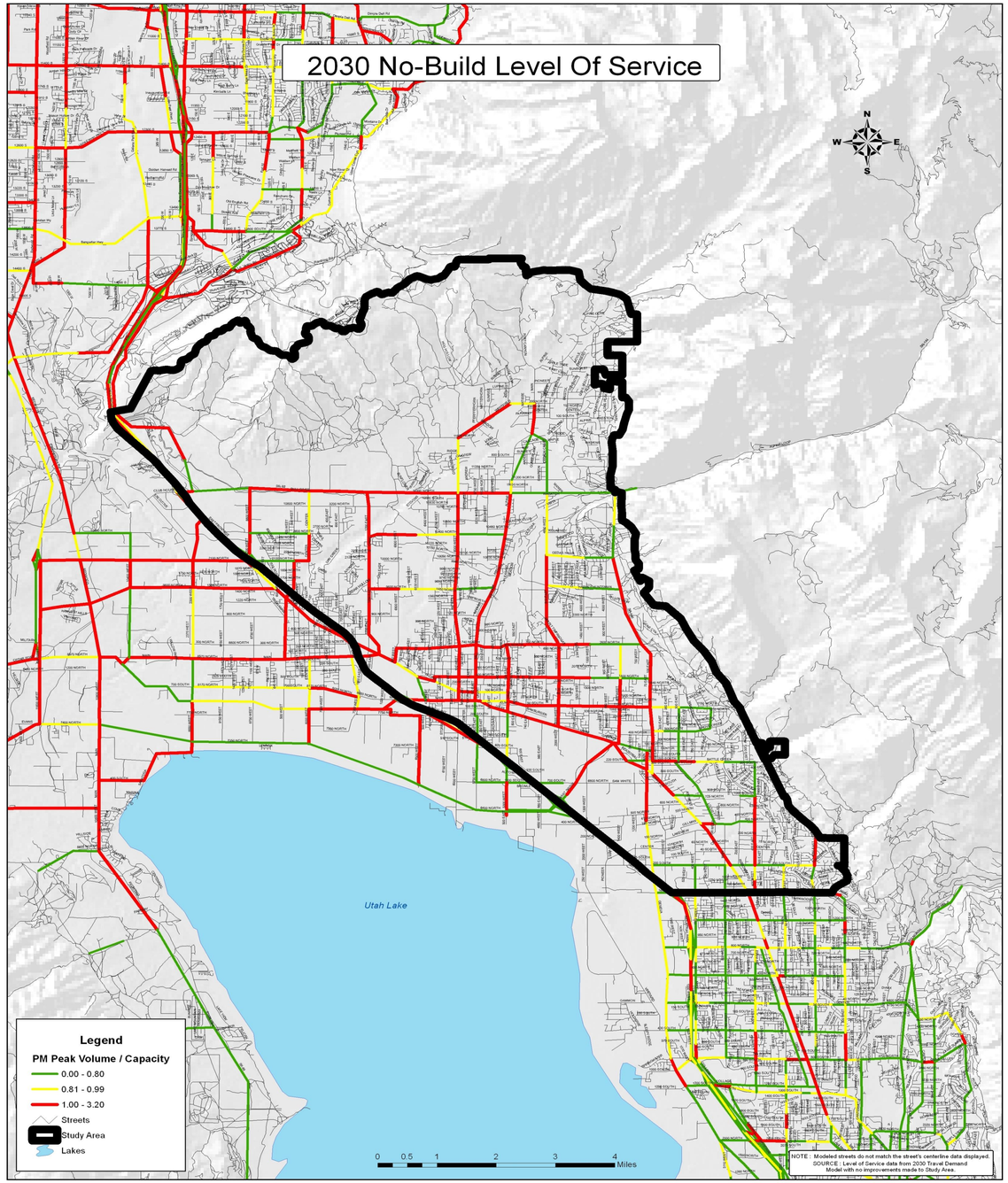
# 2015 No Build Level of Service

- TTI = 1.21
- Assumes all Phase 1 (to 2015) LRP projects are built outside study area, no future projects within study area
- Population and employment numbers are based on MAG model inputs.

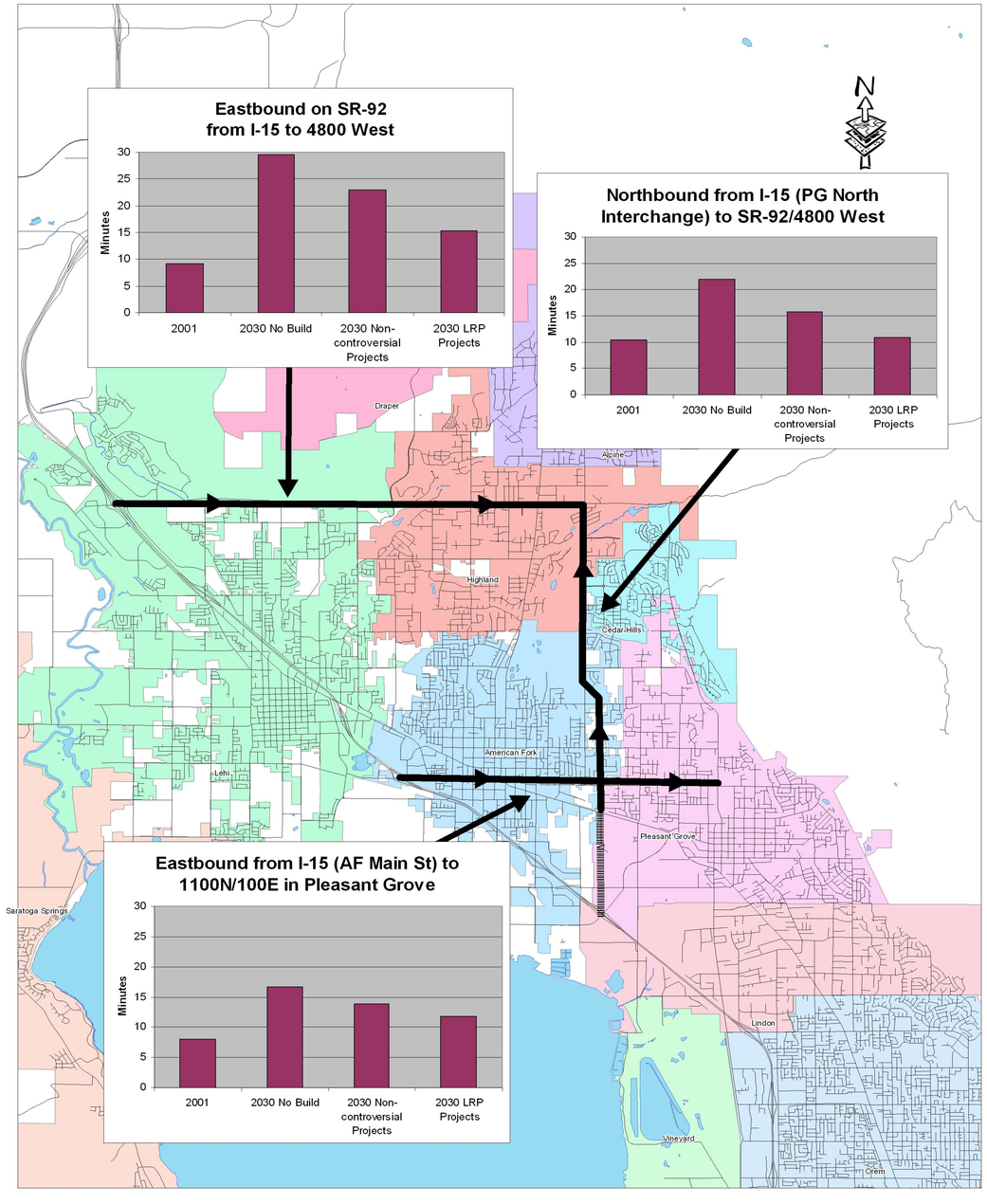


# 2030 No Build Level of Service

- TTI = 1.53
- Assumes all LRP projects are built outside study area, no future projects within study area
- Population and employment numbers are based on city-revised population and employment numbers.
  - 2030 Population = 261,729
  - 2030 Employment = 62,804



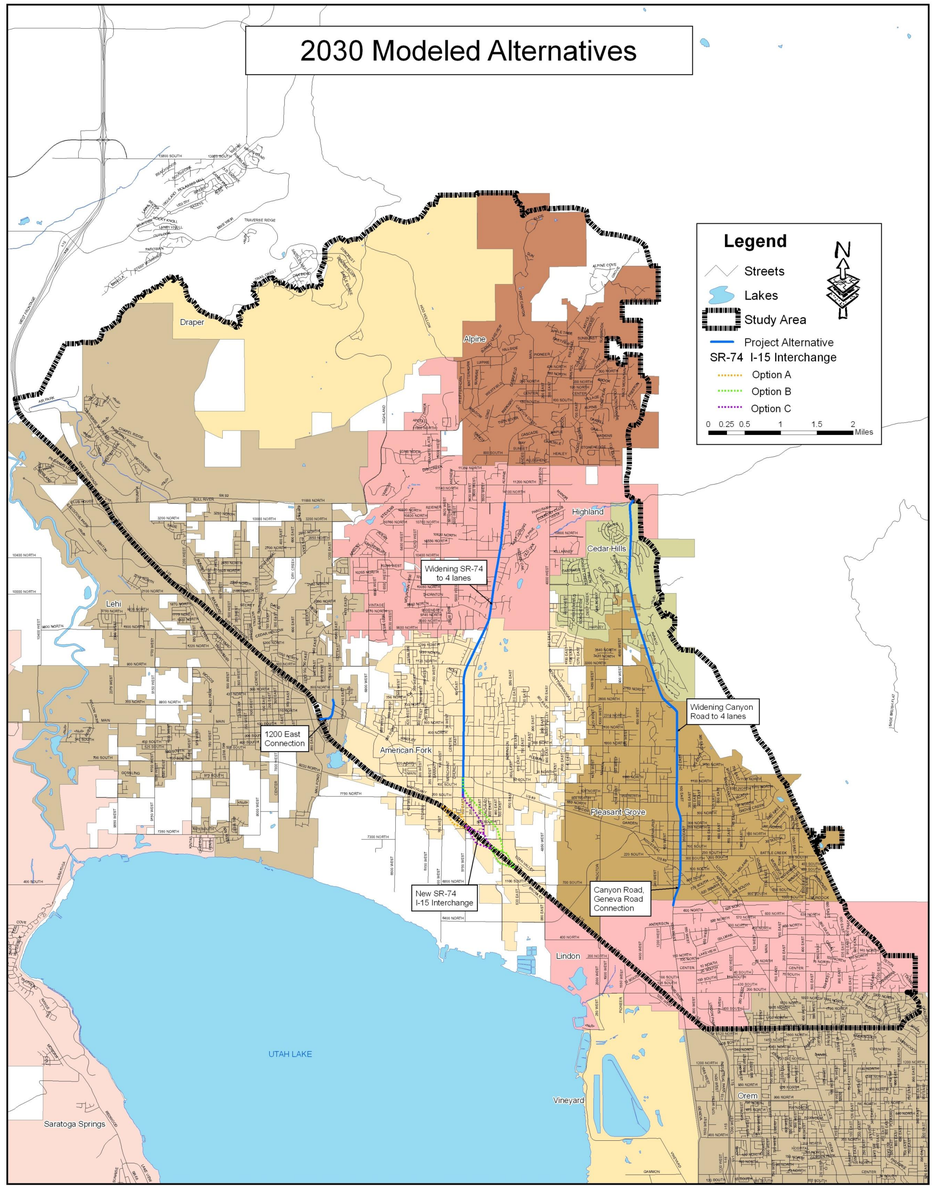
# PM Peak Hour Travel Delay

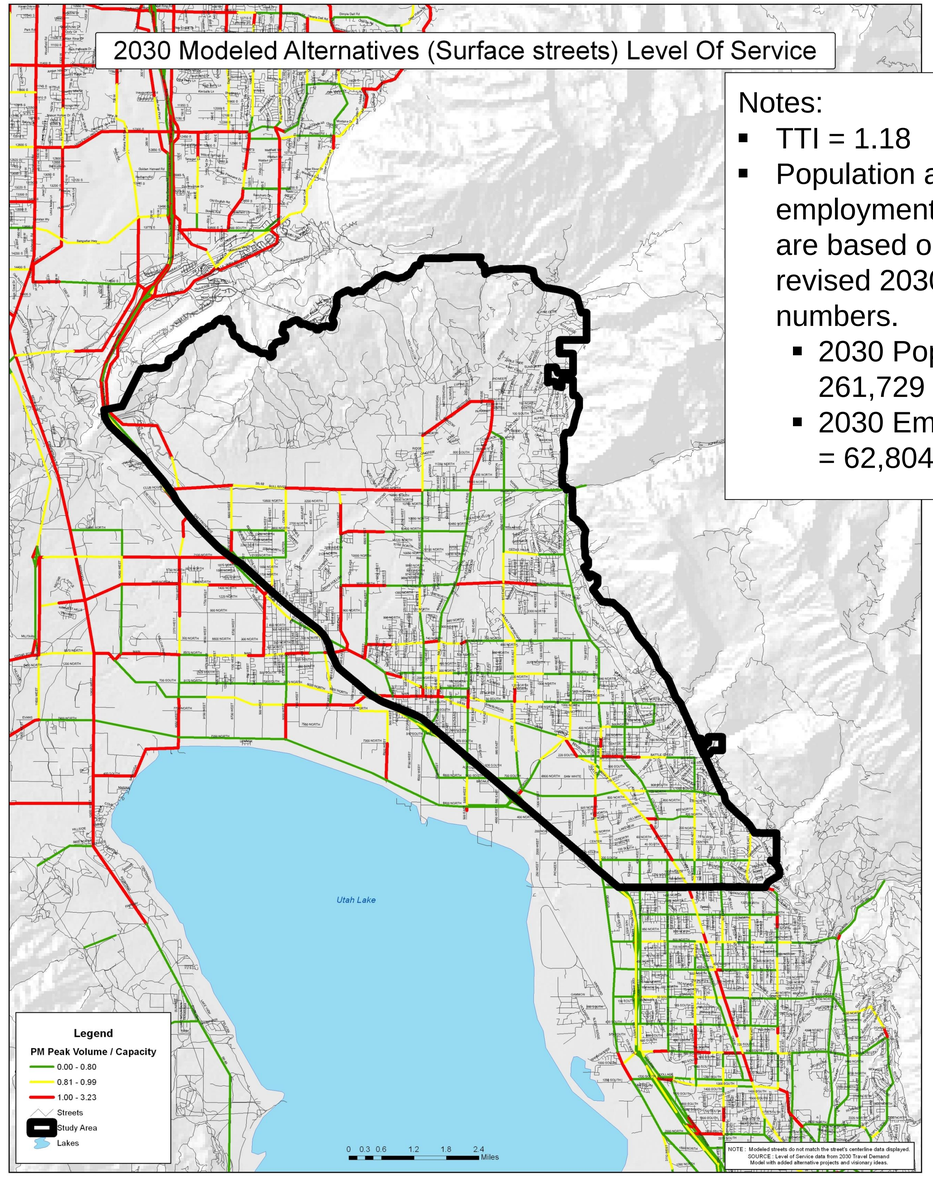


# Alternatives Analysis

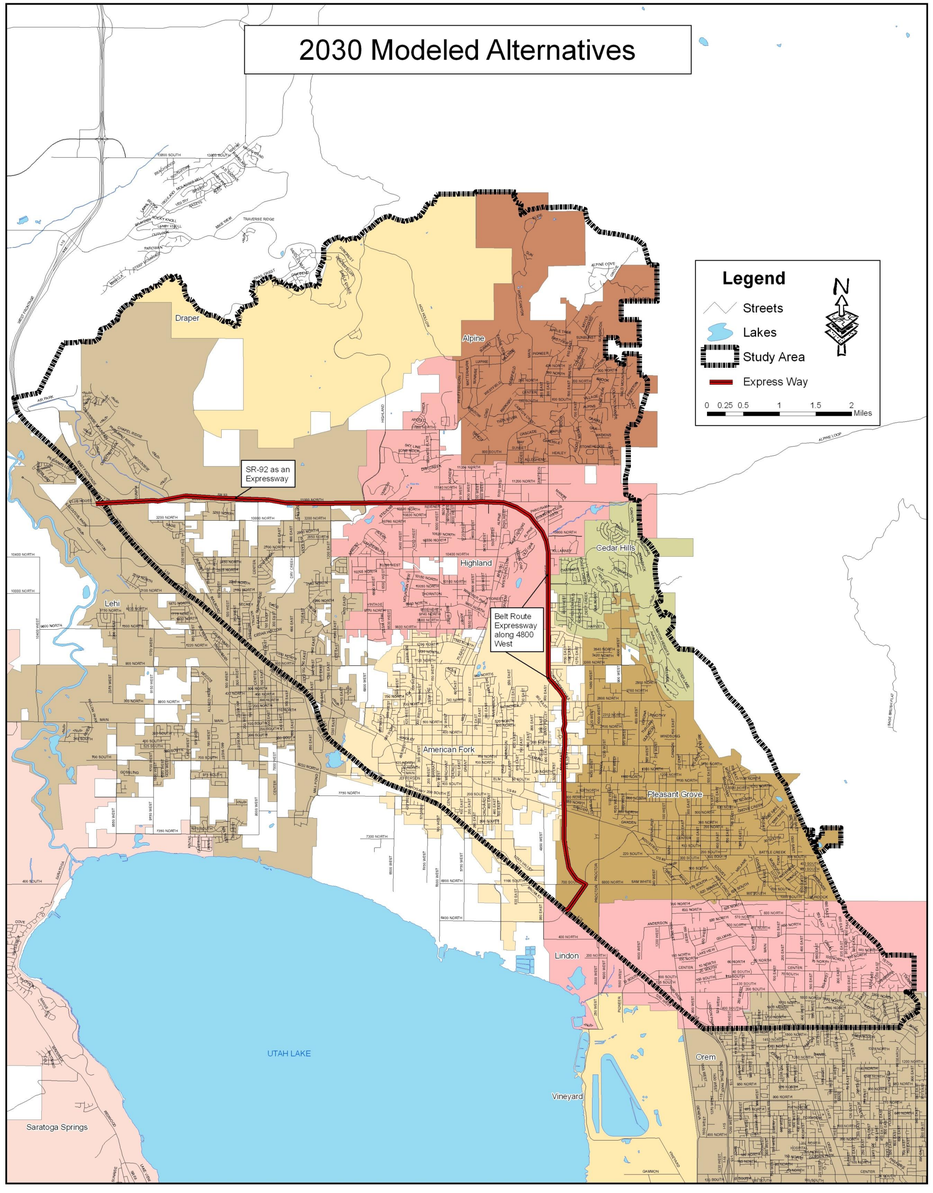
- Reduced MAG Long Range Plan to “Non-Controversial” Projects
- Tested Wide Range of “Controversial” or “Impacting” Projects
- Projects Tested Both Individually and as “Packages” of Projects
- Considered Delay Reduction and Net Present Value of Benefits

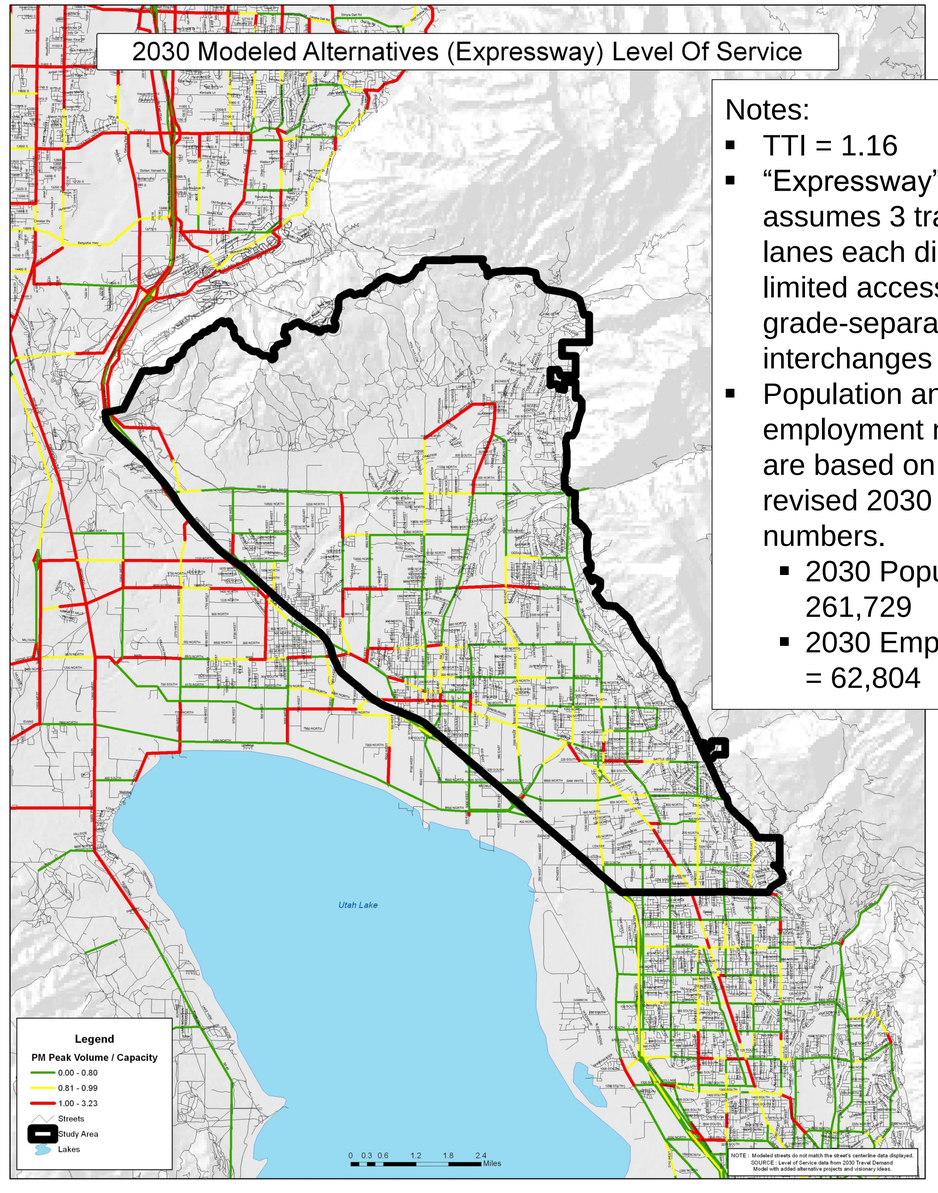
# Other Alternatives Considered:
# **Surface Streets Alternative**



# Other Alternatives Considered:
# Expressway Alternative




Notes:

- TTI = 1.16
- "Expressway" assumes 3 travel lanes each direction, limited access, some grade-separated interchanges
- Population and employment numbers are based on city-revised 2030 numbers.
  - 2030 Population = 261,729
  - 2030 Employment = 62,804

# Alternative Projects Considered

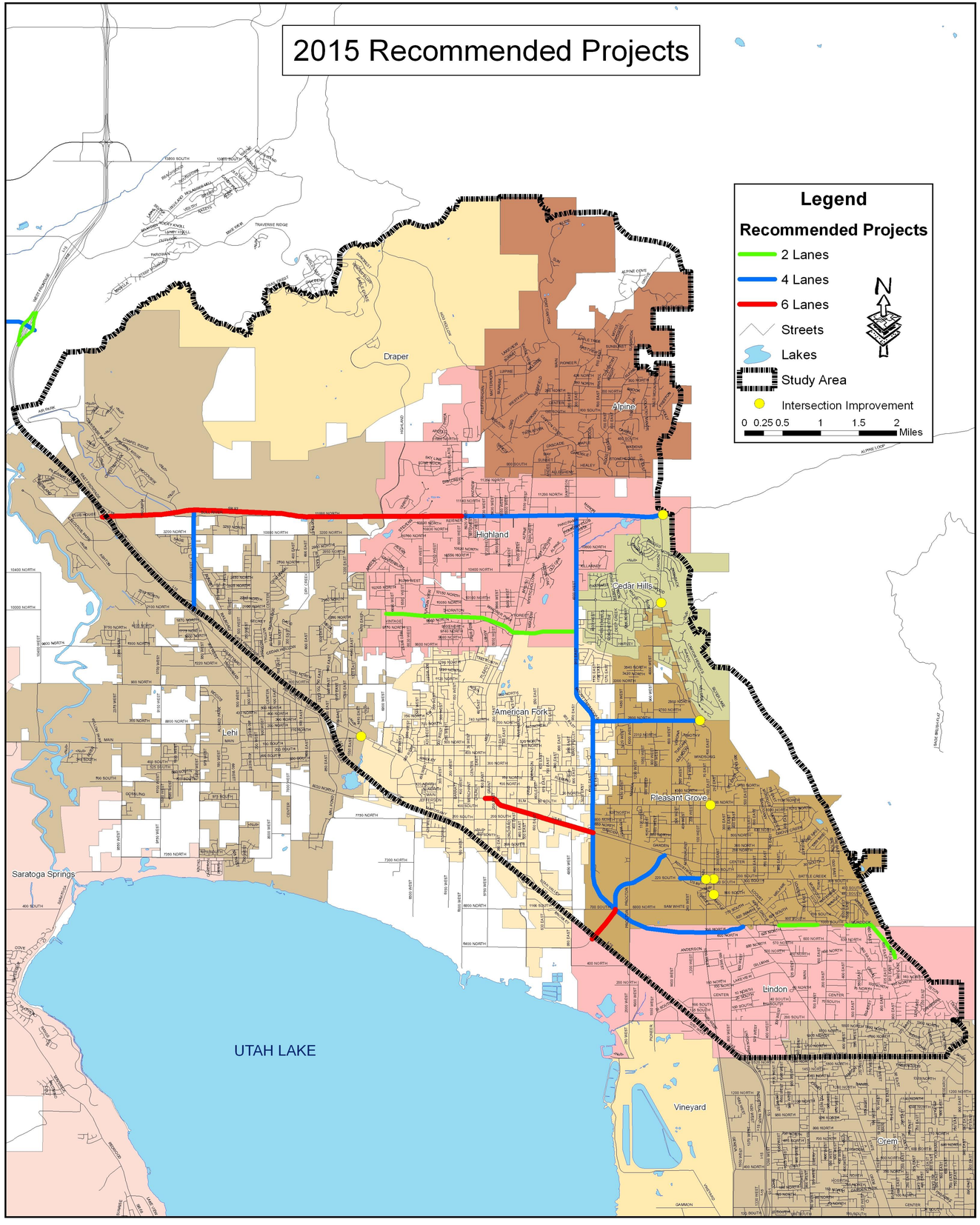
| NEUVTS Alternative Projects Considered | Total Cost (millions) | Study Area TTI[1] | Total NPV[2] Benefit | Reason not carried forward |
|---|---|---|---|---|
| 2015 Recommendations | $167.8 | 1.21 | $15.8 | Shows unacceptable levels of congestion in 2030 |
| Canyon Road/Geneva Road connection | $10.0 | | -$9.5 | No alignment has been identified |
| Canyon Road widening | $49.9 | 1.19 | -$22.7 | Possible impacts to 107 structures and negative NPV |
| Canyon Road widening and Geneva Road connection | $54.9 | 1.19 | -$32.2 | High ROW impacts and negative NPV |
| New SR-74/I-15 interchange | $16.3 | 1.20 | -$19.1 | Recommended for 2030 |
| Widening SR-74 from I-15 to SR-92 | $22.3 | | | Little benefit in Highland -- widening SR-74 to 9800 N is recommended in 2030 |
| High-capacity arterial on SR-92 | $9.5 | 1.21 | $3.0 | More benefit seen from SR-92 expressway |
| Expressway on SR-92 | $44.5 | 1.20 | -$26.3 | Recommended for 2030 |
| 1200 East connection | | 1.21 | | No project has been identified so no cost estimates are available |
| All of the above | $129.1 | 1.17 | -$99.9 | High ROW impacts and negative NPV |

1. TTI=Travel Time Index, a measure of congested conditions compared to free-flow conditions. See TTI board for more explanation.
2. NPV=Net Present Value, a measure of the value of a project over time

# Considerations in 2015 Recommendations

- Project phasing is important part of process
- 2015 recommended projects preserve the good level of service the study area now experiences
- Recommended projects need to be implemented by 2015
- There is consensus by cities regarding the recommended project list
- Year 2015 matches current MAG LRP phasing

# 2015 Recommended Roadway Projects

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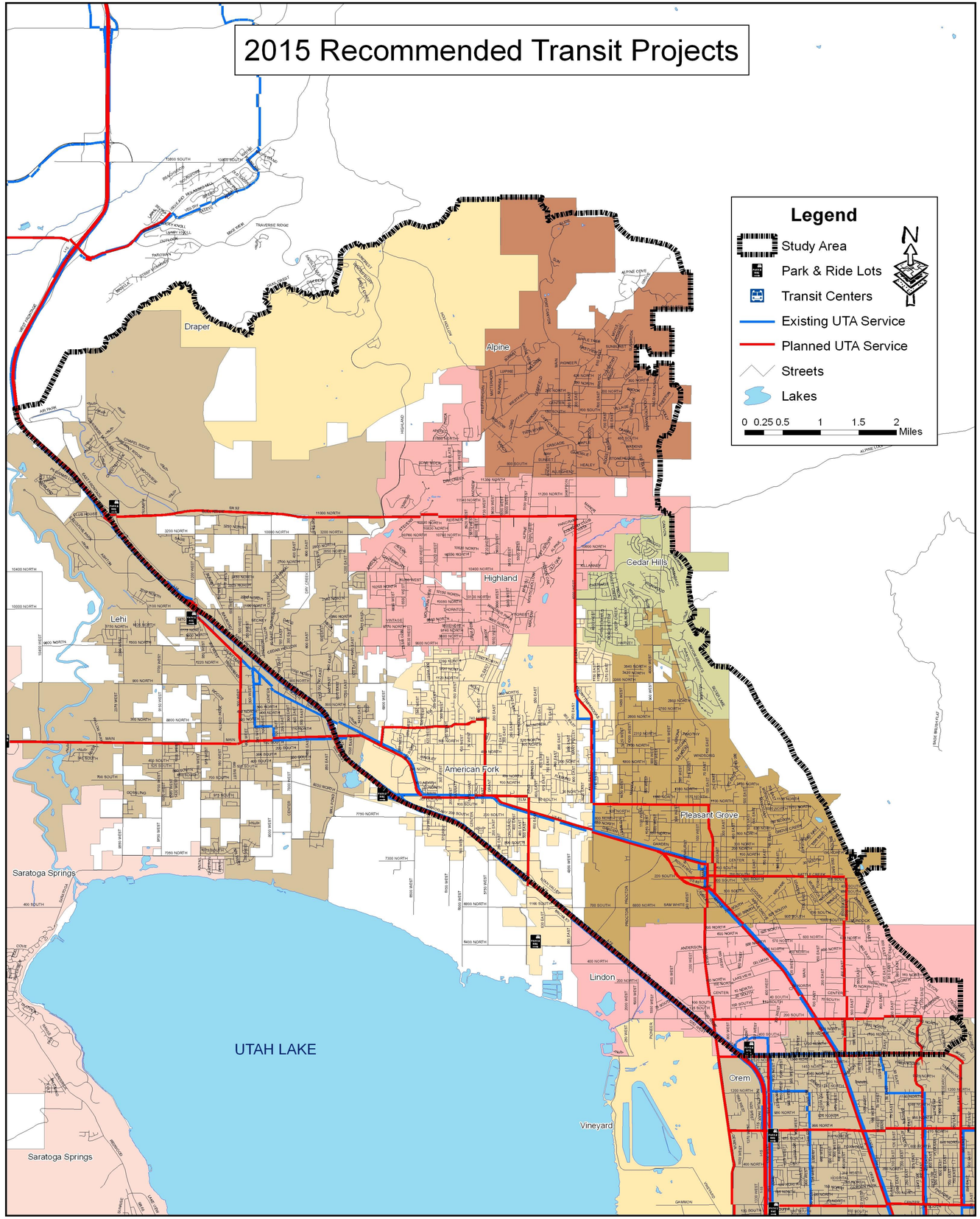
# 2015 Recommended Transit Projects

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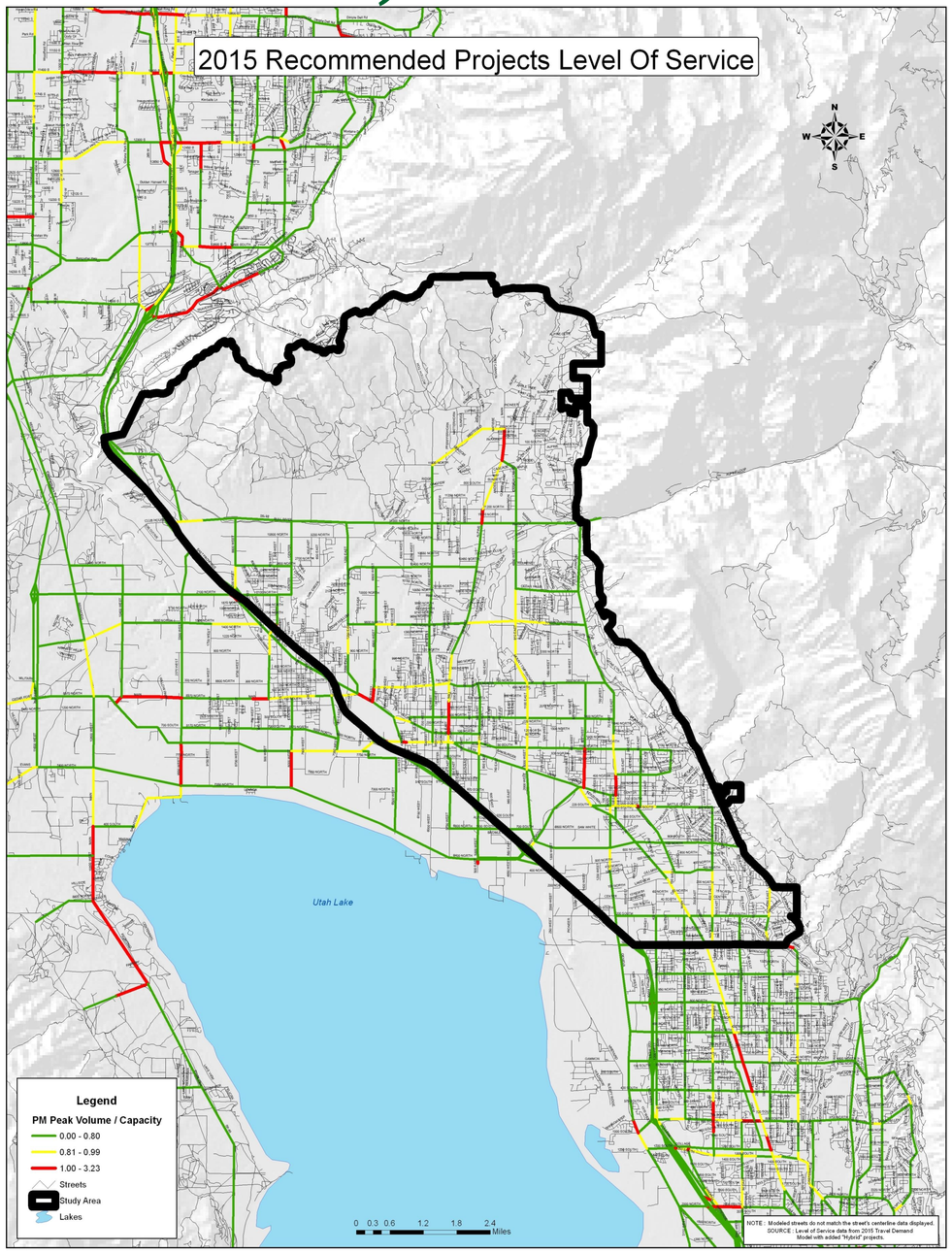
# 2015 Recommended Projects Level of Service

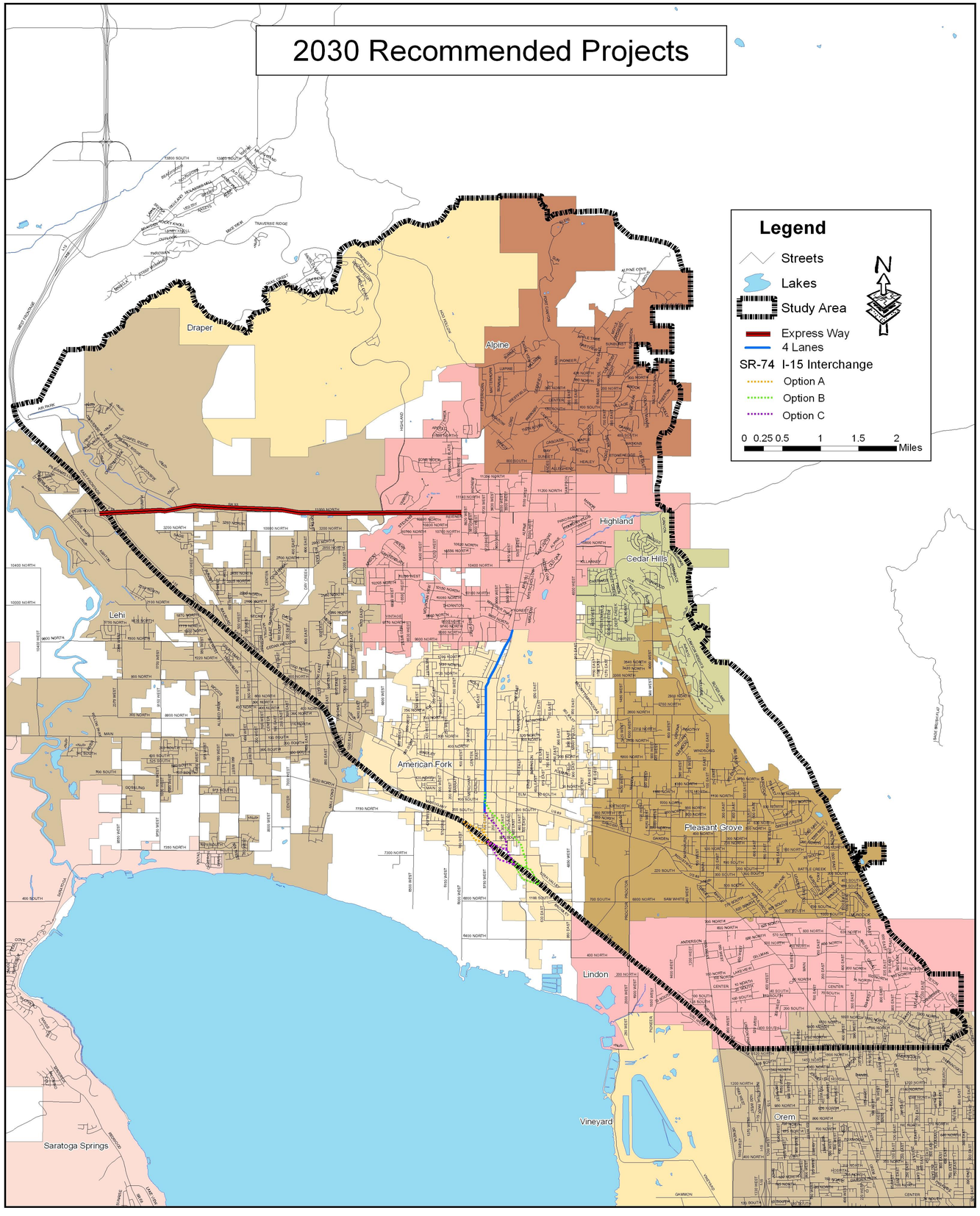
- TTI = 1.10
- Level of service is based on 2015 recommended project list
- Population and employment numbers are based on MAG model inputs.



# Considerations in 2030 Recommendations

- Difficult to evaluate cost-effectiveness of individual projects in the long term
- Recommended projects represent longer term opportunities such as available right-of-way and I-15 reconstruction
- Some of the 2030 recommendations are not based on committee consensus

# 2030 Recommended Roadway Projects

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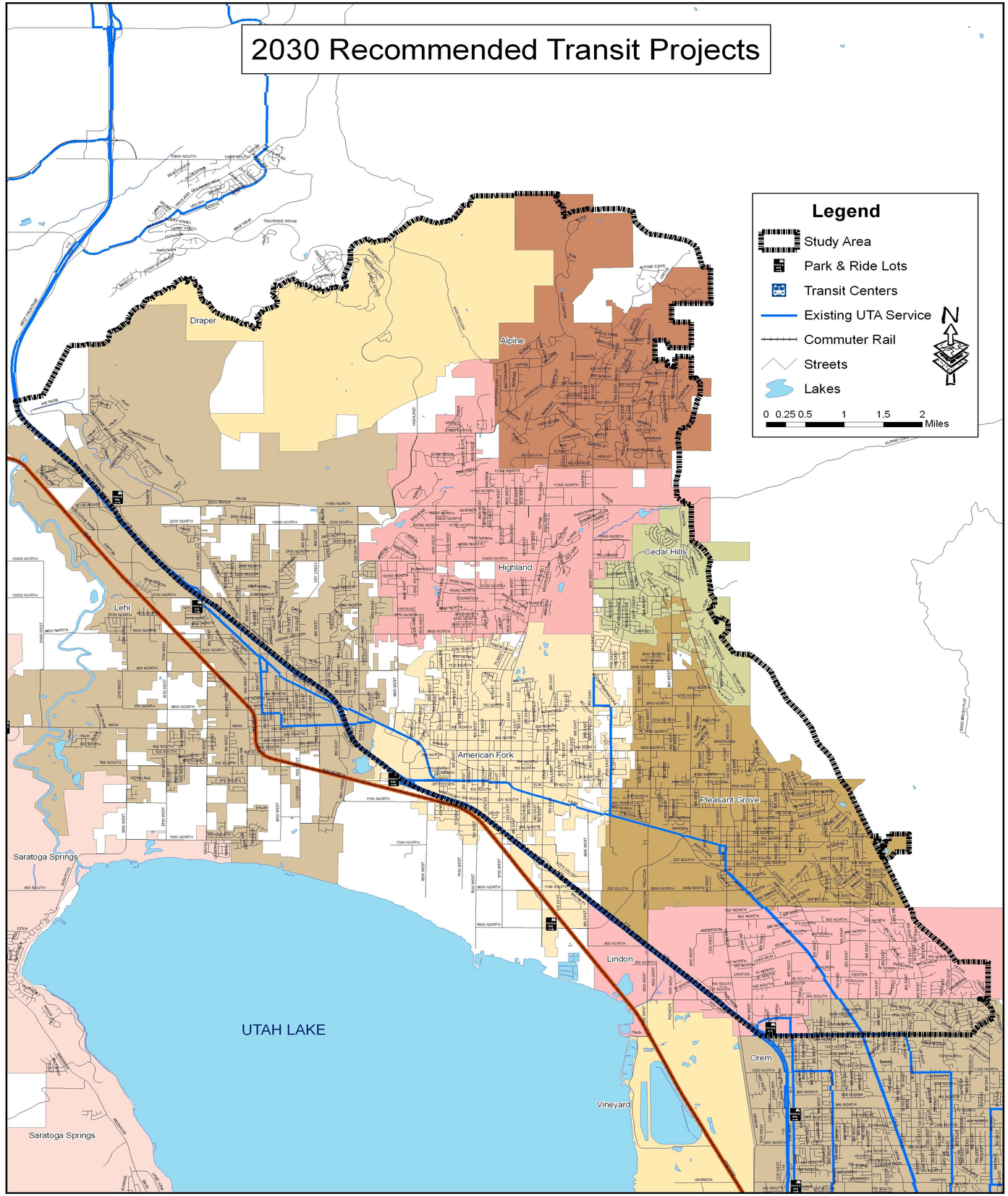
# 2030 Recommended Transit Projects

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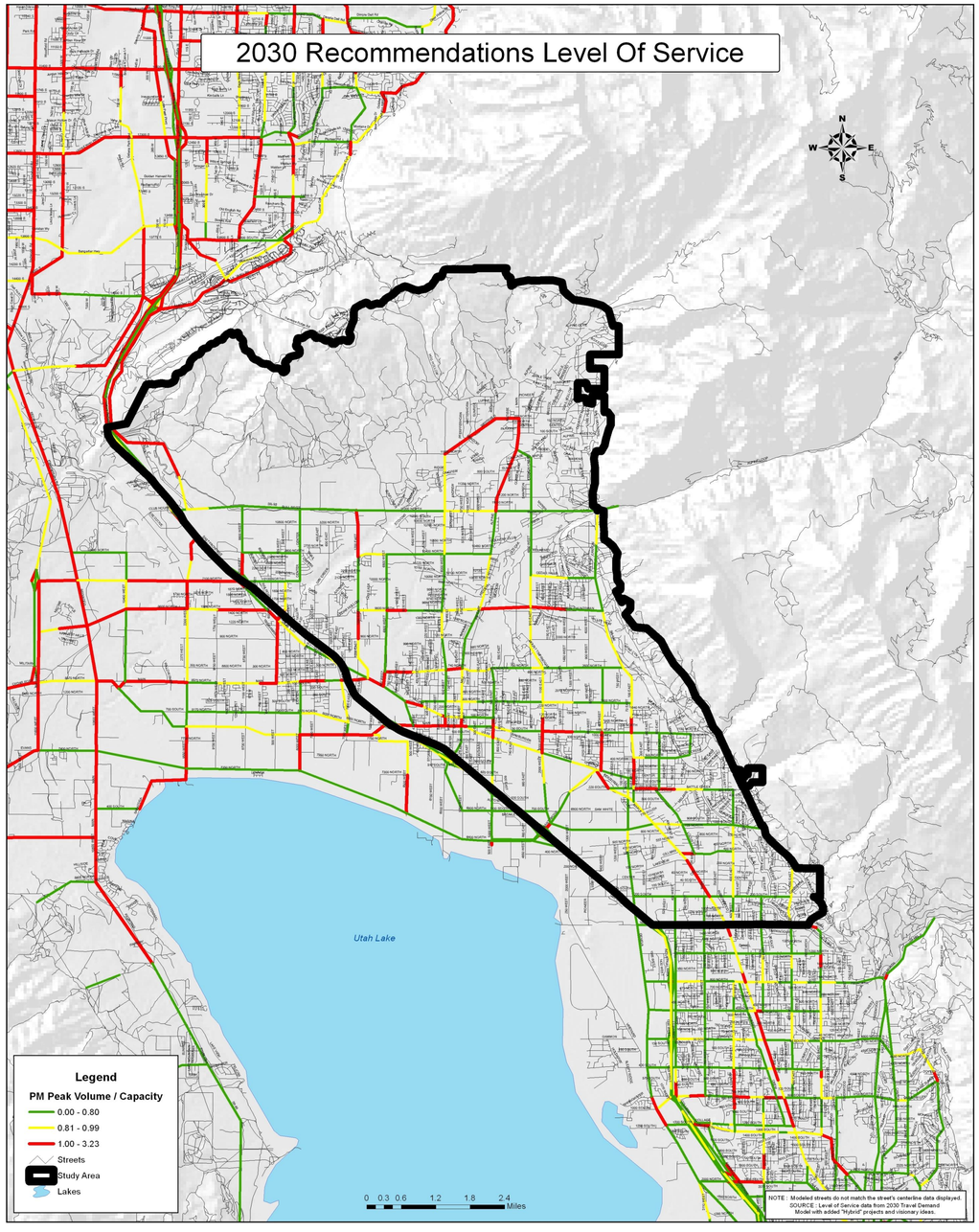
# 2030 Recommended Projects Level of Service

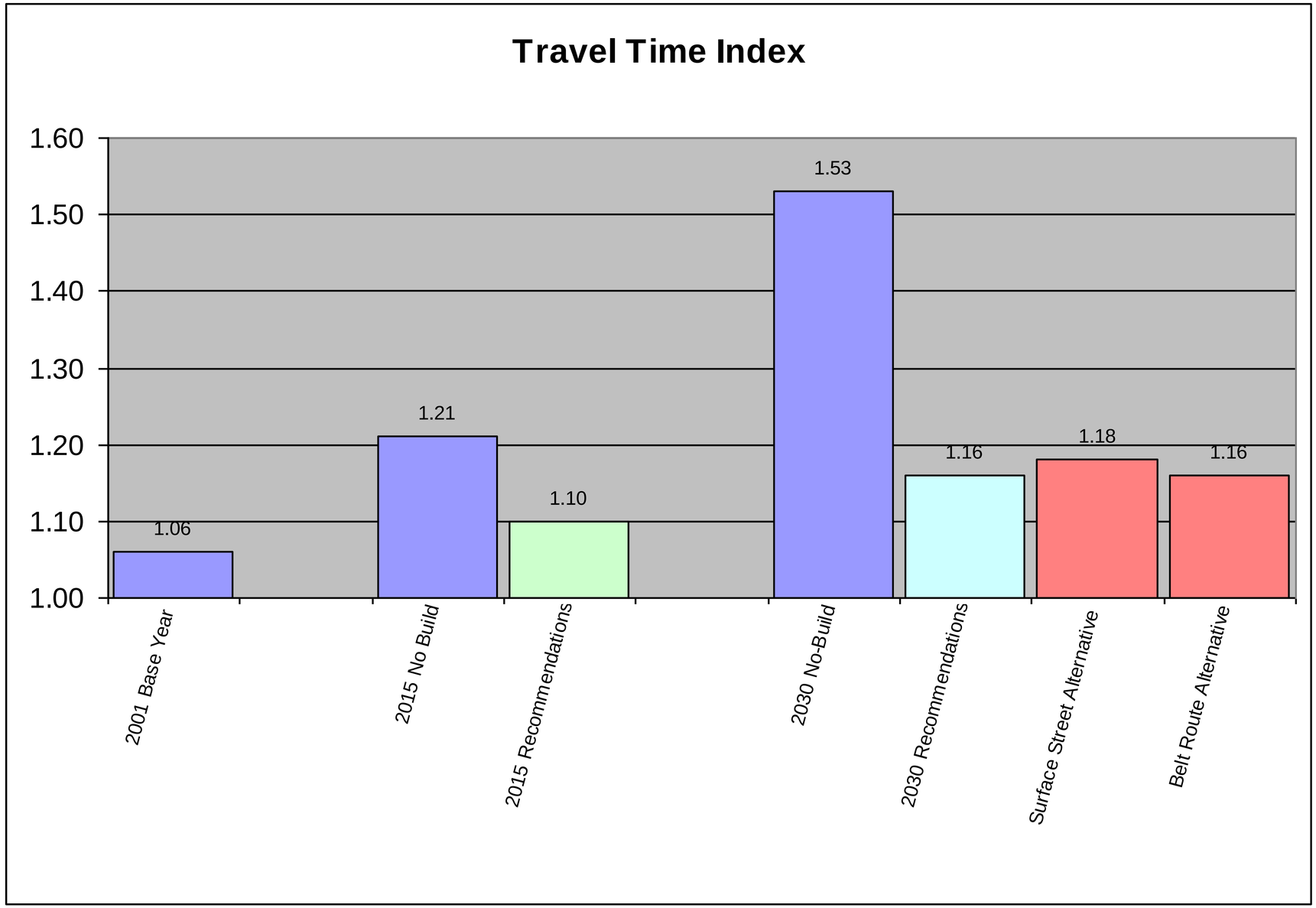
- TTI = 1.16
- All 2015 recommended projects are assumed
- Level of service is based on 2030 recommended project list
- Population and employment numbers are based on city-revised population and employment numbers.
  - 2030 Population = 261,729
  - 2030 Employment = 62,804



# Alternative Projects: Travel Time Index

Travel Time Index (TTI) is a measure of congestion that compares peak congestion conditions to free-flow conditions.

The closer the TTI is to 1.0, the more free-flow conditions reflect peak hour conditions and the less congestion there is during the peak period.



# 2015 Recommended Roadway Project List

| Number | Street | Limits | | Project | Street Classification | Length | Project Cost (Millions) | Number of Travel Lanes |
|---|---|---|---|---|---|---|---|---|
| | | Begin | End | | | (miles) | | |
| 1 | SR-92 | I-15 Interchange | 4800 West | Widen to 130' ROW | Principal Arterial | 6.23 | $58.70 | 6 |
| 2 | State Street | Pleasant Grove Blvd | 100 East Am. Fork | Widen to 130' ROW | Principal Arterial | 1.51 | $10.20 | 6 |
| 3 | Pleasant Grove Blvd | I-15 Interchange | 2000 West | Widen to 130' ROW | Principal Arterial | 0.50 | $3.40 | 6 |
| 4 | Pleasant Grove Blvd | 2000 West | State Street | Widen to 106' ROW | Principal Arterial | 1.10 | $5.80 | 4 |
| 5 | Point of the Mountain Interchange | I-15 | Redwood Road | Build new Interchange | Principal Arterial | Outside Study Area | | |
| 6 | 1200 West | SR-92 | I-15 Interchange | Widen to 106' ROW | Minor Arterial | 1.36 | $7.30 | 4 |
| 7 | 1200 East | SR-92 | State Street | Widen to 84' ROW | Minor Arterial | 3.05 | $10.60 | 2 |
| 8 | 4800 West | SR-92 | State Street | Widen to 106' ROW | Minor Arterial | 4.34 | $30.09 | 4 |
| 9 | 2600 North | Canyon Rd | 1100 East | Widen to 106' ROW | Major Collector | 1.41 | $7.60 | 4 |
| 10 | 2000 West / 700 North | State Street | State Street | Widen to 106' ROW | Minor Arterial | 2.91 | $15.80 | 4 |
| 11 | Battlecreek Dr. | State Street | Main Street | Widen to 106' ROW | Major Collector | 0.34 | $1.80 | 4 |
| 12 | Canyon Road | SR-92 | State Street | Intersection Improvements | Minor Arterial | 5.00 | $1.25 | 2 |
| 13 | 9800 North | SR-74 | 4800 West | New Construction 83' ROW | Collector | 0.82 | $3.70 | 2 |
| 14 | 700 North Am. Fork | 100 East | 200 East | New Construction 83' ROW | Local | 0.14 | $0.58 | 2 |
| 15 | 1000 South PG | Locust Ave | 1150 East | New Construction 83' ROW | Collector | 0.55 | $2.30 | 2 |
| 16 | 400East / 800 North Lindon | 400 North | 1200 East Lindon | New Construction 83' ROW | Collector | 0.89 | $3.96 | 2 |
| **2015 Roadway Project Total Cost** | | | | | | | **$163.08** | |

# 2015 Recommended Transit Project List

| Number | Project | Begin | End | Location | Existing Traffic | Project Cost (Millions) | Funding |
|---|---|---|---|---|---|---|---|
| 1 | Bus Service Expansion | Added Bus Lines County Wide including new lines in the study area | | System Wide | 24,632 | $81.50 | Fed / State / Local |
| 2 | Bus Frequency Expansion | More Buses per line County Wide including new lines in the study area | | System Wide | 16,161 | | Fed / State / Local |
| 3 | Added Park and Ride Lot | I-15 Interchange | 1600 North in Orem | Near I-15 Ramp | 17,941 | $0.50 | Fed / State / Local |
| 4 | Added Park and Ride Lot | I-15 Interchange | Main Street (American Fork) | Near I-15 Ramp | 8,688 | $0.50 | Fed / State / Local |
| 5 | Added Park and Ride Lot | I-15 Interchange | 1200 West in Lehi | Near I-15 Ramp | | $0.50 | |
| 6 | Added Park and Ride Lot | I-15 Interchange | SR-92 | Near I-15 Ramp | 1,723 | $0.50 | Fed / State / Local |
| 7 | Added Park and Ride Lot | 600 East | 1500 South (American Fork) | Near planned Mountain View Cor. | 16,595 | $0.50 | Fed / State / Local |
| **2015 Transit Project Total Cost** | | | | | | | **$84.00** |

# 2030 Recommended Roadway Project List

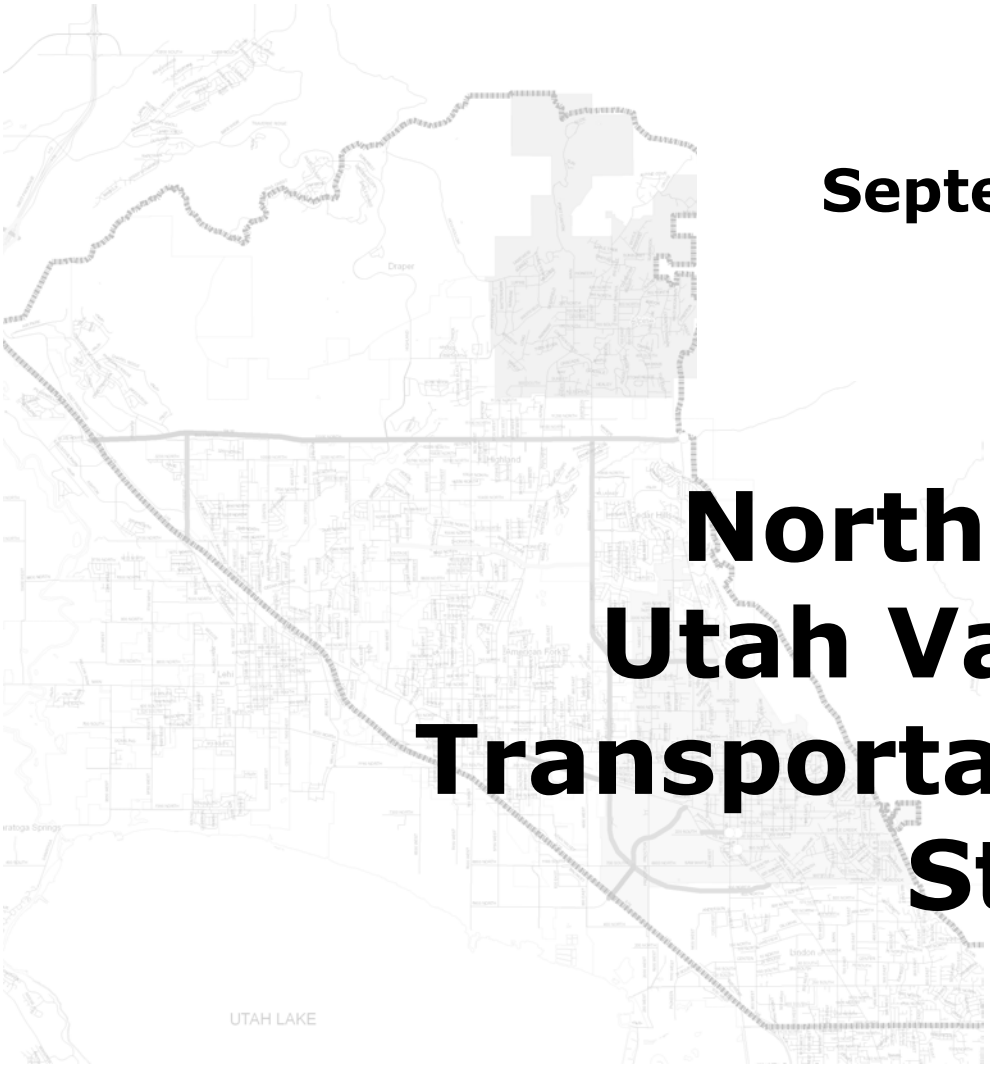
| Number | Street | Limits | | Project | Street Classification | Length (miles) | Project Cost (Millions) | Number of Travel Lanes |
|---|---|---|---|---|---|---|---|---|
| | | Begin | End | | | | | |
| 1 | SR-92 | I-15 Interchange | 4800 West | Add Grade-separated Structures | Principal Arterial | 6.23 | $44.50 | 6 |
| 2 | SR-74 | I-15 Interchange | Highland | Widen to 106' ROW | Minor Arterial | 2.56 | $13.82 | 4 |
| 3 | I-15 | American Fork | I-15 Interchange | Added or Moved Interchange | Freeway | 0.50 | $16.30 | Varies |
| **2030 Roadway Project Total Cost** | | | | | | | **$74.62** | |

# 2030 Recommended Transit Project List

| Number | Project | Limits | | Location | Length (miles) | Project Cost (Millions) | Funding |
|---|---|---|---|---|---|---|---|
| | | Begin | End | | | | |
| 1 | Added Commuter Rail | Salt Lake County | Provo Hub | West Side of I-15 Corridor | 23.00 | $300.00 | Fed / State / Local |
| **2030 Transit Project Total Cost** | | | | | | | **$300.00** |

| **Total cost of all 2015 and 2030 Roadway and Transit Project Costs** | **$621.70** |
|---|---|

*Note: Projects outside of the study area are generally based on the MAG and WFRC Long Range Transportation Plan and latest planning assumptions.*
*In particular, projects assumed outside of the study area include the following:*
*Mountainview Corrirdor "Arterial Alternative" through Lehi,*
*a new I-15 Interchange at Point of the Mountain,*
*I-15 widened to 6 lanes in each direction through the Study area,*




**September 2005**

# Northeast Utah Valley Transportation Study

Prepared for:
***Mountainland Association of Governments***

Prepared by:
***InterPlan Co.***

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# Table of Contents

# Chapter 1

## 1. Study Methodology

Utah County has long been known for its quality of life. With large areas of undeveloped land, good access to employment centers in Salt Lake City and Provo/Orem, and little traffic congestion, northeast Utah County is quickly becoming a popular place to live among Wasatch Front residents.

With some of the highest growth rates in the nation, the populations of the cities in northeast Utah County are expected to more than double by 2030. The effects of this population growth are particularly important for the transportation infrastructure of the region. Pro-actively assessing the impacts region-wide and on specific roads allows local and regional decision-makers the opportunity to develop a system that meets the mobility needs of the transportation system users of northeast Utah County.

The goal of the Northeast Utah Valley Transportation Study is two-fold. First, it identifies transportation problems in the fast-growing area of northeast Utah County. Second, it defines transportation projects and strategies that will satisfy projected travel demand in northeast Utah County in both the near and long term. Projects identified as those of high priority will be included in the Mountainland Association of Governments' (MAG) 2030 regional Long Range Transportation Plan (LRTP).

MAG contracted with a consultant, InterPlan Co., to supply technical support to MAG staff. A Technical Advisory Committee (TAC) was assembled to provide direction and oversight to the process. The TAC included representation from cities within the study area and MAG, met on a monthly basis from December 2004 through June of 2005, and was instrumental in weighing the impacts of various alternatives and developing the recommended alternative, presented later in this document. The TAC also offered guidance on topics such as:

- Population and employment projections
- Analysis of LRTP projects
- 2030 alternative transportation network development
- Alternative cross-section development
- Access control policies.

Agendas from each TAC meeting are included in Appendix A.

In order to accomplish the first goal of the project, identifying future transportation problems in the study area, the project team examined population and employment projections previously done by MAG staff during the previous LRTP update process about three years ago. Revisions to socioeconomic data were made to reflect more recent growth and development trends. This updated data was used for travel demand modeling throughout the rest of the study.

Travel demand modeling is done by transportation planning agencies to determine the number of vehicles on roads and transit in the region for a specified future year. The model determines trips based on land uses and where people live, work, shop, recreate, and other destinations. Initial modeling efforts focused on establishing existing and future travel patterns of vehicle trips that originate in the study area. This gave the project team important information related to where

people were traveling to, whether north into Salt Lake County or other areas north, or to the Provo/Orem area, etc. In addition, in order to identify future transportation problems, a set of analysis scenarios was developed, including a no-build scenario, a LRTP scenario, and a "non-controversial projects" scenario. All are detailed later in this chapter.

Modeling these future scenarios indicated that traffic congestion issues were to be anticipated in each of them. In order to address the second goal of the project, to identify projects and strategies to solve those issues, the Technical Advisory Committee began examining specific transportation improvements. These improvements included widening existing roads, providing better connections between existing facilities, and identifying access management policies. At the same time, planning-level potential alignments were drawn in order to have a better understanding of possible property impacts of some of these improvements. Using measures of effectiveness such as vehicle hours of travel and travel time index, projects were chosen to be included in the preferred alternative. Finally, phasing of improvements was considered related to the timing of population growth and the relative need for individual projects over time.

The above is intended only to give a brief summary of the study methodology and the process undertaken over the course of the project. Each of these steps is discussed in more detail later in this document. Specifically, elements addressed in further chapters include:

- Existing and future conditions related to socioeconomic data, land use, travel characteristics, local and regional planning efforts
- Problem identification
- Alternatives analysis including Locally Preferred Alternative

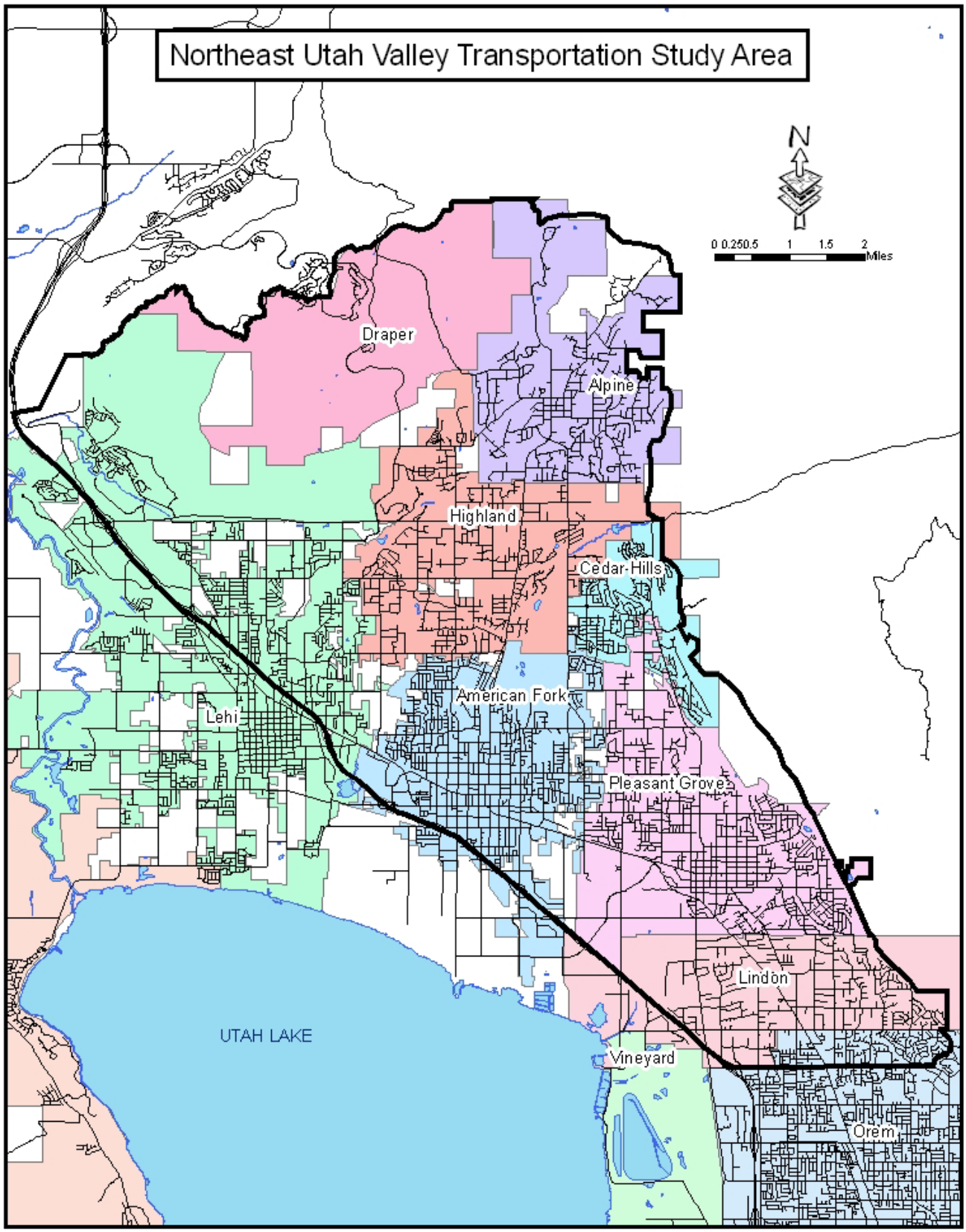
In addition to the TAC, a Policy Committee met twice during the process to offer insight related to problem identification and transportation projects that addressed these solutions. The Policy Committee consisted of locally elected officials including mayors and city council members as well as planning commissioners from cities throughout the study area. Appendix B contains sign-in sheets and comments from the two Policy Committee meetings.

## A. Study Area

The study area extended from approximately the Utah/Salt Lake County line to 1600 North in Orem, and from Interstate-15 to the eastern boundaries of the cities near the Uinta National Forest in the study area. All or portions of the cities in the study area include Alpine, American Fork, Cedar Hills, Draper, Highland, Lehi, Lindon, Orem, and Pleasant Grove. The study area is shown in Figure 1-1.

Consideration was given to including in the study the area west of I-15 and north of Utah Lake, encompassing the areas of west Lehi, Saratoga Springs and Eagle Mountain. This area was not included within the boundaries of the study because a similar study done by MAG in 2000 which looked at east/west connections to I-15 identified a north, central, and south corridor. Also, I-15 was chosen as the western boundary for the study area as it serves as a "logical terminus" of people traveling within the study area with many trips going to or coming from I-15. In addition a future study called the Lake Mountain Study will address travel demand in the area west of I-15 in northern Utah County.

*Figure 1-1*

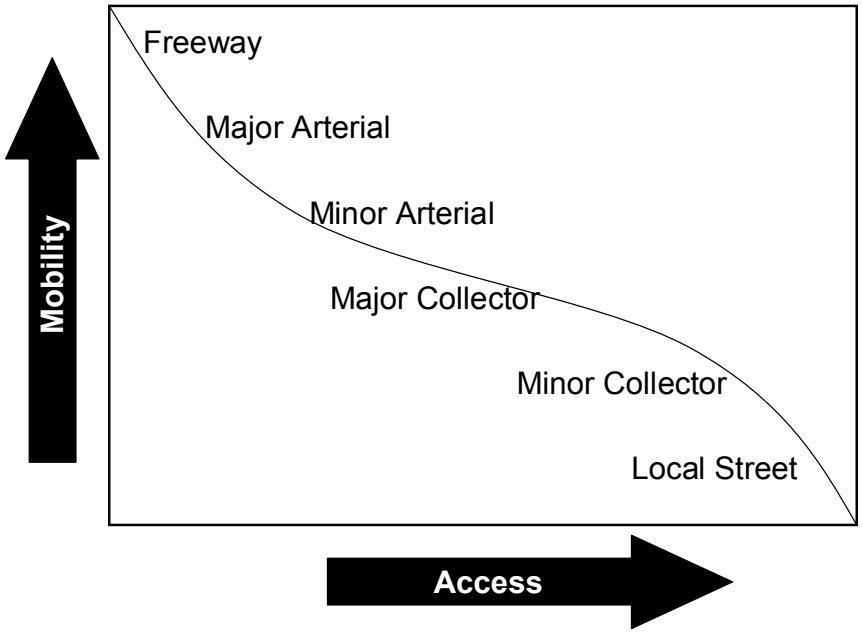

Northeast Utah Valley Transportation Study Area
N
0 0.250.5 1 1.5 2
Miles
Draper
Alpine
Highland
Cedar Hills
American Fork
Lehi
Pleasant Grove
Lindon
UTAH LAKE
Vineyard
Orem

## B. Transportation Systems Analyzed

i. Road Network

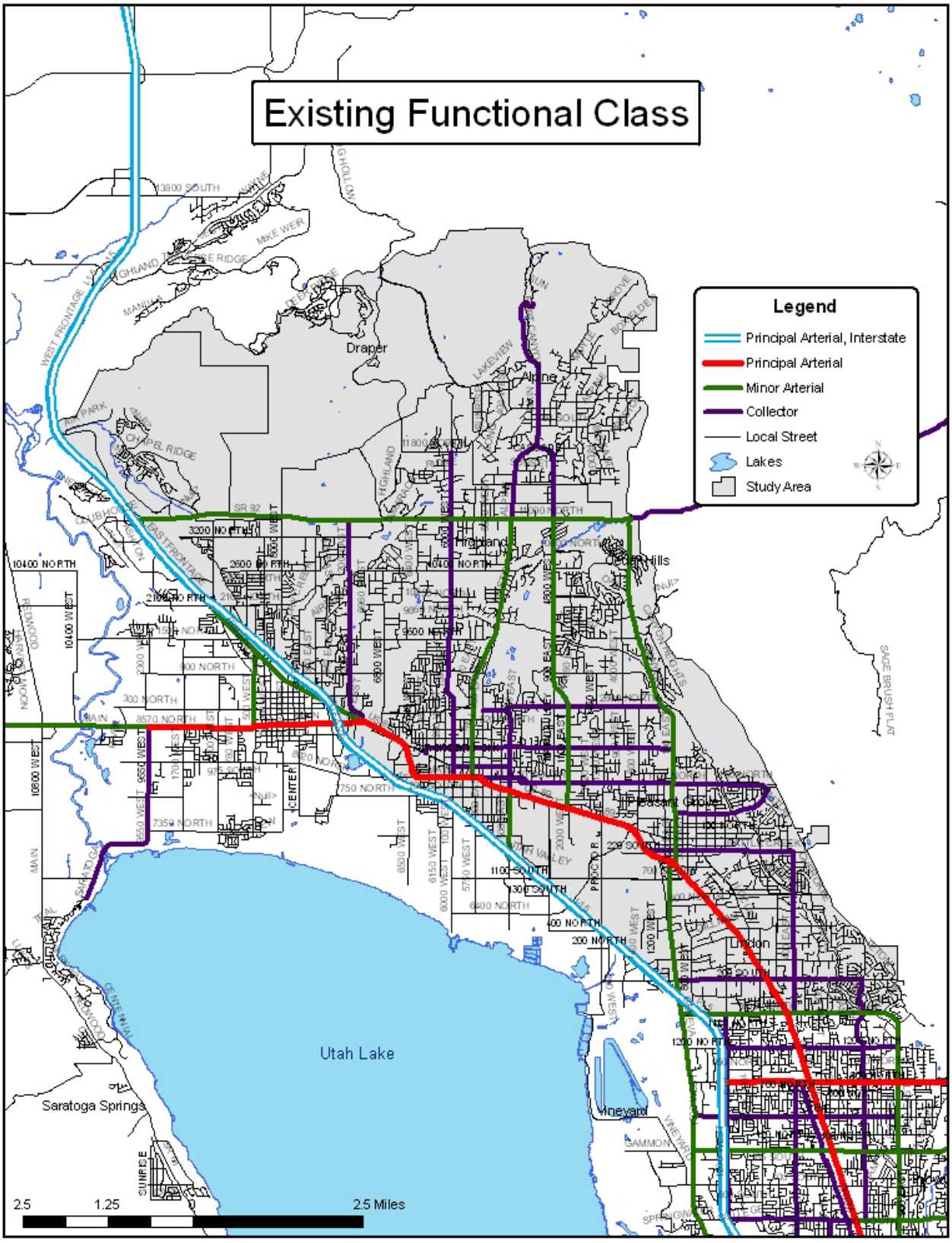
The transportation system that was examined during this process was the existing functional classification network. The functional class network is the foundation of the transportation system, moving people and goods into, out of, and throughout the region. It includes freeways, expressways, arterials, and collector roads under the jurisdiction of the state, county, and local entities. Generally, a road's functional classification is determined by whether its purpose is to provide access or mobility. Those roads at the smaller end of the functional class system move traffic more slowly but provide greater access, such as to local roads or to residential or small commercial properties. On the other end of the scale, expressways provide greater mobility as they move more traffic at greater speeds, but with more limited accesses such as driveways and intersections. This concept is illustrated in Figure 1-2. The existing functional class network in the study area is shown in Figure 1-3.

**Figure 1-2: Access and Mobility by Functional Classification**




Transportation projects that would help to meet projected travel demand in the year 2030 were considered during this process. These projects included those already included in the region's Long Range Transportation Plan, as well as other new improvements that were suggested by city representatives. These projects were discussed and debated by the study's TAC and were considered with respect to how "controversial" they were between cities. This process is discussed in more detail in later in this chapter and each of these projects is detailed in Chapter 4 of this document.

*Figure 1-3*


Existing Functional Class
Legend
Principal Arterial, Interstate
Principal Arterial
Minor Arterial
Collector
Local Street
Lakes
Study Area
Draper
Alpine
Highland
Cedar Hills
Lindon
Utah Lake
Saratoga Springs
Vineyard
2.5
1.25
2.5 Miles

ii. Transit Network

Transit is an important part of the MAG's future transportation choices. As a result, the existing and planned transit system was also considered when identifying projects to satisfy future travel demand. Existing transit facilities include bus service as well as park and ride facilities. Planned transportation improvements center on commuter rail connecting Utah and Salt Lake Counties, and a doubling of the bus services in the study area.

## C. Analysis Year: 2030

All transportation network analysis was done for the year 2030, the planning horizon for MAG's existing regional Long Range Transportation Plan activities. Phasing of projects is an important element in a long-term planning process. This process first identified infrastructure needs in the year 2030 and then later determined timing of those projects in terms of when they were needed and in what order. Analysis was performed for the year 2030 for coordination with other transportation planning efforts for I-15, Mountain View Corridor, and the MAG Long Range Transportation Plan.

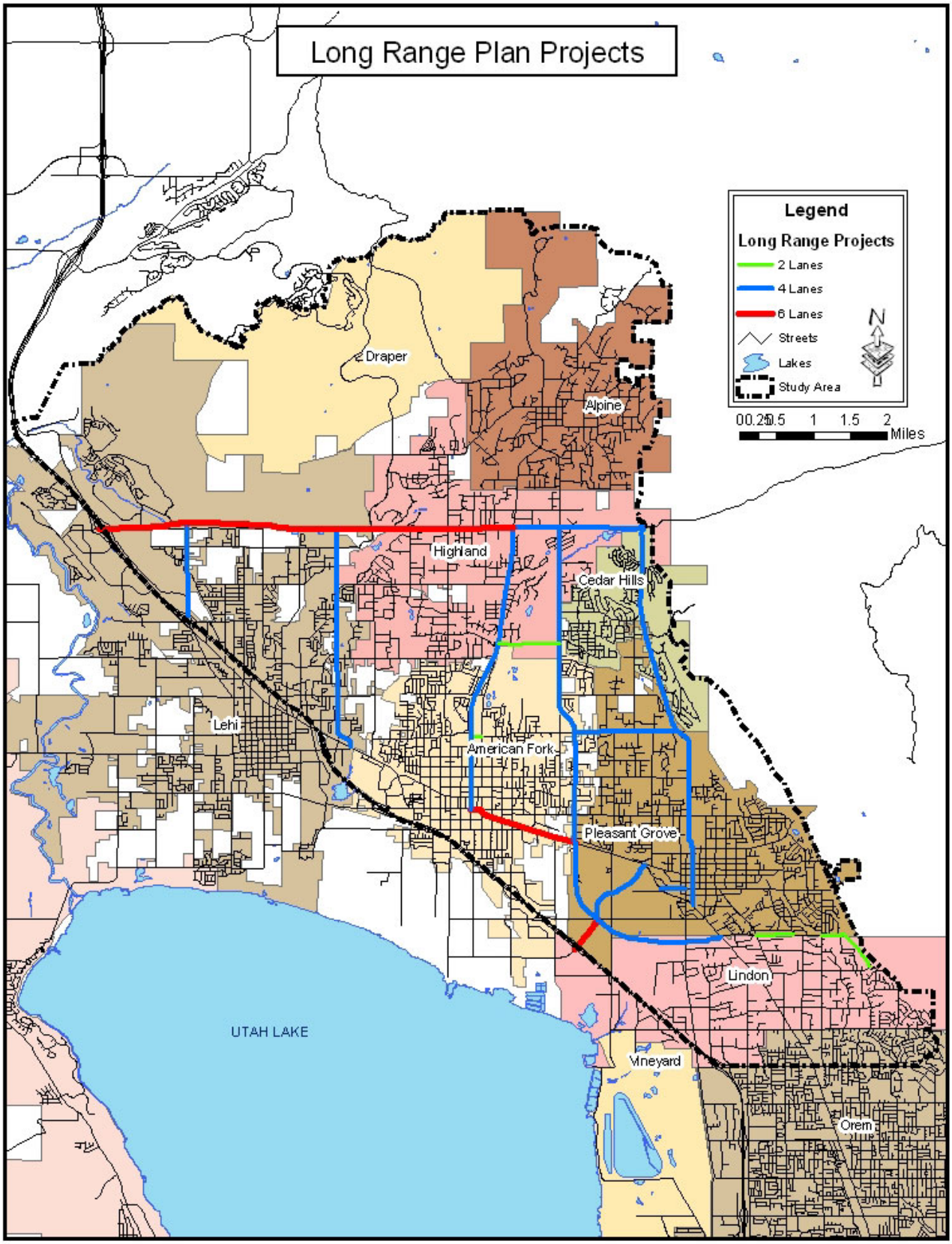
## D. Mapping

All mapping data was provided by the Mountainland Association of Governments and map development was done by MAG and InterPlan. Additional layers needed throughout the course of the project such as national wetlands inventory and historic register properties were made available by MAG.

## E. Existing Long Range Transportation Plan

The MAG 2030 Long Range Transportation Plan was the starting point for transportation project analysis. The LRTP development process involves collaboration with cities in the region as well as the Utah Department of Transportation. Cities sponsor the projects that are included within the LRTP, although with little analysis or scrutiny in terms of project viability or fatal flaws. Often, city-planned transportation projects reflect development priorities within its boundaries and not necessarily regional development scenarios or phasing. For example, while a road may be planned for a five-lane cross-section in the future, the city might anticipate that that expansion takes place upon development or redevelopment of an area. However, regional transportation needs may necessitate improvements being made prior to the area's redevelopment, which may not coincide with the city's timing. In addition, the collection of projects included within MAG's LRTP is not necessarily a cohesive and collaborative plan that represents a common strategy of all cities. Some projects included in the LRTP are not widely accepted and are considered "controversial" projects. MAG's Long Range Transportation Plan projects are shown in Figure 1-4. The LRTP is discussed in more detail in Chapter 3.

*Figure 1-4*


Long Range Plan Projects
Legend
Long Range Projects
2 Lanes
4 Lanes
6 Lanes
Streets
Lakes
Study Area
N
0 0.25 0.5 1 1.5 2
Miles
Draper
Alpine
Highland
Cedar Hills
Lehi
American Fork
Pleasant Grove
Lindon
UTAH LAKE
Vineyard
Orem

## F. Proposed Analysis Scenarios

Analysis scenarios included:

- A "No Build" scenario where all projects included in the LRTP were built *outside* of the study area but none are built within the study area.
- A RTP scenario which assumes all LRTP projects are built both within and outside of the study area.
- A "non-controversial projects" scenario that was chosen by the TAC from the LRTP projects. These are projects that are considered by each of the sponsoring cities to be relatively easy to implement and without much controversy at the city or regional level. Obviously, most projects will engender some amount of debate at the local and neighborhood level.
- Additional projects on an individual basis.

These alternatives were evaluated with respect to several different performance measures, discussed below. Care was given in choosing the measures used so that they would be effective means of relaying relatively technical information to a wide range of audiences. For example, the performance measures needed to be able to be graphically represented in charts or graphs so that they would be quickly and easily understood and compared. They also needed to be understood in a non-technical way, so that they would be meaningful to all interested groups, including elected officials, city staff, and area residents.

Alternatives were compared based on several transportation performance measures or analysis tools. The measures listed here are discussed in greater detail in Chapters 3 and 4.

- Level of service (LOS) – standard measurement used by engineers that identifies the amount of congestion on a given roadway. Level of service is given grades of A through F, with A being free-flow conditions and F being highly congested, "parking lot" conditions.
- Travel Time – refers to the time it would take a person driving from point A to point B in a personal vehicle.
- Daily Hours of Travel – total daily travel time for a household was totaled and was compared across alternatives.
- Travel Time Index (TTI) – refers to a measure of congestion determined by dividing the time it takes to travel a given road segment at the peak hour by the free-flow travel time for that segment.
- Net Present Value (NPV) – a measure of the economic benefits of transportation projects over time.

## Chapter 2

## II. Existing Conditions Analysis

Chapter 2 offers a description of the existing conditions within the study area. By having a clear picture of existing conditions, it is easier to more accurately predict future trends. Socioeconomic data, including population and employment, as well as generalized land use in the study area are discussed here. Also included is information regarding existing travel characteristics of the region, including study area mode choice and travel patterns.

### A. Socioeconomic Data

Population and employment and their projected trends are key elements of the transportation planning process. Determining the location and extent of residential development is one of the many challenges of transportation planning. This section offers an examination of the existing population and employment for the Northeast Utah Valley study area. Future conditions are discussed in Chapter 3.

#### i. Population

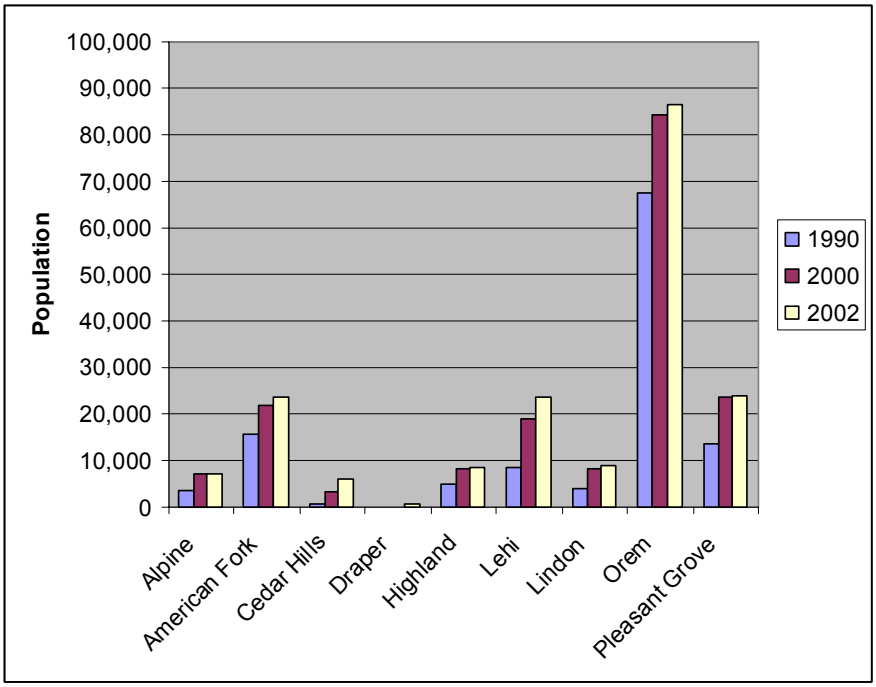
Like the rest of Utah County, the northeast portion of Utah Valley has been growing in population in since 1990. As Table 2-1 indicates, cities closer to the Provo/Orem urbanized area experienced somewhat smaller rates of population increase. Cities farther from the urban core grew at extremely high rates due primarily to large amounts of undeveloped land in these areas. Figure 2-1 shows population increase by city for those within the study area. Although populations for the whole cities are shown, only portions of Lehi, American Fork, Lindon, and Orem are within the boundaries of the study area. These areas are calculated by adding up census travel/traffic analysis zones.

***Table 2-1: Population Growth by City, 1990-2002***

| City | 1990 | 2000 | 2002 | % Increase: 1990-2002 | AARC 1990-2002 |
|---|---|---|---|---|---|
| **Alpine** | 3,492 | 7,148 | 7,191 | 105.9% | 6.2% |
| **American Fork** | 15,696 | 21,941 | 23,563 | 50.1% | 3.4% |
| **Cedar Hills** | 769 | 3,094 | 5,991 | 679.1% | 18.7% |
| **Draper** | NA | NA | 812 | NA | NA |
| **Highland** | 5,002 | 8,172 | 8,566 | 71.3% | 4.6% |
| **Lehi** | 8,475 | 19,028 | 23,457 | 176.8% | 8.9% |
| **Lindon** | 3,818 | 8,363 | 9,093 | 138.2% | 7.5% |
| **Orem** | 67,561 | 84,324 | 86,346 | 27.8% | 2.1% |
| **Pleasant Grove** | 13,476 | 23,468 | 24,070 | 78.6% | 5.0% |

Source: 1990 and 2000 data, US Census. 2002 data, MAG traffic analysis zones.
Notes: Only the portion of Draper in Utah County is included here. For all other cities, total city population is given although the whole city is not necessarily within the study area boundary.

***Figure 2-1: Population Growth by City, 1990-2002***




ii. Employment

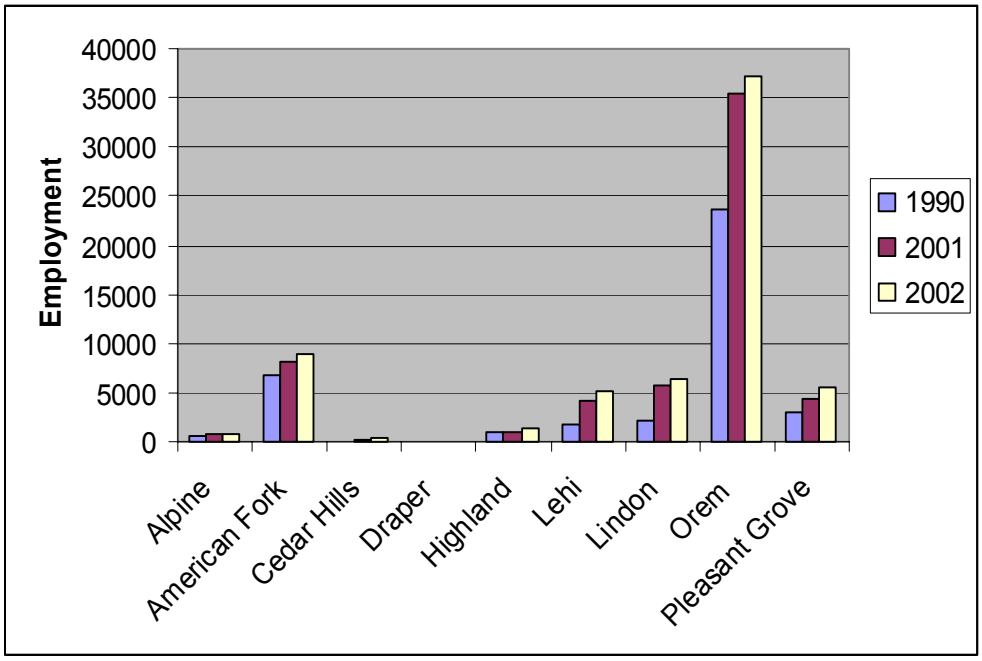
As with population, employment in the study area has seen growth over the last decade. Generally, employment growth follows population growth, although to a lesser extent in the study area. The smaller increase in employment is an indication of service-sector jobs which typically come after population growth and reflect the primarily residential nature of the study area. Employment information for the study area is shown in Table 2-2 and is given in terms of the total number of jobs located within each city in that year. Figure 2-2 shows employment growth for each city.

***Table 2-2: Employment Growth by City, 1990-2002***

| City | 1990 | 2001 | 2002 | % Increase: 1990-2002 | AARC 1990-2002 |
|---|---|---|---|---|---|
| **Alpine** | 549 | 768 | 787 | 43.4% | 3.0% |
| **American Fork** | 6,739 | 8,192 | 8,954 | 32.9% | 2.4% |
| **Cedar Hills** | 9 | 143 | 490 | 5,344.4% | 39.5% |
| **Draper** | 0 | 14 | 92 | NA | NA |
| **Highland** | 941 | 1,031 | 1,330 | 41.3% | 2.9% |
| **Lehi** | 1,701 | 4,170 | 5,181 | 204.6% | 9.7% |
| **Lindon** | 2,175 | 5,784 | 6,307 | 190.0% | 9.3% |
| **Orem** | 23,669 | 35,446 | 37,286 | 57.5% | 3.9% |
| **Pleasant Grove** | 3,030 | 4,357 | 5,512 | 81.9% | 5.1% |

Source: MAG traffic analysis zones.
Notes: Only the portion of Draper in Utah County is included here. For all other cities, total city employment is given although the whole city is not necessarily within the study area boundary.

*Figure 2-2: Employment Growth by City, 1990-2002*



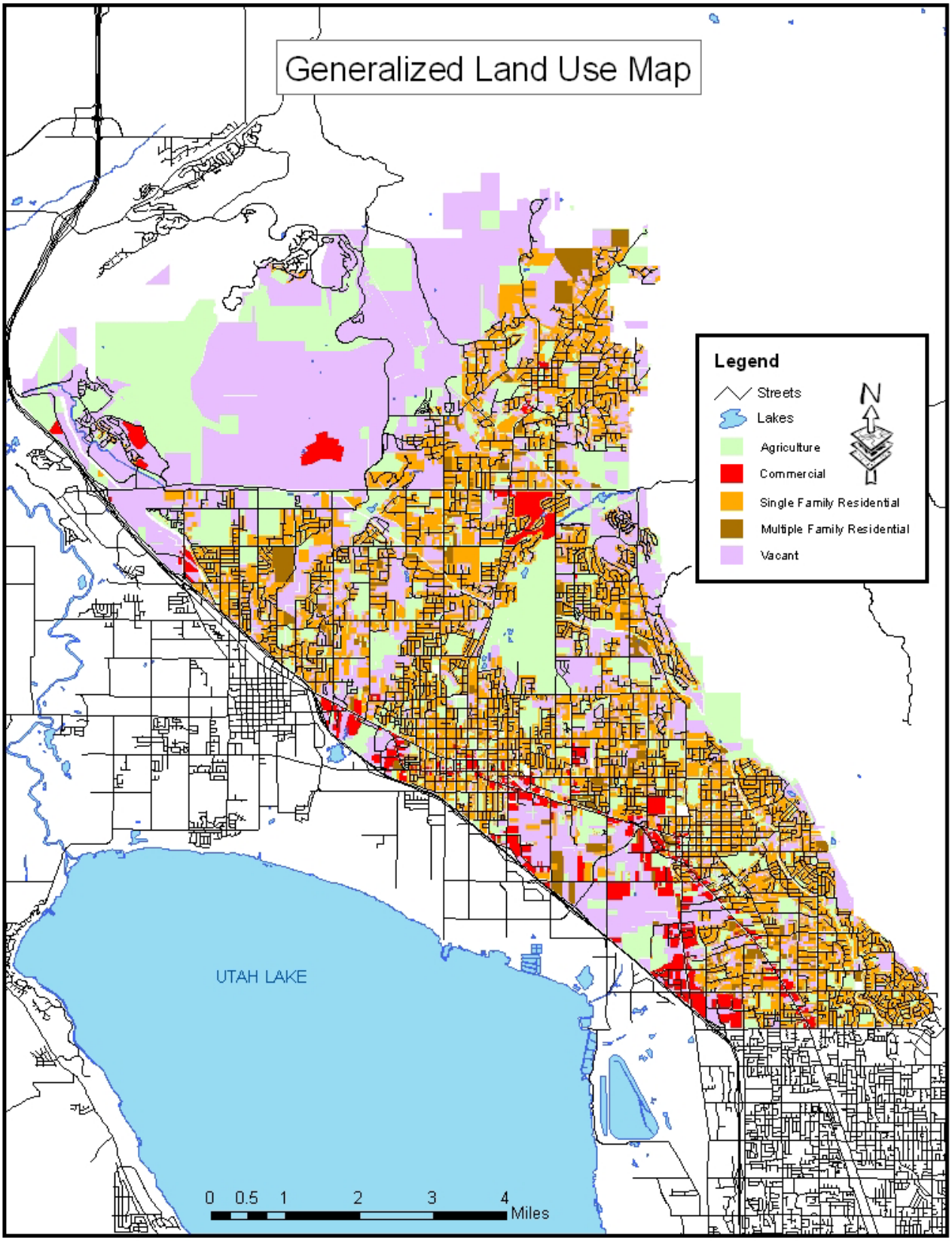

## B. Land Use

As previously mentioned, land use within the study area is primarily low-density single-family residential development. It is a suburban area that serves the employment centers of Provo/Orem and Salt Lake City. The proximity of the study area to Utah Valley State College (UVSC) lends itself to some multi-family residential development in the area.

While there are commercial areas within the study area, they tend to be of a local nature and located on arterial streets or industrial uses adjacent to Interstate-15. Recently some regional commercial areas have been developed near I-15 in American Fork and Thanksgiving Point, just outside the study area boundary at I-15 and SR-92 draws visitors from around the region to its gardens, amphitheater, shopping, and other commercial activities.

Figure 2-3 shows generalized land use in the study area. Land use data is from Utah County's GIS database.

*Figure 2-3*


Generalized Land Use Map
Legend
Streets
Lakes
Agriculture
Commercial
Single Family Residential
Multiple Family Residential
Vacant
N
UTAH LAKE
0 0.5 1 2 3 4
Miles

## C. Existing Travel Characteristics

### i. Mode Choice

Mode choice refers to how people get to and from their destinations, whether by car, bus, train, walking, or bicycle. For existing conditions, census information provides the best data related to mode choice, but is available only for work trips. Mode choice for all vehicle trips is discussed with respect to analysis scenarios and alternatives in Chapter 4 of this document. Table 2-3 shows mode choice for work trips for residents of cities in the study area for 1990 and 2000 as well as the percent of each mode for all workers.

***Table 2-3: Mode Choice to Work, 1990 and 2000***

| | 1990 | | 2000 | |
|---|---|---|---|---|
| **Mode** | **#** | **%** | **#** | **%** |
| **Drove Alone** | 35,090 | 75.2 | 66,263 | 82.0 |
| **Carpooled** | 7,185 | 15.4 | 11,776 | 14.6 |
| **Bus** | 730 | 1.6 | 1,005 | 1.2 |
| **Train** | 0 | 0.0 | 186 | 0.2 |
| **Bicycle** | 212 | 0.5 | 228 | 0.3 |
| **Walked** | 1,048 | 2.2 | 964 | 1.2 |
| **Other** | 154 | 0.3 | 427 | 0.5 |

Source: 1990 and 2000 US Census.
Note: Numbers shown are for residents of the entire city, for every city in the study area. For example, all Orem residents are included here, although only a small portion of Orem is within the study area.

As Table 2-3 shows, the percent of people who drove alone to work increased between 1990 and 2000. While transit use for work trips is typically in the range of three to four percent in Wasatch Front Counties, it is significantly less within the study area. This is most likely due to the large lot, single-family residential nature of the area and that it has less transit infrastructure than in other parts of the region. Transit tends to have more extensive service and greater ridership in areas of higher density and with major employment centers, both of which are lacking in this area. This study did look at transit improvements to address future travel demand needs. However, as transit use is obviously a small portion of total trips in the area, it was not seen to be a panacea solution to transportation issues, and so was not a priority of the technical committee.

### ii. Travel Patterns

Existing travel patterns of people living in the study area were examined early in the planning process. From travel model output, trip destinations were analyzed and grouped for all trips that originated within the study area. This was done for all trips, regardless of purpose, and for work trips. Figures 2-4 and 2-5 show the results of that analysis.

In 2001, about two-thirds of all trips that originated in the study area stayed within the study area. Less than one-fifth of the trips went to the Provo/Orem area, and the remaining trips were distributed among Salt Lake and other northern counties, western Utah County, and southern Utah County.

Work trips are somewhat more evenly distributed with about 42 percent staying within the study area, 30 percent heading to the Provo/Orem area, 21 percent to Salt Lake and other northern counties, and the rest to other areas of Utah County. This distribution of work trips is an indication of the importance of the regional transportation system in moving people to and from their jobs around the Wasatch Front as the study area becomes even more of a bedroom community in the future.

*Figure 2-4*

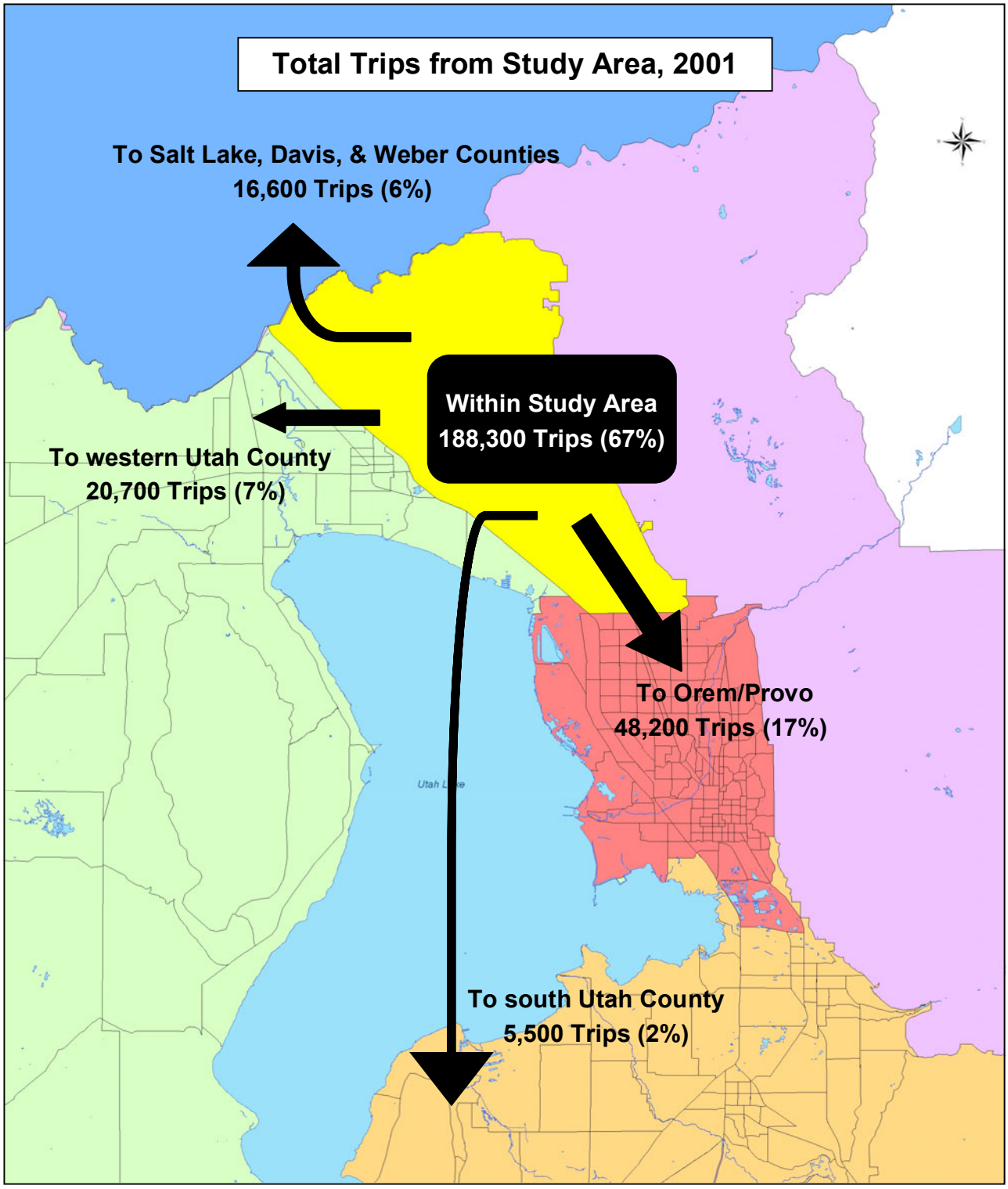
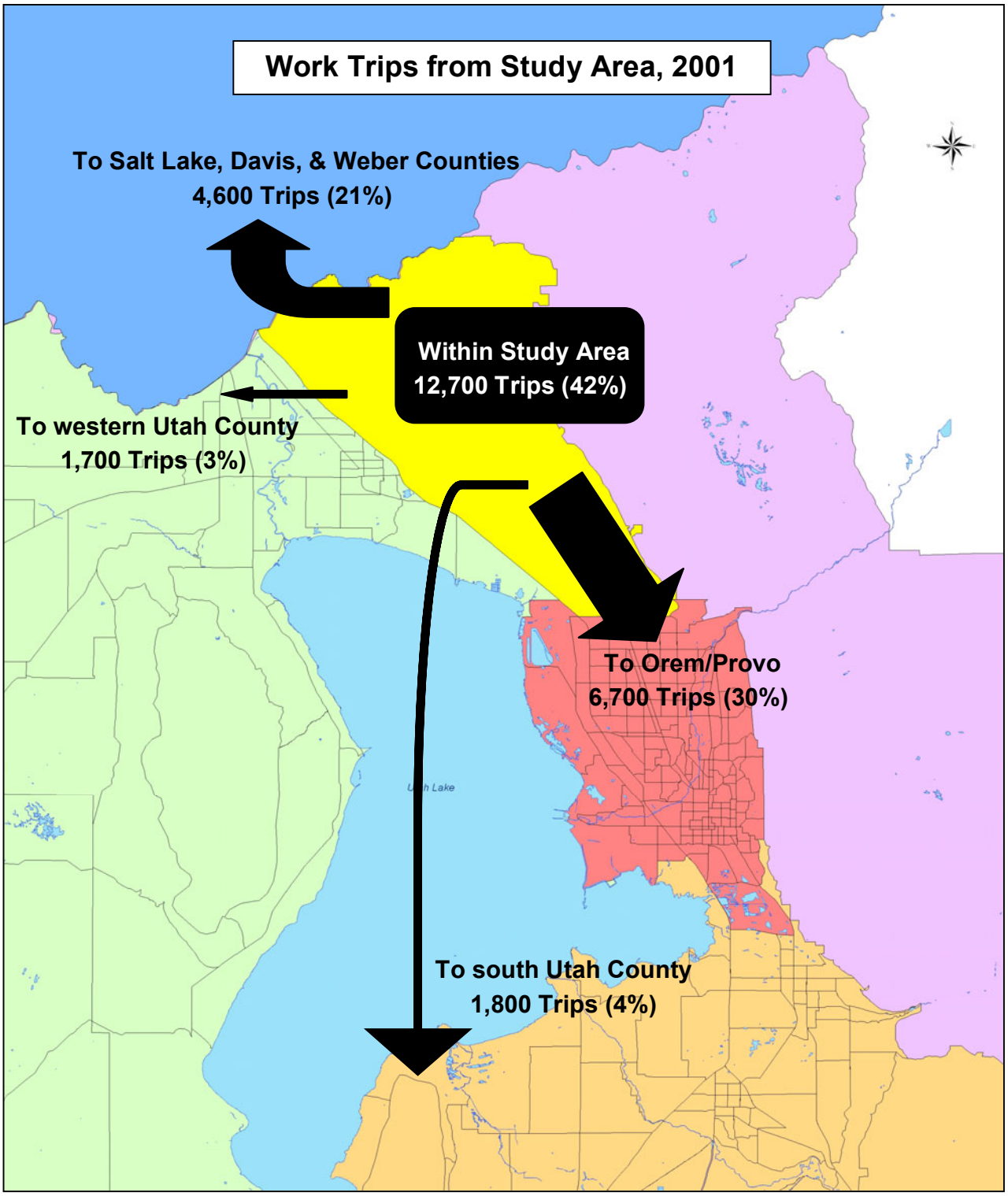

Total Trips from Study Area, 2001
To Salt Lake, Davis, & Weber Counties
16,600 Trips (6%)
Within Study Area
188,300 Trips (67%)
To western Utah County
20,700 Trips (7%)
To Orem/Provo
48,200 Trips (17%)
To south Utah County
5,500 Trips (2%)

*Figure 2-5*


Work Trips from Study Area, 2001
To Salt Lake, Davis, & Weber Counties
4,600 Trips (21%)
Within Study Area
12,700 Trips (42%)
To western Utah County
1,700 Trips (3%)
To Orem/Provo
6,700 Trips (30%)
To south Utah County
1,800 Trips (4%)

iii. Level of Service

As discussed in Chapter 1, level of service refers to a standardized measure of traffic conditions on a given roadway. Figure 2-7 shows level of service on the functional class system in the study area for 2001. Red lines indicate heavy congestion in the peak hour and green lines indicate little congestion during that time. With the exception of a few pockets of congestion on State Street, Geneva Road, and near the location of the new Pleasant Grove interchange (which did not exist in 2001), traffic conditions tend to be relatively stable with little failure during the peak hour.

iv. Travel Time Index

Travel Time Index (TTI) is a measure of peak hour congestion compared to free-flow conditions. The closer the TTI is to 1.0, the less difference there is between peak hour and free flow travel time, indicating minimal traffic congestion. Figure 2-6 shows the travel time index in 2001 for the study area and other parts of the Wasatch Front region. These figures were taken from travel model data related to peak hour and free flow travel time.

***Figure 2-6***

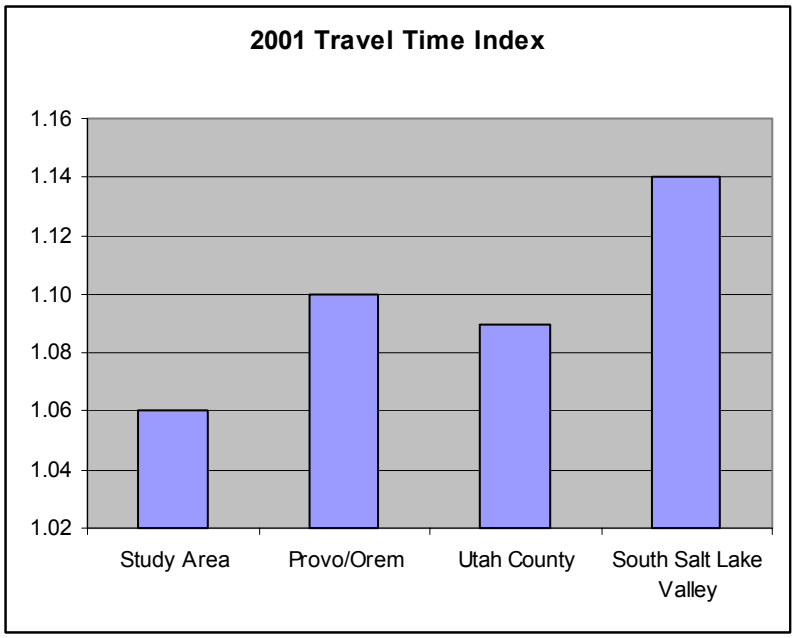
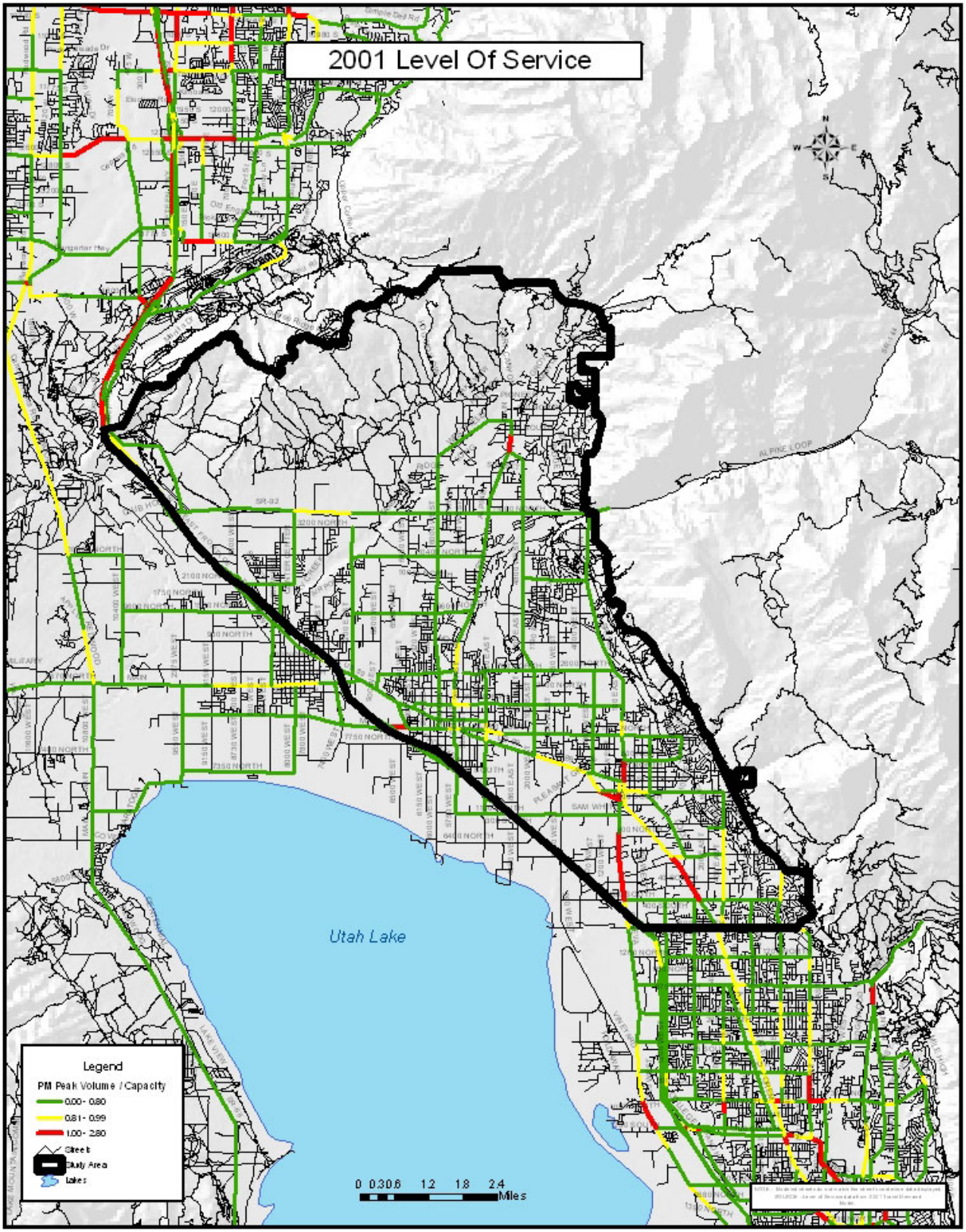


*Figure 2-7*


2001 Level Of Service
Utah Lake
Legend
PM Peak Volume / Capacity
0.00 - 0.80
0.81 - 0.99
1.00 - 2.80
Street
Study Area
Lakes
0 0.3 0.6 1.2 1.8 2.4
Miles

# Chapter 3

## III. Future Conditions

### A. Socioeconomic Data

The first step in planning a transportation network that will accommodate growth is identifying future traffic problems based on current development patterns and anticipated growth. Quantifying that growth in terms of population and employment relies on projections made by state and regional agencies and local city staff. This section describes projected changes in socioeconomic data for the study area.

i. Population

Population projections completed for the northeastern part of Utah Valley by the State of Utah Governor's Office of Planning and Budget and the Mountainland Association of Governments show steady growth in the area. As part of the planning process and prior to any travel demand modeling, it is typical to verify these population projections with city staff and to work with them to update population information with more up-to-date numbers. Often these people are involved on a daily basis with development plans and plat approvals and are more able to accurately predict population growth at the local level than those at the regional or state level.

Existing, future, and city-revised future population numbers are shown for the study area in Table 3-1 and in Figures 3-1 and 3-2. Numbers shown in the following table and figures reflect total city populations, not just the portion of the city within the study area. The exceptions are Draper and Orem, for which data is given only within the study area.

***Table 3-1: Population by City: 2002, 2030***

| | | | Revised | % Change | AARC |
|---|---|---|---|---|---|
| **City** | **2002** | **2030** | **2030** | **2002-r2030** | **2002-r2030** |
| **Alpine** | 7,191 | 13,808 | 13,808 | 92.0% | 5.6% |
| **American Fork** | 23,563 | 36,943 | 44,072 | 87.0% | 5.4% |
| **Cedar Hills** | 5,991 | 9,147 | 12,500 | 108.6% | 6.3% |
| **Draper** | 812 | 11,043 | 11,043 | 1260.0% | 24.3% |
| **Highland** | 8,566 | 17,419 | 25,000 | 191.9% | 9.3% |
| **Lehi** | 23,457 | 54,885 | 80,399 | 242.8% | 10.8% |
| **Lindon** | 9,093 | 16,915 | 17,970 | 97.6% | 5.8% |
| **Orem** | 7,504 | 8,191 | 8,191 | 9.2% | 0.7% |
| **Pleasant Grove** | 24,070 | 33,095 | 48,746 | 102.5% | 6.1% |
| **Study Area Total** | **110,247** | **201,446** | **261,729** | **137.4%** | **7.5%** |

*Figure 3-1: Study Area Population: 2002, 2030*

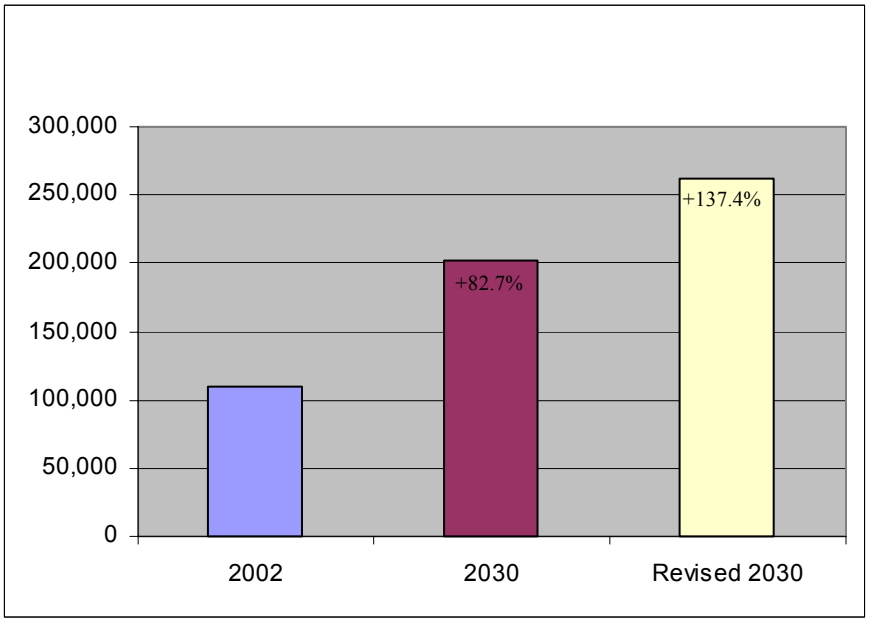
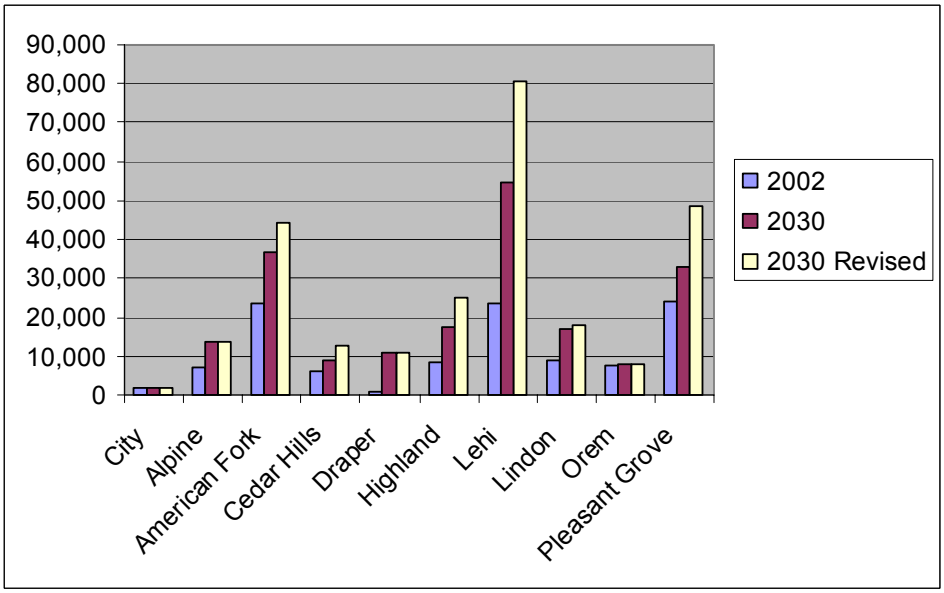



*Figure 3-2: Study Area Population: 2002, 2030*




Differences in future population numbers are greatest in Lehi, mostly due to development in western Lehi and the Traverse Mountain development just east of I-15 near the Salt Lake County border. Pleasant Grove is also anticipating significant more population than initially projected. This increase comes primarily from planned multi-family residential development in the western part of the city.

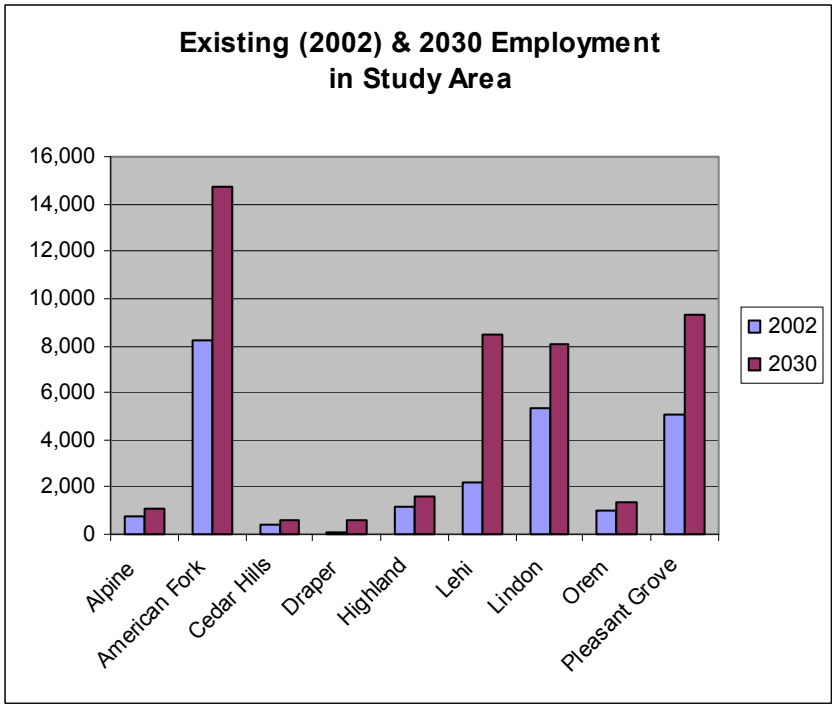
ii. Employment

Employment in northeast Utah Valley area is expected to increase as well, although not to the same magnitude as that of population. As with population, city staff were invited to revise future employment numbers to more accurately reflect planned commercial developments. However, no changes were made to employment numbers, although jobs were redistributed between two areas in the city of Lindon. Employment numbers for the study area are shown in Table 3-2 and Figure 3-3.

***Table 3-2: Study Area Employment: 2002, 2030***

| City | 2002 | 2030 | Percent Change | AARC 2002-2030 |
|---|---|---|---|---|
| **Alpine** | 726 | 1,128 | 55.4% | 3.7% |
| **American Fork** | 8,220 | 14,688 | 78.7% | 5.0% |
| **Cedar Hills** | 452 | 601 | 33.0% | 2.4% |
| **Draper** | 85 | 583 | 585.9% | 17.4% |
| **Highland** | 1,227 | 1,581 | 28.9% | 2.1% |
| **Lehi** | 2,218 | 8,497 | 283.1% | 11.8% |
| **Lindon** | 5,375 | 8,048 | 49.7% | 3.4% |
| **Orem** | 1,036 | 1,321 | 27.5% | 2.0% |
| **Pleasant Grove** | 5,088 | 9,300 | 82.8% | 5.2% |
| **Study Area Total** | **29,890** | **62,804** | **110.1%** | **6.4%** |

***Figure 3-3: Study Area Employment: 2002, 2030***



While employment within the study area is expected to more than double by the year 2030, it remains a fraction of the total population. This is further evidence that the area is intended to remain a suburban residential community in the future.

## B. Changes in Future Travel Patterns

In general, the portion of all vehicle trips that stay within the study area decreases by 2030. This is expected given the nature of the area and that more residential development is anticipated than commercial development. More people will work at jobs that are not within the study area and more people will seek shopping and recreational opportunities outside the study area as well, lending to the "bedroom community" character of the area. A greater proportion of trips are headed north into Salt Lake and other northern counties in the year 2030. These travel patterns demonstrate the importance of major facilities in the study area and connections to I-15, as more people move throughout the Wasatch Front region on a daily basis. Figures 3-4 and 3-5 show the destinations of trips that originate within the study area for all trips and for work trips, respectively.

*Figure 3-4*

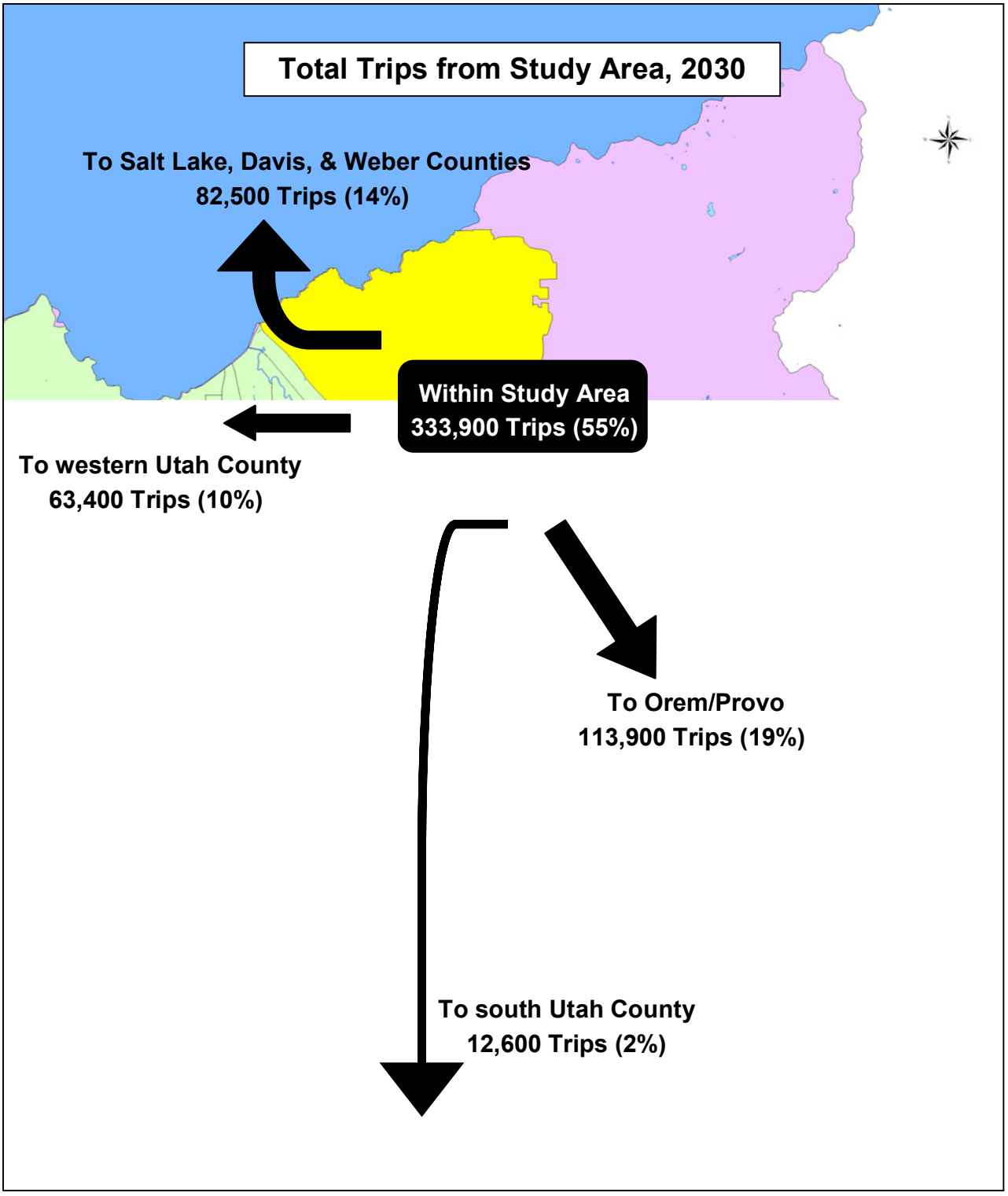
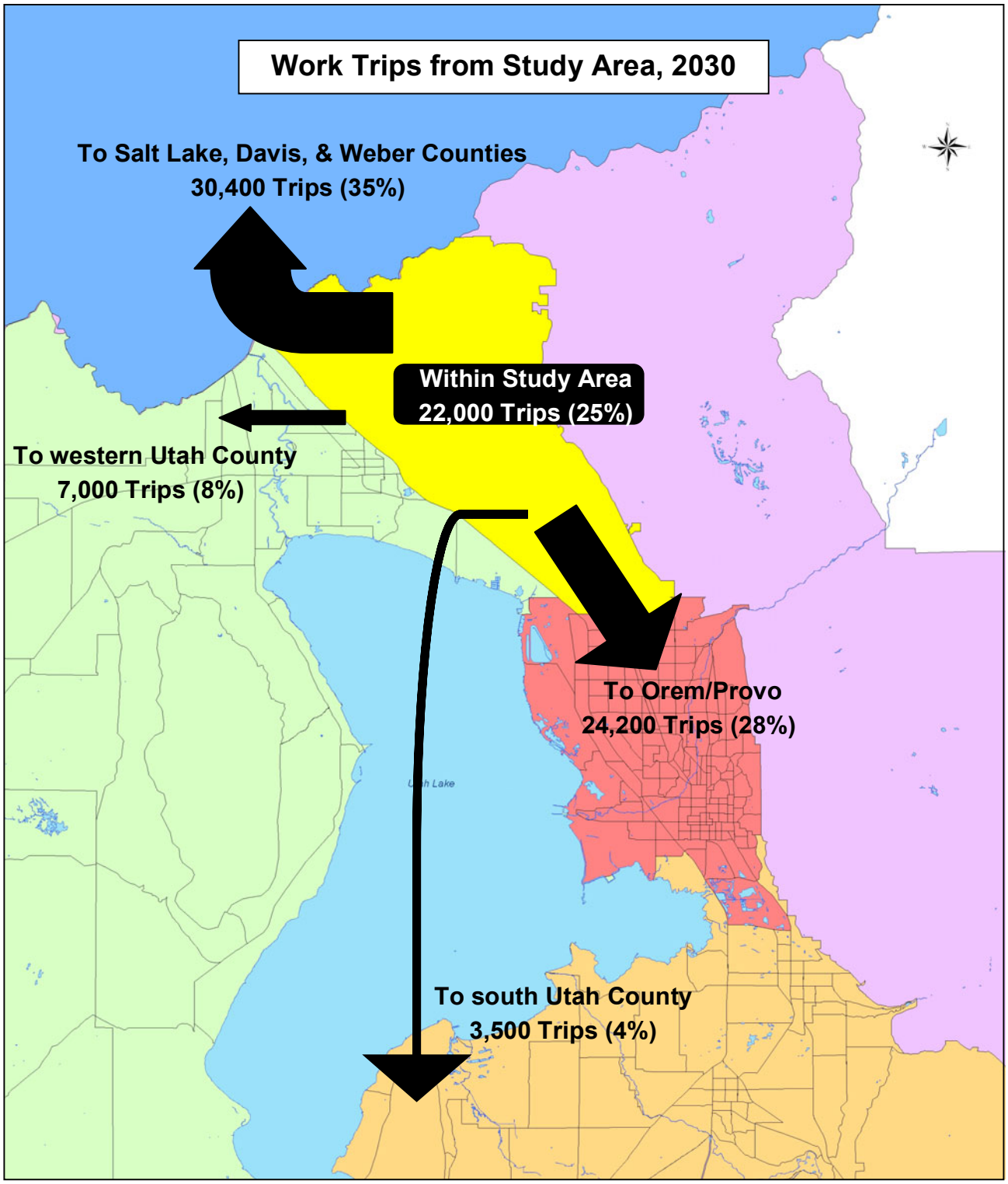

Total Trips from Study Area, 2030
To Salt Lake, Davis, & Weber Counties
82,500 Trips (14%)
Within Study Area
333,900 Trips (55%)
To western Utah County
63,400 Trips (10%)
To Orem/Provo
113,900 Trips (19%)
To south Utah County
12,600 Trips (2%)

*Figure 3-5*


Work Trips from Study Area, 2030
To Salt Lake, Davis, & Weber Counties
30,400 Trips (35%)
Within Study Area
22,000 Trips (25%)
To western Utah County
7,000 Trips (8%)
To Orem/Provo
24,200 Trips (28%)
To south Utah County
3,500 Trips (4%)

## C. Study Area Transportation Planning Efforts

Transportation planning at the local and regional levels differs somewhat in priority and intent. The best way to characterize this difference is an example from within the study area. In Highland City, 4800 West serves as a key north/south transportation facility and is included in the City's Master Transportation Plan for corridor preservation. As development occurs along the road, developers will be asked to preserve right-of-way width for future expansion of the roadway. This minimizes the future land use impacts of widening the roadway.

Regional transportation plans, which attempt to incorporate local transportation plan priorities, also see the facility as a key north/south route. However, the timing of the need for the facility may differ from a regional perspective versus than from a local perspective.

### i. Local Transportation Planning

As exemplified in the previous example, local transportation plans generally identify needed future right-of-way for specific roads and the intent focuses on preserving that right-of-way during development and redevelopment efforts. Through this process, transportation plans often guide development standards at the local level. In addition, local transportation planning is usually unconstrained by projected future funding.

The Northeast Utah Valley Transportation Study process did not undertake a review of all city transportation plans. TAC members from study area cities provided insight as to which projects in their city should be included in the "non-controversial" alternative. See Chapter 4 for more detailed discussion of this alternative.

### ii. Regional Transportation Planning

In contrast to local planning, regional transportation planning focuses on regional priorities, future travel demand, and facilities. In addition, regional planning typically highlights things such as providing an efficient transportation system, supporting economic well-being of a region, and maintaining the existing transportation infrastructure. Regional plans are generally more "need based" where the need for projects is determined by regional travel demand modeling. Regional transportation plans are required to be constrained by funding. This means that for each project included in the LRTP, a future cost and funding source must be determined. In addition, the LRTP must demonstrate that projects included within it conform to the State Implementation Plan for air quality.

#### a. MAG Long Range Transportation Plan

The most recent MAG Long Range Transportation Plan was adopted in February 2005. It identifies a list of transportation projects including roads, transit, and bicycle and pedestrian facilities that satisfy travel demand to the year 2030. Regional road priorities identified in the plan include I-15 reconstruction, Lehi Main Street, State Street in Pleasant Grove, 800 North in Orem, among others. Road projects included in MAG's Long Range Transportation Plan that are located in the study area are shown in Chapter 1, Figure 1-3.

Transit service within Utah County is focused in Orem and Provo, the areas of greater employment and higher population density. Transit priorities in the current LRTP include commuter rail from Provo to Salt Lake City, additional transit centers and intermodal hubs, and doubling of the existing bus system. Transit projects from the LTRP in the study area are shown in Figure 3-6.

b. MAG Transportation Improvement Program

The Transportation Improvement Program (TIP) is a three-year program of federally-funded transportation projects that is prepared annually by MAG. In addition to projects funded within the upcoming three years, it also lists concept development projects for two years beyond the three-year program. These are projects that are still in development and for which exact costs and details are still being determined. TIP projects in the study area are shown in Figure 3-7.

c. Other Studies

Several other transportation studies are being or have recently been conducted in or near the study area. A summary of each of those studies is included here. With the exception of the North Valley Connector Study and the Inter-Regional Corridor Alternatives Analysis, these studies are project-specific, meaning that they are the initial step in the process of constructing a transportation facility. The Northeast Utah Valley Transportation Study, similar to the North Valley Connector Study and the Inter-Regional Corridor Alternatives Analysis, is looking at travel demand and long-term need throughout the study area and focuses on planning rather than constructing. These processes were initiated without a specific outcome in terms of recommended alternative in mind.

The ***I-15 South Environmental Impact Statement***, the NEPA-required environmental process, is for approximately 65 miles of the corridor between 10600 in South Lake County and Santaquin in Utah County. The study will look at transportation alternatives that address the considerable demand in the corridor over the next 25 years. The study began in the summer of 2004 and is scheduled to be completed in 2007.

*Figure 3-6*

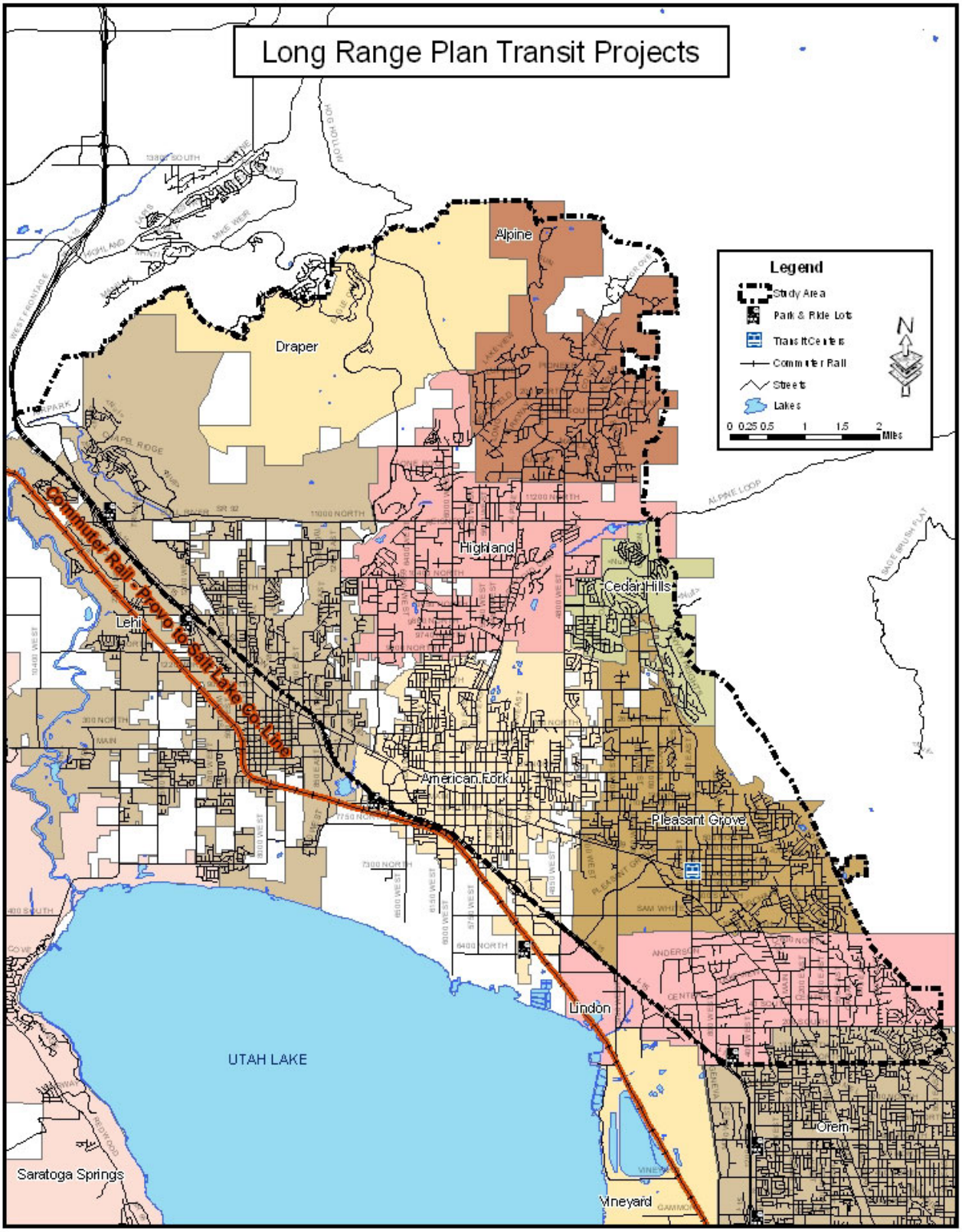
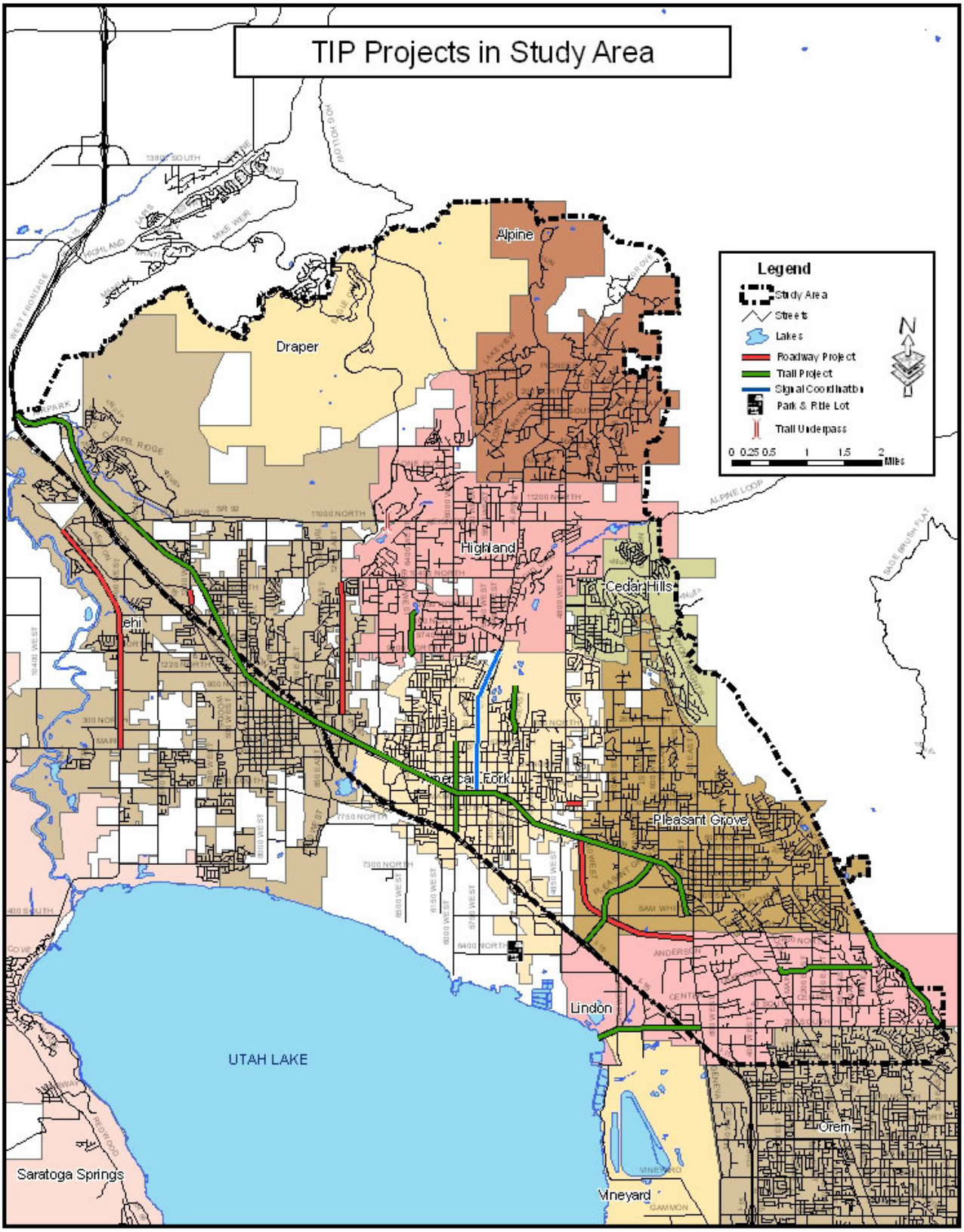

Long Range Plan Transit Projects
Legend
Study Area
Park & Ride Lots
Transit Centers
Commuter Rail
Streets
Lakes
0 0.25 0.5 1 1.5 2 Miles
N
Alpine
Draper
Highland
Cedar Hills
Lehi
American Fork
Pleasant Grove
Lindon
Orem
Vineyard
Saratoga Springs
UTAH LAKE
Commuter Rail - Provo to Salt Lake Co. Line

*Figure 3-7*


TIP Projects in Study Area
Legend
Study Area
Streets
Lakes
Roadway Project
Trail Project
Signal Coordination
Park & Ride Lot
Trail Underpass
0 0.25 0.5 1 1.5 2 Miles
N
Alpine
Draper
Highland
Cedar Hills
Pleasant Grove
Lindon
Orem
Vineyard
Saratoga Springs
UTAH LAKE

The ***Mountain View Corridor Environmental Impact Statement*** is a joint effort on the part of the Utah Department of Transportation, the Utah Transit Authority, the Mountainland Association of Governments, and the Wasatch Front Regional Council. It addresses a specific alignment for a new major transportation facility in western Salt Lake County and northwest Utah County. It builds upon the work done in the North Valley Connectors Study conducted by MAG in 2001.

The ***Utah County I-15 Corridor Management Plan*** recommended improvements by phase for the I-15 mainline and interchanges. Recommended improvements included widening I-15 in various phases through Utah County and reconstructing most interchanges in the corridor and adding interchanges in specific locations.

The ***North Valley Connector Study*** was similar in intent to the Northeast Utah Valley Transportation Study. Its purpose was to evaluate east/west transportation needs west of I-15 and north of Utah Lake, taking into consideration the explosive growth projected for the cities of Saratoga Springs, Eagle Mountain, and west Lehi. At the time, population projections were indicating a 250 percent increase by 2030. Results of the study indicated a need for major east/west facilities to serve regional travel demand. The preferred alternative consisted of three corridors:

- North Recommended Corridor (Lehi 2100 North/Saratoga Springs 11600 West)
- Central Recommended Corridor (American Fork Main Street/Lehi 1000 South)
- South Recommended Corridor (North Lake Road)

The ***Inter-Regional Corridor Alternatives Analysis*** provided a multi-modal analysis of travel demand from Payson to Sandy. The study recommended the implementation of commuter rail service from Provo to Salt Lake City in addition to other transit improvements, expansion of I-15 to ten lanes including two high-occupancy vehicle (HOV) lanes from University Avenue to Salt Lake County, and widening US-89 to six lanes.

## D. Proposed Development Review

Review of development plans within the study area is especially important, given its high expected growth rates. As previously discussed, Technical Advisory Committee members were closely involved in revisions to the population projections in order to more accurately reflect future conditions. These revisions to land use information were made prior to travel demand modeling. They take the form of updated population, household, and employment numbers in the model, organized by Traffic Analysis Zone (TAZ). TAZs are the geographic building block of the travel demand model and are roughly equivalent to census blocks.

### i. Consistency of local land use and regional transportation plans

MAG staff makes every effort to keep socioeconomic data and land use information up-to-date with respect to the regional travel demand model. However, with the number of local governments and the rates of population growth that many of these cities are experiencing, it is important that any transportation study that relies on travel demand modeling results be proactive in looking in more detail at population and employment projections.

The regional transportation plan is based on travel model results and so it is important to the reliability of the regional plan that data be as accurate as possible. In updating land use information, city representatives considered specific development plans along with conceptual city development principles.

ii. Consistency of TAZ inputs and project phasing

Currently, no organization provides a comprehensive monitoring of population growth. Cities generally keep track of the number of building permits issued, but none tracks whether or not population growth is occurring within the TAZs in which it was projected. Without information on how development actually keeps pace with projections in terms of location, planners are left to speculate about specific areas of population increase and so with future transportation needs as well. Due to this uncertainty, one of the primary transportation planning tools through land use is setback requirements during development.

## E. Problem Identification

Early in the planning process, careful consideration was given as to how to determine future transportation need. The TAC did not want to assume future transportation problems based solely on population growth or anecdotal evidence. The committee was careful to begin the process by quantifying future transportation conditions and then determining whether or not a future problem should be anticipated within the study area. The process used to determine whether or not there was future need was to test a "No Build" alternative assuming projected socioeconomic conditions.

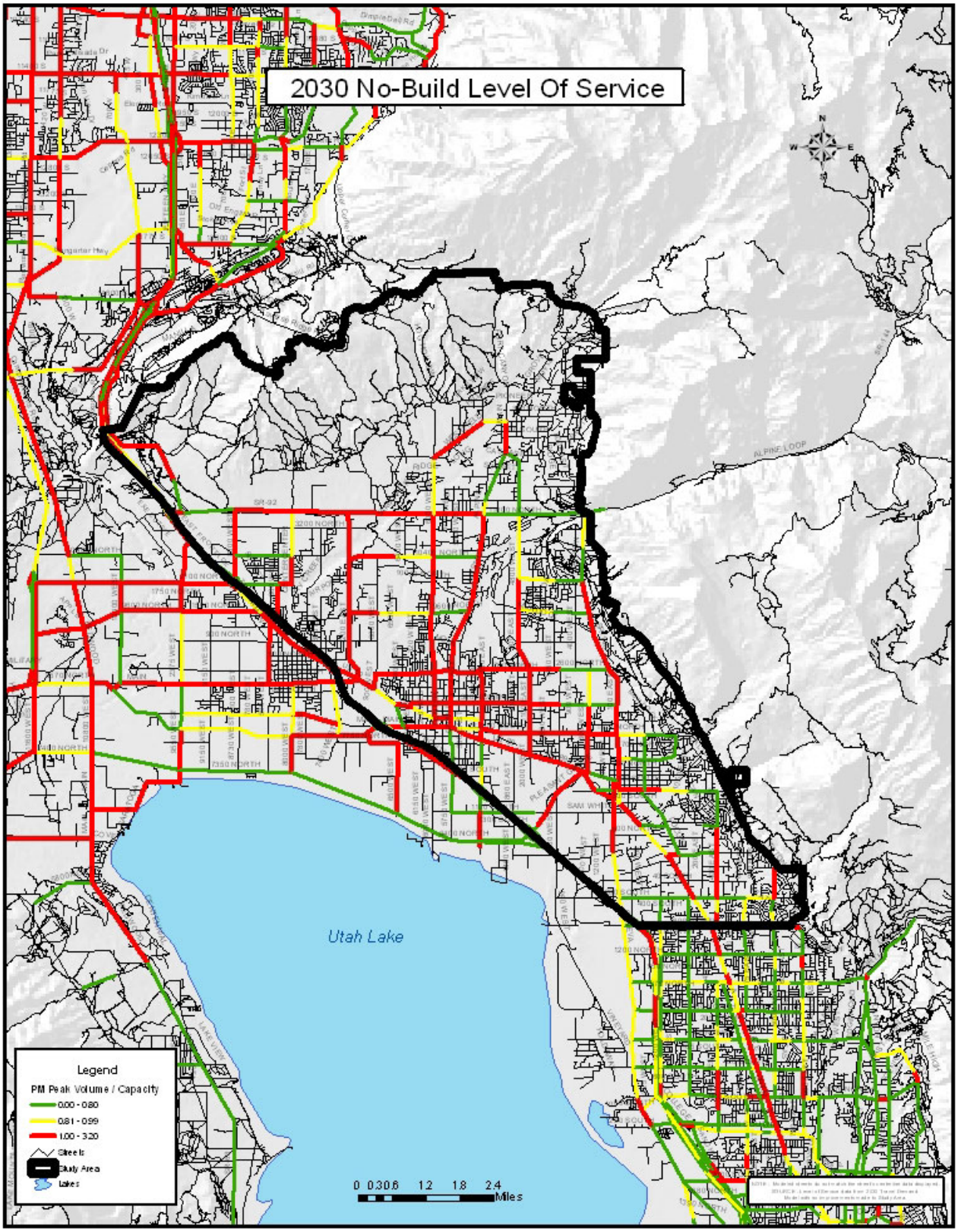
i. "No Build" Alternative

After revisions to land use information were made in the regional travel demand model based on city recommendations, the model was run with these revised 2030 population and employment numbers and with a transportation network that assumed no additional improvements within the study area. All 2030 Long Range Transportation Plan improvements are assumed to be built outside of the study area.

a. "No Build" Alternative Level of Service

Figure 3-8 shows level of service conditions for this "No Build" alternative with the same LOS definitions as described in Chapter 2's existing level of service discussion. Red lines indicate heavy congestion in the peak hour and green lines indicate little congestion during that time. As is evident in the figure, most roads within the study area are expected to experience significant congestion under this scenario in 2030.

*Figure 3-8*


2030 No-Build Level Of Service
Utah Lake
Legend
PM Peak Volume / Capacity
0.00 - 0.80
0.81 - 0.99
1.00 - 3.20
Streets
Study Area
Lakes
0 0.30.6 1.2 1.8 2.4
Miles

## Chapter 4

## IV. Alternatives Analysis

The project's Technical Advisory Committee went through a process of alternatives analysis that systematically compared different transportation network alternatives. Alternatives were compared using various analysis tools such as volume to capacity ratios and travel time index as explained earlier in Chapter 1. This chapter details the alternatives analysis process including the analysis tools, how each of the alternatives was developed, and results. The chapter concludes with a description of the recommended alternative and timeframe.

### A. Analysis Tools

Each of the transportation network alternatives is analyzed with respect to a set of transportation indicators or analysis tools. While some of these tools were mentioned in Chapter 1, the following is a more detailed description of each used in the alternatives analysis in addition to level of service. Different tools were used at various levels of comparison during this process. For example, daily hours of travel was used to compare the initial alternatives such as the 2030 Long Range Transportation Plan and the 2030 No Build. As alternatives became more detailed, additional tools were used such as Travel Time Index and Net Present Value.

#### i. Travel Time

Travel time refers to the time it takes an individual in a personal vehicle to drive from point A to point B. This measure is typically observed in the afternoon peak hour of traffic, when the greatest congestion usually occurs. For this process, specific roads were chosen and travel times were measured during the afternoon peak hour, typically the most congested time of the day. Peak hour travel times are calculated between two points so that changes to travel time between the various alternatives is easy to discern. Points were chosen based on key travel movements in the afternoon peak hour, such as east from I-15 on American Fork Main Street and on SR-92.

#### ii. Daily Hours of Travel

In order to make the differences between the various alternatives more meaningful at the household level, a daily travel diary for a typical Utah County household was developed. Hypothetical trips for a two parent, two school-aged children, two car household were determined based on land uses for traffic analysis zones. Travel time for each of these trips was compared across alternatives and summed for a total daily hours of travel by alternative. The daily travel diary used in this comparison is shown in Table 4-1 below.

***Table 4-1: Daily Travel Diary***

| **Driver A** | | |
|---|---|---|
| **From** | **To** | **Time of Trip** |
| home | work | AM |
| work | lunch | Mid-day |
| lunch | work | Mid-day |
| work | store | PM |
| store | home | PM |
| home | soccer practice | PM |
| soccer practice | home | PM |
| | | |
| **Driver B** | | |
| **From** | **To** | **Time of Trip** |
| home | school | AM |
| school | home | AM |
| home | grocery store | AM |
| grocery store | home | AM |
| home | school | PM |
| school | home | PM |
| home | library | PM |
| library | piano lessons | PM |
| piano lessons | home | PM |
| home | theater | PM |
| theater | home | Evening |

iii. Travel Time Index

Travel Time Index (TTI) is a measure of congestion that was developed by the Texas Transportation Institute as a way to compare peak congestion conditions to free-flow conditions. The TTI is determined by dividing the travel time during the peak hour by the travel time in free-flow conditions and gives a result of 1.0 or greater. The closer the quotient is to 1.0, the more free-flow conditions reflect peak hour conditions and the less congestion there is during the peak period. The TTI can be used to compare congestion in specific corridors or system-wide. For this process, the TTI reflects system-wide congestion.

iv. Net Present Value

The Net Present Value (NPV) refers to the value over time of investments made today. Benefits and costs of transportation projects are identified and assigned a monetary value, and then are calculated over a specific time period. In this analysis, benefits were simplified to reflect only the direct time saving value of congestion relief. By assigning a value to a person's time, costs are subtracted from benefits to determine the overall value of the investment. NPV can be negative over time, indicating that the benefits of a project do not compensate for its costs.

v. Vehicle Hours of Travel

Similar to Daily Hours of Travel, Vehicle Hours of Travel (VHT) is a calculation of the total time all vehicles spend on the highways. This measure is easily obtained from the travel demand model and helps to identify area-wide congestion changes with each model run.

vi. Volume/Capacity Ratio

The volume/capacity ratio describes the number of vehicles on a roadway compared to the capacity of that roadway. Level of service discussions and graphics in this process are basically volume/capacity ratios represented as green, yellow, and red lines. While the colored lines are an effective graphic means to display level of service, they are subjective in that level of service thresholds are somewhat arbitrary and can be changed to reflect different conditions. Level of service thresholds for this project were consistent throughout analysis and were defined as:

- Red = .87 and greater
- Yellow = .73-.87
- Green = 0 - .73

## B. Alternatives

i. Review of "No Build" Alternative

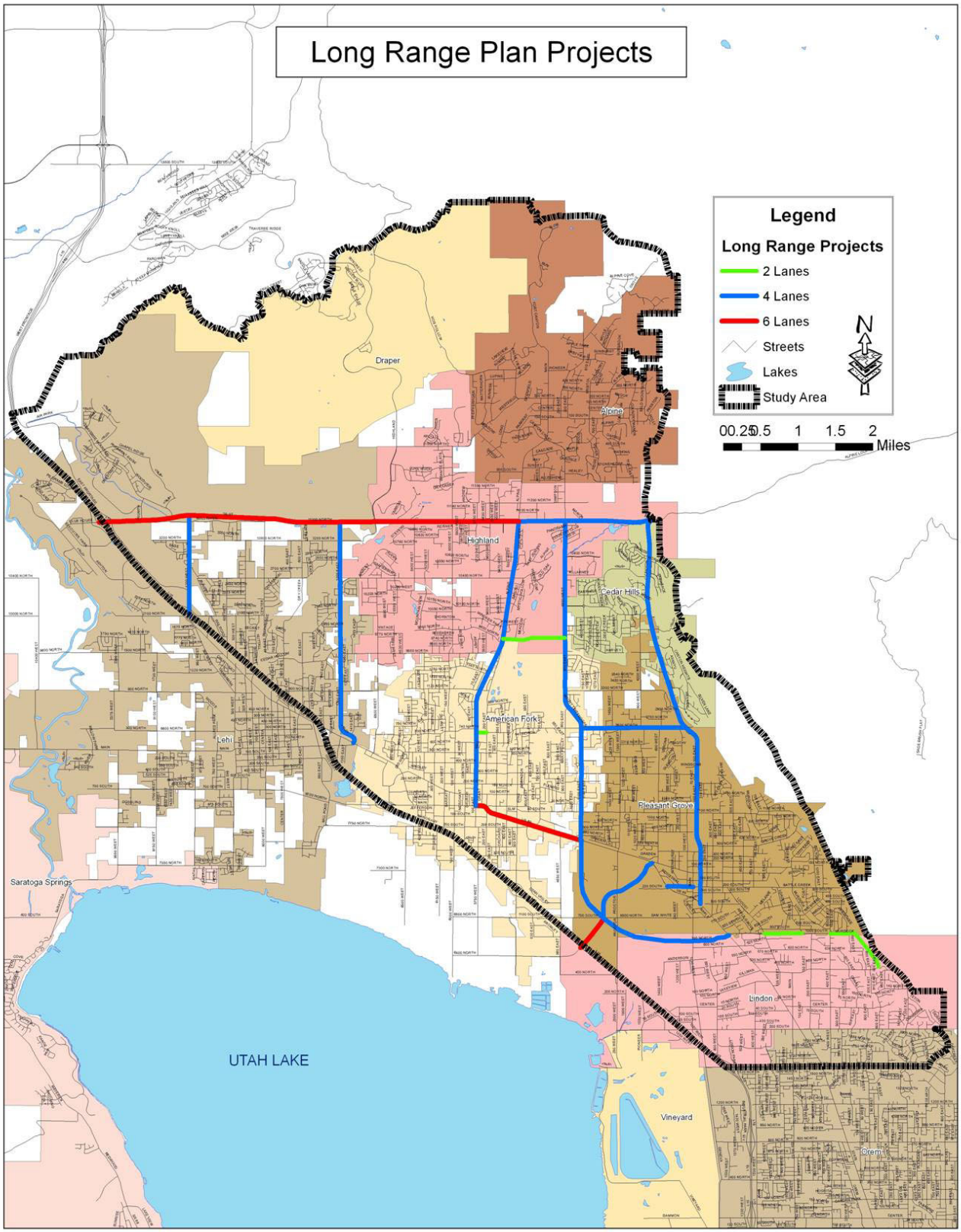
As discussed in Chapter 3, a No Build alternative was developed first in the travel modeling process. This was done for two reasons. First, it offered a quantification of anticipated future traffic congestion in the study area, demonstrating the need rather than relying solely on population projections to infer future traffic problems. Second, a No Build alternative offered a baseline scenario from which to compare other alternatives and the degree to which those alternatives addressed future problems.

With significant areas showing failing conditions (see Figure 3-8) in 2030, it was determined that sufficient future problems were demonstrated to warrant analyzing additional alternatives and identify solutions.

ii. 2030 LRTP Alternative

The first alternative that was offered was the 2030 Long Range Transportation Plan alternative, which includes all of the projects in the study area that are currently included in MAG's LRTP. Those projects are shown in Figure 4-1. Level of service, travel time, and daily hours of travel information is shown at the end of this section, in comparison to the No Build and subsequent alternative

*Figure 4-1*

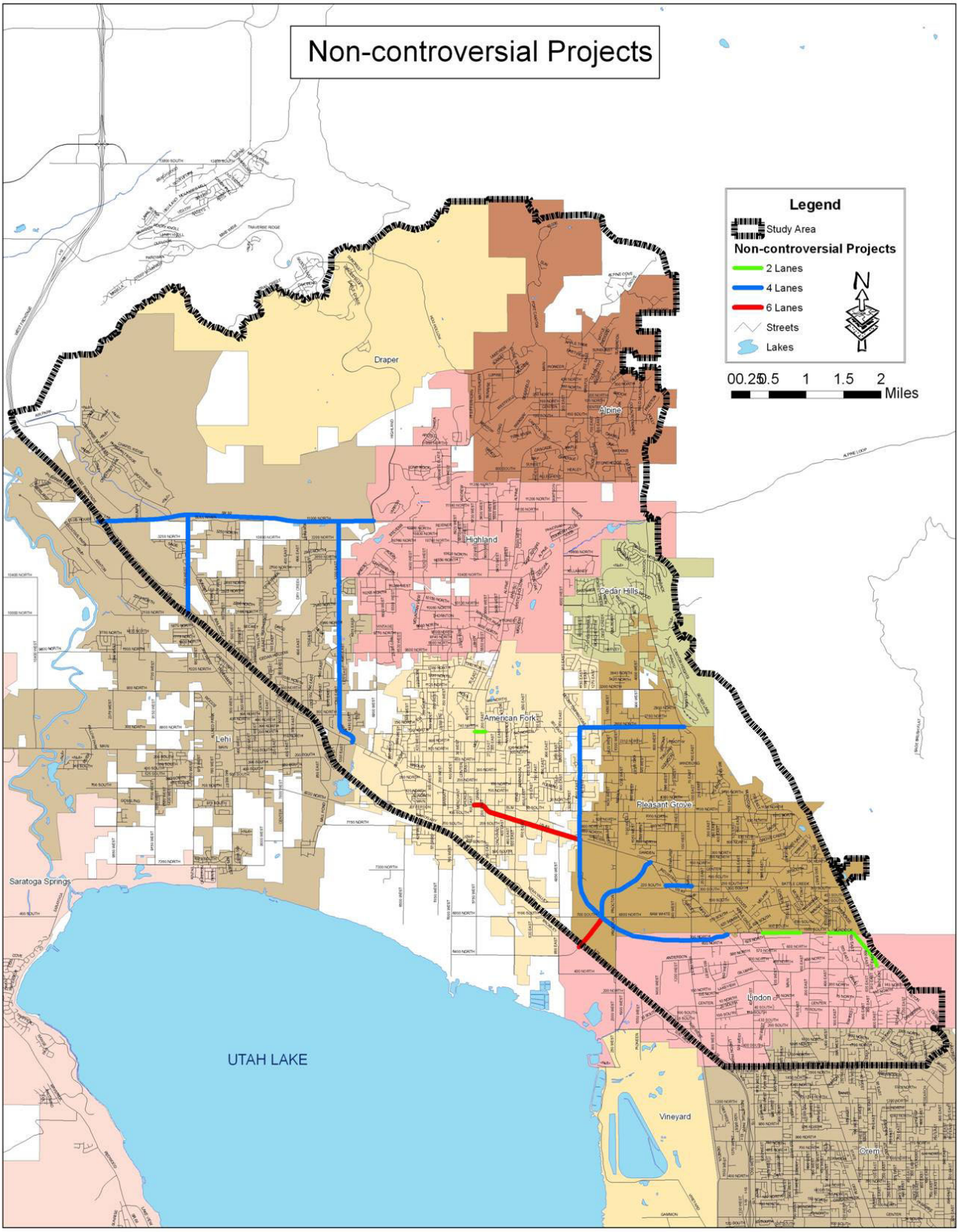

Long Range Plan Projects
Legend
Long Range Projects
2 Lanes
4 Lanes
6 Lanes
Streets
Lakes
Study Area
N
0 0.25 0.5 1 1.5 2
Miles
Draper
Alpine
Highland
Cedar Hills
American Fork
Lehi
Pleasant Grove
Saratoga Springs
Lindon
UTAH LAKE
Vineyard
Orem

iii. 2030 Non-Controversial Projects Alternative

Reflecting the fact that the region's Long Range Transportation Plan does not always accurately portray local government priorities, the TAC developed an alternative that includes projects that TAC members felt were more widely supported by city councils and mayors or that cities were actively planning for. The Technical Advisory Committee started with the No Build transportation network in the study area and began adding projects from the Long Range Transportation Plan. Projects were chosen based on two somewhat conflicting purposes. First, projects were chosen that were believed to relieve future congestion. Second, projects were chosen that minimized community and land use impacts. In addition, these projects were characterized by the fact that they were generally more established within city transportation planning processes but maybe lacked the funding to proceed. Overall, city representatives felt fairly confident that these projects would proceed.

This alternative was called the Non-Controversial Projects alternatives. Figure 4-2 shows the projects that were included in this alternative.

*Figure 4-2*


Non-controversial Projects
Legend
Study Area
Non-controversial Projects
2 Lanes
4 Lanes
6 Lanes
Streets
Lakes
N
0 0.25 0.5 1 1.5 2
Miles
Draper
Alpine
Highland
Cedar Hills
American Fork
Lehi
Pleasant Grove
Saratoga Springs
Lindon
UTAH LAKE
Vineyard
Orem

## Alternatives Comparison

*Level of Service*

A level of service analysis shows that both the LRTP and Non-Controversial Projects alternatives offer improvements over that of the 2030 No Build scenario. Level of service for these alternatives is shown in Figures 4-3 and 4-4.

***Figure 4-3: 2030 LRTP Level of Service***

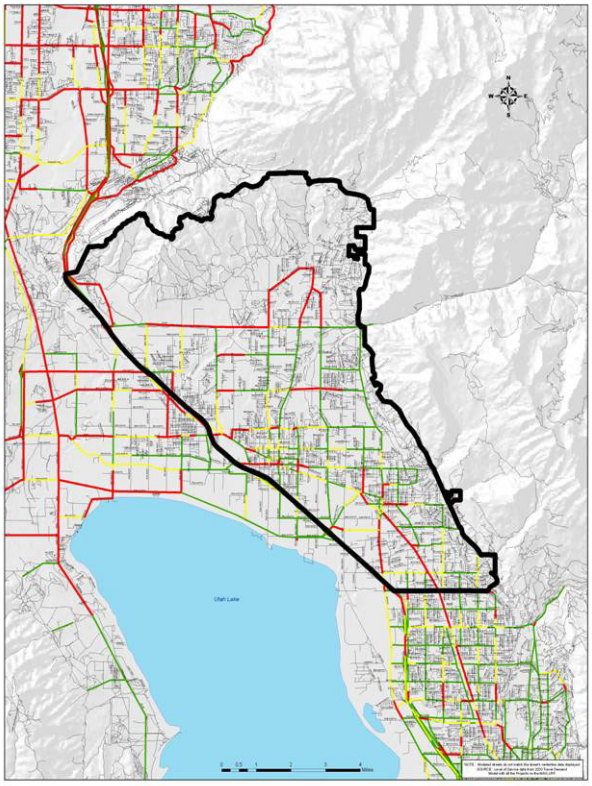
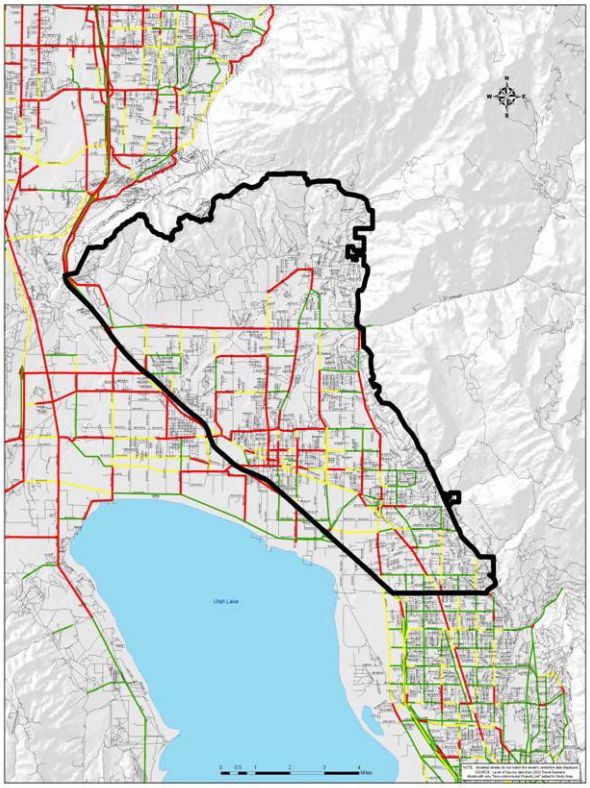


***Figure 4-4: 2030 Non-Controversial Projects***

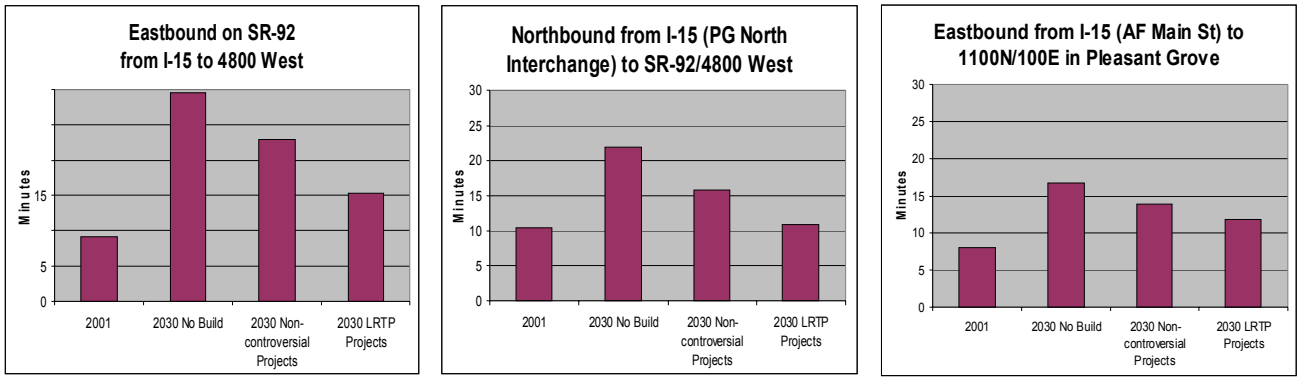


*Travel Time*

Travel times in the PM peak hours were compared on three major facilities for the No Build, LRTP, and Non-Controversial Projects alternatives. Existing conditions were included in the comparison in order to offer a sense of how much difference in travel time each of the alternatives make over time. Figure 4-5 shows a comparison of the three alternatives and the existing conditions on three different facilities in the study area.

On each of the three roads examined, travel time improved over the spectrum of the No Build, Non-Controversial Projects, and LRTP alternatives. The most extreme improvement was seen on the eastbound SR-92 from I-15 to 4800 West. Travel times improved from 30 minutes in the No Build scenario to just over 15 minutes in the LRTP alternative, reduction in travel time by 50 percent. The other roads showed similar improvements in travel time, although not to the same degree.

*Figure 4-5: Travel Time Comparison*



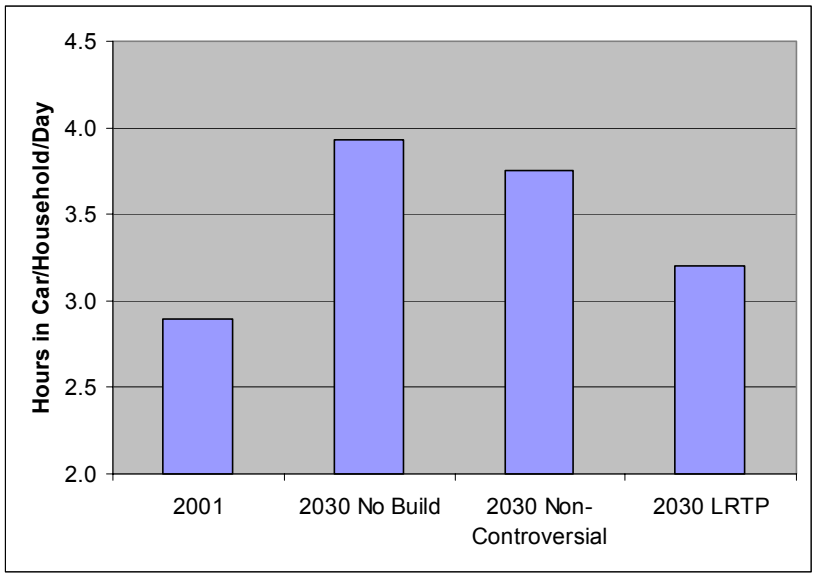

*Daily Hours of Travel*

In order to assess how each of the alternatives affects travel time over a full day, trip times were compared and totaled for the daily travel diary discussed earlier. Results are shown in Table 4-2 and Figure 4-6.

*Table 4-2: Daily Hours of Travel Comparison*

| | | 2001 | 2030 No Build | 2030 Non-Controversial | 2030 LRTP |
|---|---|---|---|---|---|
| **Driver A** | | | | | |
| **From** | **To** | | | | |
| home | work | 19 | 26 | 26 | 23 |
| work | lunch | 5 | 6 | 6 | 6 |
| lunch | work | 5 | 6 | 6 | 6 |
| work | store | 8 | 11 | 11 | 11 |
| store | home | 15 | 24 | 22 | 17 |
| home | soccer practice | 10 | 15 | 13 | 11 |
| soccer practice | home | 13 | 23 | 21 | 15 |
| | | | | | |
| **Driver B** | | | | | |
| **From** | **To** | | | | |
| home | school | 5 | 5 | 5 | 5 |
| school | home | 5 | 5 | 5 | 5 |
| home | grocery store | 12 | 17 | 16 | 13 |
| grocery store | home | 12 | 13 | 13 | 11 |
| home | school | 5 | 5 | 5 | 5 |
| school | home | 5 | 5 | 5 | 5 |
| home | library | 13 | 18 | 18 | 14 |
| library | piano lessons | 10 | 19 | 15 | 12 |
| piano lessons | home | 8 | 10 | 10 | 9 |
| home | theater | 13 | 16 | 16 | 13 |
| theater | home | 11 | 12 | 12 | 11 |
| | **Minutes/Household/Day** | **174.0** | **236.0** | **225.0** | **192.0** |
| | **Hours/Household/Day** | **2.9** | **3.9** | **3.8** | **3.2** |

***Figure 4-6: Daily Hours of Travel Comparison***




On a daily basis, the hours spent in a vehicle for a typical Utah County household decreases from nearly four per day in the No Build scenario to about 3.8 hours under the non-controversial alternative to just over three hours in the LRTP alternative. While each of the alternatives increases daily hours of travel over existing conditions, the LRTP alternative increases it by only 18 minutes per day.

Further study of additional alternatives was pursued for two reasons: first, due to concern over the political viability of many projects included in the LRTP alternative; and second, because it was felt by the TAC that the Non-Controversial Projects alternative did not provide sufficient congestion relief. For these reasons, further alternatives were pursued by the TAC.

iv. 2030 Hybrid Alternative

The Hybrid Alternative came about as the result of the committee taking the Non-Controversial Projects alternative and adding projects that were somewhat more controversial among the cities, such as widening 4800 West. Specifically, concerns of the committee centered on north/south transportation facilities and SR-92, both providing enough north/south capacity and spreading capacity improvements throughout the region so that impacts were not focused in one or two cities.

The project team undertook a detailed study of 4800 West, Canyon Road, and SR-92 and specifically what the anticipated impacts would be of widening those facilities with respect to land use impacts. This examination of impacts was intended to be planning-level only, and not to replace the more exhaustive impacts analysis of environmental processes required by the National Environmental Policy Act (NEPA).

On 4800 West, if the current roadway were widened to a five-lane cross-section with a 106 foot right-of-way (UDOT standard with two travel lanes in each direction and a center turn lane)

approximately 86 structures along the road would be within 15 feet of the ROW line, UDOT's standard distance for purchasing property within. The proposed widening would be from SR-92 in the north down to State Street in the south. The number of structures is based on GIS analysis from a 2003 aerial photograph of the area. The actual number of structures may vary due to homes and businesses being built or demolished since 2003 as well as various engineering and alignment considerations. Symmetrical widening was assumed when in reality, improvements could likely be aligned in order to minimize impacts to existing structures.

Similar analysis was done on Canyon Road. In this corridor, 107 structures (out of 202 total structures) would be impacted by widening the road to 106 feet of right-of-way. Again, the exact number and location of structures may have changed somewhat since the aerial photo was taken.

On SR-92, a six-lane cross-section of either 130 feet or 150 feet ROW indicated impacts on 64 structures in the corridor between I-15 and Canyon Road. Because of the two year-old aerial, the actual number of structures might vary slightly.

Due to these impacts, the Hybrid Projects Alternative did not include widening Canyon Road. However, it did assume a center turn lane and intersection improvements on Canyon Road to improve function of the facility. Elements such as flaring intersections, signal timing, and access management are things that can be implemented relatively easily and should be examined in more detail.

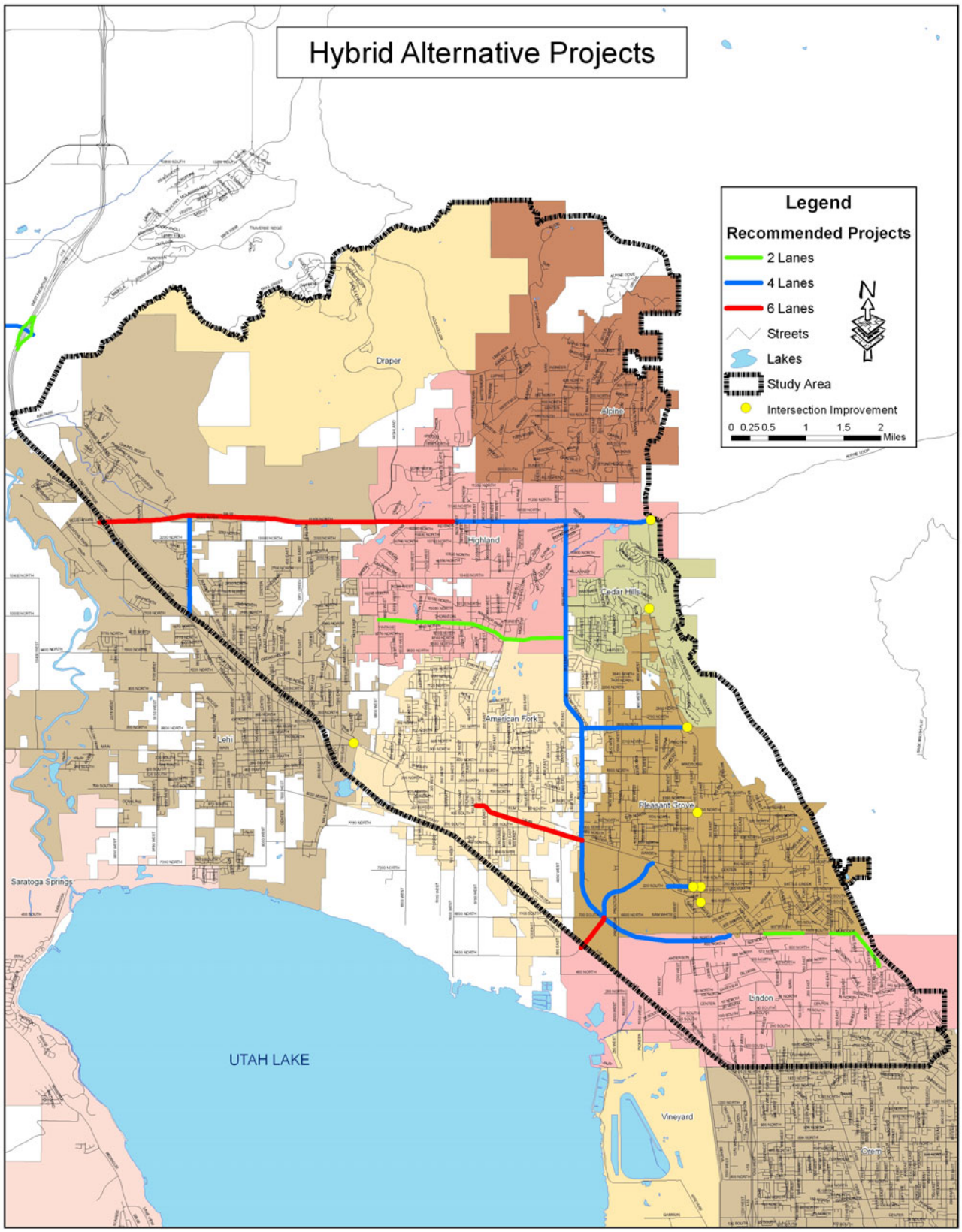
Screening of corridors was done primarily by TAC members. Many committee members liked the context sensitive design of recent improvements on SR-74 through Highland City. Widening this facility would force trade-offs to these recent improvements. Further, with the new direct access of 4800 West to I-15 via the new Pleasant Grove interchange, it was felt that 4800 West could provide greater regional benefits. For these reasons, the Hybrid Alternative included widening 4800 West to 106 feet of right-of-way because and did not include capacity improvements to SR-74.

The projects included in the Hybrid Alternative are shown in Table 4-3 and Figure 4-7.

## *Table 4-3: Hybrid Alternative Project List*

| | Street | Limits | | Project | Street Classification | Length | Project Cost (Millions) | MAG Cost (Millions) |
|---|---|---|---|---|---|---|---|---|
| | | Begin | End | | | (miles) | | |
| **1** | SR-92 | I-15 Interchange | 4800 West | Widen to 130' ROW | Principal Arterial | 6.23 | $58.70 | $43.00 |
| **2** | State Street | Pleasant Grove Blvd | 100 East American Fork | Widen to 130' ROW | Principal Arterial | 1.51 | $10.20 | $12.00 |
| **3** | Pleasant Grove Blvd | I-15 Interchange | 2000 West | Widen to 130' ROW | Principal Arterial | 0.50 | $3.40 | $1.10 |
| **4** | Pleasant Grove Blvd | 2000 West | State Street | Widen to 106' ROW | Principal Arterial | 1.10 | $5.80 | $3.90 |
| **5** | Point of the Mountain Interchange | I-15 | Redwood Road | Build new Interchange | Principal Arterial | | | |
| **6** | 1200 West | SR-92 | I-15 Interchange | Widen to 106' ROW | Minor Arterial | 1.36 | $7.30 | $3.90 |
| **7** | 1200 East | SR-92 | State Street | Widen to 106' ROW | Minor Arterial | 3.05 | $16.60 | $9.30 |
| **8** | 4800 West | SR-92 | State Street | Widen to 106' ROW | Minor Arterial | 4.34 | $30.09 | $12.90 |
| **9** | 2600 North | Canyon Rd | 1100 East | Widen to 106' ROW | Major Collector | 1.41 | $7.60 | $4.90 |
| **10** | 2000 West / 700 North | State Street | State Street | Widen to 106' ROW | Minor Arterial | 2.91 | $15.80 | $11.80 |
| **11** | Battlecreek Dr. | State Street | Main Street | Widen to 106' ROW | Major Collector | 0.34 | $1.80 | $1.20 |
| **12** | Canyon Road | SR-92 | State Street | Intersection Improvements | Minor Arterial | 5.00 | $1.25 | |
| **13** | 9800 North | SR-74 | 4800 West | New Construction 83' ROW | Collector | 0.82 | $3.70 | $2.70 |
| **14** | 700 North Am. Fork | 100 East | 200 East | New Construction 83' ROW | Local | 0.14 | $0.58 | $0.60 |
| **15** | 1000 South PG | Locust Ave | 1150 East | New Construction 83' ROW | Collector | 0.55 | $2.30 | $1.00 |
| **16** | 400East / 800 North Lindon | 400 North | 1200 East Lindon | New Construction 83' ROW | Collector | 0.89 | $3.96 | $8.10 |
| | | | | | **Totals** | | **$169.08** | **$116.40** |

*Figure 4-7*


Hybrid Alternative Projects
Legend
Recommended Projects
2 Lanes
4 Lanes
6 Lanes
Streets
Lakes
Study Area
Intersection Improvement
0 0.25 0.5 1 1.5 2
Miles
N
Draper
Alpine
Highland
Cedar Hills
American Fork
Lehi
Pleasant Grove
Saratoga Springs
Lindon
UTAH LAKE
Vineyard
Orem

In analyzing projects and moving towards a recommended future plan for the study area, the committee consistently attempted to have as a goal maintaining low levels of congestion that the area currently enjoys with few impacts in the form of right-of-way and land use impacts. Basically, the TAC deemed the Non-Controversial Projects Alternative an acceptable level of impact and then looked beyond those projects to determine if there were others that might provide additional dramatic improvements in congestion relief by adding more controversial projects. In the end, the Hybrid Projects Alternative represents an alternative that contains many projects that cities have no issues with, and a few projects that are somewhat controversial, but are acceptable due to their spreading of the impacts and their regional benefit.

## C. Additional Alternative Projects

The Technical Advisory Committee identified additional projects to examine in more detail that were outside the current LRTP project list. InterPlan tested each of these projects individually along with the Hybrid Alternative. In other words, each of these additional alternative projects was added to the Hybrid Alternative separately so that the value of each project could be compared to each other assuming all the projects of the Hybrid Alternative as well. This was done using the regional travel demand model. These Additional Alternative Projects included:

- Widening Canyon Road to five lanes
- Widening Canyon Road to five lanes and adding the Geneva Road direct connection
- Extending SR-74 south to I-15 and adding a new interchange on I-15
- High-capacity arterial on SR-92
- Widening SR-92 to a six-lane expressway
- Improving the 1200 East/I-15 Interchange
- Combining all of the above

Several analysis tools were used to compare each of the above scenarios. Vehicle Hours Traveled (VHT) was taken from each travel model run and is the product of multiplying the traffic volume by the average daily travel time for each specific roadway, and then aggregated across the study area network. Vehicle Miles Traveled (VMT) is also taken from the travel model and reflects the total distance traveled by all vehicles on the transportation network. Travel Time Index (TTI) is a measure of congestion that compares free flow to congested conditions, with a TTI of 1.0 having no congestion. VHT, VMT, and TTI for the Hybrid Alternative and the Additional Alternative Projects are shown in Table 4-4.

***Table 4-4: Vehicle Hours Traveled, Vehicle Miles Traveled, and TTI for Additional Alternative Projects***

| | Utah County VHT | Study Area VHT | Utah County VMT | Study Area VMT | Study Area TTI | County VHT % Change | Study Area VMT % Change |
|---|---|---|---|---|---|---|---|
| **2030 Hybrid** | 440,611 | 62,337 | 16,498,508 | 2,057,783 | 1.21 | NA | NA |
| 2030 Hybrid Plus Canyon Rd. Widening | 438,648 | 61,477 | 16,484,223 | 2,057,619 | 1.19 | 0.45% | 0.01% |
| 2030 Hybrid Plus Canyon Rd. Widening & Geneva connection | 438,977 | 61,628 | 16,487,053 | 2,058,254 | 1.19 | 0.37% | -0.02% |
| 2030 Hybrid Plus New SR-74 I-15 interchange | 440,524 | 61,645 | 16,503,598 | 2,048,244 | 1.20 | 0.02% | 0.46% |
| 2030 Hybrid Plus High Capacity Arterial for SR-92 | 439,703 | 61,793 | 16,486,089 | 2,051,637 | 1.21 | 0.21% | 0.30% |
| 2030 Hybrid Plus Expressway for SR-92 | 439,300 | 60,907 | 16,553,704 | 2,092,941 | 1.20 | 0.30% | -1.71% |
| 2030 Hybrid Plus 1200 East connection | 439,703 | 61,793 | 16,486,089 | 2,051,636 | 1.21 | 0.21% | 0.30% |
| 2030 Hybrid Plus All of the above | 438,506 | 59,873 | 16,554,918 | 2,086,933 | 1.17 | 0.48% | -1.42% |

Cost-benefit comparisons were made for each of the Additional Alternative Projects as well. As discussed earlier, Net Present Value (NPV) is a way to compare costs of various projects over time while considering their current cost and future benefit. It makes assumptions with respect to the value of time ($9.43 per hour) and it needs estimated project costs in order to perform the comparison. Planning-level costs for each project were estimated on a per mile basis and then determined for the distance of the improvement. In the cases where more detailed corridor information was available such as the potential number of impacted homes within the improvement right-of-way, the costs were adjusted to include best-guess estimates of added costs. Per mile costs were based on the improved roadway cross-section. Some factors on which the costs were based include right-of-way width, pavement width, right-of-way acquisition costs, curb and gutter type, added traffic signals, among many other factors. A table of costs is included in Appendix C.

For the purposes of this analysis, the value of travel time was calculated directly for the local area and reflects a rough estimate of the daily make-up of travel through the Northeast Utah Valley study area. Based on the per capita annual income of Utah County equal to $19,604 (Utah Department of Workforce Services, 2003) and assuming a 2080 hour work year, the hourly value of time in Utah County is $9.43. However, not all users of the road value time at the same rate. Table 4-5 describes the calculations used to derive the value of hourly travel time which has been estimated and used as $9.77 per vehicle.

***Table 4-5: Calculations of Value of Time***

| | Work Trips | Other Trips | Trucks | Total |
|---|---|---|---|---|
| Vehicle Occupancy | 1.17 | 1.90 | 1.00 | **1.66** |
| Driver Rate (Per Capita Wage) | $9.43 | $4.71 | $20.50 | |
| Passenger Rate (50% Per Capita Wage) | $4.71 | $4.71 | 0 | |
| % Daily Traffic | 0.28 | 0.68 | 0.04 | |
| Total | $2.86 | $6.09 | $0.82 | **$9.77** |

Source: Transportation Research Circular Number 477, *Assessing the Economic Impact of Transportation Projects*, October 1997.

By applying the value of time to all the total vehicle hour reduction, the net travel time benefits can be estimated. However, the value of future year benefits is both uncertain and less valuable in terms of present day benefits. A discount rate of three percent per year was used to discount all future year benefits to today's costs. Net Present Value calculations and estimated project costs for each of the Additional Alternative Projects are shown in Table 4-6.

***Table 4-6: Project Costs and NPV for Additional Alternative Projects***

| | Road Cost | Added Structure Cost | Added ROW Cost | Total Cost | NPV | Total NPV Benefit |
|---|---|---|---|---|---|---|
| **2030 Hybrid** | 2005 Costs not Inflated | | | $167.8 | $183.7 | $15.8 |
| 2030 Hybrid Plus Canyon Road Widening | $28.5 | $0.0 | $21.4 | $49.9 | $27.2 | -$22.7 |
| 2030 Hybrid Plus Canyon Road Widening & Geneva connection | $30.7 | $0.0 | $24.2 | $54.9 | $22.7 | -$32.2 |
| 2030 Hybrid Plus New SR-74 I-15 interchange | $5.3 | $11.0 | $0.0 | $16.3 | $1.2 | -$15.1 |
| 2030 Hybrid Plus High Capacity Arterial for SR-92 | $9.5 | $0.0 | $0.0 | $9.5 | $12.5 | $3.0 |
| 2030 Hybrid Plus Expressway for SR-92 | $9.5 | $35.0 | $0.0 | $44.5 | $18.2 | -$26.3 |
| 2030 Hybrid Plus 1200 East connection | $3.9 | $0.0 | $0.0 | $3.9 | $12.6 | $8.7 |
| 2030 Hybrid Plus All of the above | SR-92 Expressway Option | | | $129.1 | $29.2 | -$99.9 |

Notes: Benefits equal VHT reduction times $9.77 per vehicle hour over each week day over 25 years, discounted to 2005 dollars. Costs reflect 2005 planning level estimates reported in 2005 dollars. Costs and benefits are in millions of dollars.

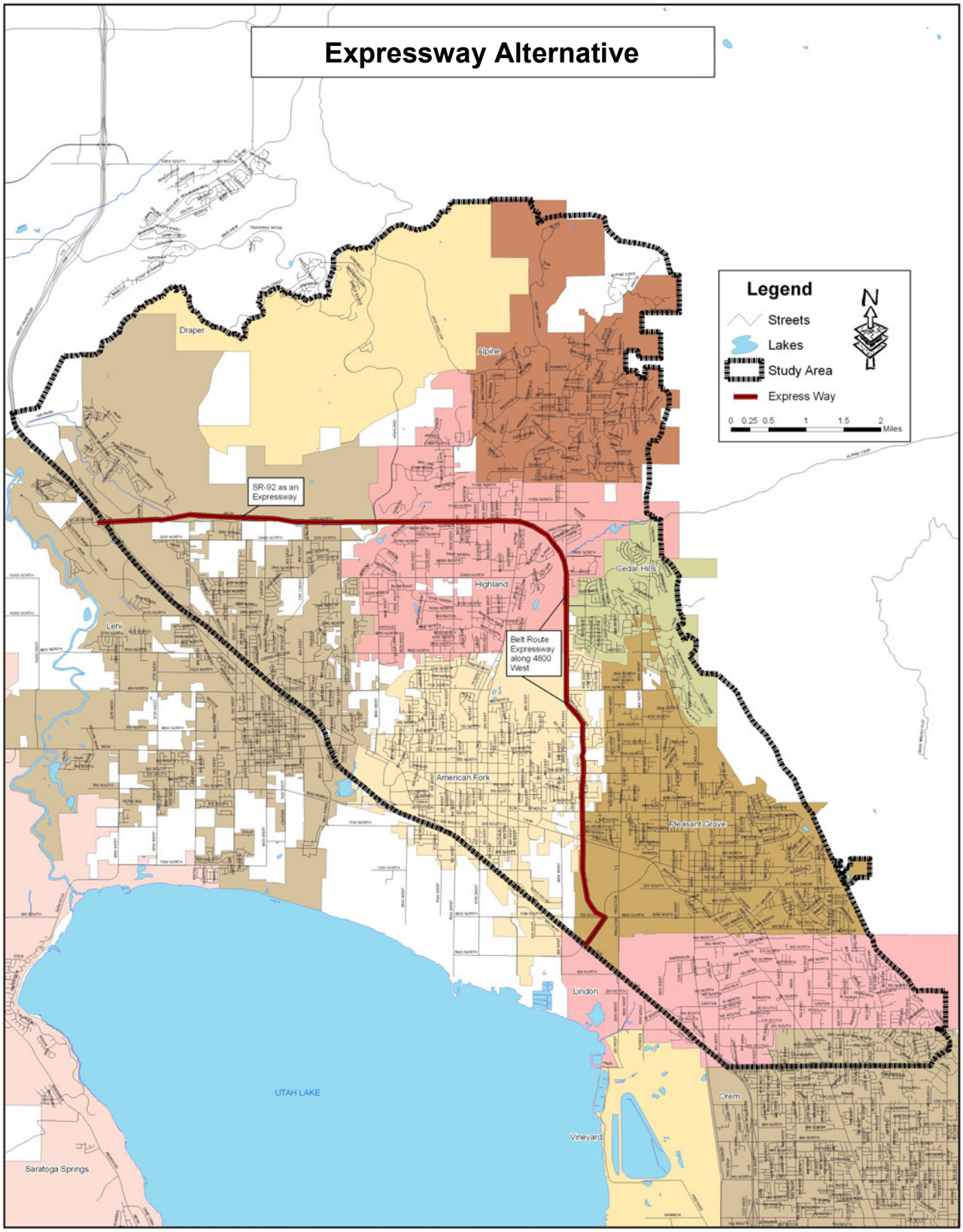
Table 4-7 offers a summary of alternative project cost, Travel Time Index, and Net Present Value. Based on these factors, the table also indicates which of the alternative projects were carried forward in the study's recommendations and why others were not.

*Table 4-7: Alternative Projects Considered, Summary*

| NEUVTS Alternative Projects Considered | Total Cost (millions) | Study Area TTI | Total NPV Benefit | Reason not carried forward |
|---|---|---|---|---|
| 2015 Recommendations | $167.8 | 1.21 | $15.8 | Shows unacceptable levels of congestion in 2030 |
| Canyon Road widening | $49.9 | 1.19 | -$22.7 | Possible impacts to 107 structures and negative NPV |
| Canyon Road widening and Geneva Road connection | $54.9 | 1.19 | -$32.2 | High ROW impacts and negative NPV |
| New SR-74/I-15 interchange | $16.3 | 1.20 | -$15.1 | Recommended for 2030 |
| Widening SR-74 from I-15 to SR-92 | $22.3 | | | Modeling showed little benefit in Highland in terms of carrying traffic, no TTI or NPV analysis was done. Widening SR-74 to 9800 N is recommended in 2030 |
| High-capacity arterial on SR-92 | $9.5 | 1.21 | $3.0 | More benefit seen from SR-92 expressway |
| Expressway on SR-92 | $44.5 | 1.20 | -$26.3 | Recommended for 2030 |
| 1200 East connection | $3.9 | 1.21 | $8.7 | No project has been identified so cost estimates are available |

An additional alternative that was considered by the project team late in the alternatives analysis process was an expressway "beltway" in the area. Although a specific route was never defined, it was assumed to run east/west at approximately SR-92 and north/south at approximately 4800 West, tying into I-15 on each end of the route. Figure 4-8 shows the general route of this alternative. The alternative was modeled as a high-speed six-lane expressway with limited access and some grade-separated interchanges. Model results showed little improvement in Travel Time Index over other smaller, more dispersed projects throughout the study area. Because the alternative showed insufficient improvement and construction and right-of-way costs were assumed to be relatively high, this alternative was not pursued.

*Figure 4-8*


Expressway Alternative
Legend
Streets
Lakes
Study Area
Express Way
0 0.25 0.5 1 1.5 2 Miles
N
Draper
Alpine
SR-92 as an Expressway
Highland
Cedar Hills
Lehi
Belt Route Expressway along 4800 West
American Fork
Pleasant Grove
Lindon
UTAH LAKE
Orem
Vineyard
Saratoga Springs

## D. Recommendations

Recommendations were made based on careful consideration of the benefit that various alternatives provided in terms of future traffic congestion relief along with the existing and future costs of those projects. Also important in project recommendations was the consensus of the cities involved and their willingness to support the individual projects included in the final recommendations.

### i. 2015 Recommendation

From the beginning, phasing was an important part of the planning process and ensuring that project recommendations met study area transportation needs throughout the planning horizon. While the projects included within the Hybrid Alternative achieved consensus among cities, there were concerns that they did not adequately address 2030 transportation needs. However, to address phasing concerns, the Hybrid Alternative was tested under 2015 land use and socioeconomic conditions provided by the MAG travel demand model. First, a No Build level of service was determined for comparison purposes. 2015 No Build level of service is shown in Figure 4-9. It assumes that all Phase 1 (to 2015) Long Range Transportation Plan projects are completed outside the study area, and no additional projects are built within the study area.

While 2015 No Build conditions do not appear as poor as 2030 No Build conditions (see Chapter 3 – Future Conditions), there are still traffic-related concerns in the area. The Hybrid Alternative (Hybrid Alternative projects are shown previously in Figure 4-7) was applied to the 2015 land use and socioeconomic conditions, again using data already assumed in the MAG model. Level of service results are shown in Figure 4-10.

As shown in Figure 4-10, level of service improves significantly over that of the No Build conditions, and so the Hybrid Alternative is the 2015 Recommendation for this project. Specific projects are shown in Figure 4-11 and project type along with approximate costs are shown in Table 4-8.

*Figure 4-9*

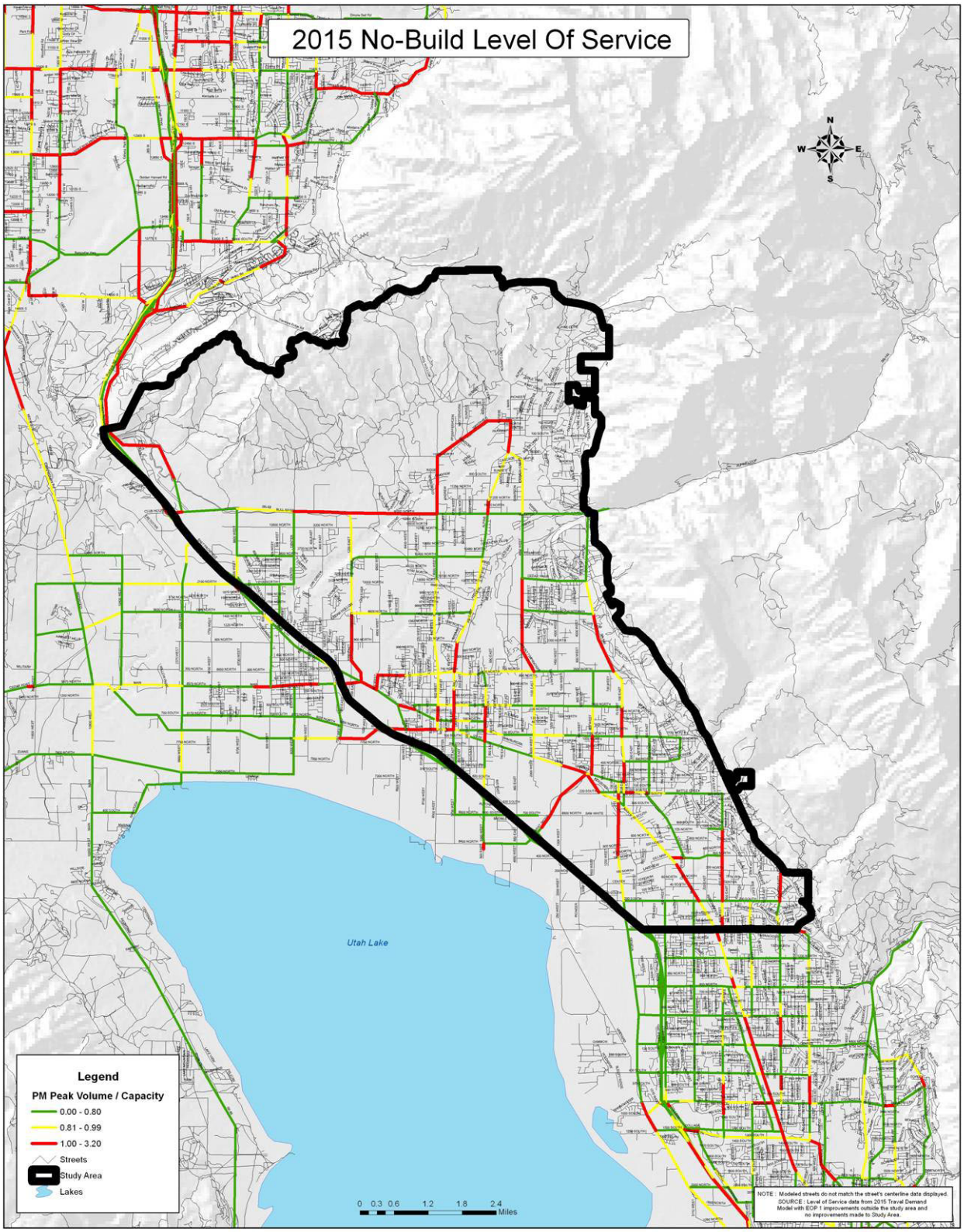

2015 No-Build Level Of Service
N
W
E
S
Utah Lake
Legend
PM Peak Volume / Capacity
0.00 - 0.80
0.81 - 0.99
1.00 - 3.20
Streets
Study Area
Lakes
0 0.3 0.6 1.2 1.8 2.4
Miles
NOTE : Modeled streets do not match the street's centerline data displayed.
SOURCE : Level of Service data from 2015 Travel Demand
Model with EOP 1 improvements outside the study area and
no improvements made to Study Area.

*Figure 4-10*

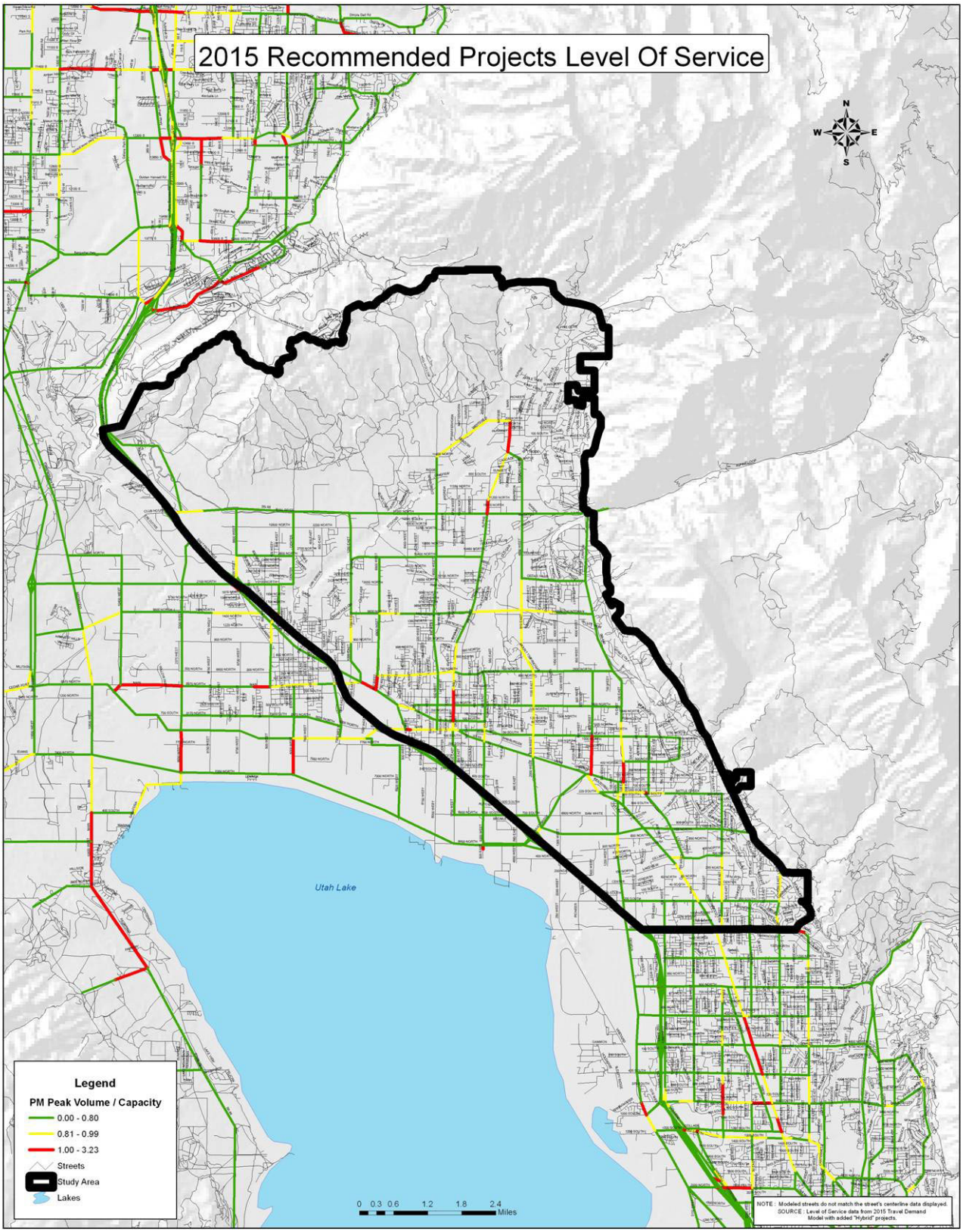
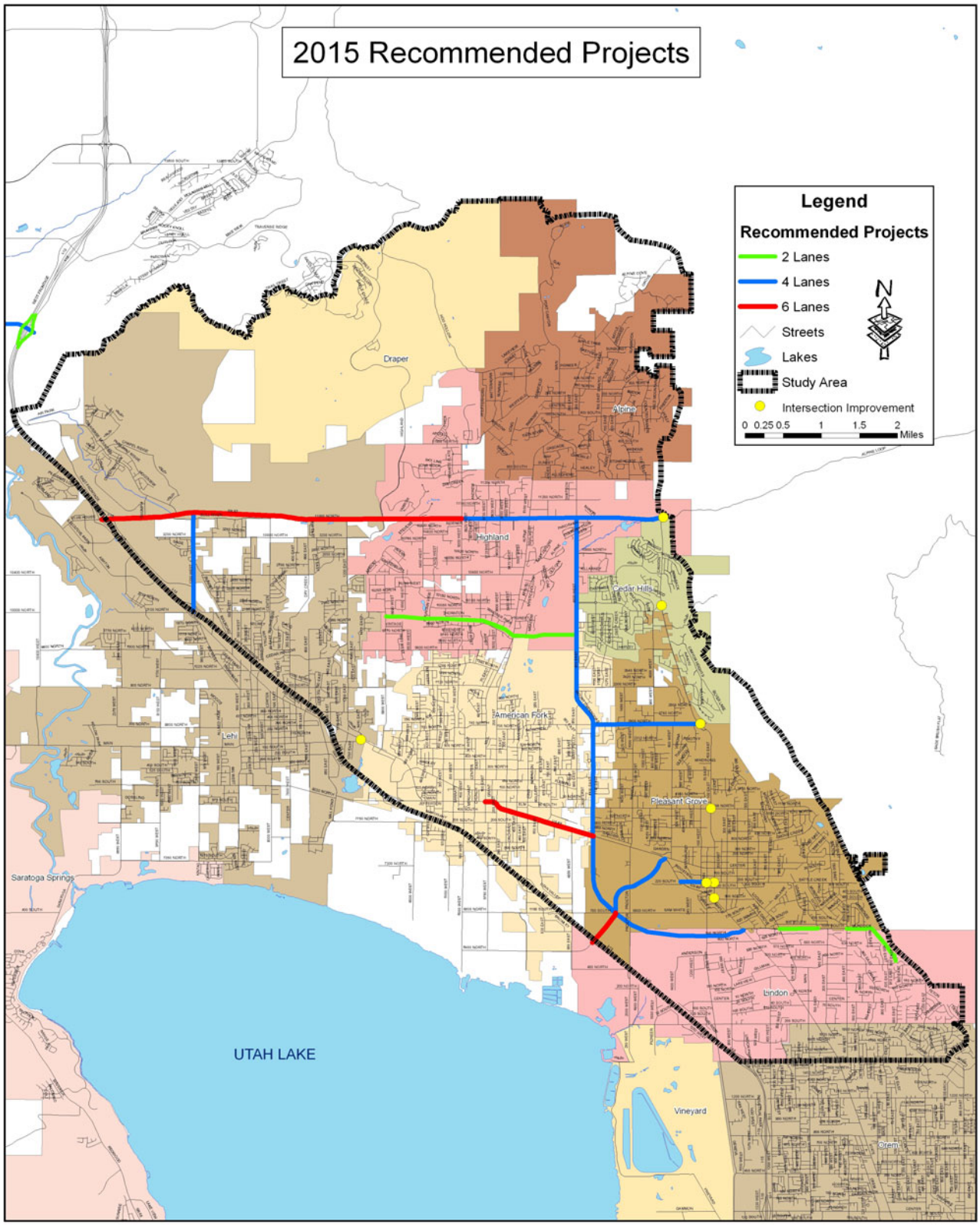

2015 Recommended Projects Level Of Service
N
W
E
S
Utah Lake
Legend
PM Peak Volume / Capacity
0.00 - 0.80
0.81 - 0.99
1.00 - 3.23
Streets
Study Area
Lakes
0 0.3 0.6 1.2 1.8 2.4
Miles
NOTE : Modeled streets do not match the street's centerline data displayed.
SOURCE : Level of Service data from 2015 Travel Demand
Model with added "Hybrid" projects.

*Figure 4-11*


2015 Recommended Projects
Legend
Recommended Projects
2 Lanes
4 Lanes
6 Lanes
Streets
Lakes
Study Area
Intersection Improvement
0 0.25 0.5 1 1.5 2
Miles
N
Draper
Alpine
Highland
Cedar Hills
American Fork
Lehi
Pleasant Grove
Saratoga Springs
Lindon
UTAH LAKE
Vineyard
Orem

## *Table 4-8: 2015 Recommended Roadway Project List*

| Number | Street | Limits | | Project | Street Classification | Length | Project Cost (Millions) |
|---|---|---|---|---|---|---|---|
| | | Begin | End | | | (miles) | |
| **1** | SR-92 | I-15 Interchange | 4800 West | Widen to 130' ROW | Principal Arterial | 6.23 | $58.70 |
| **2** | State Street | Pleasant Grove Blvd | 100 East Am. Fork | Widen to 130' ROW | Principal Arterial | 1.51 | $10.20 |
| **3** | Pleasant Grove Blvd | I-15 Interchange | 2000 West | Widen to 130' ROW | Principal Arterial | 0.50 | $3.40 |
| **4** | Pleasant Grove Blvd | 2000 West | State Street | Widen to 106' ROW | Principal Arterial | 1.10 | $5.80 |
| **5** | Point of the Mountain Interchange | I-15 | Redwood Road | Build new Interchange | Principal Arterial | | |
| **6** | 1200 West | SR-92 | I-15 Interchange | Widen to 106' ROW | Minor Arterial | 1.36 | $7.30 |
| **7** | 1200 East | SR-92 | State Street | Widen to 106' ROW | Minor Arterial | 3.05 | $16.60 |
| **8** | 4800 West | SR-92 | State Street | Widen to 106' ROW | Minor Arterial | 4.34 | $30.09 |
| **9** | 2600 North | Canyon Rd | 1100 East | Widen to 106' ROW | Major Collector | 1.41 | $7.60 |
| **10** | 2000 West / 700 North | State Street | State Street | Widen to 106' ROW | Minor Arterial | 2.91 | $15.80 |
| **11** | Battlecreek Dr. | State Street | Main Street | Widen to 106' ROW | Major Collector | 0.34 | $1.80 |
| **12** | Canyon Road | SR-92 | State Street | Intersection Improvements | Minor Arterial | 5.00 | $1.25 |
| **13** | 9800 North | SR-74 | 4800 West | New Construction 83' ROW | Collector | 0.82 | $3.70 |
| **14** | 700 North Am. Fork | 100 East | 200 East | New Construction 83' ROW | Local | 0.14 | $0.58 |
| **15** | 1000 South PG | Locust Ave | 1150 East | New Construction 83' ROW | Collector | 0.55 | $2.30 |
| **16** | 400East / 800 North Lindon | 400 North | 1200 East Lindon | New Construction 83' ROW | Collector | 0.89 | $3.96 |

| **Totals** | **$169.08** |
|---|---|

Notes:
Projects outside of the study area are generally based on the MAG and WFRC Long Range Transportation Plan and latest planning assumptions.
In particular, projects assumed outside of the study area include the following:
Mountain View Corridor "Arterial Alternative" through Lehi,
a new I-15 Interchange at Point of the Mountain,
I-15 widened to 6 lanes in each direction through the study area.

While mode split in the regional travel demand model results is overwhelmingly in favor of the private vehicle, this study also considered transit recommendations as part of its scope. MAG's current Long Range Transportation Plan addresses transit improvements and serves as the basis for the 2015 transit recommendations. Those projects are listed in Table 4-9 and are shown in Figure 4-12.

***Table 4-9: 2015 Recommended Transit Projects***

| Number | Project | Limits | | Location | Project Cost (Millions) |
|---|---|---|---|---|---|
| | | Begin | End | | |
| 1 | Bus Service Expansion | Additional bus routes countywide including new routes in the study area | | System Wide | $81.50 |
| 2 | Bus Frequency Expansion | Additional bus routes countywide including new routes in the study area | | System Wide | |
| 3 | Added Park and Ride Lot | I-15 Interchange | 1600 North in Orem | Near I-15 Ramp | $0.50 |
| 4 | Added Park and Ride Lot | I-15 Interchange | Main Street (American Fork) | Near I-15 Ramp | $0.50 |
| 5 | Added Park and Ride Lot | I-15 Interchange | 1200 West in Lehi | Near I-15 Ramp | $0.50 |
| 6 | Added Park and Ride Lot | I-15 Interchange | SR-92 | Near I-15 Ramp | $0.50 |
| 7 | Added Park and Ride Lot | 600 East | 1500 South (American Fork) | Near planned Mountain View Corridor | $0.50 |
| | | | | **Totals** | **$84.00** |

The total number of traffic lanes on transportation facilities of regional importance is shown in Figure 4-13. Lanage shown includes improvements recommended for the year 2015.

*Figure 4-12*

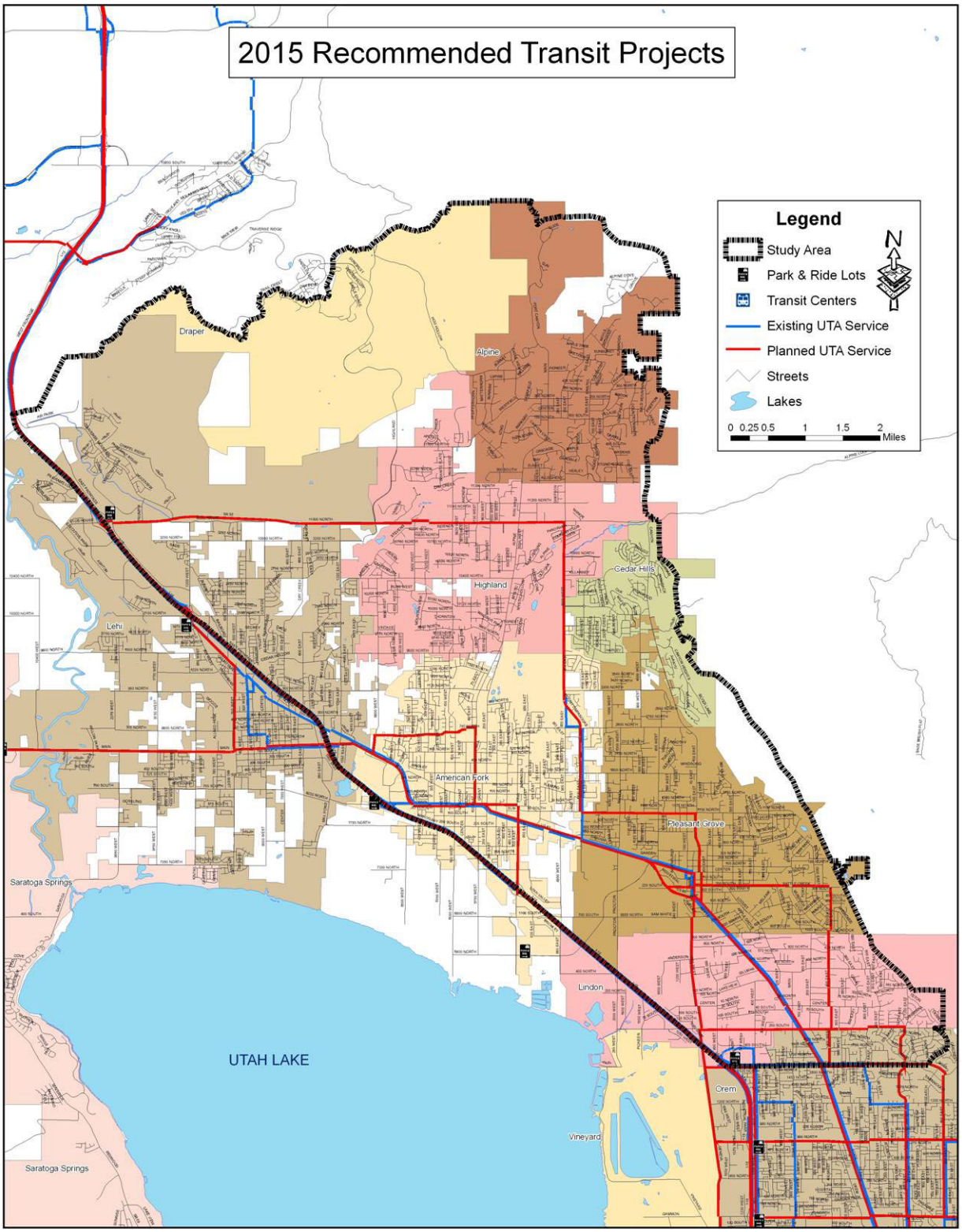
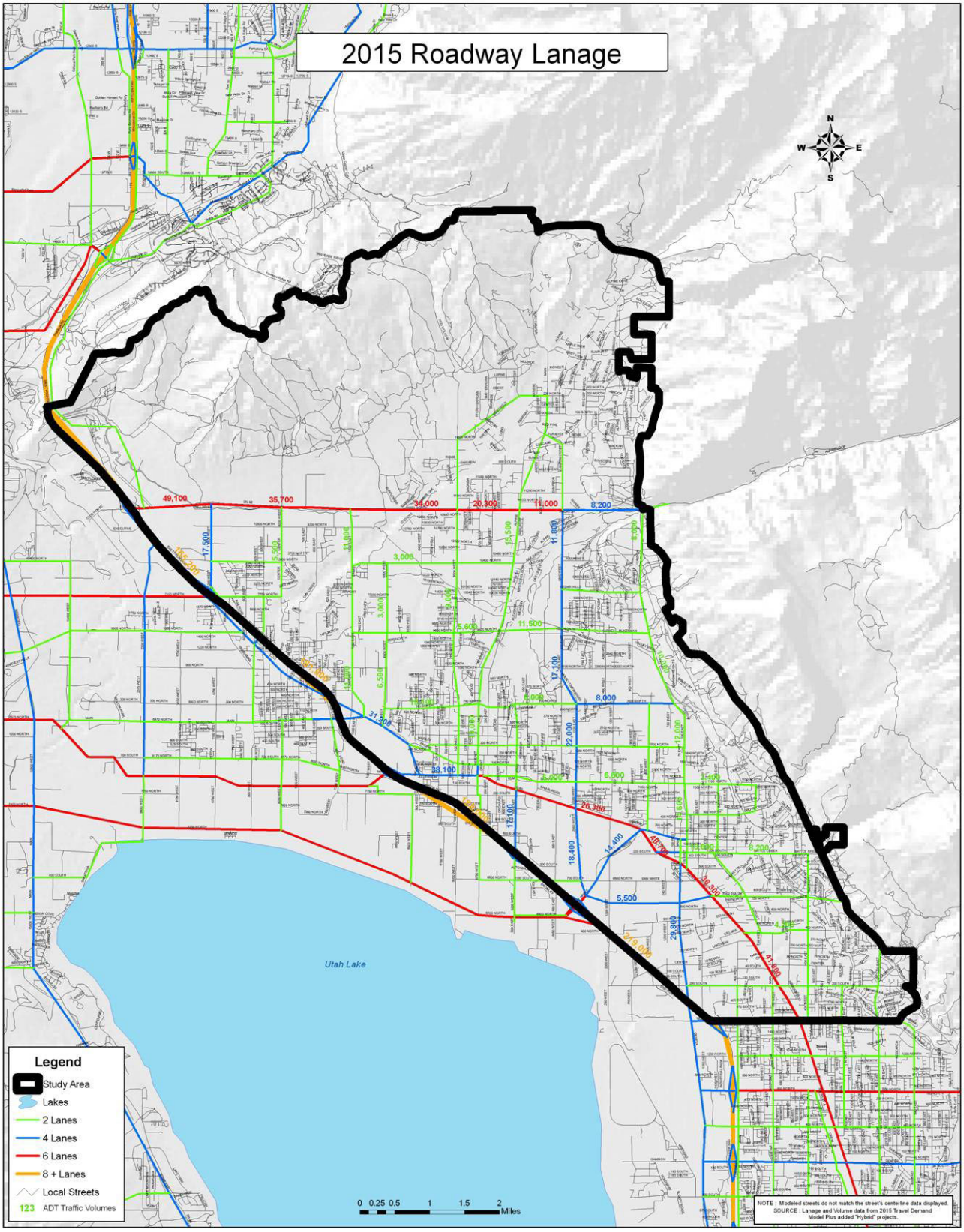

2015 Recommended Transit Projects
Legend
Study Area
Park & Ride Lots
Transit Centers
Existing UTA Service
Planned UTA Service
Streets
Lakes
0 0.25 0.5 1 1.5 2
Miles
N
Draper
Alpine
Highland
Cedar Hills
Lehi
American Fork
Pleasant Grove
Saratoga Springs
Lindon
UTAH LAKE
Orem
Vineyard
Saratoga Springs

*Figure 4-13*


2015 Roadway Lanage
N
W
E
S
Utah Lake
Legend
Study Area
Lakes
2 Lanes
4 Lanes
6 Lanes
8 + Lanes
Local Streets
123 ADT Traffic Volumes
0 0.25 0.5 1 1.5 2
Miles
NOTE : Modeled streets do not match the street's centerline data displayed.
SOURCE : Lanage and Volume data from 2015 Travel Demand
Model Plus added "Hybrid" projects.

ii. 2030 Recommendations

After developing the 2015 recommended project list, the TAC examined additional projects that would move toward fulfilling transportation need in 2030. The difficulties in this task centered on the fact that it is hard to evaluate cost-effectiveness, or lack of, for individual projects in the long term. In addition, gaining consensus of committee members became increasingly difficult as projects became more controversial and their benefits became more negligible and costs became more striking.

The recommendations for 2030 are based primarily on taking advantage of future opportunities. For example, on the west end of SR-92, right-of-way is still available as the area is mostly undeveloped. When development begins occurring in the corridor, there is opportunity to preserve right-of-way for long-term visions of the corridor as a larger facility expressway.

Unlike the 2015 recommendations, 2030 recommendations do not necessarily reflect TAC consensus. Recommended projects are shown in Figure 4-14 and Table 4-10 below.

***Table 4-10: 2030 Recommended Roadway Project List***

| Number | Street | Limits | | Project | Street Classification | Length | Project Cost (Millions) |
|---|---|---|---|---|---|---|---|
| | | Begin | End | | | (miles) | |
| 1 | SR-92 | I-15 Interchange | 4800 West | Add Grade-separated Structures | Principal Arterial | 6.23 | $44.50 |
| 2 | SR-74 | I-15 Interchange | Highland | Widen to 106' ROW | Minor Arterial | 2.56 | $13.82 |
| 3 | I-15 | American Fork | I-15 Interchange | Added or Moved Interchange | Freeway | 0.50 | $16.30 |
| | | | | | **Totals** | | **$74.62** |

Notes: Projects outside of the study area are generally based on the MAG and WFRC Long Range Transportation Plan and latest planning assumptions. In particular, projects assumed outside of the study area include Mountain View Corridor "Arterial Alternative" through Lehi, a new I-15 Interchange at Point of the Mountain, I-15 widened to 6 lanes in each direction through the study area.

Over the long term, transit improvements in the area are planned to be considerable, with the implementation of commuter rail transit between Utah and Salt Lake Counties. Recommended transit improvements for 2030 are shown in Figure 4-15 and Table 4-11.

***Table 4-11: 2030 Recommended Transit Project List***

| Number | Project | Limits | | Location | Length | Project Cost (Millions) |
|---|---|---|---|---|---|---|
| | | Begin | End | | (miles) | |
| 1 | Added Commuter Rail | Salt Lake County | Provo Hub | West Side of I-15 Corridor | 23.00 | $300.00 |
| | | | | **Totals** | | **$300.00** |

The total number of traffic lanes on transportation facilities of regional importance is shown in Figure 4-16. Lanage shown includes improvements recommended for the years 2015 and 2030.

*Figure 4-14*

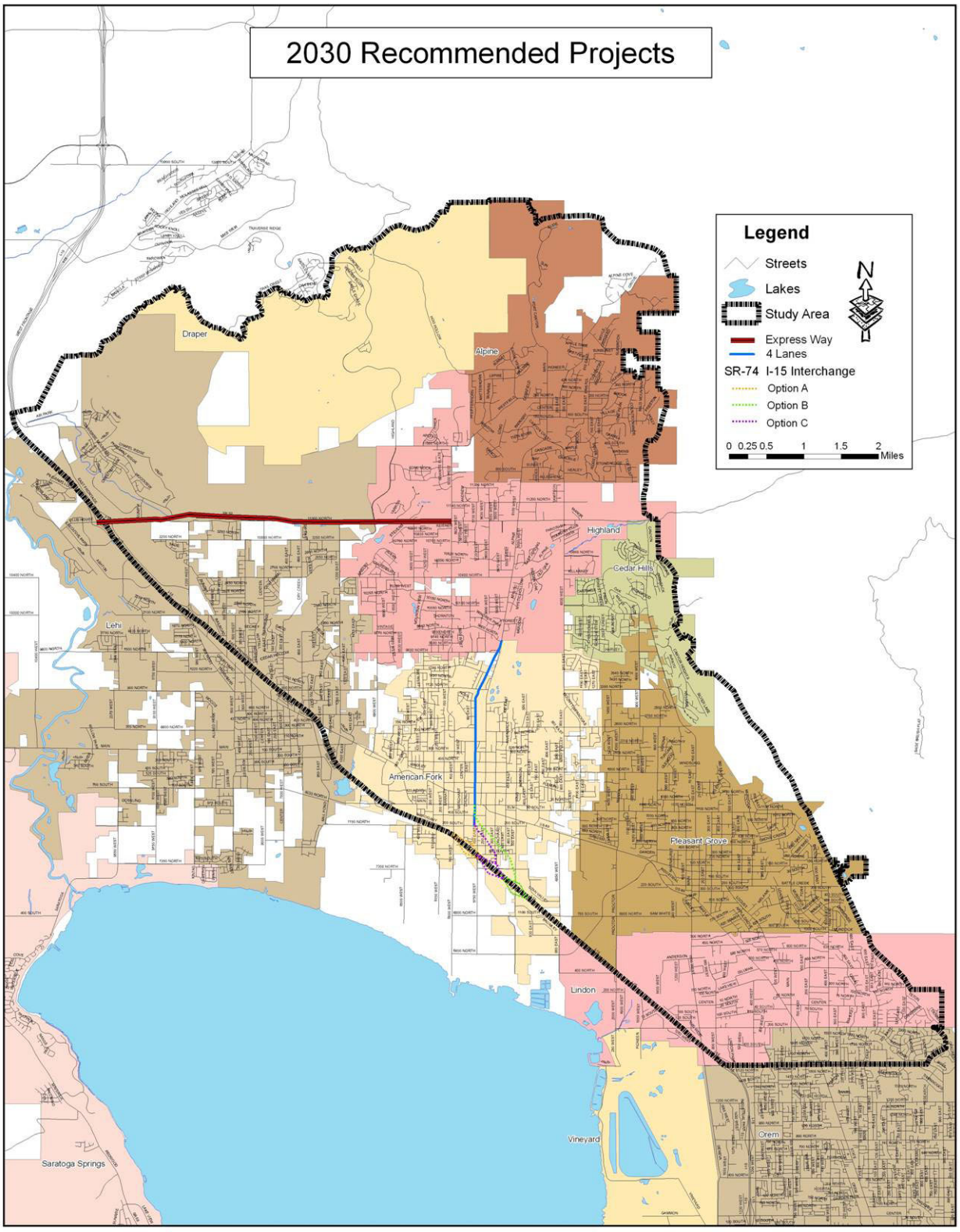

2030 Recommended Projects
Legend
Streets
Lakes
Study Area
Express Way
4 Lanes
SR-74 I-15 Interchange
Option A
Option B
Option C
0 0.25 0.5 1 1.5 2 Miles
N
Draper
Alpine
Highland
Cedar Hills
Lehi
American Fork
Pleasant Grove
Lindon
Vineyard
Orem
Saratoga Springs

*Figure 4-15*

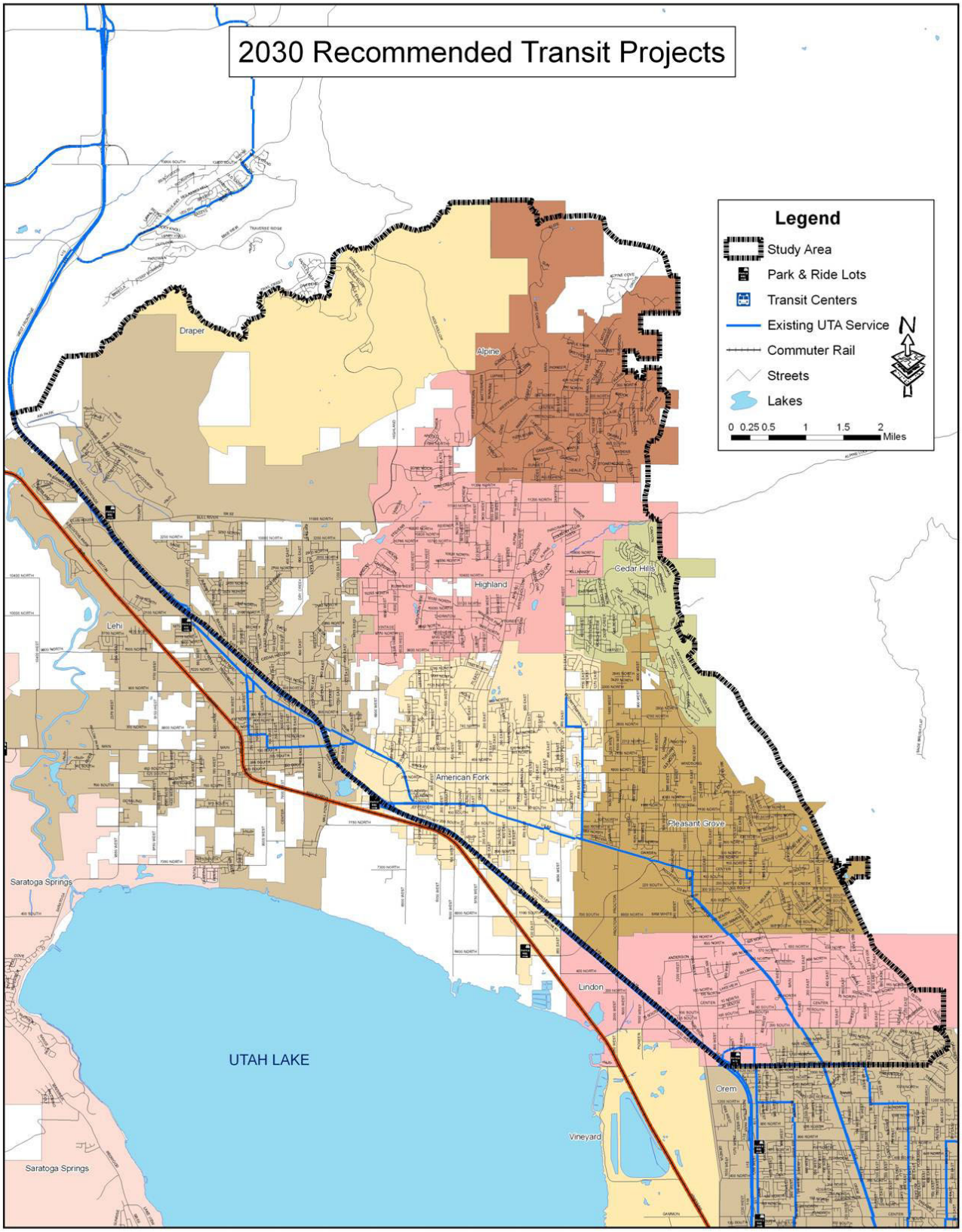
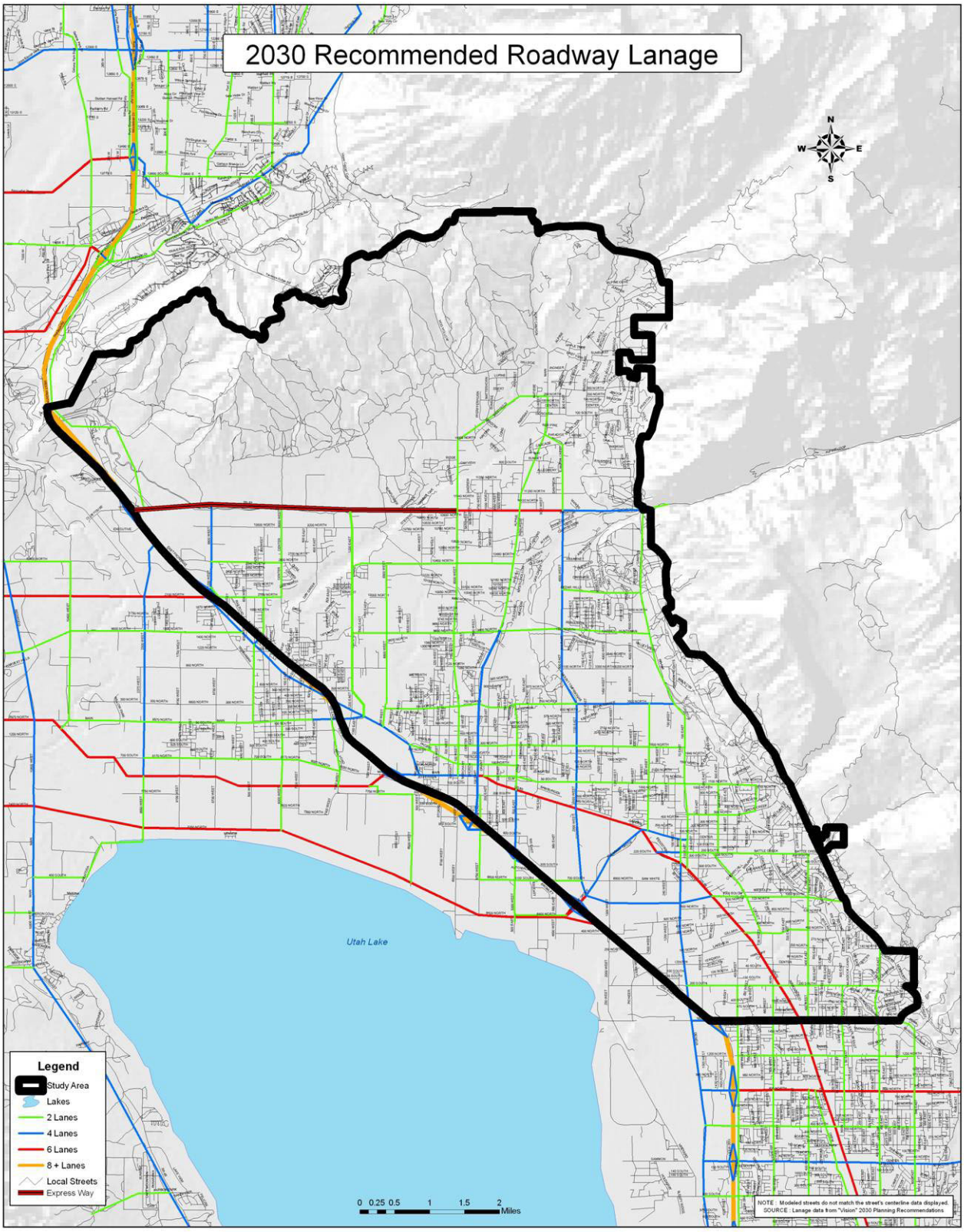

2030 Recommended Transit Projects
Legend
Study Area
Park & Ride Lots
Transit Centers
Existing UTA Service
Commuter Rail
Streets
Lakes
0 0.25 0.5 1 1.5 2 Miles
N
Draper
Alpine
Highland
Cedar Hills
Lehi
American Fork
Pleasant Grove
Saratoga Springs
Lindon
UTAH LAKE
Orem
Vineyard
Saratoga Springs

*Figure 4-16*


2030 Recommended Roadway Lanage
N
W
E
S
Utah Lake
Legend
Study Area
Lakes
2 Lanes
4 Lanes
6 Lanes
8 + Lanes
Local Streets
Express Way
0 0.25 0.5 1 1.5 2
Miles
NOTE : Modeled streets do not match the street's centerline data displayed.
SOURCE : Lanage data from "Vision" 2030 Planning Recommendations

# Appendix A:
# Technical Advisory Committee Meeting Agendas

MOUNTAINLAND
ASSOCIATION OF GOVERNMENTS
Serving Summit, Utah and Wasatch Cities & Counties
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# NORTH EAST UTAH VALLEY TRANSPORTATION STUDY

## *Wednesday, December 8, 2004*

***American Fork Public Library***
***64 South 100 East***
***Conf. Room #128 (East Entrance)***
***See map on back***

***American Fork, Utah***

## *3:00 P.M.*

## *TECHNICAL COMMITTEE*

## *Agenda*

1. Consultant Team Introduction - Shawn Seager
2. Travel demand forecasts and Study purpose and need - Shawn Seager
3. Background, Assumptions and schedule - Andrea Olson, InterPlan
4. Population and employment projections - Andrea Olson
5. Do Nothing: Existing + TIP" level of service map - Andrea Olson
6. Questions, other business and policy committee members - Shawn Seager
7. Next meeting schedule - Andrea Olson

If you have any questions or comments please contact Shawn Seager at (801) 229-3837or sseager@mountainland.org You can also visit us on the web at www.mountainland.org

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# NORTH EAST UTAH VALLEY TRANSPORTATION STUDY

## *Wednesday, January 12, 2005*

***American Fork Public Library***
***64 South 100 East, American Fork***
***Conf. Room #128 (East Entrance)***
***See map on back***
***3:00 P.M.***

## *TECHNICAL COMMITTEE Agenda*

1. Population and employment data follow up - Andrea Olson, InterPlan
2. Travel Demand Modeling 101 – Matt Riffkin, InterPlan
3. Northeast Utah Valley Travel Patterns – InterPlan
4. Long Range Plan/committed improvements project list – InterPlan
5. Policy Committee Members and February meeting – Shawn Seager, MAG
6. Questions and other business - Shawn Seager
7. Next meeting schedule - Andrea Olson

If you have any questions or comments please contact Shawn Seager at (801) 229-3837or sseager@mountainland.org You can also visit us on the web at www.mountainland.org

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# NORTH EAST UTAH VALLEY TRANSPORTATION STUDY

## *TECHNICAL COMMITTEE*

## *3:00 P.M.*
## *Wednesday, February 9, 2005*

***Highland City Offices***
***5378 West (SR 74) 10400 North***
***Highland, Utah 84003***
***(See map on back)***

## *Agenda*

1. Population and employment data follow up - Andrea Olson, InterPlan
2. 2030 Travel Model Results - InterPlan Co.
    a. 2030 No Build
    b. 2030 "Non-Controversial Projects"
3. 2030 Alternative Networks Discussion – InterPlan Co.
4. Policy Committee Members and first PC meeting – Shawn Seager, MAG
5. Presentations to Cities – Andrea Olson
6. Questions and other business - Shawn Seager
7. Next meeting schedule - Andrea Olson

If you have any questions or comments please contact Shawn Seager at (801) 229-3837or sseager@mountainland.org You can also visit us on the web at www.mountainland.org

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# NORTH EAST UTAH VALLEY TRANSPORTATION STUDY

## *TECHNICAL COMMITTEE*

## *3:00 P.M.*
## *Wednesday, March 9, 2005*

***Cedar Hills City Offices***
***3925 West Cedar Hills Drive,***
***Cedar Hills, Utah 84062***

## *Agenda*

1. 2030 Travel Model Results - InterPlan Co.
    a. 2030 No Build
    b. 2030 "Non-Controversial Projects
    c. 2030 LRP"
2. Power Point Presentation – InterPlan Co.
3. Joint Policy Committee and technical committee meeting - Shawn Seager,
4. Questions and other business - Shawn Seager
5. Next meeting schedule - Andrea Olson

If you have any questions or comments please contact Shawn Seager at (801) 229-3837or sseager@mountainland.org You can also visit us on the web at www.mountainland.org

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# NORTH EAST UTAH VALLEY TRANSPORTATION STUDY

## *TECHNICAL COMMITTEE*

## *9:00 AM*
## *Thursday April 14, 2005*

***Pleasant Grove Community Development Building***
***(West wing of the fire station) 86 east 100 south***
***Pleasant Grove, Utah 84062***

## *Agenda*

1. Joint Policy Committee and technical committee meeting debriefing
2. Comparison of NEUVTS area with other Wasatch Front areas
3. Travel demand solution/new ideas
4. Questions and other business - Shawn Seager
5. Next meeting schedule - Andrea Olson

If you have any questions or comments please contact Shawn Seager at (801) 229-3837or sseager@mountainland.org You can also visit us on the web at www.mountainland.org

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# NORTH EAST UTAH VALLEY TRANSPORTATION STUDY

## TECHNICAL COMMITTEE

## *3:00 P.M.*
## *Wednesday, May 11, 2005*

***Highland City Offices***
***5378 West (SR 74) 10400 North***
***Highland, Utah 84003***
***(See map on back)***

## *Agenda*

1. Alternative cross-sections on - InterPlan
    a. 4800 West
    b. SR-92
    c. Canyon Road
2. Discussion of access control policies – InterPlan.
3. Discussion of remaining tasks
4. Questions and other business - Shawn Seager
5. Next meeting schedule - Andrea Olson

If you have any questions or comments please contact Shawn Seager at (801) 229-3837or sseager@mountainland.org You can also visit us on the web at www.mountainland.org

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# NORTH EAST UTAH VALLEY TRANSPORTATION STUDY

## *TECHNICAL COMMITTEE*

## *3:00 P.M.*
## *Thursday, June 16, 2005*

*Lehi City Planning & Zoning*
*99 West Main, Suite 100, Lehi*
*Lehi, Utah 84043*
*Enter thru the east door behind Wells Fargo Bank*
*See map on back*

## *Agenda*

1. Alternatives Analysis – InterPlan
2. Study Recommendations – InterPlan
3. 2nd Policy Committee Meeting – Andrea Olson
4. Questions and other business – Shawn Seager
5. Next meeting schedule – Andrea Olson

If you have any questions or comments please contact Shawn Seager at (801) 229-3837or sseager@mountainland.org You can also visit us on the web at www.mountainland.org

# Appendix B:
# Political Advisory Committee Sign-In Sheets and Comments

# North East Utah Valley Transportation Study

Attendance List - March 23, 2005 Joint Meeting
American Fork Senior Center

| NAME | City/Organization |
|---|---|
| Kenneth Baldwin | AF Planning Commission |
| JIM TRACY | ALPINE PLANNING |
| J. H. Hadfield | AF City Engineering |
| Hepper Thompson | AF City Plng. Commission |
| DAN Nelson | MAG |
| Ken Anson | UTA |
| Brent Schvaneveldt | UDOT |
| Joseph E. Gordon | AF City Planning |
| Gail Christiansen | P. G. Planning |
| Jannicke Brewer | Alpine Planning |
| FRANK MILLS | Pl. Grove City. |
| Otto Lamerdorf | LINDON CITY |
| KIM STRUTHERS | LEHI CITY |
| DAVID BUNKER | CEDAR HILLS |
| Bruce Carpenter | Lindon City |
| Kerry Schwartz | Lehi City Planning Comm. |
| Ryan Hales | LEHI CITY PLANNING COMM. |
| JAY MEACHAM | Pleasant Grove Planning Commission |
| Cindy Boyd | PG City Council |
| | |
| | |
| | |
| | |

# North East Utah Valley Transportation Study

July 14, 2005

Highland City Hall

| NAME | City/Organization |
|---|---|
| JIM TRACY | ALPINE PLANNING |
| Larry Ellertson | utah County |
| G.J. LABONTY | UTA |
| Heber Thompson | AF- Planning Comm |
| Wendelin Knobloch | AF – Planning |
| Ed Collins | Lehi City |
| Jess Adamson | Highland |
| [illegible] | Lehi |
| TIM SHIMKO | ALPINE CITY |
| Bruce Carpenter | Lindon City |
| Gwyn Swanson | Highland City |
| DAVID BUNKER | CEDAR HILLS |
| Konrad Hildebrandt | " " |
| FRANK MILLS | Pl. Grove City |
| Mark E Atwood | Pl Grove City |
| Brent Schvaneveldt | UDOT |
| Cindy Boyd | Pl. Grove |
| STEVEN McARTHUR | ALPINE CITY P.C. |
| Barry Edwards | HIGH CAN CO |
| Matt Slipp | Highland City |
| Chuel Bellmontes | American Fork council |
| Mark Christensen | Lindon City |
| Adam M. Cowie | Lindon City |
| KIM STRUTHERS | LEHI CITY |
| Jeff Acheson | Lindon City |
| Joe Gordon | Am Fork City |

## COMMENTS

7/14/05

— Its great to see which projects on the Long Range Plan do not seem to be needed (or at least give us the best value.

— We agree that the PG 1000 South / Linden 700 North (or 800 North) corridors will need to be built as shown on the 2015 projects map.

— Good work identifying SR-92 as an expressway. Lets preserve the land or maybe even buy it now.

Name: Mark Christensen
Address: Linden City Engineer

## COMMENTS

7/14/05

1- Glad to see that some alternatives were not a very positive impact, and therefore not recommended.

2- Roads planned through Linden are necessary for circulation from North Orem, East, PG & Linden to the freeway

3- Glad to see the emphasis on the ALPINE HWY and AF 1100 East

Name: Ott H. DAMERON
Address: 467 W 175 N OREM

# Appendix C:
# Road Costs

# Cost Estimates for Northeast Utah Valley Transportation Study

**Arterial Street - 130' ROW**

| ITEM | COST | UNIT | QUANTITY | COST PER LINEAR |
|---|---|---|---|---|
| Clearing and Grubbing | $1,036.00 | Acres | =(130' x 1')/ 43,560 | $ 3.09 |
| Excavation (Roadway) | $0.16 | $Ft^3$ | (130' x (3"+ 8"+ 6")/12 x 1') = 45.33 C. | $ 29.19 |
| Subgrade Finishing | $0.09 | $Ft^2$ | (130' x 1') = 32 SQ. FT. | $ 12.08 |
| Untreated Base Course (10" thick) | $0.60 | $Ft^3$ | (99' x 10"/12 x 1') = 21.33 C. FT. | $ 49.40 |
| Bituminous Surface Course (6" thick) | $3.25 | $Ft^3$ | (99' x 6"/12 x 1') = 8 C. FT. | $ 161.03 |
| Pavement Marking Paint | $1.31 | Ft | 1 Lines x 1' = 1 L.F. | $ 1.31 |
| Curb and Gutter, Type B1 | $8.22 | Ft | 2 x 1' = 2 L.F. | $ 16.44 |
| 5' Concrete Sidewalk, 4" Thick | $1.90 | $Ft^2$ | (5' x 2 x 4"/12) = 2.67 SQ. FT. | $ 6.35 |
| Untreated Base Course for Sidewalk | $0.60 | $Ft^3$ | (2(5 + 1)' x 4"/12 x 1') = 3.33 C. FT. | $ 2.40 |
| Fire Hydrant | $2,500.00 | Each | 1/500' = .002 | $ 5.00 |
| Traffic Signal | $60,000.00 | Each | 3 per mile | $ 34.09 |
| Landscaping & Grading | $0.56 | $Ft^2$ | 2- 9' x 1' = 18 SQ. FT. | $ 10.03 |
| Right of Way Acquisition | $100,000.00 | Acres | (130' x 1')/43560 = .001 | $ 298.44 |
| | | | | |
| | | | Subtotal | $ 628.86 |
| New and Reconstructed Lighting | calculated @ 1.5% of subtotal | | | $ 9.43 |
| Signs (New) | calculated @ 1.5% of subtotal | | | $ 9.43 |
| Drainage (Inc. Structures) | calculated @ 20% of subtotal | | | $ 125.77 |
| Environmental & Design | calculated @ 15% of subtotal | | | $ 94.33 |
| | | | | |
| | | | Subtotal | $ 867.82 |
| Mobilization and Temp. Traffic Control | calculated @ 15% of subtotal | | | $ 130.17 |
| Contingency | calculated @ 20% of subtotal | | | $ 173.56 |
| | | | | |
| | | | Subtotal | $ 1,171.56 |
| Contigency for Price Increases | calculated @ 10% of subtotal | | | $117.16 |
| **TOTAL COST PER LINEAR FT.** | | | | **$ 1,288.71** |
| **Total Cost Per Mile** | | | | **$6,800,000** |

**Arterial Street - 150' ROW**

| ITEM | COST | UNIT | QUANTITY | COST PER LINEAR |
|---|---|---|---|---|
| Clearing and Grubbing | $1,036.00 | Acres | =(150' x 1')/ 43,560 | $ 3.57 |
| Excavation (Roadway) | $0.16 | $Ft^3$ | (150' x (3"+ 8"+ 6")/12 x 1') = 45.33 C. | $ 33.68 |
| Subgrade Finishing | $0.09 | $Ft^2$ | (150' x 1') = 32 SQ. FT. | $ 13.94 |
| Untreated Base Course (10" thick) | $0.60 | $Ft^3$ | (119' x 10"/12 x 1') = 21.33 C. FT. | $ 59.38 |
| Bituminous Surface Course (6" thick) | $3.25 | $Ft^3$ | (119' x 6"/12 x 1') = 8 C. FT. | $ 193.56 |
| Pavement Marking Paint | $1.31 | Ft | 1 Lines x 1' = 1 L.F. | $ 1.31 |
| Curb and Gutter, Type B1 | $8.22 | Ft | 2 x 1' = 2 L.F. | $ 16.44 |
| 5' Concrete Sidewalk, 4" Thick | $1.90 | $Ft^2$ | (5' x 2 x 4"/12) = 2.67 SQ. FT. | $ 6.35 |
| Untreated Base Course for Sidewalk | $0.60 | $Ft^3$ | (2(5 + 1)' x 4"/12 x 1') = 3.33 C. FT. | $ 2.40 |
| Fire Hydrant | $2,500.00 | Each | 1/500' = .002 | $ 5.00 |
| Traffic Signal | $60,000.00 | Each | 3 per mile | $ 34.09 |
| Landscaping & Grading | $0.56 | $Ft^2$ | 2- 9' x 1' = 18 SQ. FT. | $ 10.03 |
| Right of Way Acquisition | $100,000.00 | Acres | (150' x 1')/43560 = .001 | $ 344.35 |
| | | | | |
| | | | Subtotal | $ 724.11 |
| New and Reconstructed Lighting | calculated @ 1.5% of subtotal | | | $ 10.86 |
| Signs (New) | calculated @ 1.5% of subtotal | | | $ 10.86 |
| Drainage (Inc. Structures) | calculated @ 20% of subtotal | | | $ 144.82 |
| Environmental & Design | calculated @ 15% of subtotal | | | $ 108.62 |
| | | | | |
| | | | Subtotal | $ 999.26 |
| Mobilization and Temp. Traffic Control | calculated @ 15% of subtotal | | | $ 149.89 |
| Contingency | calculated @ 20% of subtotal | | | $ 199.85 |
| | | | | |
| | | | Subtotal | $ 1,349.01 |
| Contigency for Price Increases | calculated @ 10% of subtotal | | | $134.90 |
| **TOTAL COST PER LINEAR FT.** | | | | **$ 1,483.91** |
| **Total Cost Per Mile** | | | | **$7,800,000** |

**Major Collector Street**

| ITEM | COST | UNIT | QUANTITY | COST PER LINEAR |
|---|---|---|---|---|
| Clearing and Grubbing | $1,036.00 | Acres | =(106' x 1')/ 43,560 | $ 2.52 |
| Excavation (Roadway) | $0.16 | $Ft^3$ | (106' x (3"+ 8"+ 6")/12 x 1') = 45.33 C. | $ 23.80 |
| Subgrade Finishing | $0.09 | $Ft^2$ | (106' x 1') = 32 SQ. FT. | $ 9.85 |
| Untreated Base Course (10" thick) | $0.60 | $Ft^3$ | (75' x 10"/12 x 1') = 21.33 C. FT. | $ 37.43 |
| Bituminous Surface Course (6" thick) | $3.25 | $Ft^3$ | (75' x 6"/12 x 1') = 8 C. FT. | $ 121.99 |
| Pavement Marking Paint | $1.31 | Ft | 1 Lines x 1' = 1 L.F. | $ 1.31 |
| Curb and Gutter, Type B1 | $8.22 | Ft | 2 x 1' = 2 L.F. | $ 16.44 |
| 5' Concrete Sidewalk, 4" Thick | $1.90 | $Ft^2$ | (5' x 2 x 4"/12) = 2.67 SQ. FT. | $ 6.35 |
| Untreated Base Course for Sidewalk | $0.60 | $Ft^3$ | (2(5 + 1)' x 4"/12 x 1') = 3.33 C. FT. | $ 2.40 |
| Fire Hydrant | $2,500.00 | Each | 1/500' = .002 | $ 5.00 |
| Traffic Signal | $60,000.00 | Each | 2 per mile | $ 22.73 |
| Landscaping & Grading | $0.56 | $Ft^2$ | 2- 9' x 1' = 18 SQ. FT. | $ 10.03 |
| Right of Way Acquisition | $100,000.00 | Acres | (106' x 1')/43560 = .001 | $ 243.34 |
| | | | | |
| | | | Subtotal | $ 503.19 |
| New and Reconstructed Lighting | calculated @ 1.5% of subtotal | | | $ 7.55 |
| Signs (New) | calculated @ 1.5% of subtotal | | | $ 7.55 |
| Drainage (Inc. Structures) | calculated @ 20% of subtotal | | | $ 100.64 |
| Environmental & Design | calculated @ 15% of subtotal | | | $ 75.48 |
| | | | | |
| | | | Subtotal | $ 694.40 |
| Mobilization and Temp. Traffic Control | calculated @ 15% of subtotal | | | $ 104.16 |
| Contingency | calculated @ 20% of subtotal | | | $ 138.88 |
| | | | | |
| | | | Subtotal | $ 937.45 |
| Contigency for Price Increases | calculated @ 10% of subtotal | | | $93.74 |
| **TOTAL COST PER LINEAR FT.** | | | | **$ 1,031.19** |
| **Total Cost Per Mile** | | | | **$5,400,000** |

**Minor Collector Street**

| ITEM | COST | UNIT | QUANTITY | COST PER LINEAR FOOT OF ROADWAY |
|---|---|---|---|---|
| Clearing and Grubbing | $1,036.00 | Acres | =(83' x 1')/ 43,560 | $ 1.97 |
| Excavation (Roadway) | $0.16 | $Ft^3$ | (83' x (3"+ 8"+ 6")/12 x 1') = 45.33 C. F | $ 18.63 |
| Subgrade Finishing | $0.09 | $Ft^2$ | (83' x 1') = 32 SQ. FT. | $ 7.71 |
| Untreated Base Course (10" thick) | $0.60 | $Ft^3$ | (52' x 10"/12 x 1') = 21.33 C. FT. | $ 25.95 |
| Bituminous Surface Course (6" thick) | $3.25 | $Ft^3$ | (52' x 6"/12 x 1') = 8 C. FT. | $ 84.58 |
| Pavement Marking Paint | $1.31 | Ft | 1 Lines x 1' = 1 L.F. | $ 1.31 |
| Curb and Gutter, Type B1 | $8.22 | Ft | 2 x 1' = 2 L.F. | $ 16.44 |
| 5' Concrete Sidewalk, 4" Thick | $1.90 | $Ft^2$ | (5' x 2 x 4"/12) = 2.67 SQ. FT. | $ 6.35 |
| Untreated Base Course for Sidewalk | $0.60 | $Ft^3$ | (2(5 + 1)' x 4"/12 x 1') = 3.33 C. FT. | $ 2.40 |
| Fire Hydrant | $2,500.00 | Each | 1/500' = .002 | $ 5.00 |
| Traffic Signal | $60,000.00 | Each | 3 per mile | $ 34.09 |
| Landscaping & Grading | $0.56 | $Ft^2$ | 2- 9' x 1' = 18 SQ. FT. | $ 10.03 |
| Right of Way Acquisition | $100,000.00 | Acres | (83' x 1')/43560 = .001 | $ 190.54 |
| | | | | |
| | | | Subtotal | $ 405.02 |
| New and Reconstructed Lighting | calculated @ 1.5% of subtotal | | | $ 6.08 |
| Signs (New) | calculated @ 1.5% of subtotal | | | $ 6.08 |
| Drainage (Inc. Structures) | calculated @ 20% of subtotal | | | $ 81.00 |
| Environmental & Design | calculated @ 15% of subtotal | | | $ 60.75 |
| | | | | |
| | | | Subtotal | $ 558.93 |
| Mobilization and Temp. Traffic Control | calculated @ 15% of subtotal | | | $ 83.84 |
| Contingency | calculated @ 20% of subtotal | | | $ 111.79 |
| | | | | |
| | | | Subtotal | $ 754.55 |
| Contigency for Price Increases | calculated @ 10% of subtotal | | | $75.45 |
| **TOTAL COST PER LINEAR FT.** | | | | **$ 830.00** |
| **Total Cost Per Mile** | | | | **$4,400,000** |

# Appendix D:
# Final Recommendations Slide Presentation

# Northeast Utah Valley Transportation Study

1. Transportation Issues and Problems
2. Alternatives Considered
3. Recommendations
   - 2015
   - 2030



# Study Area Population Growth: 2002-2030

- Initial projections put study area population growth at about 83% by 2030.
- Revised city-projections show that population is expected to increase by more than 137% in that time.


Source: GOPB/MAG population projections and city revisions.

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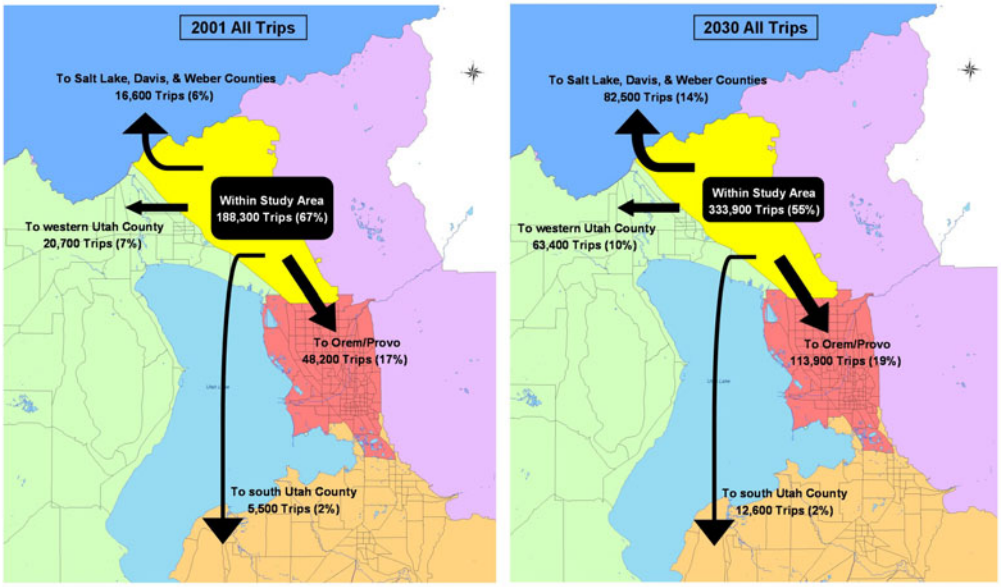
# All Trip Destinations

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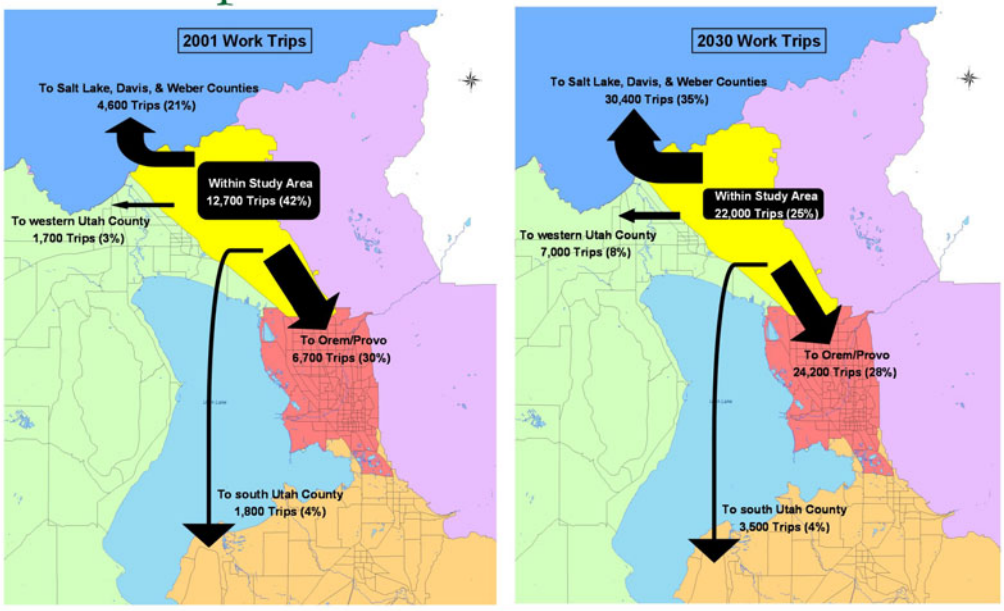
# Work Trip Destinations

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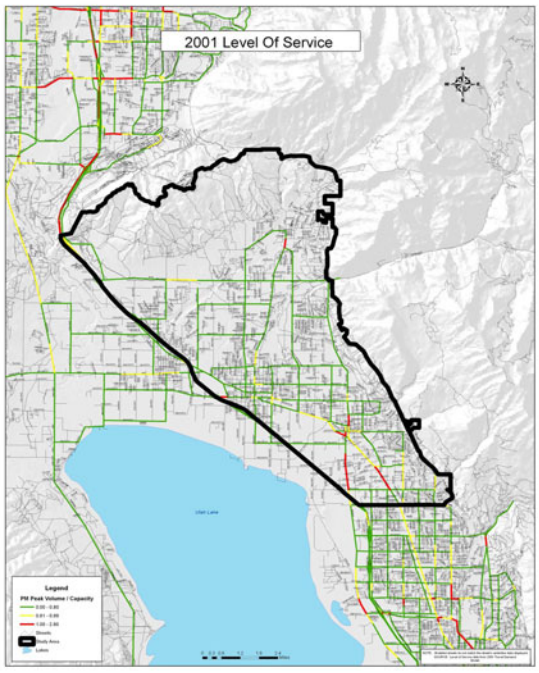
# 2001 Level of Service

- TTI = 1.06
- Population and employment numbers are based on MAG model input.
- Modeled LOS provides a simulation of reality, not necessarily an exact replication.

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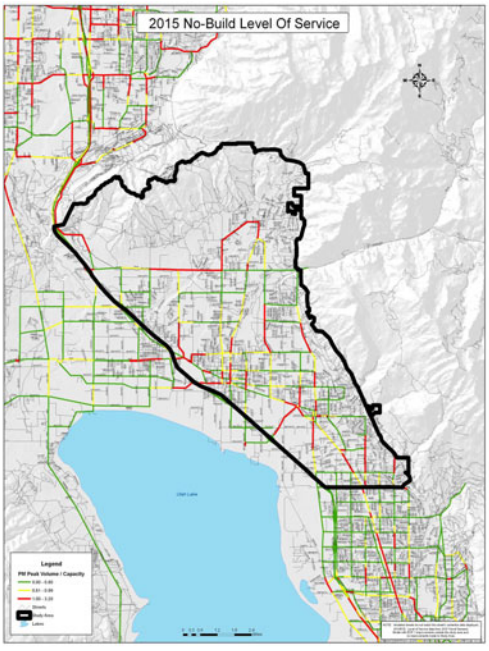
# 2015 No Build Level of Service

- TTI = 1.21
- Assumes all Phase 1 (to 2015) LRP projects are built outside study area, no future projects within study area
- Population and employment numbers are based on MAG model inputs.

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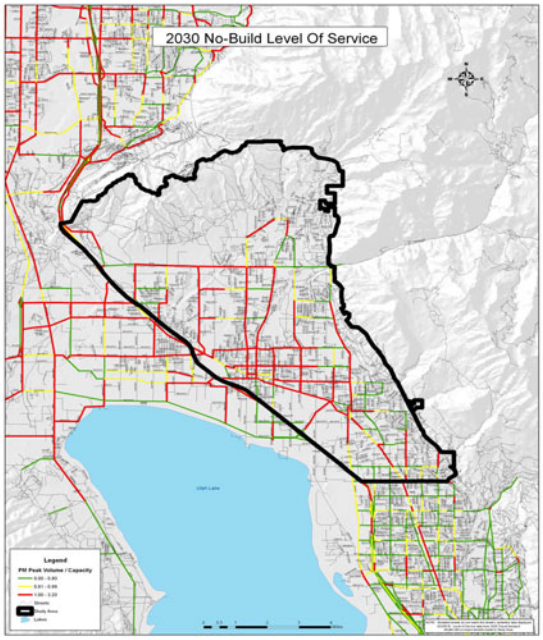
# 2030 No Build Level of Service

- TTI = 1.53
- Assumes all LRP projects are built outside study area, no future projects within study area
- Population and employment numbers are based on city-revised population and employment numbers.
  - 2030 Population = 261,729
  - 2030 Employment = 62,804

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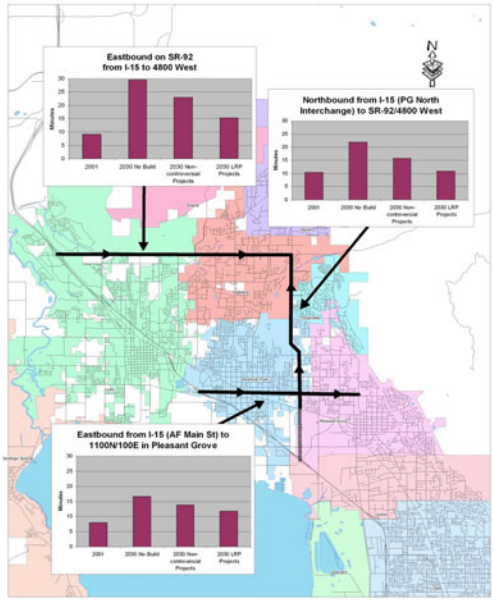
# PM Peak Hour Travel Delay

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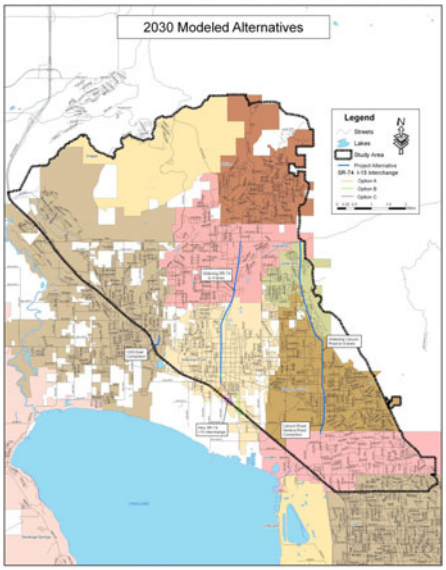
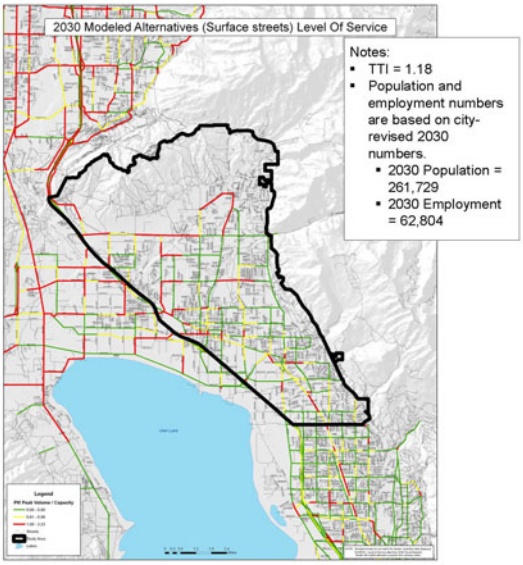
# Alternatives Analysis

- Reduced MAG Long Range Plan to "Non-Controversial" Projects
- Tested Wide Range of "Controversial" or "Impacting" Projects
- Projects Tested Both Individually and as "Packages" of Projects
- Considered Delay Reduction and Net Present Value of Benefits



# Other Alternatives Considered:
## Surface Streets Alternative

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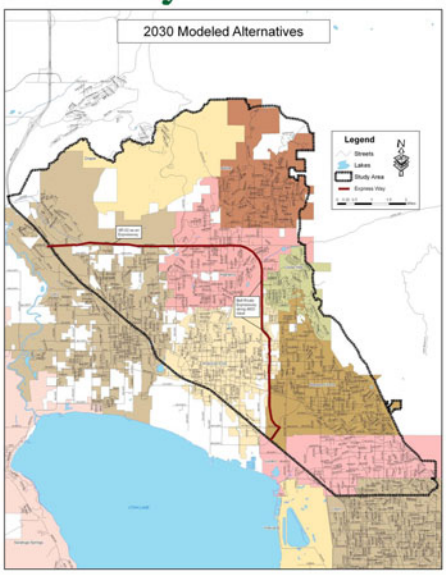
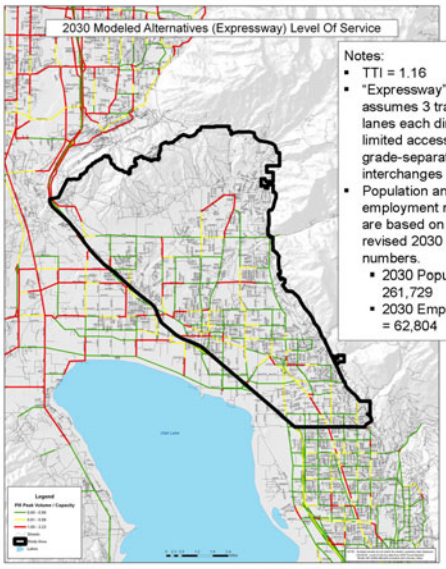
# Other Alternatives Considered:
# **Expressway Alternative**

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# Alternative Projects Considered

| NEUVTS Alternative Projects Considered | Total Cost (millions) | Study Area TTI[1] | Total NPV[2] Benefit | Reason not carried forward |
|---|---|---|---|---|
| 2015 Recommendations | $167.8 | 1.21 | $15.8 | Shows unacceptable levels of congestion in 2030 |
| Canyon Road/Geneva Road connection | $10.0 | | -$9.5 | No alignment has been identified |
| Canyon Road widening | $49.9 | 1.19 | -$22.7 | Possible impacts to 107 structures and negative NPV |
| Canyon Road widening and Geneva Road connection | $54.9 | 1.19 | -$32.2 | High ROW impacts and negative NPV |
| New SR-74/I-15 interchange | $16.3 | 1.20 | -$19.1 | Recommended for 2030 |
| Widening SR-74 from I-15 to SR-92 | $22.3 | | | Little benefit in Highland -- widening SR-74 to 9800 N is recommended in 2030 |
| High-capacity arterial on SR-92 | $9.5 | 1.21 | $3.0 | More benefit seen from SR-92 expressway |
| Expressway on SR-92 | $44.5 | 1.20 | -$26.3 | Recommended for 2030 |
| 1200 East connection | | 1.21 | | No project has been identified so no cost estimates are available |
| All of the above | $129.1 | 1.17 | -$99.9 | High ROW impacts and negative NPV |

1. TTI=Travel Time Index, a measure of congested conditions compared to free-flow conditions. See TTI board for more explanation.
2. NPV=Net Present Value, a measure of the value of a project over time

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Northeast Utah Valley Transportation Study

InterPlan Co. Transportation Planning

# Considerations in 2015 Recommendations

- Project phasing is important part of process
- 2015 recommended projects preserve the good level of service the study area now experiences
- Recommended projects need to be implemented by 2015
- There is consensus by cities regarding the recommended project list
- Year 2015 matches current MAG LRP phasing

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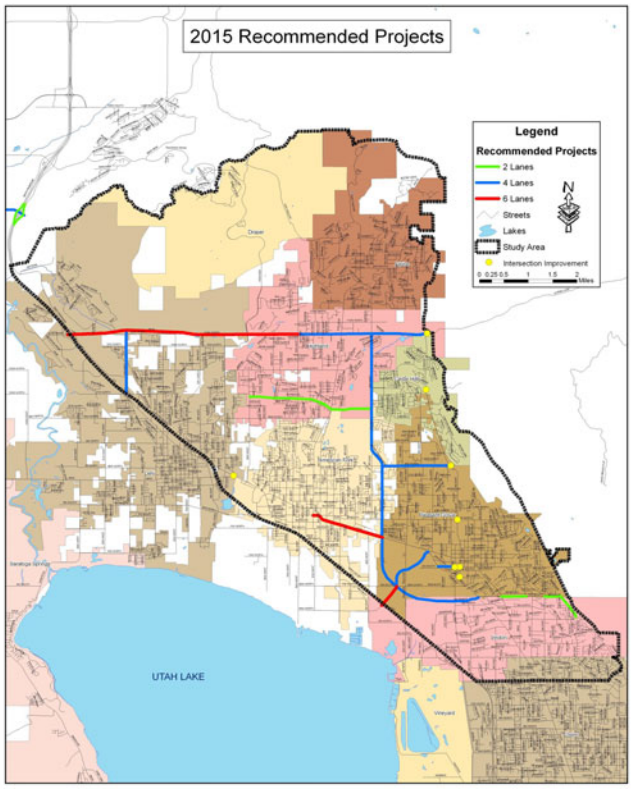
## 2015 Recommended Roadway Projects

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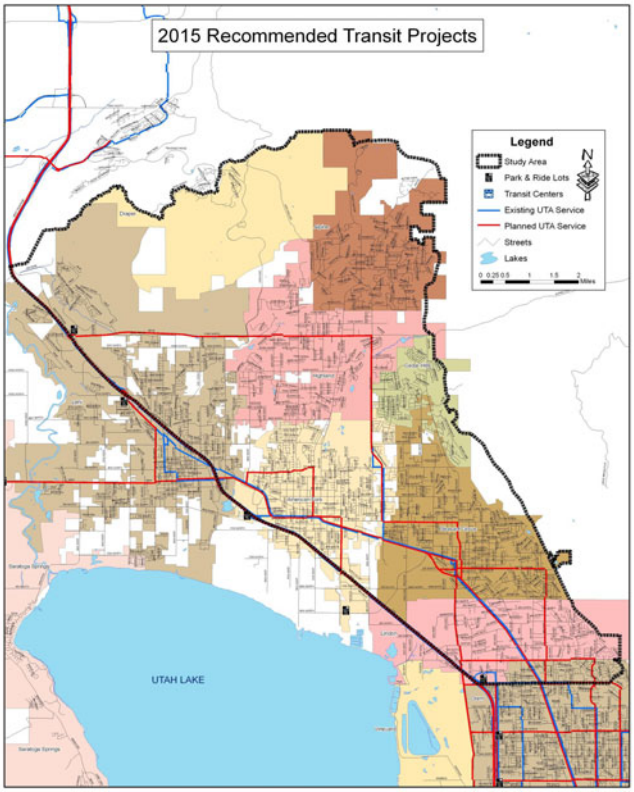
# 2015 Recommended Transit Projects

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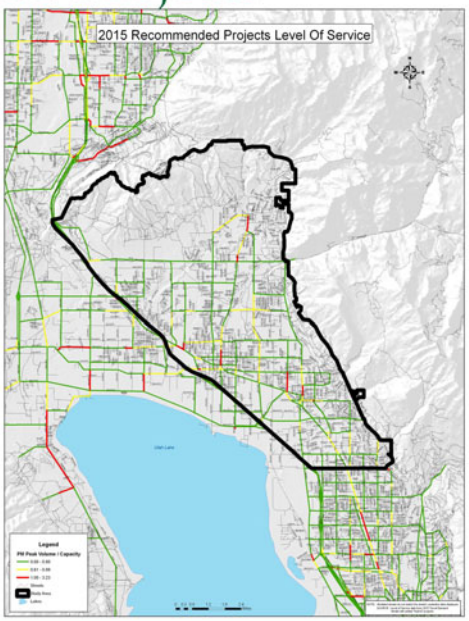
# 2015 Recommended Projects Level of Service

- TTI = 1.10
- Level of service is based on 2015 recommended project list
- Population and employment numbers are based on MAG model inputs.

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# Considerations in 2030 Recommendations

- Difficult to evaluate cost-effectiveness of individual projects in the long term
- Recommended projects represent longer term opportunities such as available right-of-way and I-15 reconstruction
- Some of the 2030 recommendations are not based on committee consensus

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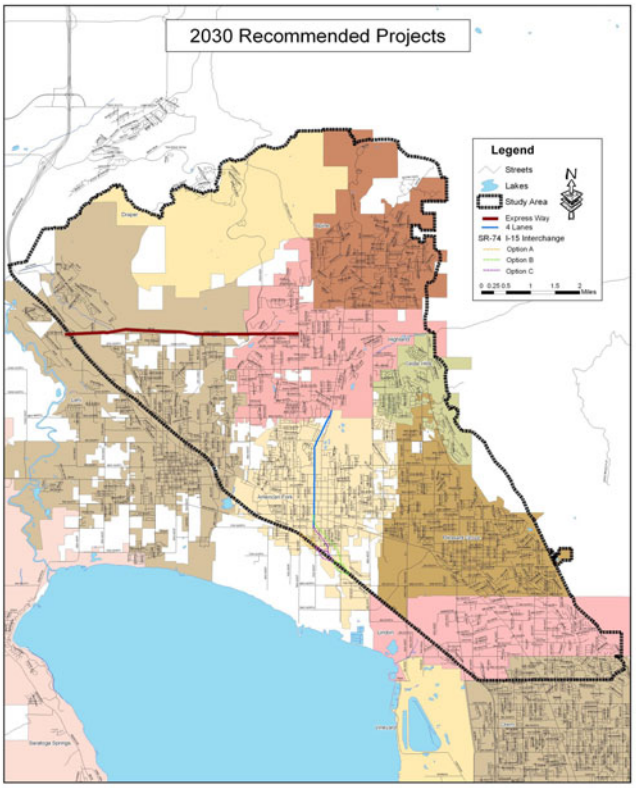
# 2030 Recommended Roadway Projects

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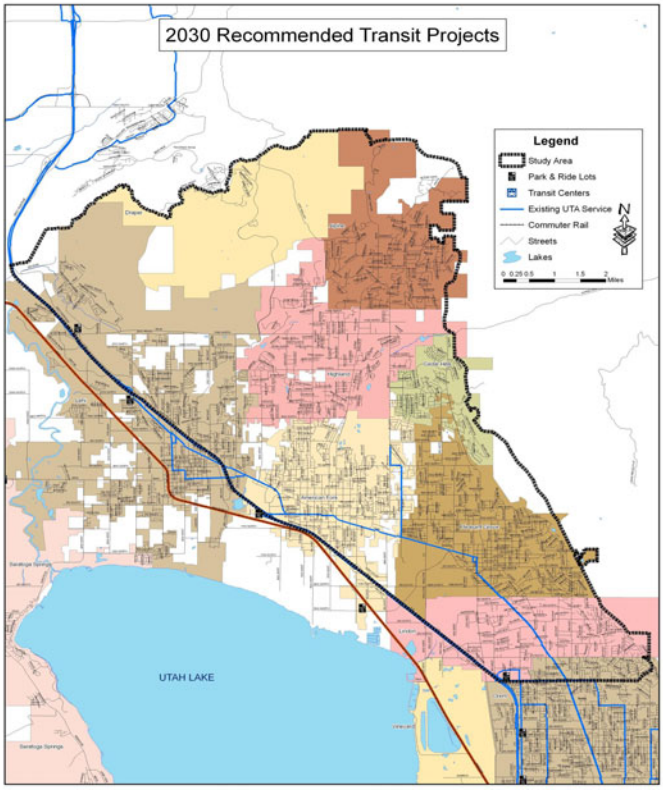
# 2030 Recommended Transit Projects

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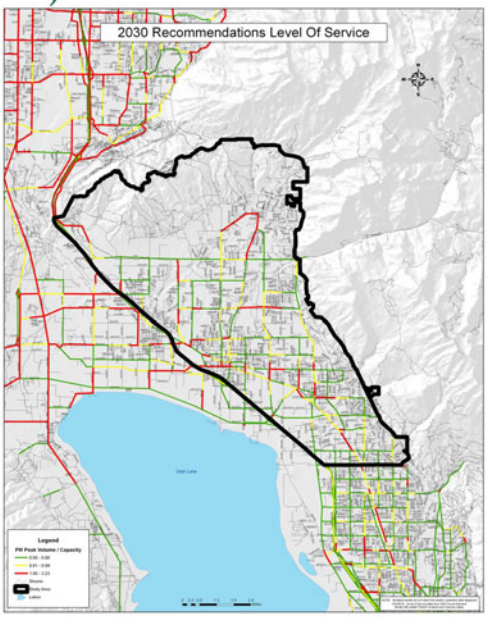
# 2030 Recommended Projects Level of Service

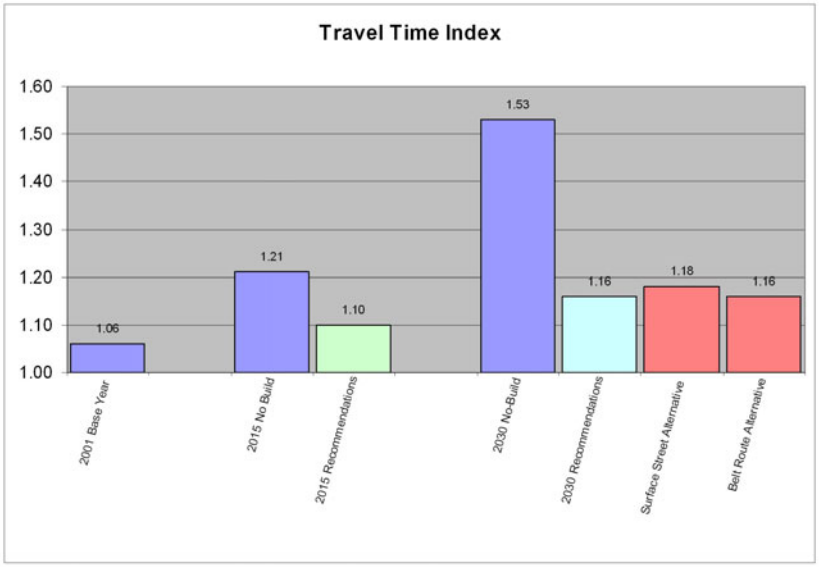
- TTI = 1.16
- All 2015 recommended projects are assumed
- Level of service is based on 2030 recommended project list
- Population and employment numbers are based on city-revised population and employment numbers.
  - 2030 Population = 261,729
  - 2030 Employment = 62,804



# Alternative Projects: Travel Time Index

Travel Time Index (TTI) is a measure of congestion that compares peak congestion conditions to free-flow conditions.

The closer the TTI is to 1.0, the more free-flow conditions reflect peak hour conditions and the less congestion there is during the peak period.






**2015 Recommended Roadway Project List**

| Number | Street | Limits | | Project | Street Classification | Length | Project Cost (Millions) | Number of Travel Lanes |
|---|---|---|---|---|---|---|---|---|
| | | Begin | End | | | (miles) | | |
| 1 | SR-92 | I-15 Interchange | 4800 West | Widen to 130' ROW | Principal Arterial | 6.23 | $58.70 | 6 |
| 2 | State Street | Pleasant Grove Blvd | 100 East Am. Fork | Widen to 130' ROW | Principal Arterial | 1.51 | $10.20 | 6 |
| 3 | Pleasant Grove Blvd | I-15 Interchange | 2000 West | Widen to 130' ROW | Principal Arterial | 0.50 | $3.40 | 6 |
| 4 | Pleasant Grove Blvd | 2000 West | State Street | Widen to 106' ROW | Principal Arterial | 1.10 | $5.80 | 4 |
| 5 | Point of the Mountain Interchange | I-15 | Redwood Road | Build new Interchange | Principal Arterial | Outside Study Area | | |
| 6 | 1200 West | SR-92 | I-15 Interchange | Widen to 106' ROW | Minor Arterial | 1.36 | $7.30 | 4 |
| 7 | 1200 East | SR-92 | State Street | Widen to 84' ROW | Minor Arterial | 3.05 | $10.60 | 2 |
| 8 | 4800 West | SR-92 | State Street | Widen to 106' ROW | Minor Arterial | 4.34 | $30.09 | 4 |
| 9 | 2600 North | Canyon Rd | 1100 East | Widen to 106' ROW | Major Collector | 1.41 | $7.60 | 4 |
| 10 | 2000 West / 700 North | State Street | State Street | Widen to 106' ROW | Minor Arterial | 2.91 | $15.80 | 4 |
| 11 | Battlecreek Dr. | State Street | Main Street | Widen to 106' ROW | Major Collector | 0.34 | $1.80 | 4 |
| 12 | Canyon Road | SR-92 | State Street | Intersection Improvements | Minor Arterial | 5.00 | $1.25 | 2 |
| 13 | 9800 North | SR-74 | 4800 West | New Construction 83' ROW | Collector | 0.82 | $3.70 | 2 |
| 14 | 700 North Am. Fork | 100 East | 200 East | New Construction 83' ROW | Local | 0.14 | $0.58 | 2 |
| 15 | 1000 South PG | Locust Ave | 1150 East | New Construction 83' ROW | Collector | 0.55 | $2.30 | 2 |
| 16 | 400East / 800 North Lindon | 400 North | 1200 East Lindon | New Construction 83' ROW | Collector | 0.89 | $3.96 | 2 |
| 2015 Roadway Project Total Cost | | | | | | | $163.08 | |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## 2015 Recommended Transit Project List

| Number | Project | Begin | End | Location | Existing Traffic | Project Cost (Millions) | Funding |
|---|---|---|---|---|---|---|---|
| 1 | Bus Service Expansion | Added Bus Lines County Wide including new lines in the study area | | System Wide | 24,632 | $81.50 | Fed / State / Local |
| 2 | Bus Frequency Expansion | More Buses per line County Wide including new lines in the study area | | System Wide | 16,161 | | Fed / State / Local |
| 3 | Added Park and Ride Lot | I-15 Interchange | 1600 North in Orem | Near I-15 Ramp | 17,941 | $0.50 | Fed / State / Local |
| 4 | Added Park and Ride Lot | I-15 Interchange | Main Street (American Fork) | Near I-15 Ramp | 8,688 | $0.50 | Fed / State / Local |
| 5 | Added Park and Ride Lot | I-15 Interchange | 1200 West in Lehi | Near I-15 Ramp | | $0.50 | |
| 6 | Added Park and Ride Lot | I-15 Interchange | SR-92 | Near I-15 Ramp | 1,723 | $0.50 | Fed / State / Local |
| 7 | Added Park and Ride Lot | 600 East | 1500 South (American Fork) | Near planned Mountain View Cor. | 16,595 | $0.50 | Fed / State / Local |
| 2015 Transit Project Total Cost | | | | | | | $84.00 |



## 2030 Recommended Roadway Project List

| Number | Street | Limits | | Project | Street Classification | Length (miles) | Project Cost (Millions) | Number of Travel Lanes |
|---|---|---|---|---|---|---|---|---|
| | | Begin | End | | | | | |
| 1 | SR-92 | I-15 Interchange | 4800 West | Add Grade-separated Structures | Principal Arterial | 6.23 | $44.50 | 6 |
| 2 | SR-74 | I-15 Interchange | Highland | Widen to 106' ROW | Minor Arterial | 2.56 | $13.82 | 4 |
| 3 | I-15 | American Fork | I-15 Interchange | Added or Moved Interchange | Freeway | 0.50 | $16.30 | Varies |
| 2030 Roadway Project Total Cost | | | | | | | $74.62 | |

## 2030 Recommended Transit Project List

| Number | Project | Limits | | Location | Length (miles) | Project Cost (Millions) | Funding |
|---|---|---|---|---|---|---|---|
| | | Begin | End | | | | |
| 1 | Added Commuter Rail | Salt Lake County | Provo Hub | West Side of I-15 Corridor | 23.00 | $300.00 | Fed / State / Local |
| 2030 Transit Project Total Cost | | | | | | | $300.00 |

| Total cost of all 2015 and 2030 Roadway and Transit Project Costs | $621.70 |
|---|---|

*Note: Projects outside of the study area are generally based on the MAG and WFRC Long Range Transportation Plan and latest planning assumptions. In particular, projects assumed outside of the study area include the following:*

- *Mountainview Corrirdor "Arterial Alternative" through Lehi,*
- *a new I-15 Interchange at Point of the Mountain,*
- *I-15 widened to 6 lanes in each direction through the Study area,*

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# Appendix E:
# Congestion Management System

**To be completed and inserted as part of the quadrant studies project in April 2006**

# Appendix F:
# Corridor Preservation

**To be completed and inserted as part of the quadrant studies project in April 2006**