

# Texas State Highway 130 Proposed Routes



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Executive Decision Making  
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# Executive Summary

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Texas State Highway 130 (SH 130) is a proposed, central Texas controlled access, transportation facility planned to extend from Interstate Highway 35 (IH 35) north of Georgetown in Williamson County to Interstate Highway 10 (IH 10) near Seguin in Guadalupe County, a distance of approximately 90 miles.

The purpose of SH 130 is to relieve congestion on IH 35 and other major transportation facilities within the Austin to San Antonio corridor, improve mobility, and increase accessibility to important public facilities.

Continued population growth, private development initiatives, and an anticipated increase in trade-related trucking activity, indicate that the corridor congestion problems will continue to worsen unless some action is taken. SH 130 is intended to address these traffic concerns<sup>1</sup>.

Many alternative routes were initially considered. All but eight were dismissed because they either failed to meet the purpose of the project or they did not offer improvements over similar alignments and were considered redundant. The ninth alternative is to reject SH 130 altogether. All nine alternatives were evaluated with respect to how well they meet the stated purpose of SH 130, along with their impact on the local communities and environment.

The estimated cost of SH 130, including right-of-way acquisition and construction, ranges from about \$848 million to \$916 million, depending on the selected route.

The comparison of alternatives supports Alternative Route 3 as the preferred route, as it best relieves congestion and improves mobility while minimizing adverse impacts.

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<sup>1</sup> Texas Department of Transportation, Texas Turnpike Authority Division

# Background

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Texas State Highway 130 (SH 130) is a proposed, controlled access highway planned to extend through central Texas, from Interstate Highway 35 (IH 35) north of Georgetown in Williamson County to Interstate Highway 10 (IH 10) near Seguin in Guadalupe County, a distance of approximately 90 miles.

The purpose of SH 130 is to relieve congestion on IH 35 and other major roadways within the Austin to San Antonio corridor. The following factors have contributed to the need for SH 130:

1. The population of the Austin-San Marcos metropolitan area has increased from 846,227 people in 1990 to an estimated 1,079,584 people in 1998. This constitutes a 28% increase in eight years<sup>2</sup>.
2. The North American Free Trade Agreement (NAFTA) has allowed for an increase in trucks travelling the North-South route. IH 35 is a primary trucking route, running from Canada, through central Texas to the Mexican border.
3. The Austin area has become an alternative location for high tech businesses preferring not to locate in Silicon Valley. Austin has drawn many semi-conductor and biotechnology companies, along with over 450 software development companies and is commonly referred to as "Silicon Hills".

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<sup>2</sup> Texas State Data Center and the U.S. Bureau of the Census

Several solutions are being pursued to alleviate the congestion problem, including:

1. IH 35 and other main routes (US 183, SH 171, SH 290), are undergoing major upgrades.
2. Long-range plans include new investments in the public transit infrastructure. A light-rail system is currently under consideration.
3. Programs and policies are being evaluated to help curb travel demand. These include:
  - Remote offices (working from home)
  - Flex start and stop times to avoid “rush hour” traffic
  - Flex work weeks, such as four, ten hour day, work weeks
4. Programs are being established to encourage high occupancy vehicle (HOV) travel.

Even with these improvements and programs, long-range traffic forecasts<sup>3</sup> show there will remain a high level of congestion on IH 35 and other major routes.

Consequently, SH 130 has been proposed to address the congestion problems. The route is broken into three primary segments – northern, central and southern. Each of these segments has two possible alternate routes – one called the “eastern route” and the other, the “western route”.

As a homeowner directly affected by some of the alternative routes, Mary Magnuson attended several public hearings and community meetings to discuss the impact of SH 130 on the local communities. David Kopp, Director, Texas Turnpike Authority Division (TTA) of the Texas Department of Transportation (TxDOT) solicited feedback from homeowners and business owners which will be included in his final recommendations to be given later this year.

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<sup>3</sup> TxDOT’s Major Investment Study

# Alternatives

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There are eight “build” alternatives and one “no-action” alternative where SH 130 would not be built, currently under consideration. The eight “build” options offer an eastern or western alternative for each of the northern, central and southern sections:

- Alt 1 – West, West, West route
- Alt 2 – East, East, East route
- Alt 3 – West, West, East route
- Alt 4 – West, East, West route
- Alt 5 – East, East, West route
- Alt 6 – East, West, West route
- Alt 7 – East, West, East route
- Alt 8 – West, East, East route
- Alt 9 – “no-action” option

SH 130 will impact the community and local environment in multiple ways. Land must be converted to SH 130, farmland will be lost, neighborhoods will be impacted, homes and businesses will need to be relocated. Parks and community facilities will also be lost or impacted, along with local wildlife. SH 130 will cross several rivers, creeks and streams that could potentially have adverse effects on the quality of surface water.

Traffic patterns have been studied to determine an estimate of how much traffic will be pulled from IH 35 to SH 130 for each route<sup>4</sup>.

Figure 1 shows a map of the area in which the route alternatives are being evaluated.

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<sup>4</sup> TxDOT’s Major Investment Study through year 2020

# PROPOSED STATE HIGHWAY 130

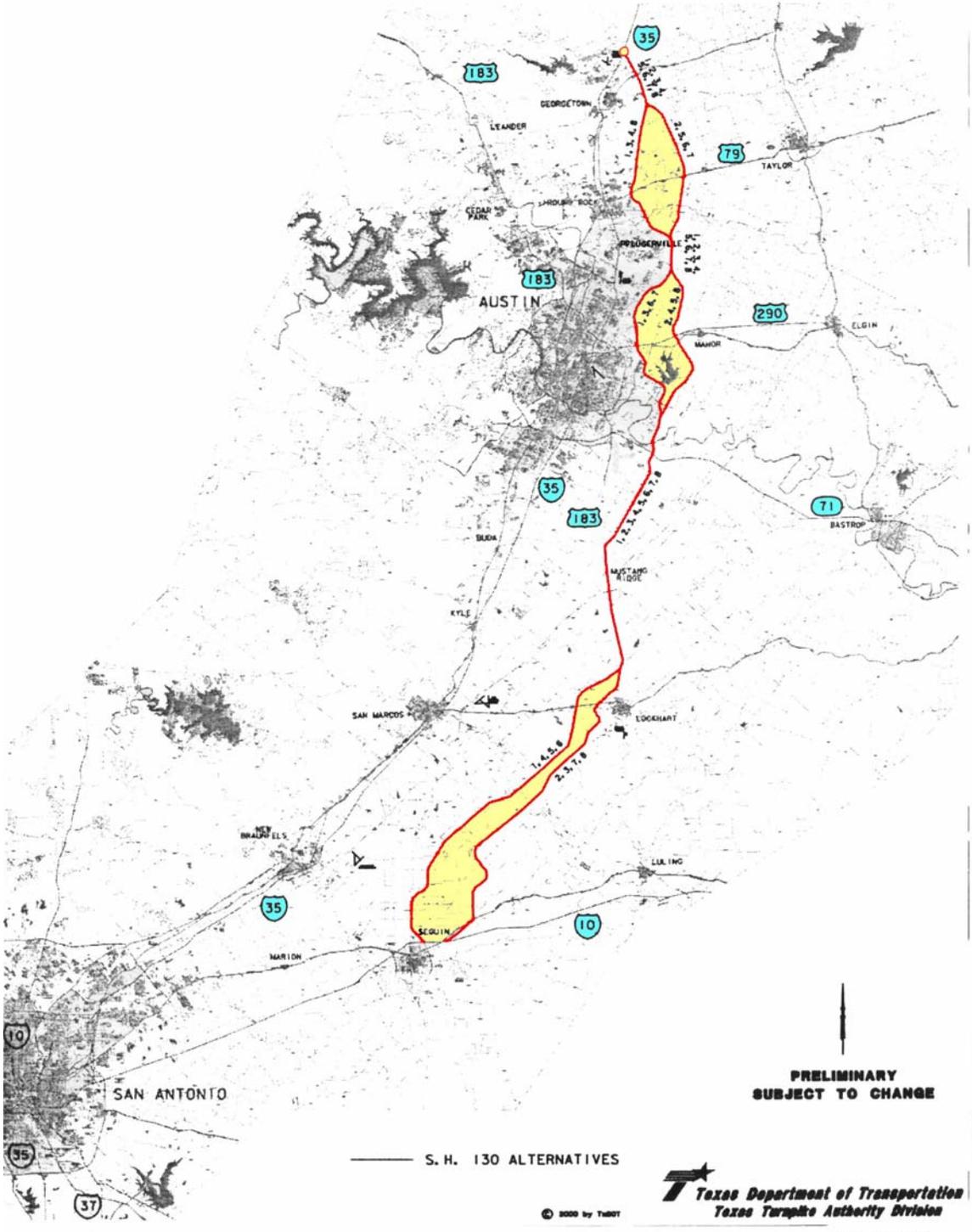


Figure 1. Map of Austin to San Antonio, with SH 130 alternate routes shown in red

## Advantages and Disadvantages

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<b>Alternatives</b>	<b>Advantages</b>	<b>Disadvantages</b>
Alt 1 – W, W, W	Highest traffic utilization Highest Cost/VMT	Highest total cost Highest adverse impact on communities and environment
Alt 2 – E, E, E	Lowest total cost 3 <sup>rd</sup> lowest adverse impact on communities Lowest adverse impact on environment	Lowest traffic utilization Lowest Cost/VMT
Alt 3 – W, W, E	Highest traffic utilization Highest Cost/VMT	Highest total cost 3 <sup>rd</sup> highest adverse impact on communities Highest adverse impact on environment
Alt 4 – W, E, W	Lowest adverse impact on communities	3 <sup>rd</sup> highest total cost 4 <sup>th</sup> lowest traffic utilization 2 <sup>nd</sup> lowest Cost/VMT
Alt 5 – E, E, W	2 <sup>nd</sup> lowest total cost Lowest adverse impact on environment	2 <sup>nd</sup> lowest traffic utilization Lowest Cost/VMT 3 <sup>rd</sup> highest adverse impact on communities
Alt 6 – E, W, W	2 <sup>nd</sup> lowest adverse impact on environment	2 <sup>nd</sup> highest total cost 6 <sup>th</sup> lowest traffic utilization 3 <sup>rd</sup> lowest Cost/VMT 2 <sup>nd</sup> highest adverse impact on communities 3 <sup>rd</sup> highest adverse impact on environment
Alt 7 – E, W, E	2 <sup>nd</sup> lowest adverse impact on communities and environment	2 <sup>nd</sup> highest total cost 5 <sup>th</sup> lowest traffic utilization 3 <sup>rd</sup> lowest Cost/VMT
Alt 8 – W, E, E	3 <sup>rd</sup> lowest total cost 2 <sup>nd</sup> lowest adverse impact on communities	3 <sup>rd</sup> lowest traffic utilization 2 <sup>nd</sup> lowest Cost/VMT
Alt 9 – “no-action”	Zero adverse impact to communities and environment	Zero traffic utilization

# Analytic Hierarchy Process

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The Analytic Hierarchy Process (AHP), along with the Expert Choice decision-making software package, was utilized to assess this problem. The first step was to decompose the problem, by determining the goal, objectives, and alternatives. The second step was to establish priorities. The final step was to synthesize the information in order to make a judgment as to the overall preference of the alternatives.

## **STEP 1: Decompose the Problem**

### **Goal:**

Determine the best route for Texas State Highway 130.

### **Objectives:**

The objectives are the key factors that will have a positive and/or negative impact on traffic congestion, the local communities, and the environment<sup>5</sup>.

**Cost** – Minimize the total cost of proposed SH 130 (right-of-way acquisition and construction).

The cost primarily depends on how much land must be acquired, and how many homes and commercial properties must be relocated.

**Traffic** – Maximize the number of daily vehicle miles of travel (VMT) over SH 130.

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<sup>5</sup> Specific objective data derived from the Environmental Impact Statement (EIS), Federal Highway Administration, in conjunction with the Texas Department of Transportation.

The TxDOT conducted a study called the Major Investment Study, containing projected traffic volumes to the year 2020. From this, the daily VMT was determined and utilized for this project.

**Cost per Vehicle** – Optimize the cost per daily vehicle miles of travel (VMT) on SH 130.

More important than the overall cost, is the cost per VMT. This reflects the efficiency of the proposed routes.

**Community** – Minimize adverse community impacts:

**Farms** – Minimize the amount of farmland converted to SH 130.

Constant growth in this area continues to threaten local farmers and ranchers.

**Social** – Minimize adverse impacts, such as noise, visual intrusion, and increased traffic from SH 130.

Where appropriate, scenic easements will be built to reduce noise and improve visual aesthetics.

**Residential Relocations** – Minimize the number of residential homes required to be relocated.

**Commercial Relocations** – Minimize the number of commercial buildings required to be relocated.

**Parks** – Minimize the number of parks and community facilities displaced.

All homeowners, business owners and non-profit organizations that are displaced, will be assisted through the TxDOT Relocation Assistance Program.

**Environment** – Minimize adverse impact to the local environment, such as water quality, loss of wetlands, vegetation and wildlife.

All proposed routes are in compliance with guidelines set forth by the Texas Natural Resource Conservation Committee (TNRCC), the Federal Emergency Management Agency (FEMA) Flood Plain Regulations and Executive Order # 12898.

**NOTE:**

Several remaining issues still need to be resolved, including:

1. A Storm Water Pollution Prevention Plan (SW3P) will be required to minimize impacts to ground water quality, in compliance with the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination Prevention Plan.
2. A Wetland Permit, as well as possible coordination with the U.S. Army Corps of Engineers (USCE), will be required for stream crossings in accordance with Section 404 of the Clean Water Act.
3. A Coast Guard permit may be required for the proposed bridge crossing the Colorado River.

All alternative routes will be equally affected by these issues; therefore, they will not affect the decision-making process.

**Alternatives:**

As mentioned earlier, eight alternatives were determined to meet the purpose of SH 130. A ninth, “no-action” option was also assessed.

## STEP 2: Establish Priorities

In order to establish priorities, the AHP pairwise comparison process was used. Using a set of verbal judgments<sup>6</sup> (extreme, very strong, strong, moderate, equal and in-between judgments such as moderate to strong), comparisons on relative importance were made between each objective in relation to the goal and between each sub-objective in relation to its parent objective.

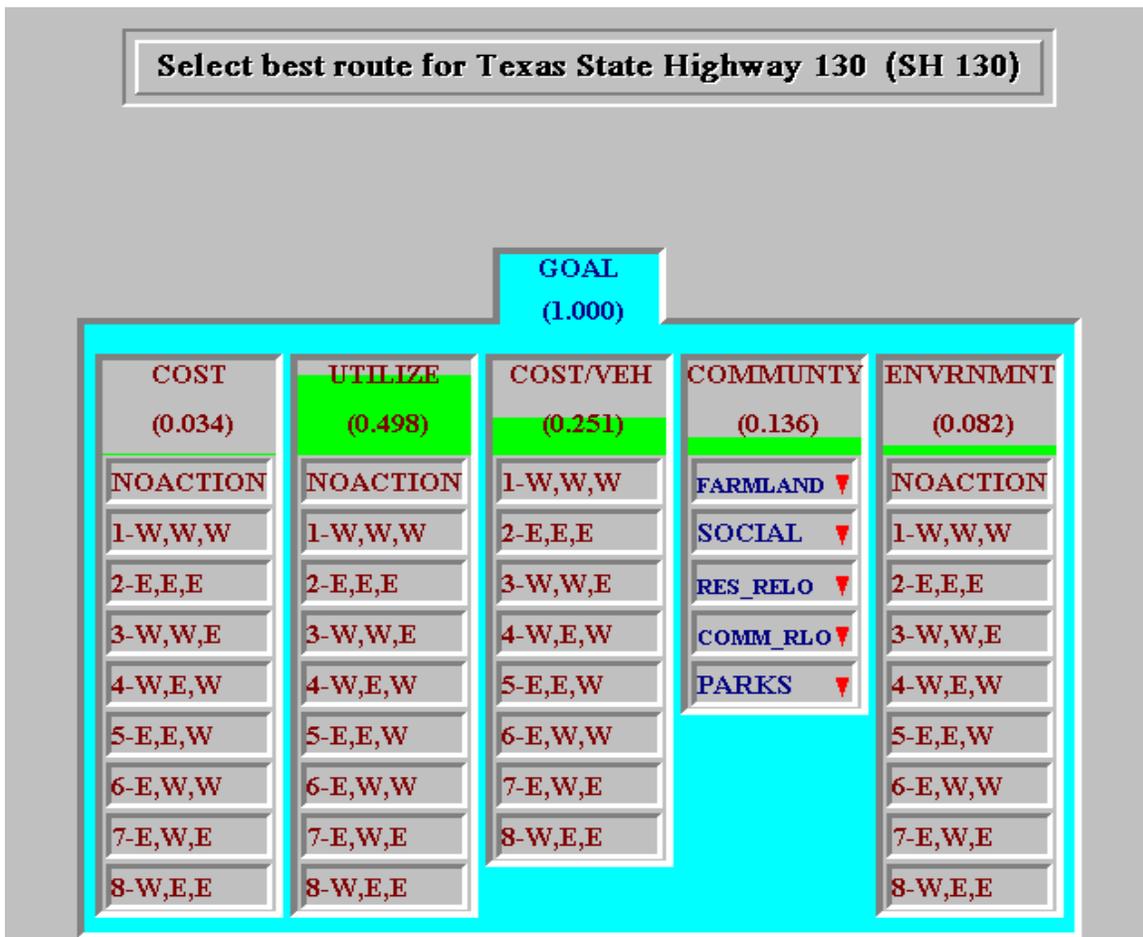


Figure 2. Basic Model from Expert Choice Software

<sup>6</sup> Expressed verbally, numerically, or graphically

Figure 3 shows how judgments were made between objectives. Traffic utilization is moderately more preferable than cost per VMT. Weights were derived from these comparisons.

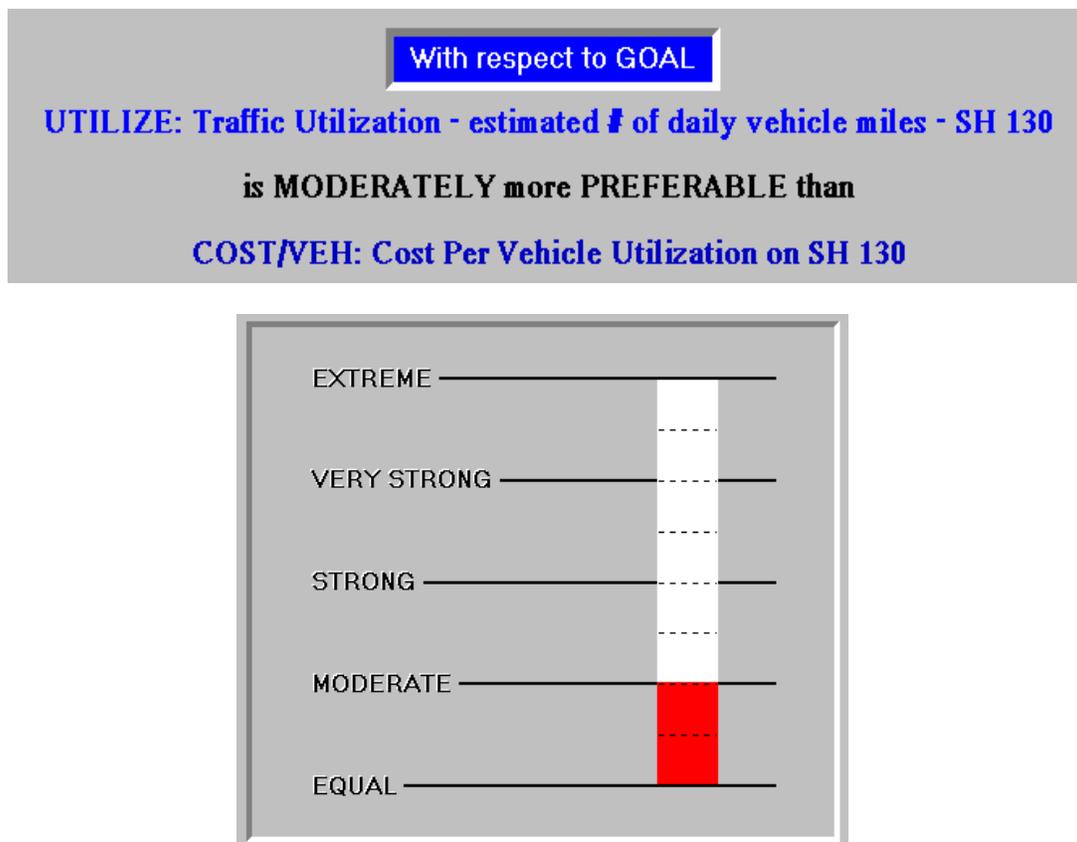


Figure 3. Pairwise Comparisons of Objectives

Next, comparisons were made between alternative routes, with respect to each objective and sub-objective. Figure 4 shows how judgments were made between alternative routes. With respect to cost, route 2 is extremely more preferable than route 1. Once again, weights were derived from these comparisons.

**With respect to COST < GOAL**

**2-E,E,E: Alt 2 - East, East, East Route**  
**is EXTREMELY more PREFERABLE than**  
**1-W,W,W: Alt 1 - West, West, West Route**

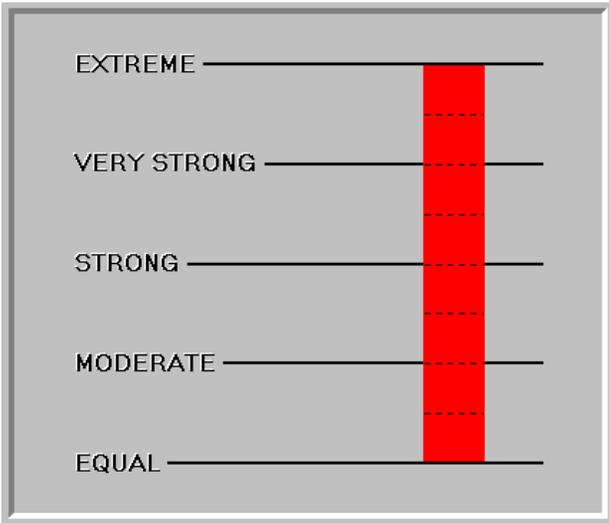


Figure 4. Pairwise Comparisons of Alternatives, with respect to objectives

Based on the derived weights, Figures 5 and 6 show the objectives in order of priority. Since the primary purpose of SH 130 is to draw traffic from other highways, it is appropriate that traffic utilization has the greatest weight. Second in importance is the overall Cost per VMT. Third and fourth are community and environment impact, while total cost has the lowest priority.

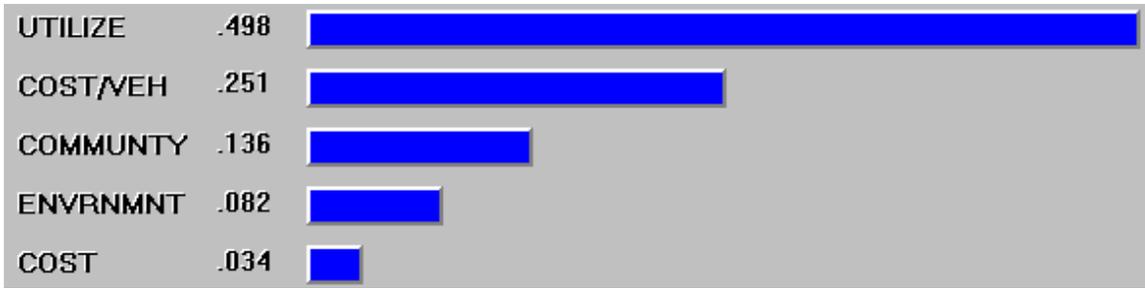


Figure 5. Priorities of Objectives

For the Community objective, local social impact has the greatest importance over all other community objectives. Second in importance is residential relocations, and third is loss of farmland. The fourth priority is commercial relocations. Loss of parks and public facilities has the lowest priority.

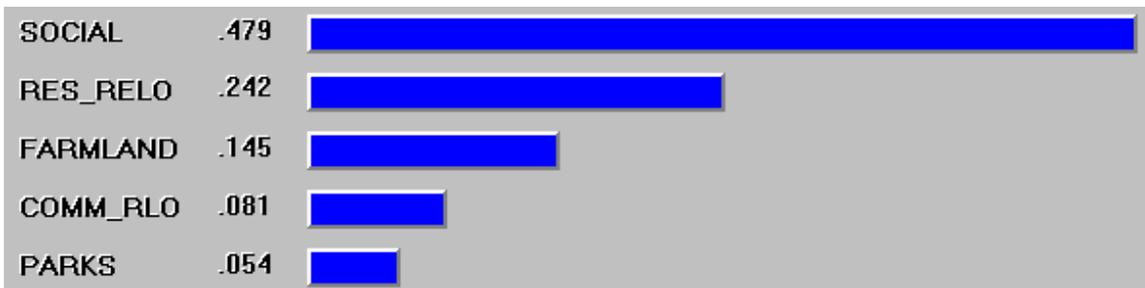


Figure 6. Priorities of Community Sub-Objectives

These priorities are next used to determine the best alternative route. This step is called “synthesis”.

### **STEP 3: Synthesis**

Once all judgments were completed, Expert Choice synthesized the information to determine the overall preference of the alternatives.

Figure 7 shows the results of the synthesis, ranked from most preferable to the least.

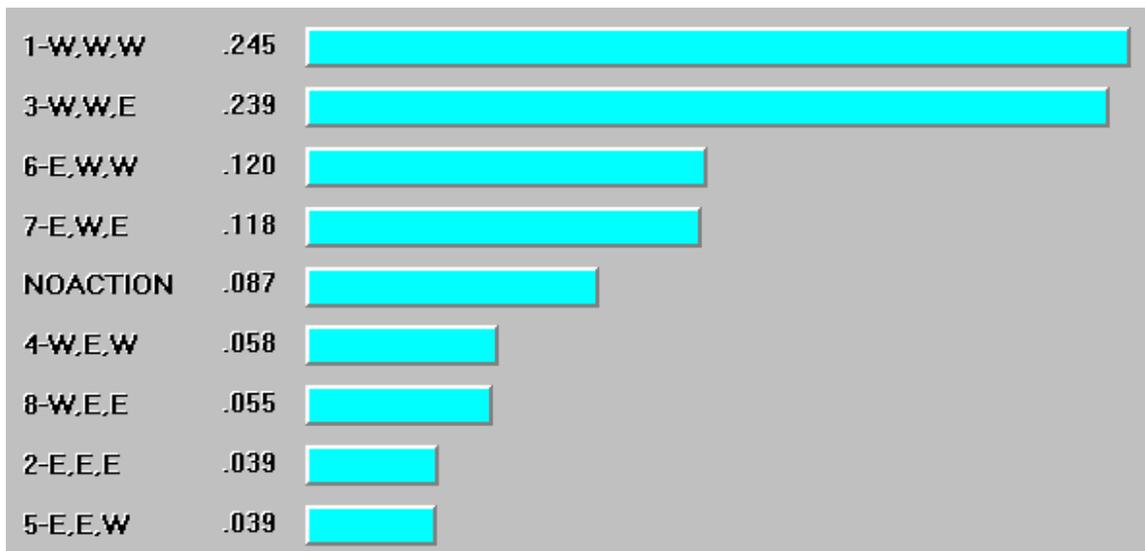


Figure 7. Synthesized Results for Alternatives

Figure 8 maps the derived weight of each alternative route against the derived weight of each objective. This way, we can easily see which alternative route is more preferable for a single objective, and which has the overall preference.

The “no-action” alternative is most preferable when considering cost, community and environmental impacts, but is least preferable when considering traffic utilization and cost per VMT. Route 1 is least preferable for the community and environment objectives, but is most preferable for the most important objectives – traffic utilization and cost per vehicle mile. Consequently, using our judgments for the objectives, Route 1 has the greatest overall preference.

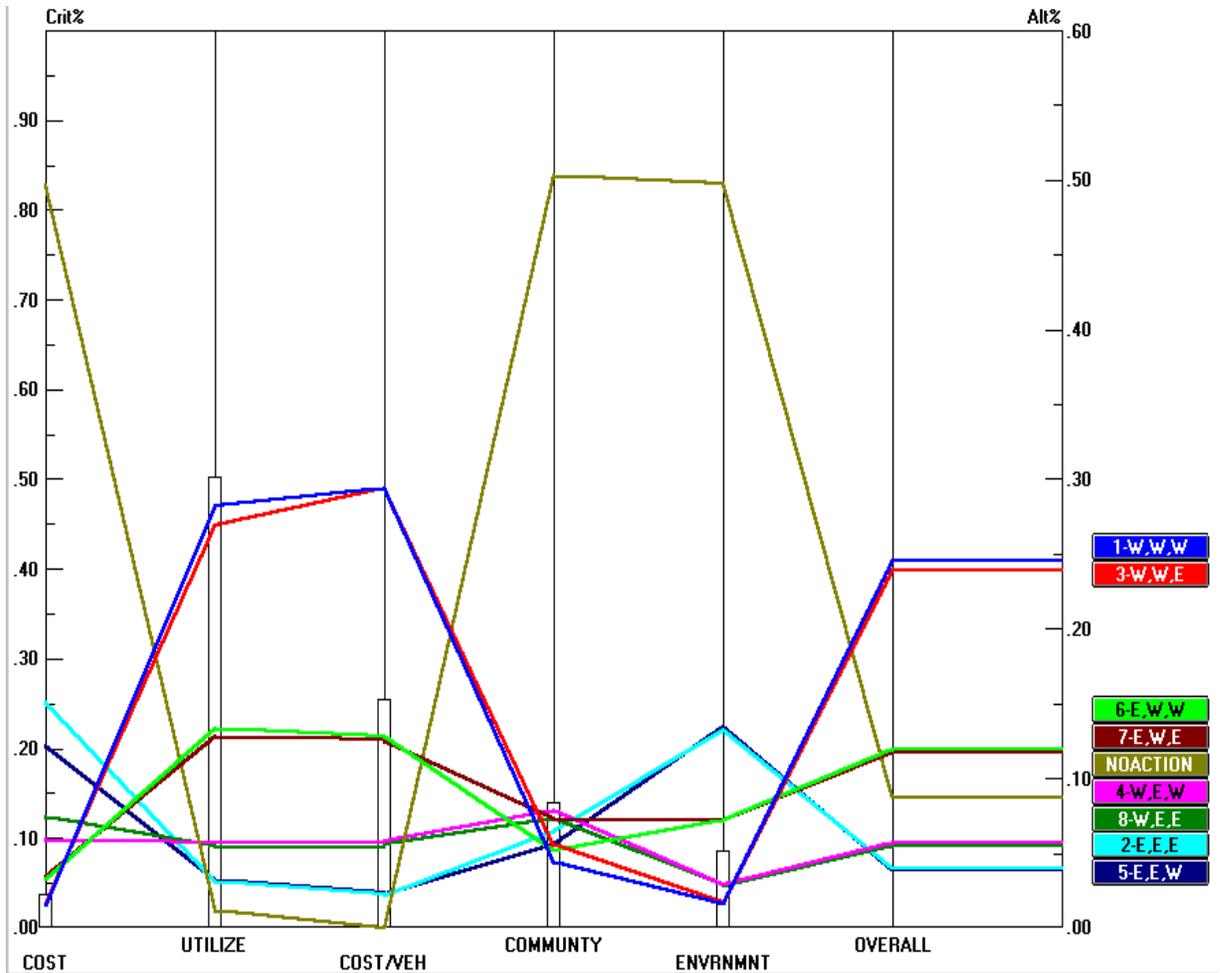


Figure 8. Sensitivity – Performance Graph

Closer inspection of the alternative routes reveals that there are only moderate differences in the routes of the southern section. The main differences are in the northern and central sections. The performance graph reflects this by showing the routes in pairs. Routes 1 and 3 are similar, as are Routes 6 and 7, Routes 4 and 8, and Routes 2 and 5. The only difference in each of these pairs is their southern section route.

The priority of traffic utilization would have to be reduced to about 13% in order for Route 3 to be the preferred route. Also, if cost is increased to about 37%, the “no-action” option becomes the preferred alternative.

# Iteration

Our findings and recommendation derived from this study were presented to Mr. David Kopp, Director, TTA. Mr. Kopp did not agree with our recommendation. Upon inspection of our judgments, Mr. Kopp stated that the amounts of traffic utilization for routes 1 and 3 are so close, that he considers them to be equally preferable. With this information, we went back and updated the decision model to reflect the new judgment.

Figure 9 shows the new sensitivity – performance graph. By judging Route 3 to be equally preferable to Route 1 with respect to traffic utilization, the outcome changes to make Route 3 slightly more preferable than Route 1.

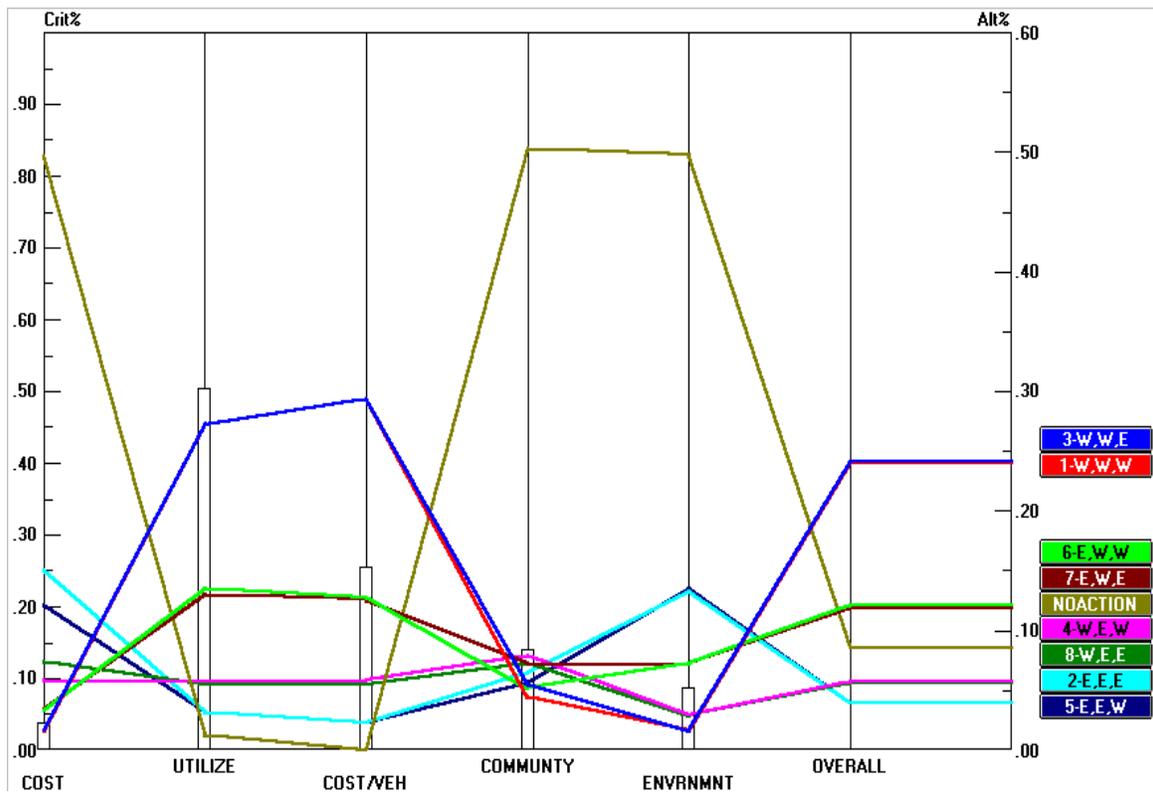


Figure 9. Updated Synthesized Results

## **Recommendation**

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Based on our final analysis using the AHP process, we recommend alternate Route 3, a west, west, east route, as the best alternative.

## **Conclusions**

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After seeing the revised decision model for Texas State Highway 130, Mr. Kopp was completely satisfied with the decision process and our final recommendation. He agreed that the main difference between Route 1 and Route 3 is the adverse impact to the local communities. All other objectives are equally preferable for these two routes.

Final selection of the best alternative route will be made by the TxDOT and Federal Highway Administration (FHA) later this year, or early 2001.

## References

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