MERCED COUNTY ASSOCIATION OF GOVERNMENTS (MCAG)

SR 99 – SR 165 PROJECT STUDY REPORT (PSR)

ALTERNATIVES SELECTION DECISION MATRIX (ASDM) PROCESS

DRAFT (SEPTEMBER 2009)

Prepared By

omni·means
ENGINEERS · PLANNERS

MATRIX EVALUATION

The matrix evaluation is a screening process designed to provide an objective method to compare the different alternative transportation improvement concepts developed for this study. Omni-Means has developed the *Alternative Selection Decision Matrix* (ASDM) process to formalize and simplify this procedure.

The ASDM provides a means to identify and either quantitatively or qualitatively evaluate the advantages and disadvantages of each of the alternative transportation improvement concepts. The ASDM provides a means to "weigh" the importance of each criterion, so that the advantages and disadvantages of each alternative can be compared and ranked in relation to each other. These rankings allow the identification of preferred alternative(s), taking into consideration the technical and social concerns of the community.

Each alternative likely meets or exceeds the threshold for some criterion, and fall short on others. In the end, this ASDM procedure, based upon the criterion importance weighting and scoring, determines the relative merits of each alternative. The ultimate purpose of the ASDM is to provide direction on, and documentation of, the selection of alternatives to be studied further.

The overall ASDM procedure involves a multiple-step process:

1) Purpose and Need
   a. Identify “Evaluation Criteria”
   b. Fatal Flaw Conditions
2) Determine "Relative Weighing" for each evaluation criteria
3) Score each evaluation criteria for each alternative
4) Calculate the final weighted scores for each alternative

The following discussion provides a more detailed description of the process.

1. PURPOSE AND NEED

The first step in the ASDM process is to develop the Purpose and Need that is used develop the “Evaluation Criteria” for comparing one alternative to another. The Purpose and Need has been developed and concurred with by the Project Development Team (PDT), the Citizens Advisory Committee (CAC) and Policy Committee (PC), and has been approved by the member Boards and Councils. The Purpose and Need for the SR 99 – SR 165 PSR project is as follows:

Need:
There is a need to improve current traffic operations and reduce traffic congestion experienced along SR 165 (also referred to as Lander Avenue). Various highway segments including the SR 165 bridge over the Merced River and intersections currently experience AM and/or PM peak hour Levels of Service “E/F”. There is a need to reduce truck impacts on traffic operations on SR 165. Regional, inter-regional and local trucks which currently represent between 10-percent (average condition) to 20-percent (during harvest season) of all traffic traveling on SR 165 contribute to congested traffic conditions including through the community of Hilmar. There is a need to improve safety along SR 165. Highway segments currently experience actual accident rates that are higher than the corresponding average accident rates from the intersection with SR 140 to north of Bradbury Road. There is a need to design traffic circulation improvements on or adjacent to SR 165 that will support continued growth in local general plans, community plans and specific plans, combined with future increases in regional and inter-regional traffic to the year 2035 (future growth). Future growth will further increase congestion along SR 165 and lead to increased congestion on both the adjacent county and city roadway systems. There is also a need to design traffic circulation improvements, including improved freeway access between SR 99 and the local roadway system that will support future growth.

Purpose:
The primary purpose of this project is to improve safety and traffic operations and reduce current and future congestion along SR 165, including congestion within the community of Hilmar, and to improve freeway access between SR 99 and the local roadway system to support continued growth in local general plans, community plans and specific plans.

Secondary purposes of the project include:

- Facilitate goods movement including the movement of agricultural products from field to processing plant and from processing plant to market.
- Widen, replace or relocate the existing SR 165 Bridge over the Merced River.
- Move regional and inter-regional truck traffic around the community of Hilmar.
- Improve local traffic circulation within the project study area.
- Support continued growth in the Merced County, Stanislaus County and City of Turlock General Plans; the communities of Hilmar and Delhi Community Plans; and the City of Turlock's SE Turlock Specific Plan.
- Implement long-term circulation system solutions that can be built in phases.

a. Identify Evaluation Criteria

Based on the Project's "Purpose", criteria are identified to use as a test to determine if individual alternatives meet the purpose and need of the project. These evaluation criteria include the following.

1. Congestion and Traffic Operations

This criterion quantifies the potential reduction in traffic congestion and improvements in traffic operations associated with each of the alternatives so that the "relative" operating merits of the alternatives can be assessed from a traffic impact standpoint. Congestion and traffic operations are generally quantified through the determination of "Level of Service" (LOS). LOS is a qualitative measure of traffic operating conditions, whereby a letter grade "A" through "F" is assigned to an intersection, ramp junction or roadway segment representing progressively worsening traffic conditions.

The project study area extends through multiple jurisdictions each with their own acceptable LOS standard. The following table provides the applicable LOS standard by jurisdiction. The applicable LOS standard is generally taken as the minimum acceptable operating standard for study transportation facilities within the ASDM evaluation process.

LEVEL OF SERVICE (LOS) STANDARD BY JURISDICTION

Agency	LOS Standard	LOS Application
Caltrans (2025 Concept LOS)		
SR 99:	C	Bradbury Rd. to Lander Ave. (SR 165) Interchanges (Rural)
	D	North of Lander Ave. (SR 165) Interchange (Urban)
SR 165:	D	Entire Length
Merced County (GP)	C	Rural Areas
	D	Specific Urban Development Areas such as Hilmar and Delhi
Stanislaus County (GP)	C	On all roadways
City of Turlock (GP)	C	General standard with exceptions for city facilities not located within project study area

GP – General Plan

2. Safety

This criterion evaluates the potential improvement in traffic safety associated with each of the alternatives through the quantification of the potential accident cost savings. Potential accident cost savings can be calculated using "Collision Data on California State Highways" published by Caltrans which includes basic average accident rates for various highway, intersection and ramp junction types in conjunction with Caltrans "California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C)" that, among the model outputs, calculates accident cost savings.

3. Improved Freeway Access between State Route 99 (SR 99) and the Local Roadway System

Within the study area, access between SR 99 and the local roadway system is primarily provided at the local freeway interchanges with SR 165 (Lander Avenue) and Golden State Boulevard and to a lesser extent at W. Main Street and Bradbury Road. For the various circulation alternatives, this criteria considers whether improved access between State Route 99 (SR 99) and the local roadway system can be provided by either improving access currently provided at the existing interchanges within the study area or if a new interchange (or interchanges) will be required.

4. Goods Movement – Local, Regional and Interregional

SR 165 is north/south route connecting Interstate 5 (I-5) south of Santa Nella with State Route 99 (SR 99) in the City of Turlock and provides a connection for regional traffic including heavy trucks between I-5 and SR 99. SR 165 also carries a large amount of agricultural truck traffic needed to transport the significant agricultural resources produced along this corridor from field to processing plant and from processing plant to market. SR 165 also serves as the primary north/south arterial through the community of Hilmar. The highway traverses past schools (Elim Union Elementary School and Hilmar High School), residences and through the central business district. Approximately 10% of the traffic traveling on SR 165 is truck traffic with trucks increasing to approximately 22% of all traffic on this route during the harvest season.

This criterion considers whether an alternative improves the movement of goods along the SR 165 corridor. This criterion also considered whether an alternative has the potential to reduce ~~while reducing~~ truck traffic through the community of Hilmar.

5. Local Traffic Circulation within Project Study Area

This criterion considers the potential effects of an alternative on local traffic circulation within the project study area. Factors that could be considered include:

- Increased traffic congestion on existing roadways (potentially negative impact depending on the level of increased congestion).
- Reduced traffic congestion on existing roadways (potentially positive impact depending on the reduction in congestion – example would be SR 165 through Hilmar).
- Improved traffic circulation and connectively within the broad study area.

6. Coordination with Community, Specific and General Plans

This criterion considers whether an alternative is consistent with the Policies, Goals, and Objectives within the various Community Plans (Hilmar and Delhi), Specific Plans (SE Turlock) and General Plans (Merced County, Stanislaus County and City of Turlock).

7. Constructability / Phasing

This criterion considers whether an alternative can be constructed in phases.

The PDT also identified the following secondary criteria to be evaluated with each individual alternative:

8. Environmental Impacts

This criterion considers the potential environmental impacts resulting from each of the alternatives. These could include impacts to cultural resources (historic areas or properties), land use (for noise), farmland

(Williamson Act contracts), FEMA Floodzones (Merced River), Biological Resources (special status species and wetlands) etc.

9. Right of Way Impacts

This criterion considers how each alternative will impact existing farmland as well as developed properties such as residential, industrial, manufacturing and commercial properties within the study area. These impacts are scored based upon amount of right-of-way required, and the number housing units and industrial/ manufacturing/commercial square footage taken as a result of the alternative in question. In addition this criterion considers loss or changes in existing property access for each alternative.

10. Design Standards

Roadway and interchange design standards are set by the local agency, Caltrans and the FHWA. This criteria scores each alternative as it relates to these design standards.

11. Cost

The cost criteria provides a means to include the potential costs for each alternative into the decision making process, and is based upon rough planning level cost estimates. These criteria will be used to score the cost of each alternative in direct relationship to the other alternatives costs. *{Note: The costs presented in the ASDM are planning level estimates for comparative purposes only and do not represent actual costs. Actual project construction costs for each listed component or as totaled may vary substantially and therefore should not be used outside of the context of this comparison.}*

b. Fatal Flaw Conditions

There may be conditions present that would preclude considering a potential project alignment or improvement. Currently, the PDT has identified the following conditions that are to be avoided when considering possible project alternatives. The PDT also noted that the presence of Jurisdictional waters and wetlands could affect alternative selection.

- Land-uses that are classified as 4(f) such as public parks, schools, public golf courses, etc.

2. WEIGHTING EVALUATION CRITERIA

The second step in the ASDM evaluation procedure is determining the "relative importance" by the PDT of each evaluation criteria by assigning a weighted value to each. Certain criterion is typically considered to be more important than others. Therefore, each evaluated criterion is assigned a relative weighted value to indicate its relative importance in relation to the other criteria.

Each of the evaluation criterion is weighted on a scale of one to five. Five is the upper end of the scale and indicates that the evaluated criterion is of extreme importance. One therefore is the low end of the scale and indicates that the evaluation criterion is far less important. Each criterion is weighted independent of the others. For example, multiple criteria may be considered extremely important and each assigned a five. Conversely, other criteria may be considered far less important and assigned lower numbers.

Weighted Scale

Relative Weight Scale	
1	Not Important
2	Less Important
3	Important
4	Very Important
5	Most Important

Each of the evaluation criterions were weighted by each participating agency on the PDT. The following table presents the relative importance identified by agency for each of the criterion and the average score for each criteria. As shown in the table, "Congestion and Traffic Operations" and "Safety" scored the highest and are considered the most important evaluation criterion while "Local Traffic Circulation" and "Design Standards scored the lowest.

Weighting of Individual Evaluation Criteria

Criteria	PDT/Agency Input						Total Score	Average Score	%
	Caltrans	MCAG	StanCOG	Stanislaus County	Merced County	City of Turlock			
Congestion and Traffic Operations	5	5	4	4	5	5	28	4.67	11.34%
Safety	5	5	5	4	5	5	29	4.83	11.74%
Improved Access with SR 99	4	5	4	3	3	5	24	4.00	9.72%
Goods Movement	3	3	3	4	4	3	20	3.33	8.10%
Local Traffic Circulation	2	1	3	2	3	5	16	2.67	6.48%
Coordination with CP, SP and GP	2	3	5	4	5	5	24	4.00	9.72%
Constructability / Phasing	3	4	4	5	3	5	24	4.00	9.72%
Environmental Impacts	5	3	4	4	4	5	25	4.17	10.12%
Right of Way Impacts	4	2	3	3	4	3	19	3.17	7.69%
Design Standards	4	1	4	3	3	3	18	3.00	7.29%
Cost	3	4	3	4	3	3	20	3.33	8.10%
						Total	**247**	**41.17**	**100%**

3. EVALUATION CRITERIA SCORING

The third step in the ASDM procedure is evaluating and scoring each alternative within each evaluation category. The scoring in each evaluation category is then multiplied by the "importance weighting" and totaled with the other categories to arrive at an overall ranking.

Within the ASDM, there may be some multiplication of impacts. For instance, an alternative that impacts a commercial building is scored low for the impact and then receives another low score resulting from the cost increase for the property acquisition. In this way, major impacts are given relatively greater importance within the matrix thereby affecting final scoring totals.

Throughout the ASDM, there are various criteria that are not easily quantifiable but nonetheless represent an important consideration in the Alternative Selection process. For these criteria, a qualitative scale is recommended typically ranging from of one (1) to three (3) where: 1 represents little or no impact (good), 2 represents minor impact (fair), and 3 represents a major impact (poor). Where an Alternative does not address a known issue, the qualitative scale was applied in reverse. In other words if the issue is not addressed then (3) would be applied.

Following is a description for each evaluation criteria currently identified in this report.

1. Congestion and Traffic Operations

Congestion and traffic operations refers to the quantification of traffic impacts associated with each one of the alternatives, so that the "relative" operating merits of the alternatives can be assessed from a traffic impact

standpoint. In order to help score and rank the alternatives based on Levels of Service, a point system is applied to quantify LOS operations for the facilities analyzed. The following table provides an example of how points can be assigned for LOS "A" through "F" based on the applicable LOS standard.

	LOS C Standard	LOS D Standard
Level of Service	**Point Value**	**Point Value**
A	1.0	1.0
B	1.0	1.0
C	1.0	1.0
D	1.5	1.0
E	2.0	2.0
F	3.0	3.0

Note: Lower point value is best.

2. Safety

Safety refers to the potential improvement in traffic safety associated with each of the alternatives through the quantification of the potential accident cost savings. Potential accident cost savings can be calculated using "Collision Data on California State Highways" published by Caltrans which includes basic average accident rates for various highway, intersection and ramp junction types in conjunction with Caltrans "California Life-Cycle Benefit/Cost Analysis Model (Cal-B/C)" that, among the model outputs, calculates accident cost savings. The following table provides an example of how points can be assigned based on whether an alternative results in a decrease in accident costs, no change over base or "No Build" conditions, or there is an increase in accident costs.

Ranking Scale	
1.0	Results in a decrease in accident costs compared to the base or "No Build" condition.
2.0	Results in no change in accident costs compared to the base or "No Build" condition.
3.0	Results in an increase in accident costs compared to the base or "No Build" condition.

Note: Lower point value is best.

3. Improved Freeway Access between State Route 99 (SR 99) and the Local Roadway System

Within the study area, access between SR 99 and the local roadway system is primarily provided at the local freeway interchanges with SR 165 (Lander Avenue) and Golden State Boulevard and to a lesser extent at W. Main Street and Bradbury Road. This criteria considers whether improved access between State Route 99 (SR 99) and the local roadway system can be provided by improving access currently provided at the existing interchanges within the study area, a new interchange is needed in support of a viable SR 165 corridor alternative, or a new interchange not associated with a viable SR 165 corridor alternative is required to improve freeway access between SR 99 and the local roadway system. The following table provides an example of how points can be assigned based on each condition.

Ranking Scale	
1.0	Local access can be improved with SR 99 by improving existing interchange (s).
2.0	New interchange access is needed with SR 99 in conjunction with a viable SR 165 corridor alternative with no additional improvements needed at existing interchanges.
3.0	New interchange access is required that is not associated with a viable SR 165 corridor alternative.

Note: Lower point value is best.

4. Goods Movement – Local, Regional and Interregional

SR 165 is north/south route connecting Interstate 5 (I-5) south of Santa Nella with State Route 99 (SR 99) in the City of Turlock and provides a connection for regional traffic including heavy trucks between I-5 and SR 99. SR 165 also carries a large amount of agricultural truck traffic needed to transport the significant agricultural resources produced along this corridor from field to processing plant and from processing plant to market. SR 165 also serves as the primary north/south arterial through the community of Hilmar. The highway traverses past schools (Elim Union Elementary School and Hilmar High School), residences and through the central business district.

Approximately 10% of the traffic traveling on SR 165 north of the junction with SR 140 is truck traffic with trucks increasing to approximately 22% of all traffic on this route during the harvest season. Regional and interregional truck traffic is estimated to represent approximately 6% of all traffic traveling on this route. Regional and interregional truck traffic is primarily bound to destinations within the City of Turlock or to destinations further north on SR 99. A comparison of travel time and travel distance between SR 140 and SR 99 can be used to estimate how trucks will utilize each alternative alignment. This comparison will also provide an indication of the potential reduction in truck traffic through the community of Hilmar that could be achieved by each alternative alignment. The following table provides an example of how points can be assigned based on whether an alternative results in a reduction in travel time/travel distance ~~and truck traffic through the community of Hilmar~~; there is no change in travel time and/or travel distance over the base or "No Build" conditions ~~but truck traffic would be reduced through the community of Hilmar~~; or, there is an increase in travel time and/or travel distance. ~~such that truck traffic would continue to travel through the community of Hilmar.~~

Ranking Scale	
1.0	The alignment results in a reduction in travel time and/or travel distance. ~~and a reduction in all truck traffic through the community of Hilmar.~~
2.0	The alignment results in no reduction in travel time and/or travel distance over the base or "No Build" condition. ~~but would result in a reduction in truck traffic through the community of Hilmar.~~
3.0	The alignment results in an increase in travel time and/or travel distance. ~~and truck traffic would continue to travel through the community of Hilmar.~~

Note: Lower point value is best.

5. Local Traffic Circulation within Project Study Area

This criterion considers the potential effects of an alignment alternative on local traffic circulation within the project study area. The ranking would consider whether an alternative is expected to both reduce traffic congestion on existing roadways and improve traffic circulation and connectivity within the study area, either reduces traffic congestion on existing roadways or improves traffic circulation within the study area, or provides no relief in traffic congestion on existing roadways nor improves traffic circulation and connectivity within the project study area. The following table provides an example of how points can be assigned based on each condition.

Ranking Scale	
1.0	Reduces traffic congestion on existing roadways and improves traffic circulation and connectivity.
2.0	Either reduces traffic congestion on existing roadways or improves traffic circulation and connectivity.
3.0	Neither reduces traffic congestion on existing roadways nor improves traffic circulation and connectivity.

Note: Lower point value is best.

6. Coordination with Community, Specific and General Plans

This criterion considers whether an alternative is included within the circulation element or sections of an approved various Community Plans (CP – Hilmar and Delhi), Specific Plans (SP - SE Turlock) and General Plans (GP - Merced County, Stanislaus County and City of Turlock); or is consistent in concept with the Policies, Goals, and Objectives within the various CP, SP and GP, or is not included within the circulation element/section and is not consistent with the Policies, Goals, and Objectives within the various CP, SP and GP. The following table provides an example of how points can be assigned based on each condition.

Ranking Scale	
1.0	Alternative is included within an approved CP, SP and GP.
2.0	Alternative is not included but is consistent with Policies, Goals, and Objectives within a CP, SP and GP.
3.0	Alternative is not consistent with Policies, Goals, Objectives within a CP, SP and GP.

Note: Lower point value is best.

7. Constructability / Phasing

This criterion considers two elements; ability to phase and ability to fund an alternative. The following rating scale for this criterion is based upon the anticipated ability to phase elements of the project in multiple phases and the ability to fund each of these phases.

Ranking Scale	
1.0	Alternative can be phased and funding will be available
2.0	Alternative can be phased but funding may be difficult
3.0	Alternative cannot be phased or funding is not available

Note: Lower point value is best.

8. Environmental Impacts

The potential environmental impacts resulting from each of the alternatives will be identified based on existing available data and field observations. These could include number of potential cultural resources sites (historic areas or properties), number of land uses that could be sensitive to noise impacts, acres of farmland impacted (total acres and acres within Williamson Act contracts), presence of FEMA Floodzones (Merced River), and presence of sensitive Biological Resources (special status species and wetlands). The following table provides an example of how points can be assigned based on the number and types of potential environmental impacts.

Ranking Scale	
1.0	No impacts present
2.0	Impacts present that can be mitigated
3.0	Significant impacts present that may be immitigable.

Note: Lower point value is best.

9. Right of Way Impacts

This criterion rates how each alternative will impact existing farmland as well as developed properties such as residential, industrial, manufacturing and commercial properties within the study area. These impacts are scored based upon amount of right-of-way required, and the number housing units and industrial/ manufacturing/commercial square footage taken as a result of each alternative. In addition this criterion considers loss or changes in existing property access for each alternative. The following table provides an example of how points can be assigned based on the number and types of potential right of way impacts.

Ranking Scale	
1.0	Alternative requires minor amount of additional right of way, does not impact existing structures, and results in minimal impacts to existing property access.
2.0	Alternative requires medium amount of additional right of way, has minimal impacts to existing structures, and requires new or relocated access to some properties.
3.0	Alternative requires significant amount of additional right of way, requires acquisition of a number existing structures, and significantly impacts existing property access.

Note: Lower point value is best.

10. Design Standards

Roadway and interchange design standards are set by the local agency, Caltrans and the FHWA. The roadway design standards criteria are divided into State and Local facilities. On the State highway system, it is required that a Design Exception Fact Sheet be prepared and approved for each deviation from a mandatory or advisory standard. Design preferences do not require a separate approval process; however any deviation from a preferred design must be justifiable. Relevant standards that can be quantified in the ASDM include (but are not limited to) the following:

State Facilities:

- Mandatory Design Exceptions
  - Interchange Spacing (< 1 mile)
  - Intersection Spacing (< 400 feet)
- Advisory Design Exceptions
  - Intersection Spacing (< 500')
  - Local Access opposite an Off Ramp
  - Weaving Length (<500m)
- Preferences
  - No Loop Off Ramps
  - No Hook On Ramps
  - Good Pedestrian/ADA and Bicycle Compatibility
  - Good Driver Expectation

Local Facilities:

- County/City Design Standards
  - Roadway Cross-Section
  - Intersection Spacing
  - Design Speed
  - Pedestrian Facility

Points can be applied for each standard using the following ranking scale:

Ranking Scale	
1.0	Alternative can be designed to meet all applicable design standards.
2.0	Alternative can generally be designed to meet all applicable design standards but may vary from design "Preferences" and/or may have nonstandard "Advisory" design features.
3.0	Alternative may have nonstandard "Advisory" and/or "Mandatory" design features.

Note: Lower point value is best.

11. Cost

The costs presented in the ASDM will be for comparative purposes only and will not represent actual costs. Actual project construction costs for each listed component or as totaled may vary substantially and therefore should not be used outside of the context of this comparison. The individual ranking for each alternative is based on the estimated costs. For example, if the SR 165 corridor has multiple alignment alternatives, the lease expensive alternative would be ranked as one while the most expensive alternative would be ranked as three.

4. COMPOSITE SCORES

In this fourth and final step in the ASDM procedure, raw scores earned within each evaluation criteria will be adjusted using their corresponding relative weighted factor to achieve a corresponding weighted score. The sum of the weighted scores for each alternative will give an overall indication of its standing with respect to the other alternatives. The alternative, or alternatives, that receive the lowest point total can then be identified as candidate projects for further detailed evaluation.

Composite Score Summary from Another Project Used as an Example Only

SUMMARY

Criteria	Importance Weighting		Alternative No. 0	1	2	2A	3	4	5	6
Traffic Operations / Congestion Relief	5	21.7%	8	4	6	6	5	2	3	1
Safety	4	17.4%	7	1	5	5	1	1	7	1
Environmental Impacts	2	8.7%	1	2	4	3	4	6	7	8
Right-of-way Acquisition	3	13.0%	1	2	5	4	3	6	8	7
Constructability	2	8.7%	1	4	7	6	3	4	7	2
Design Standards	4	17.4%	8	6	1	1	4	6	1	5
Cost	3	13.0%	8	6	1	1	4	6	1	5
Total Unweighted Score			34	26	31	26	27	35	39	35
Total Weighted Score			5.70	3.65	4.09	3.78	3.48	4.09	4.43	3.70
Ranking			**8**	**2**	**5**	**4**	**1**	**6**	**7**	**3**
Meets Purpose and Need Criteria?			**N**	**Y**	**N**	**N**	**N**	**Y**	**N**	**Y**
Selected Alternative by Design Type			**0**	**2**				**6**		**3**

Importance Weighting uses a scale of 1 to 5, with 5 being very important and 1 being unimportant. Initially selected alternatives include all alternatives that score equal to or better than the no-build alternative (Alt 0). Colors denote similar alternatives (blue =1,3,4) (green=2,2A,5) (yellow=6) (orange=7,8) (pink=9,10,11) (gray=13,13A)