Laredo River Road

Corridor Study

Prepared for
City of Laredo

Prepared by

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Transportation Group, Inc.

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Executive Summary

In response to a Laredo Urban Transportation Study (LUTS) request, Alliance Transportation Group, Inc. has been retained to conduct a feasibility study concerning the construction of a road (River Road) that would run parallel to the Rio Grande River in Laredo, TX. This proposed roadway corridor would connect the existing portion of River Road to Mines Road to the north and US 83 to the south. **Figure 1** shows an overview of the study area as well as the proposed River Road Corridor as examined in this study.

The proposed River Road Corridor has the potential to provide Laredo with an additional north-south access from northwest Laredo to southern Laredo. The current routes providing primary north-south connectivity are IH 35, FM 1472, and US 83. These roadways are currently experiencing congestion.

The primary objective of the study is to assess the feasibility of constructing River Road to expedite the flow of cars and trucks within and through Laredo. This required evaluation of the existing conditions and traffic characteristics of Laredo, as well as the future conditions based on the city's current development plans and socio-economic forecasts.

Alliance developed travel projections, performed operational analyses, and evaluated design constraints to determine the feasibility of River Road to meet the needs of people, businesses, and community organizations in the area. In evaluating the roadway, this study considers future roadway congestion, mobility, access, topography and economic development impacts.

Constraints of the project included in the analysis were cost and constructability. Constructability includes the evaluation of cross-slopes, flood plain, existing developments (business relocation, public utilities, residential displacements), and connectivity to the existing transportation system.

Several sections of the proposed Laredo River Road project alignment are situated in the floodplain of the Rio Grande River. In order to comply with Federal and State requirements, development of a new roadway in a floodplain would require a determination that the placement of the roadway in the floodplain was necessary and that no alternate alignment or solution would work. Review of the National Environmental Policy Act (NEPA) indicates that the NEPA process would apply to this project even if no federal dollars were used in the construction of a roadway.

Based on the analysis conducted, Alliance Transportation Group, Inc. submits the following conclusions regarding the Proposed Laredo River Road:

1. A preliminary assessment of the horizontal alignment indicates that roadway can be designed and built.
2. River Road has the most potential benefit around the City Center.
3. Section 4 that runs from the existing River Road to Southgate Boulevard provides the most benefits.
4. Several section of the proposed corridor do not warrant construction based on a benefit/cost analysis.
5. The proposed River Road is expected to trigger a NEPA process.

Based on these results it is recommended that Section 4 be analyzed further for determination of constructability to help alleviate further congestion at the intersection of Meadow Avenue and US 83. Sections 2 and 3 should be re-evaluated when a final alignment has been determined for River Road to gage the effects that the physical constraints have on these sections.

Introduction

Alliance Transportation Group, Inc., has conducted a feasibility study of the proposed River Road Corridor. The River Road corridor runs parallel to the existing alignments of Mines Road and Zapata Hwy/US 83 along the Rio Grande River. This proposed roadway would connect existing River Road downtown to Mines Road to the north and US 83 to the south. The proposed alignment would also tie into existing roadways where feasible. **Figure 1** shows an overview of the study area as well as the proposed alignment of River Road examined in this study.

The purpose of this report is to present the feasibility of Laredo River Road. Alliance developed travel projections, performed operational analyses, and evaluated design constraints determining the feasibility of River Road to meet the needs of people, businesses, and community organizations in the area. In evaluating the roadway, this study considers future roadway congestion, mobility, access, topography and economic development impacts.

The following summarizes the elements performed during the Laredo River Road study. These elements include:

- Data collection and description of existing conditions;
- Evaluation of existing conditions;
- Design criteria;
- Laredo River Road Alignment;
- Logical Project Segmentation;
- NEPA Requirements;
- Evaluation of future conditions;
- Project Cost;
- Benefit/Cost Analysis; and
- Findings and Recommendations.

Individually the sections describe the study methodology applied for that portion of the analysis and provide an overview of the work performed. Collectively they provide an overview of how the individual steps in the analysis contributed to development of the findings and recommendations of the Laredo River Road Feasibility Study.

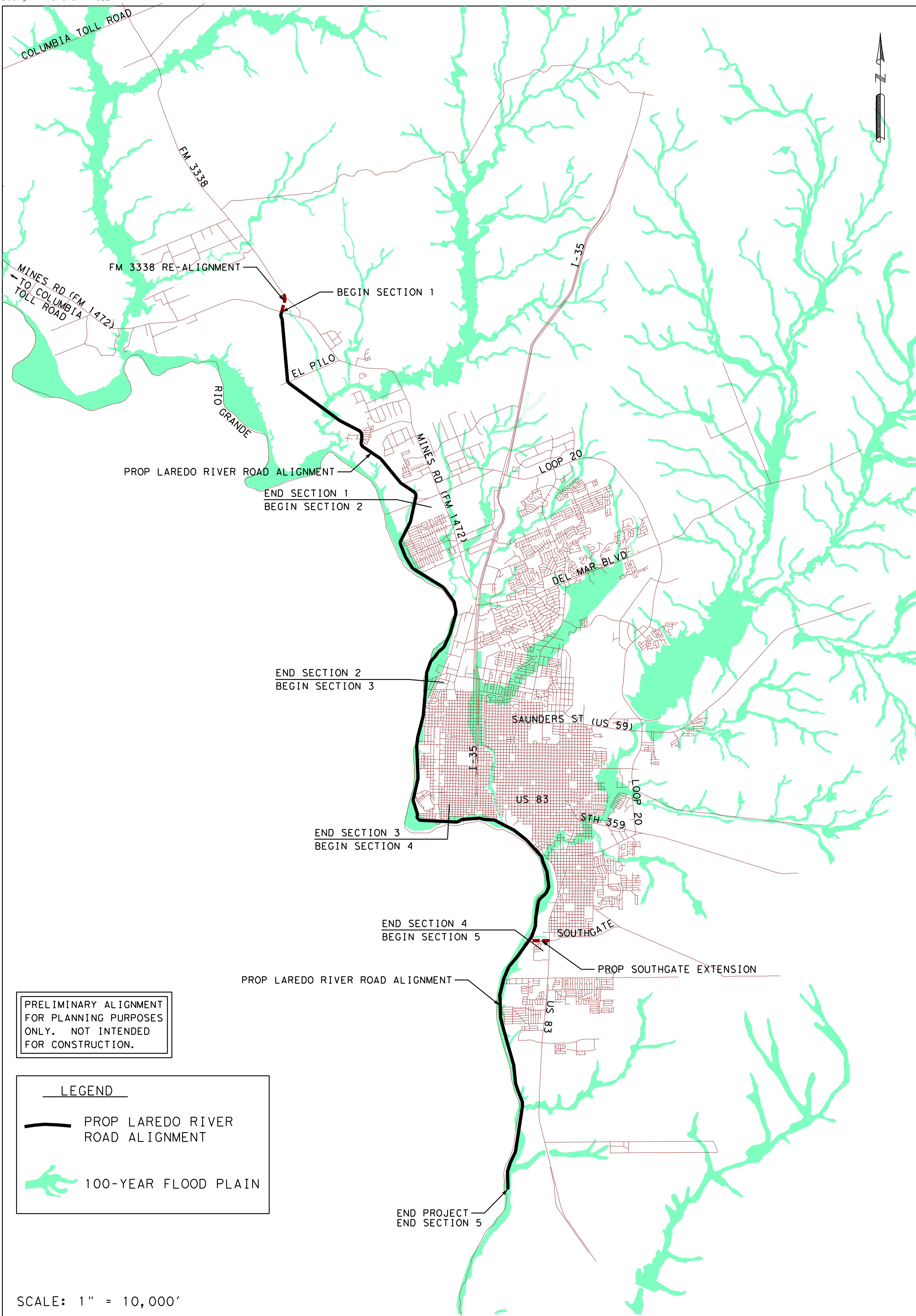

Figure 1. OVERALL LAREDO RIVER ROAD ALIGNMENT

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Data Collection and Description of Existing Conditions

This section describes the existing conditions observed along the River Road corridor. Existing conditions are described in terms of geometric and operational conditions of existing roadways in the study area, existing land uses in and adjacent to the proposed roadway corridor, and traffic counts on major study area roadways.

The Laredo River Road study area contains several major roadways that have the potential to compete with, complement, or interact with the proposed River Road project. These roadways include:

Mines Road - Mines Road is a six-lane roadway in the City of Laredo and is a four-lane divided facility north of the city. The potential for development along Mines Road is high due to the large amount of open land available for development. Mines road currently connects to IH-35 at a signalized intersection along the IH-35 frontage road on the west side of IH-35.

The World Trade Bridge - The World Trade Bridge is located on Loop 20 (Bob Bullock Loop) and connects to Mines Road and IH-35.

The Camino Columbia Bridge - The Camino Columbia Bridge currently serves commercial truck traffic only. The bridge connects to the Camino Columbia Toll Road and Mines Road (FM 1472) and eventually IH-35 via the Camino Columbia Toll Road

Zapata Highway/US 83 - Zapata Highway/US 83 is a four-lane highway intersected by numerous residential streets and is located in southern Laredo.

Bridges 1 and 2 - Bridges 1 and 2 take access off of IH-35 and Convent Avenue. These two bridges are closed to commercial truck access.

Alliance conducted data collection to evaluate the operations of the existing facilities. In addition, existing data resources and analytical tools were assembled from available sources. The following data and analytical resources were collected:

- 24-hour counts (4 locations);
- Video GPS Roadway Inventory;
- Existing Signal timings; Appendix B
- Accident Data; Figures 5 and 6
- Most Current Travel Demand Model Components;
- Land Use; Figure 7
- ROW widths; and
- USGS Digital Elevation Model.

Data Collection

24-HOUR VEHICLE TRAFFIC COUNTS

After analysis of the current transportation system, two corridors were chosen that would best describe the traffic flows among the major traffic generators in the region. These corridors were Mines Road from IH-35 to Bridge #3 (Columbia Solidarity) and US 83 from South Meadow Avenue to 2 miles south of Mangana Hein Road.

For this study, it was determined that the most effective measure of traffic would be 24-hour directional counts. These 24-counts can be used to describe a typical traffic flow within a full day, as well as peak hour volumes.

24-hour traffic counts were collected in 2005 at selected locations within the corridor study area. The 24-hour traffic counts were taken at the following locations (as show in Figure 2):

- Mines Road south of Camino Columbia Road;
- Mines Road between El Pico Road and Las Tiendas Road;
- Mines Road north of Loop 20; and
- US Hwy 83 north of La Pita Mangana Road.

These counts are provided in **Appendix A**.

VIDEO GPS ROADWAY INVENTORY

Geometric data was collected on roadways parallel to the proposed River Road. Video GPS allows data to be recorded to a video file that is linked with the vehicle's location as determined using GPS. The resulting video provides a visual reference that can be reviewed to observe current roadway geometry, and provides a "hands on" understanding of the physical features of the roadway, current operational characteristics, and the exact location, function and form of land uses in the study area. Each intersection of the study area was observed to determine the number of lanes on each roadway and to document the lane assignments.

There were two intersections determined to be significant to the analysis of this particular corridor: the signalized intersection of Mines Road and Old Santa Maria Road shown in **Figure 3**; and the un-signalized intersection of US 83 and South Meadow Avenue shown in **Figure 4**.

EXISTING SIGNAL TIMING AND PHASING PLANS

Signal timing and phasing plans are needed to evaluate the existing operation at the signalized intersections. These plans were provided by the City of Laredo and are located in **Appendix B**. These plans were used to evaluate the Levels of Service at the existing intersections.

ACCIDENT DATA

The ability of a proposed project to improve transportation safety in a community is always a significant factor to consider in any feasibility analysis. A fundamental data element used to evaluate the safety of a community's transportation system is vehicle accident data. Historical data on the location, frequency, and type of vehicle-vehicle and vehicle-pedestrian accidents provides immediate insight into the transportation system's ability to meet the goal of moving people and goods safely. In this study, available vehicle accident data was used to assess the problems currently experienced by the general public and determine whether these accidents were a result of driver error or if there are planning measures than can be taken to prevent such incidents.

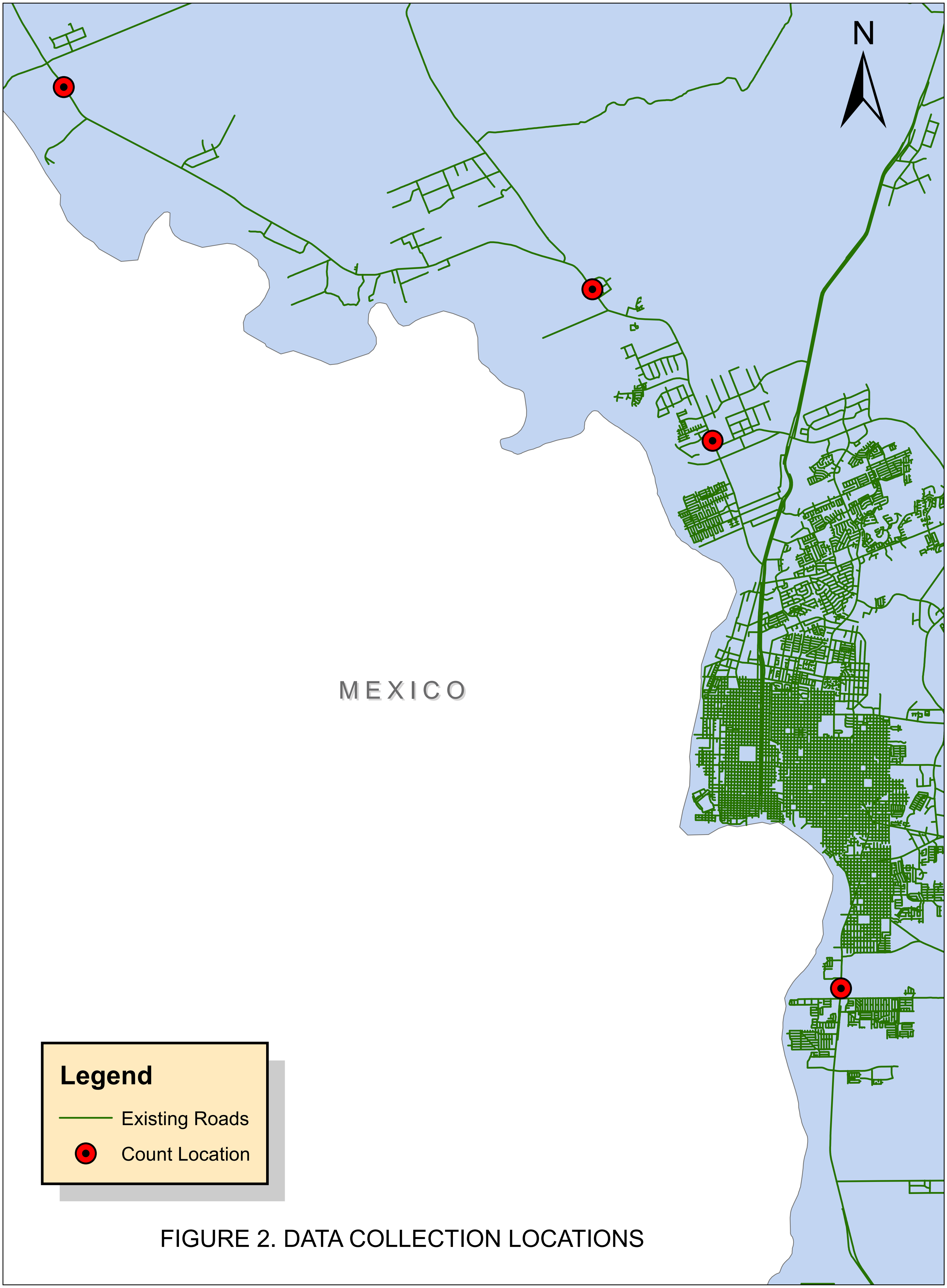


FIGURE 2. DATA COLLECTION LOCATIONS

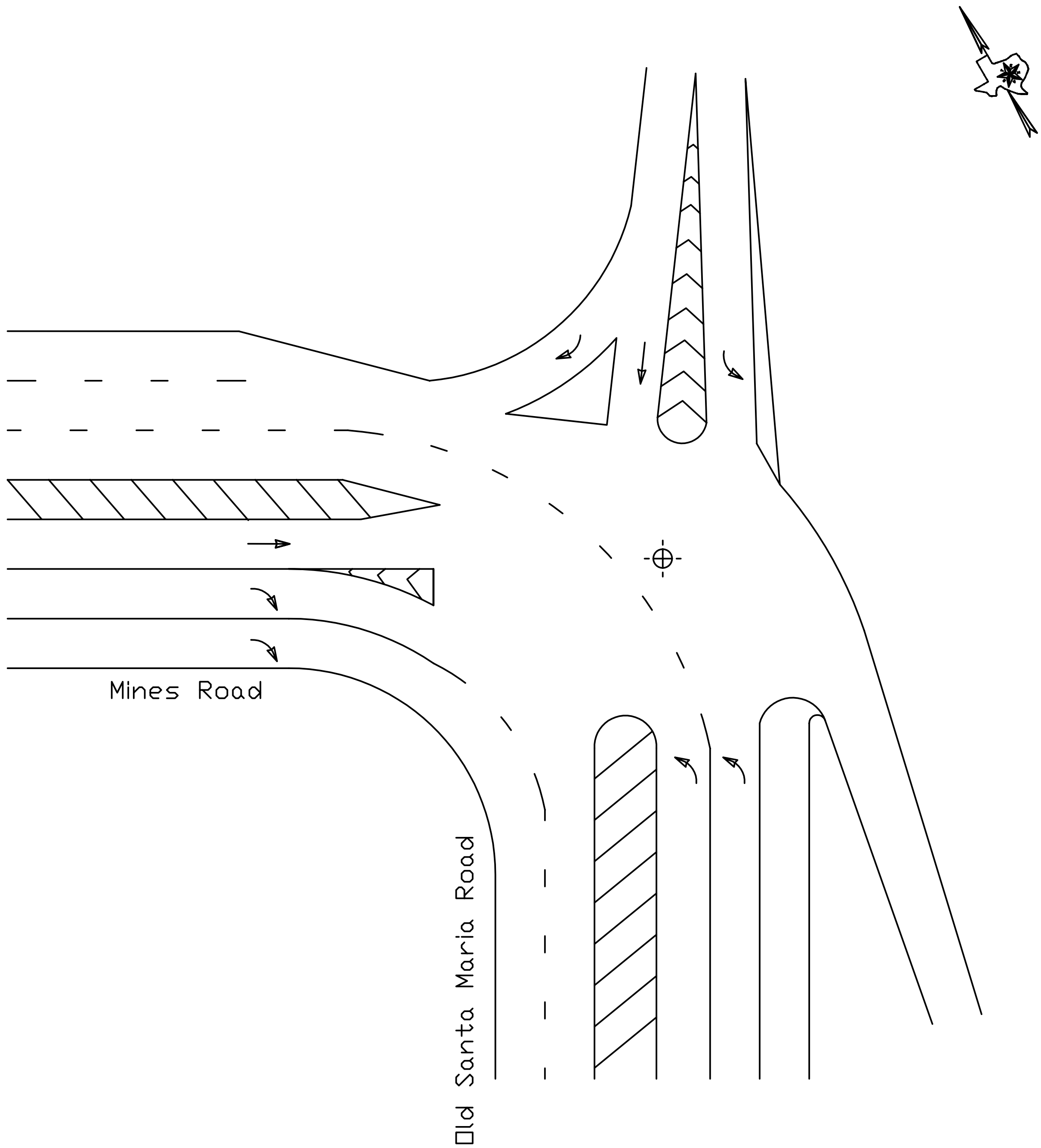


FIGURE 3

Mines Road & Old Santa Maria Road

EXISTING 2005
INTERSECTION LAYOUT

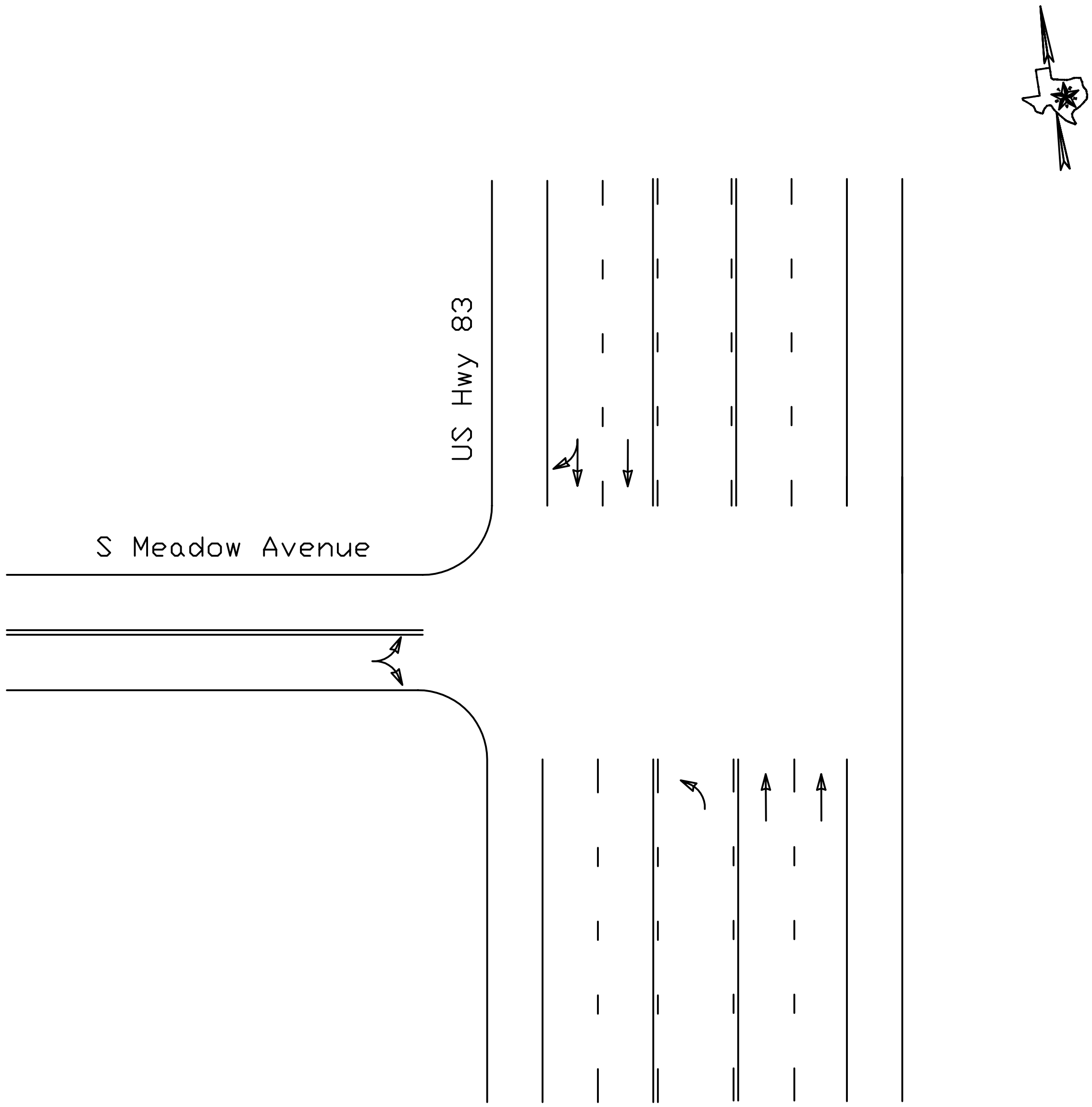


FIGURE 4

US Hwy 83 & S Meadow Avenue

EXISTING 2005
INTERSECTION LAYOUT

The City of Laredo Police Department (CLPD) provided vehicle accident data on the number and type of accidents, as well as what type of vehicles were involved, for the full length of the main north/south corridor through the city. **Figure 5** shows accident counts for Zapata Highway, and **Figure 6** shows the accident data for Mines Road.

The next section labeled Evaluation of Existing Conditions (page 15) identifies the construction projects that are currently underway to mitigate the problem areas identified by this accident data.

FIGURE 5. 2001 ACCIDENT COUNTS ON ZAPATA HWY

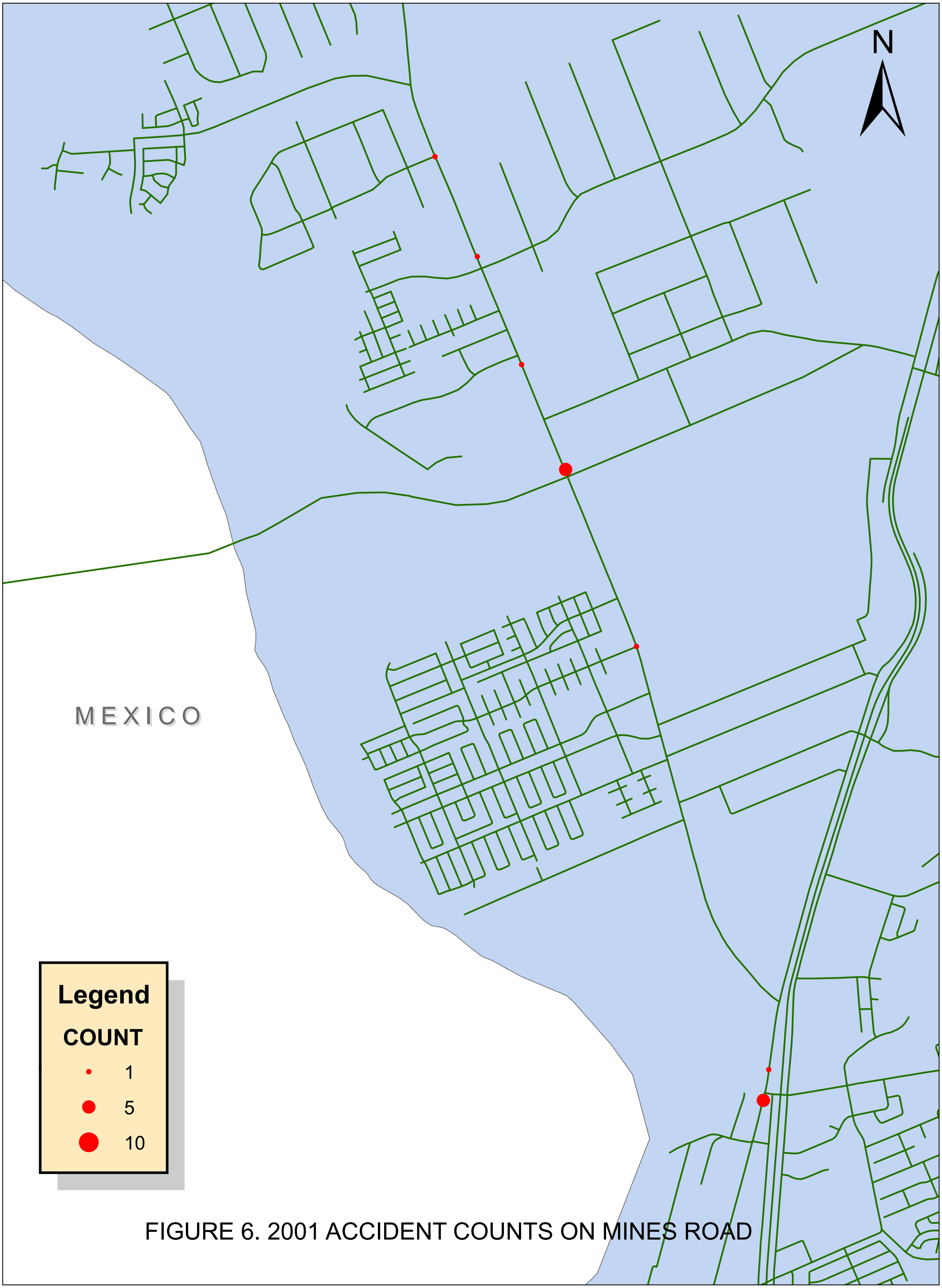


FIGURE 6. 2001 ACCIDENT COUNTS ON MINES ROAD

Travel Demand Model

Travel demand models are used to forecast future traffic volumes likely to be produced by anticipated future land use patterns. The travel demand model is used to determine how many trips may be generated, how these trips are likely to be distributed among the various activity centers, and on what roadways the trips are most likely to travel.

During project initiation, Alliance evaluated the available travel demand models that depicted travel in the Laredo Area. In order to capture all the analysis parameters necessary to evaluate the feasibility of the proposed River Road, a combination of the City of Laredo 2030 Plan Model and the TxDOT Laredo Model were applied during the analysis. Roadways in the model network were updated to reflect roadways that were not included in the 2030 model, such as the Loop 20 / Mines Road interchange as well the freeway portion of Loop 20. Proposed roadways identified by the City of Laredo were also added, such as the River Road and an alternate loop around the city.

The 2005 trip table was created from the 2000 model run supplied by the Laredo MPO. The 2005 external trips were removed from the trip table, and the 2025 external trip table supplied by Laredo was preloaded to the 2025 network. The 2005 trip table for internal nodes was applied to the 2025 network, and the 2005 model-generated traffic numbers were factored up to 2030. The external trips were then added to the factored traffic numbers to get total link volumes. A more detailed explanation of the travel demand model can be found in **Appendix C**.

Available Data

LAND USE

Land use plays an important part in the future development of a region. Current land uses were obtained from the City of Laredo and are shown in **Figure 7.** These existing land uses were used to help evaluate the 2005 Travel Demand model for accuracy.

RIGHT-OF-WAY DATA

Right-of-Way data was provided by the City of Laredo in a GIS streets layer. This ROW data was used to determine if it would be feasible for the current roadway cross-sections to be widened if it is determined that portions of the River Road could not be built.

USGS DIGITAL ELEVATION MODEL

Elevation Data was provided in the form of a DEM file to determine the amounts of cut or fill required for River Road within the corridor. This data will be important in determining the associated cost of the roadway, and selecting a reasonable alignment for the proposed River Road.

The new data collected, available data assembled, and the analytical resources developed during this phase of the project were used to document and evaluate existing conditions, develop design criteria for evaluating the feasibility of the corridor, identify an alignment suitable for evaluating River Road, and evaluate future conditions. The first step in this process once the data was collected and the current conditions were documented was to evaluate current conditions in the study area in terms of measures of effectiveness that could be used as a baseline for comparison with proposed future conditions.

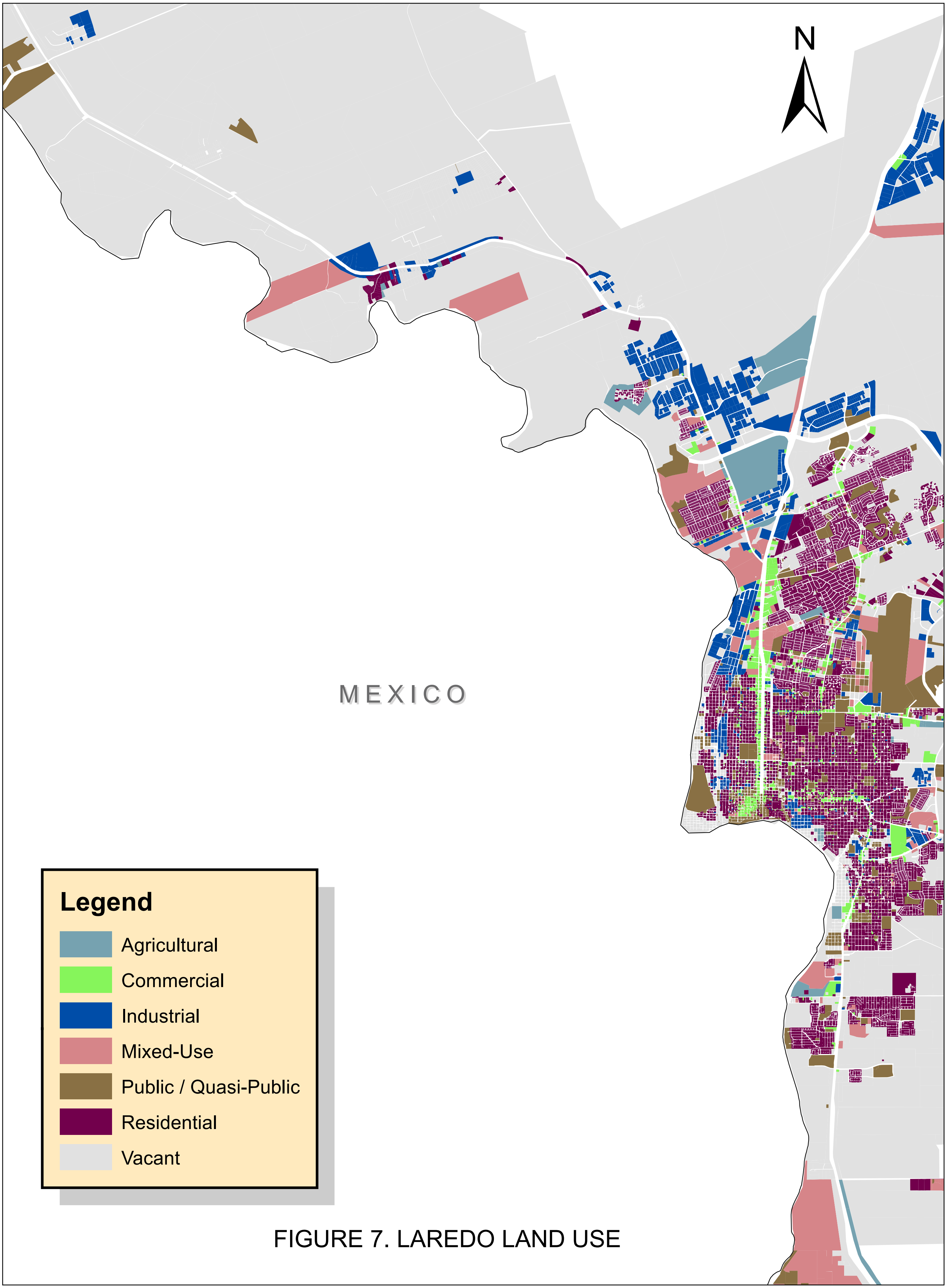


FIGURE 7. LAREDO LAND USE

Evaluation of Existing Conditions

Using the data collected during the initial phase of this project, several activities were undertaken to evaluate existing conditions. These efforts included: (1) review of aerial photography, and USGS digital elevation model data; and (2) review of the VideoGPS.

The River Road corridor was evaluated using available aerial Digital Ortho Quarter Quads (DOQQ's). The DOQQs were provided by the City of Laredo and combined with the U.S. Geological Survey (USGS) Digital Elevation Model (DEM) data. This information was reviewed and the following physical constraints were identified in the River Road corridor:

- Flood Plain;
- Water Treatment Plant Locations (2);
- Rail Yard; and
- Streams/creeks feeding into the Rio Grande River.

Video GPS roadway inventory was conducted for the roadways that parallel the proposed River Road corridor, and roadways that would potentially connect to River Road. In addition traffic counts were collected along Mines Road and US 83 as denoted in the previous section. The culmination of these efforts was reviewed to observe current geometric data, and provides a “hands on” understanding of the physical characteristics and exact land uses of the area.

The following locations were observed to be bottlenecks within the existing Mines Road and Hwy 83 corridors:

- IH-35 and Mines Road at the UP Railroad grade crossing
- US 83/Zapata Hwy and Meadow Avenue

It should be noted that the observed bottleneck at IH 35 and Mines Road is currently being mitigated by the construction of two projects. These projects include the Direct Connector #7 (Northbound IH-35 to westbound Loop 20) that is scheduled for completion in Spring 2006. The other project is the construction of the railroad grade separation at FM 1472 and IH-35. The railroad grade separation project began in March 2006 and will be completed in November 2008.

These intersections have been observed to have deficiencies through both visual observations as well as intersection Level of Service analysis. Level of Service analysis sheets can be found in **Appendix D**. Accident data collected in 2001 also indicated a high concentration of crashes around and to the south of the US 83 and Meadow Avenue intersection.

The evaluation of existing conditions provided the information needed to develop design criteria and identify existing physical constraints for the alignment. The next section details the design criteria developed to properly evaluate River Road.

Design Criteria

To properly evaluate River Road a set of design criteria were developed. This set of criteria was used to evaluate whether the River Road can be built in the proposed corridor. A preliminary model run was conducted to determine the volumes of traffic expected on the roadway. Based on these volumes a preliminary set of cross-sections was developed.

The proposed typical sections for the River Road project are shown in **Figure 8**. These sections include:

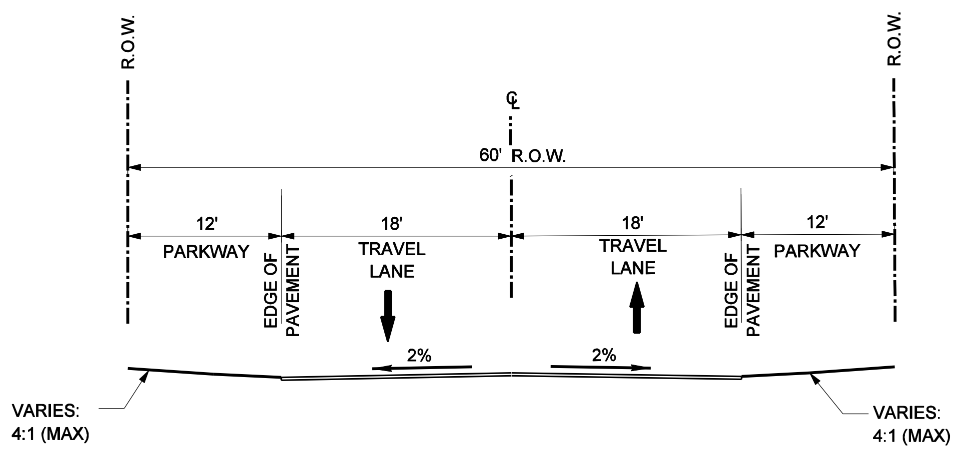
- Minor Collector – Two-lane;
- Minor Collector – Three-lane;
- Minor Arterial – Four-lane, divided; and
- Minor Arterial – Five-lane.

Table 1 is a listing of the characteristics for each proposed section. Expected Right-of-Way (ROW) for these sections range from 60 feet to 90 feet.

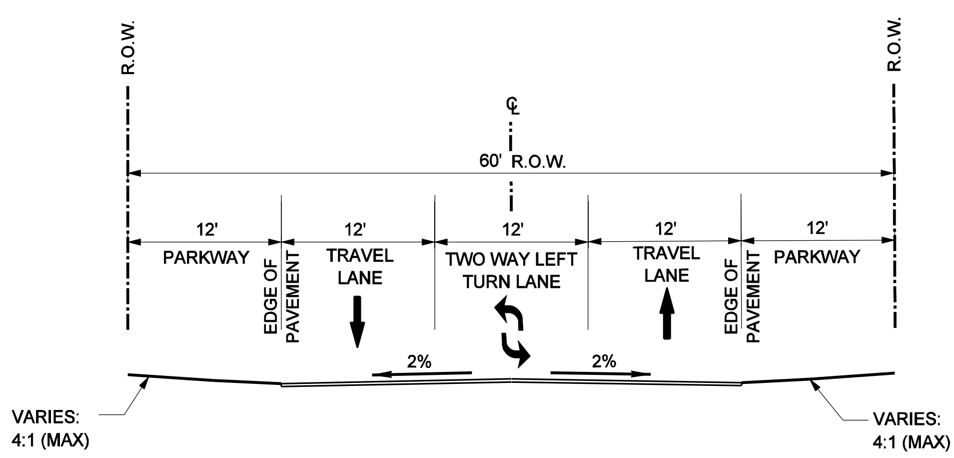
Table 1: City of Laredo/ Laredo MPO – Roadway Classifications – River Road

Characteristic	Roadway Classification					
	Minor Collector		Minor Arterial (Undivided)		Minor Arterial (Divided)	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
Average Daily Traffic (ADT) volume	1,500 vpd	5,000 vpd	18,000 vpd	21,000 vpd	21,000 vpd	23,000 vpd
Number of Traffic Lanes	2	3	5	5	4	4
Min. Lane Width	10 ft.	12 ft.	11 ft.	12 ft.	11 ft.	12 ft.
Median Width	-na-	-na-	11 ft.[1]	14 ft.[1]	16 ft.	26 ft.
Pavement Width	30 ft.	36 ft.	55 ft.	60 ft.	44 ft. (2 sides x 22 ft.)	48 ft. (2 sides x 24 ft.)
Total Right-of-way width[2]	60 ft.	60 ft.	80 ft.	80 ft.	90 ft.	90 ft.
Parkway width	12 ft.	12 ft.	10 ft.	12 ft.	10 ft.	13 ft.
Sidewalk width	4 - 5 ft.	4 - 5 ft.	5 ft.	6 ft.	5 ft.	6 ft.
On-street parking allowed?	Yes[3]	Yes	No	No	No	No
Design Speed	30 mph	35 mph	35 mph	35 mph	40 mph	45 mph
Pavement cross slope	1.5%	2%	1.5%	2%	1.5%	2.0%
Min. Centerline Radius w/ no superelevation	350 ft.	500 ft.	500 ft.	500 ft.	750 ft.	1,000 ft.
Min. K-Value (Crest)	19	29	29	29	44	61
Min. K-Value (Sag)	37	49	49	49	64	79
Grade (%)	---	7%	---	5%	---	5%
Lateral Clearance (desirable)	6 ft.	-na-	6 ft.	-na-	6 ft.	-na-
Vertical Clearance (desirable)	14 ft.	17 ft.	14 ft.	17 ft.	14 ft.	17 ft.

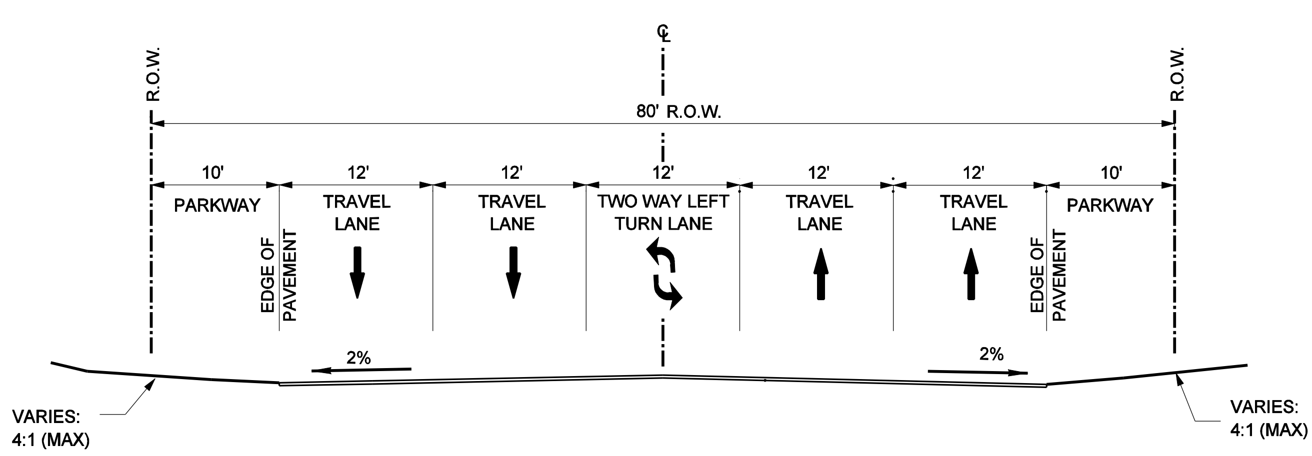
[1] Dimension is for a continuous, two-way left-turn lane
[2] Does not account for widening on approaches to major intersections
[3] Parking on both sides of the street using the minimum pavement width will prevent continuous, two-way traffic operations



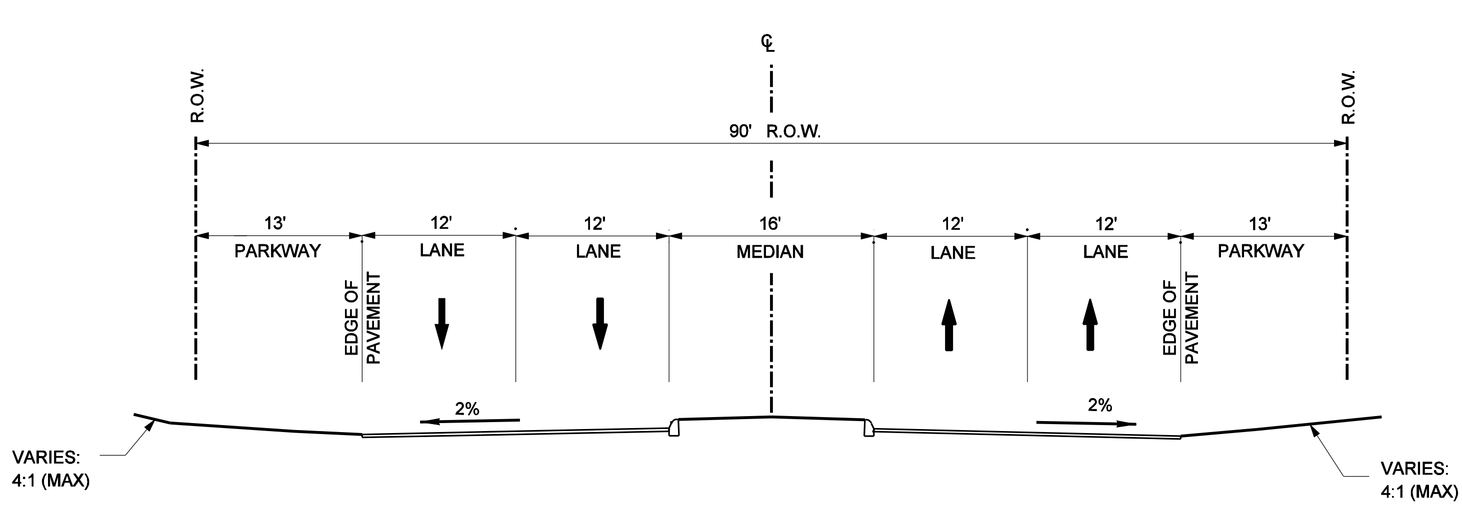
PROPOSED TYPICAL SECTION
MINOR COLLECTOR



PROPOSED TYPICAL SECTION
MINOR COLLECTOR
(ALT. CONFIGURATION FOR URBAN
BUSINESS DISTRICT)



PROPOSED TYPICAL SECTION
MINOR ARTERIAL



PROPOSED TYPICAL SECTION
MINOR ARTERIAL

November 3, 2005

Figure 8. **PROPOSED RIVER ROAD TYPICAL SECTIONS**

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The evaluation of the alignment of River Road required a cross-section to be chosen for cost estimation purposes. The width of right-of-way needed for each section determines whether or not a proposed cross-section would fit in the given corridor. It was determined that a minor collector cross-section would be used based on limited potential for development to the west of the corridor and to minimize the encroachment into the flood plain. The next section details the preliminary alignment for River Road that was used in the feasibility analysis.

Laredo River Road Alignment

Using the data collected and criteria developed previously, a preliminary alignment was selected to evaluate the physical constraints and opportunities of the River Road project. The proposed cross-section was a minor collector which requires a pavement width of 36 feet, and a right-of-way width of 60 feet.

Aerial photography, DEM data, and flood plain data were used to develop this preliminary alignment. The existing physical constraints of the area, including flood plains (obtained from the Federal Emergency Management Agency's Q3 Flood Data), are shown in **Figure 9**. **Figure 1** shows this preliminary alignment and its surrounding roadway network.

A preliminary assessment of the horizontal and vertical alignment of the proposed River Road has been completed by the sub-consultant. This assessment indicates that there are no known problems with the proposed horizontal alignment of River Road. Using this alignment, the next section details the logical segmentation needed for future evaluation.

Logical Project Segmentation

The previous section looked at overall horizontal and vertical alignment for River Road. This section delineates the logical segmentation selected for the evaluation of building separate sections of River Road.

Logical section breaks were determined based on existing roadway locations as termination points. This yielded a total of six (6) sections of roadway to be evaluated. The northern section of the alignment labeled Section 0 on **Figure 1** has been evaluated and determined not to be viable due to the lack of traffic volume on the segment and its close proximity to Mines Road as an existing parallel highway route with excess capacity. As part of this assessment, further evaluation was performed on the following five sections of River Road:

1. From Mines Road to approximately the Bob Bullock Loop;
2. From approximately the Bob Bullock Loop to Anna Road/Marco Drive;
3. From Anna Road/Marco Drive to the existing portion of River Road;
4. From existing portion of River Road to Southgate Boulevard; and
5. From Southgate Boulevard to 2 miles south of Mangana Hein Road.

Figure 1 shows each of the six sections, or more detailed alignments of these viable five sections can be found in **Appendix E**.

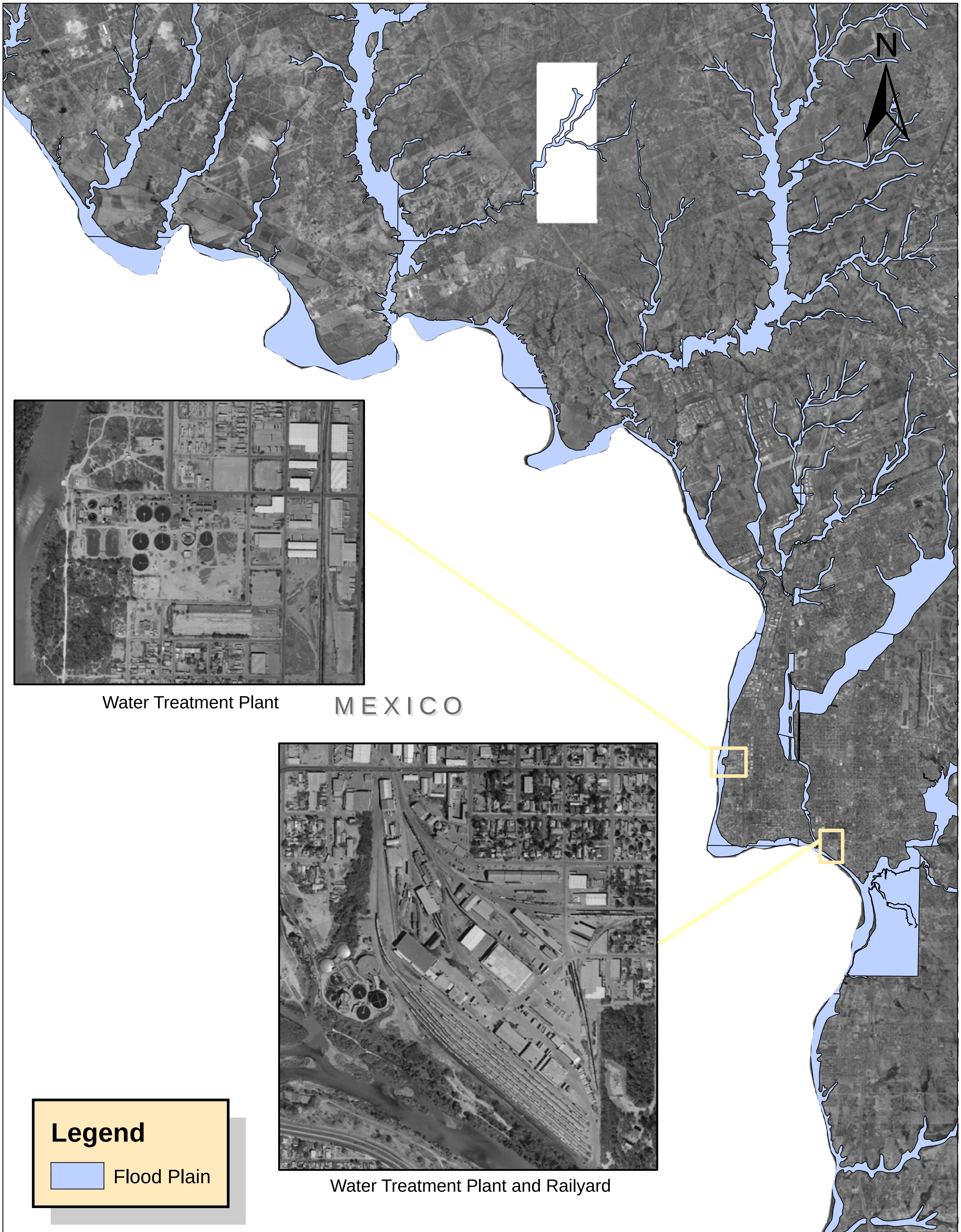


FIGURE 9. PHYSICAL CONSTRAINTS

NEPA Requirements

To determine the state and federal requirements that would apply to construction of the Laredo River Road Project, Alliance conducted interviews with state and federal officials and reviewed the FHWA guidance for roadway construction projects. The following information is provided based on the interviews and review.

Several sections of the proposed Laredo River Road project alignment are situated in the floodplain of the Rio Grande River. According to FHWA Planning and Program Development Director Michael Leary and former TxDOT Engineer Max Proctor, development of a new roadway in a floodplain would require a determination that the placement of the roadway in the floodplain was necessary and that no alternate alignment or solution is feasible.

This requirement is problematic for the Laredo River Road project. The analysis conducted in this feasibility study, indicates that there may be effective alternatives that meet the identified need and accomplish the stated purpose of the proposed roadway without construction in the floodplain.

The operative process for making the described determination of necessity would be an environmental impact study (EIS) carried out under the provisions of the National Environmental Policy Act (NEPA). In order to obtain a record of decision (ROD) in favor of the project it would need to meet the requirements for building in the floodplain as well as meet requirements posed by any other federal interests that may be impacted by the project.

Review of the National Environmental Policy Act (NEPA) indicates that the NEPA process applies if there is a federal interest involved in the project. Even if no federal dollars are used in the construction of a roadway, any impacts to floodplains, wetlands, endangered species, historic and archeological sites, parklands, air quality, wildlife habitat, etc. will require the preparation of an environmental impact statement.

Based on the review of the proposed alignment in this study, at a minimum, the following areas of federal interest are present with regard to the Laredo River Road project. Any or all of which would be expected to trigger the NEPA process and require, at a minimum, an environmental assessment and likely an environmental impact study.

- Impacts to the floodplain;
- Impacts to a navigable waterway;
- Impacts on Federal facilities (US Highways and Border Crossings);
- Air quality impacts; and
- Impacts to wildlife habitat .

The above list is not intended to be comprehensive. There may be other considerations that would need to be addressed in the NEPA process. However, the above list does present several challenges to forward momentum on the River Road project.

Evaluation of Future Conditions

During the Laredo River Road Feasibility Study, a travel modeling process was used to help identify areas of congestion and aid in developing of the operational analysis. An extensive effort was made to develop a complete process that resulted in a Laredo River Road Feasibility Study model. The procedures established for this project were developed to conform to state-of-the-practice modeling procedures used and/or developed in the State of Texas. The overall objective of these efforts was to develop time-of-day traffic projections that can be input into traffic simulation models (Synchro) for further analysis. For this analysis, the travel demand forecast from the refined TxDOT Laredo model was used.

Travel demand models are used to predict traffic volumes on proposed roadways for the development of transportation plans. The traffic forecast is based on forecasted demographics, i.e., population and employment. Since it is a computerized model, a roadway can be tested for its traffic forecast even if it does not yet exist. Based on the origins and destinations of expected population and employment concentrations, the computer simulation forecasts the traffic a roadway would be expected to carry if it were built or improved. The traffic model can also be used to predict the impact of widening roadways (increasing their expected speed) as well as the impact of specific residential developments or shopping and employment centers.

The Laredo River Road Feasibility Study model was developed using TransCAD, which serves as the software for prediction of forecasted traffic for the River Road Corridor Study. The Laredo River Road Feasibility Study model is a refinement of the TxDOT Laredo planning model. The refinements of the planning model were intended to better reflect detailed changes. The resulting forecasted traffic demand, including turning movements, were input into the operational simulation model Synchro. The network used in the analysis is based on the current Laredo 2030 plan, with a few revisions to reflect changes in planned roadways or corrected alignments. All of the through trip assumptions for the region are the same as for the TxDOT Laredo model, and all of the external volumes match the TxDOT Laredo model.

Table 2 shows the associated network statistics for 2005 and 2030 with and without River Road in place. **Figures 10 and 11** are flow band maps that graphically illustrate this difference.

Table 2. Network Statistics

Model Run	Vehicle Miles Traveled	Vehicle Hours Traveled
2005 24-hour	2,643,534	109,387
2030 w/o River Road 24-hour	4,699,820	465,759
2030 w/ River Road 24-hour	4,705,371	445,598

2030 24 Hour Traffic Flow Bands Without River Road

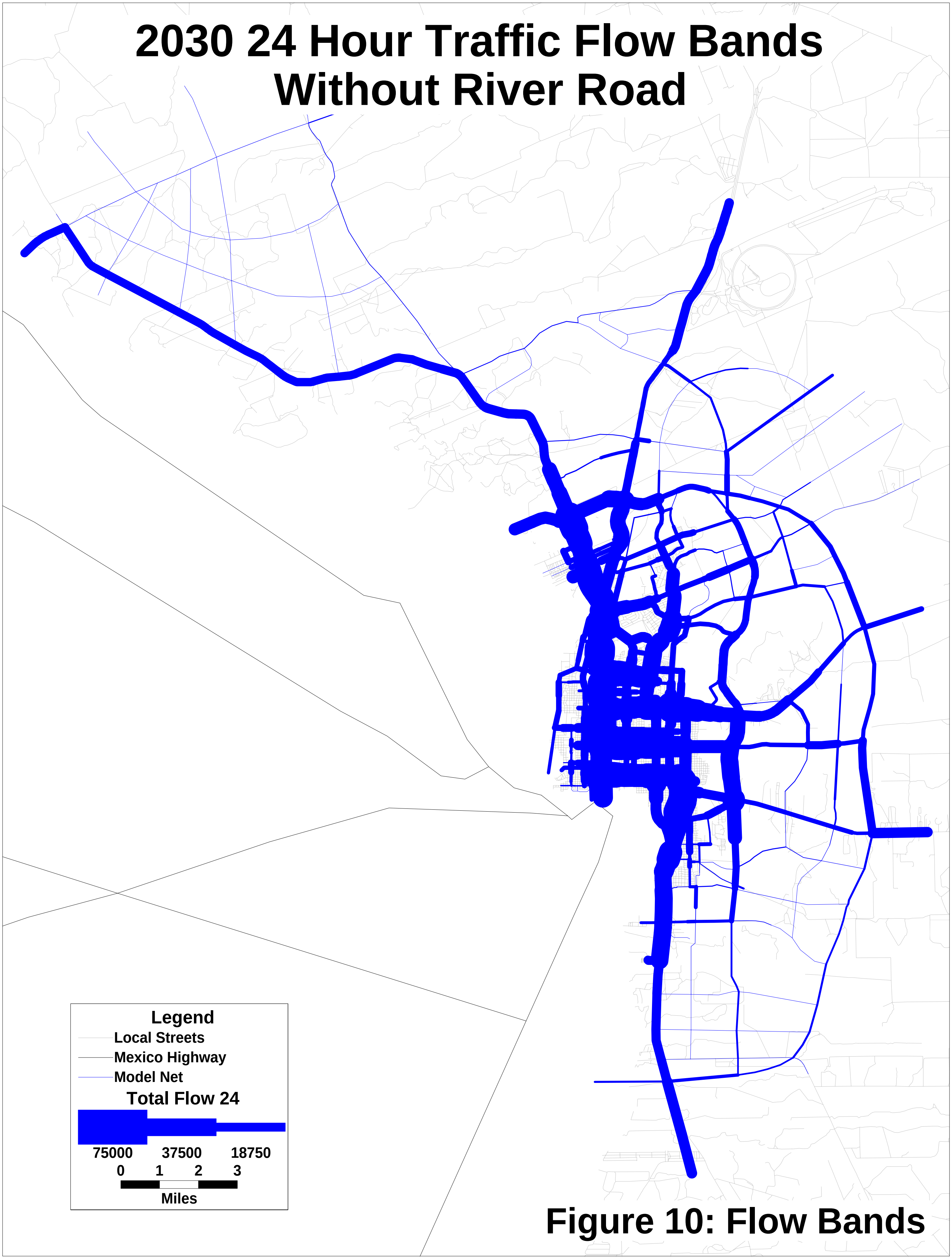


Figure 10: Flow Bands

2030 24 Hour Traffic Flow Bands With River Road

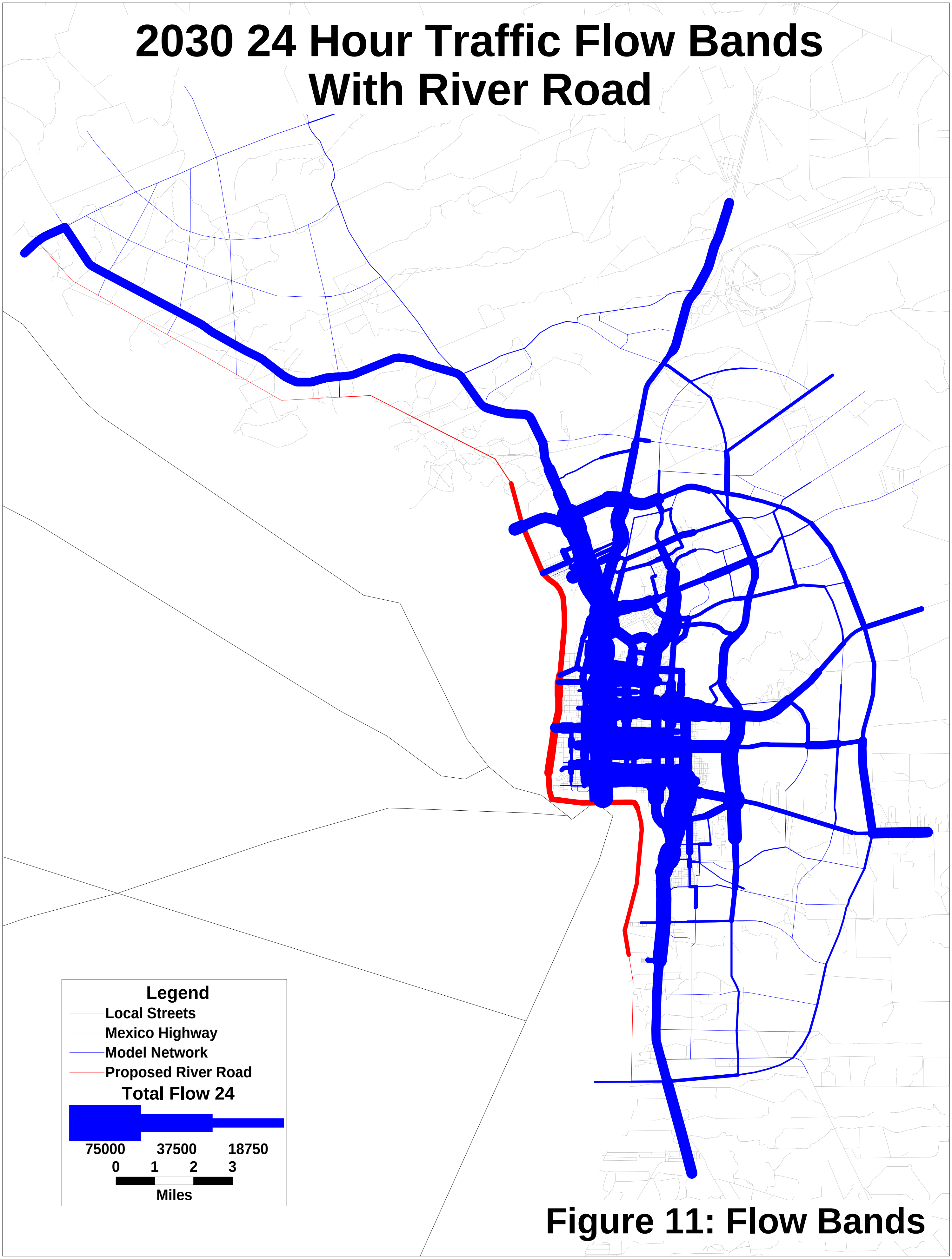


Figure 11: Flow Bands

Project Cost

Using the developed criteria, a preliminary alignment was set and logical segmentation was developed in order to evaluate River Road. Using this information, a cost estimate for each section was developed. The following table shows an estimation of the proposed cost of each section. The costs are an estimation of pavement cost based on a 36-foot wide cross-section and 44-foot wide bridge structure as well as an estimation of maintenance costs over a 25-year period. However, these estimates do not include any other planning, engineering, or design costs. The maps detailing the alignments of these sections as well as the associated costs can be found in **Appendix E**. The next section used this estimation of cost to determine a benefit/cost analysis for each section of River Road.

Table 3. Cost Analysis of Laredo River Road Segments

Section	Limits	Length of Roadway (miles)	Estimated Roadway Cost	Estimated Maintenance Cost (2005-2030)*	Total Cost	Cost /Mile
1	Mines Road to Bob Bullock Loop	5.27	$30,026,376	$4,148,667	$34,175,043	$6,484,828
2	Bob Bullock Loop to Anna Avenue	4.43	$18,976,268	$3,434,889	$22,411,157	$5,058,952
3	Anna Avenue to Exiting River Road	3.58	$12,242,615	$2,731,556	$12,242,615	$4,182,729
4	Existing River Road to Southgate Boulevard	4.10	$26,515,682	$2,515,000	$26,515,682	$7,080,654
5	Southgate Boulevard to 2 miles south of Mangana Hein Road	5.45	$40,775,945	$4,368,111	$40,775,645	$8,283,258

Note: This information is intended to be used for planning level purposes only. It does not include other probable costs, such as: right-of-way, permits, fees, landscaping, sidewalks, pavement markings, signs, signalization, lighting, traffic control, among other items which may be required. Due to extended portions of this alignment being within the flood plain, it is anticipated that wetland/environmental issues will be a significant part of the overall design and approval process and are not reflected in the above costs.
*This estimated cost assumes a 4% maintenance cost for pavement maintenance and $0.50 per square yard for bridge maintenance annually.

Benefit/Cost Analysis

Using the estimated costs for a 36-foot cross section from the previous section, a benefit/cost ratio was calculated for each section of the proposed roadway segments. The benefit shown in **Table 4** is based on vehicle-hours of travel saved over a 25-year period. This value was determined using a base year and future year model. The benefit is the difference between using the new River Road over an existing parallel route. Benefit is estimated at $13.50 per vehicle-hour based on the Web County median household income from the 2000 Census.

Table 4. Benefit/Cost Analysis of Laredo River Road Segments

Section	Limits	2005 Average Daily Trips	2030 Average Daily Trips	2005 veh-hrs of travel saved*	2030 veh-hrs of travel saved*	Benefit @ $13.5/veh-hrs (2005-2030)**	Benefit/Cost
1	Mines Road to Bob Bullock Loop	1,319	4,646	5,500	34,750	$7,057,204	0.21
2	Bob Bullock Loop to Anna Avenue	5,217	20,072	73,000	513,500	$102,964,110	4.59
3	Anna Avenue to Exiting River Road	8,624	16,904	49,250	348,750	$69,850,982	4.66
4	Existing River Road to Southgate Boulevard	5,085	26,900	203.250	1,062,750	$222,206,475	7.65
5	Southgate Boulevard to 2 miles south of Mangana Hein Road	2,280	9,429	-53,500	-101,250	-$27,149,693	-0.60

Note: This information is derived from the 2005 and 2030 Laredo Travel Demand Models and is a comparative difference between travel time on River Road and travel time on an existing parallel route.
* An annualization factor of 250 was used based on 52 weeks a year, minus 2 weeks vacation/holidays, times a 5-day work-week.
**Based on average median household income for Webb County from 2000 Census ($28,100) divided by the average work hours per year (2080).

The benefit/cost ratios were developed using the estimated cost of roadway, bridge, and roadway maintenance as the denominator, and the benefit derived from vehicle-hours saved using River Road over an alternate route as the numerator. The benefit/cost ratio can be used to evaluate which section of the roadway is feasible based on the cost and benefit estimates. A ratio of less than one (<1) means that the cost is greater than the benefit and may not be feasible to build, whereas a ratio of greater than one (>1) means that the benefits are greater the associated costs and this roadway segment has the potential to be built.

Sections 2, 3, and 4 have the potential to be built based on their benefit/cost ratio. The next section lists the finding of the feasibility analysis and provides some background on the elements that may be contributing to the benefit-cost ratios obtained.

Findings and Recommendations

This section summarizes the overall feasibility evaluation of the proposed River Road project. Based on the analysis, the construction of River Road does have the potential to improve local traffic flow in the forecast year. However, it does not alleviate existing traffic bottlenecks at two key intersections on parallel facilities.

A 36-foot pavement width has been selected due to the limited potential for development on the west side of the corridor. The roadway classification associated with this pavement width is a minor collector. This width was chosen because of the limited corridor width and to minimize encroachment onto the flood plain.

A preliminary assessment of the horizontal and vertical alignment of the proposed River Road has been completed by the sub-consultant. This assessment indicates that there are no known problems with the proposed horizontal alignment of River Road.

Through the creation of logical segments based on existing roadways, both a cost of construction and a benefit from time savings could be developed. Using these two values a benefit/cost ratio was computed. Based on this ratio, roadway section 2, section 3, and section 4 are shown to have potential for being built. However the cost used in this evaluation does not include any planning, engineering or design costs. Nor does it include any external cost such as environmental impacts to the Rio Grande or its drainage basin.

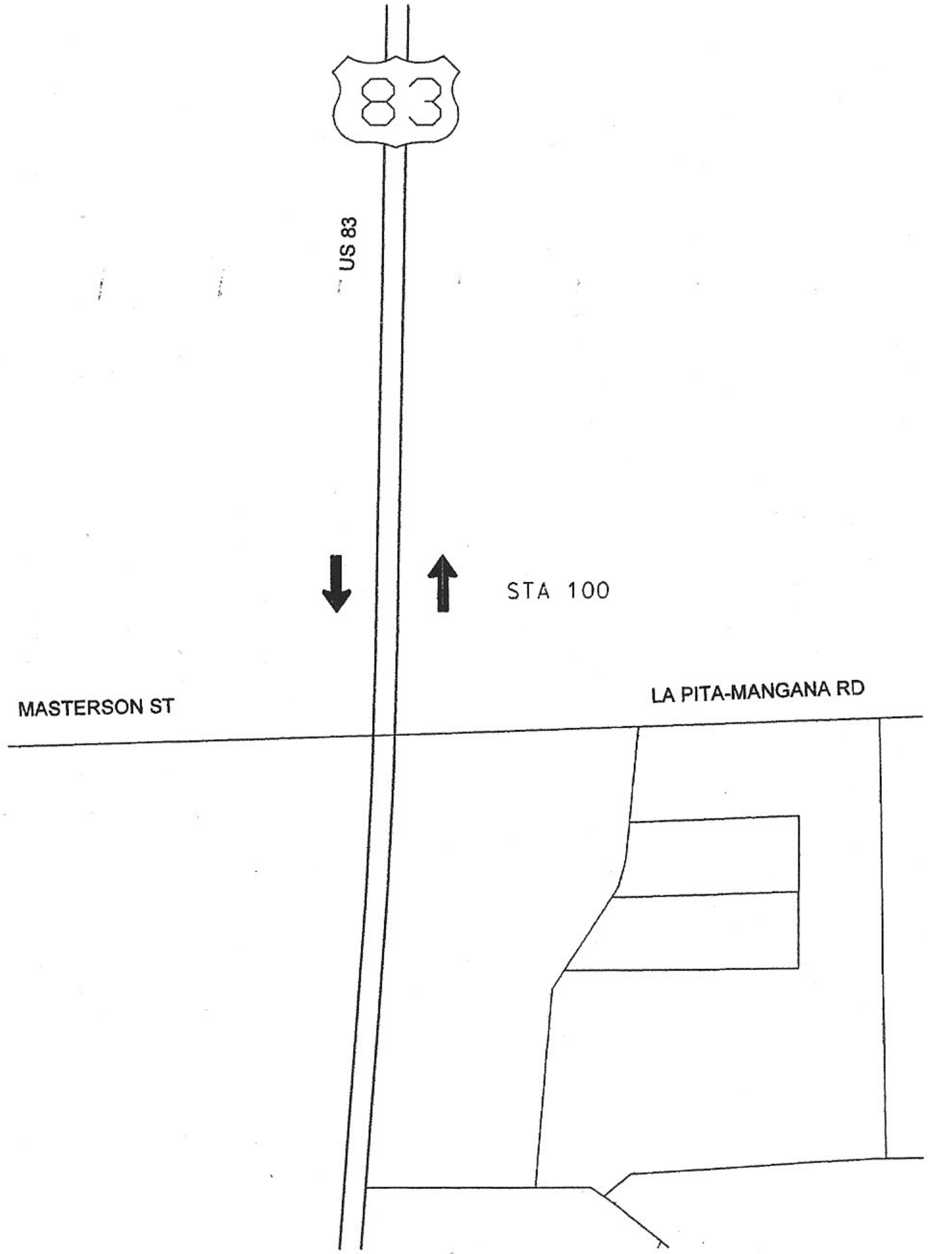
Several alternative improvements to existing roads have the potential to directly reduce congestion at several key intersections. These improvements include the existing plans to grade separate the intersection of Mines Road and IH-35 as well as the fly-over that is being constructed from southbound IH-35 to WB Loop 20. Other possible alternatives to consider may include improvements to existing corridors or grade separations.

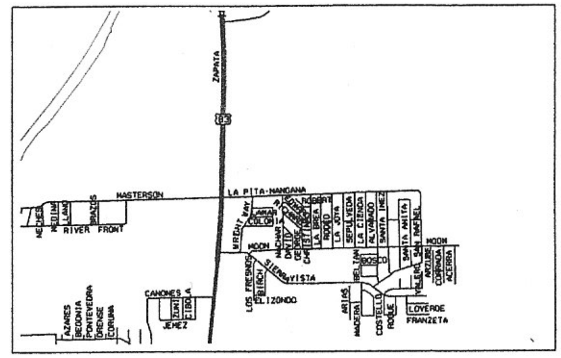
Based on the data collection, documentation and evaluation of existing conditions, travel forecasts, a time of day traffic operational analysis, and a segment by segment cost benefit analysis, Alliance Transportation Group, Inc. submits the following conclusions.

1. River Road is most beneficial around the City Center, as the roadways on the outskirts of town have excess capacity.
2. Of the five sections analyzed, Section 4 that runs from the existing River Road to Southgate Boulevard provides the most benefits, but also has significant physical constraints.
3. Sections 2 and 3 also provide benefit, but not enough to offset the associated cost of construction.
4. Sections 1 and 5 are essentially not viable due to the lack of traffic that would use these sections.
5. Section 0 (shown in Figure 1) was analyzed using the Laredo Model and found to have little or no traffic using it, therefore it was not analyzed in the cost-benefit analysis and is considered non-viable. Access to developable land can be achieved with cross streets connecting to the existing roadway network.
6. Overall network Vehicle Hours Traveled (VHT) for 2030 is decreased with River Road in place.
7. River Road is expected to trigger a NEPA process and require, at a minimum, an environmental assessment and likely an environmental impact study.
8. Additional work regarding physical constraints is needed to determine if the rail yard and water treatment plants present any additional complications.

Based on these results we recommend that Section 4 be analyzed further for determination of constructability to help alleviate further congestion at the intersection of Meadow Avenue and US 83, and Sections 2 and 3 should be re-evaluated when a final alignment has been determined for River Road to gage the effects that the physical constraints have on these sections.

Appendix A. 24-hour Count Data





LOCATION MAP

AC GROUP LLC
Traffic Data Surveyors

5838 CLIFFBRIER DRIVE
SAN ANTONIO, TEXAS 78250
OFFICE (210) 256-2447
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WWW.ACGROUPLLC.COM

TRAFFIC SURVEY LAYOUT

US 83

LEGEND

CLASSIFICATION DATA

TURNING MOVEMENT DATA

NOT TO SCALE

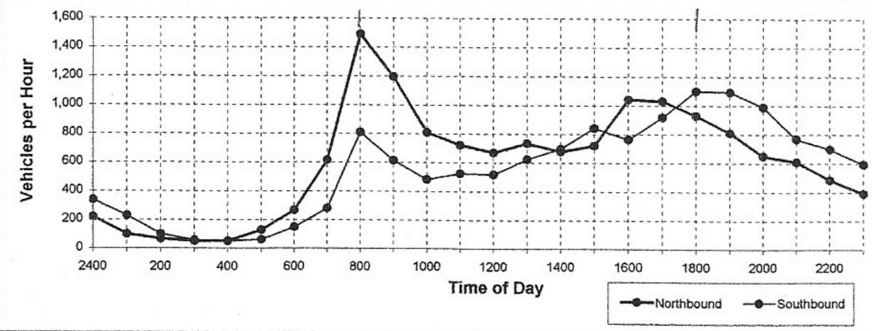
JOB NUMBER:	36-05
CLIENT:	ALLIANCE TRANSPORTATION GROUP
MAJOR STREET:	US 83
MINOR STREET:	
CITY:	LAREDO, TEXAS
SURVEY DATE:	4 MAY 2005
SHEET NO.	1
OF	1

AC GROUP LLC
Traffic Data Surveyors

Average Daily Traffic Data

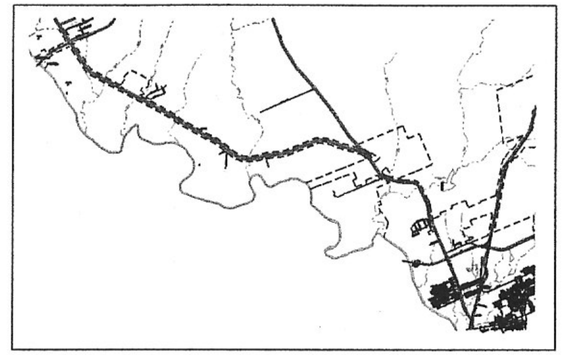
Project No. :	36-05
Station No. :	100
Counter No. :	7594 / 6408
Date:	4 May 2005
Day of Week:	Wednesday
Site:	North of Pita-Mangana Road
Location:	US Highway 83
City/State:	Laredo, Texas

US Highway 83

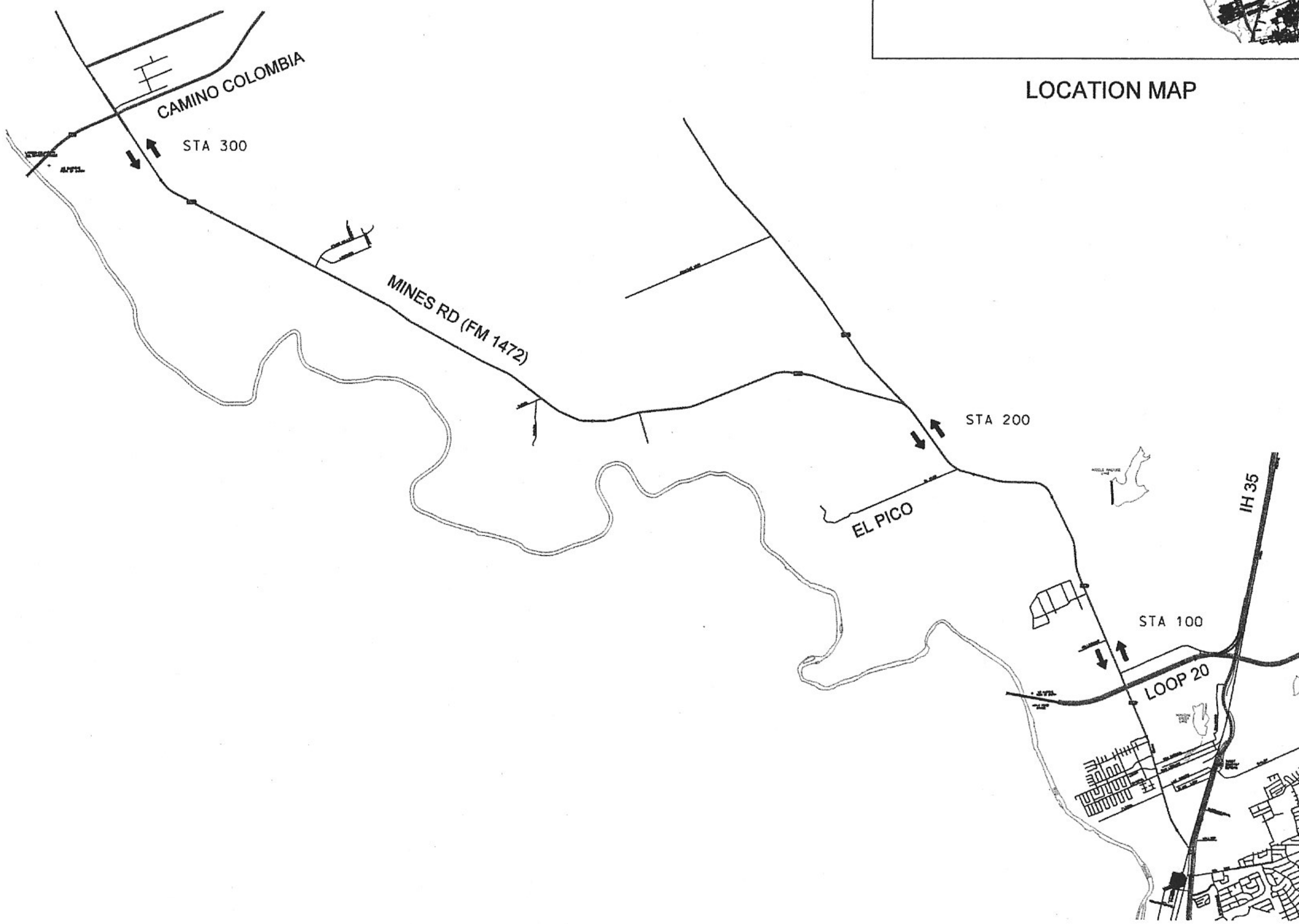


End Time	Northbound US Highway 83		Southbound US Highway 83	
15	34		61	
30	27		62	
45	20		60	
100	20	101	47	229
115	20		32	
130	23		35	
145	15		20	
200	9	67	14	100
215	12		16	
230	10		16	
245	15		14	
300	14	51	13	58
315	11		12	
330	9		11	
345	18		18	
400	15	53	12	52
415	18		9	
430	24		16	
445	29		11	
500	58	129	26	62
515	48		22	
530	68		36	
545	76		41	
600	75	267	50	149
615	76		69	
630	131		62	
645	199		61	
700	210	616	91	281
715	268		155	
730	402		214	
745	414		234	
800	407	1,491	207	809
815	335		182	
830	298		178	
845	318		126	
900	244	1,195	127	613
915	221		109	
930	197		126	
945	188		120	
1000	203	809	128	482
1015	186		137	
1030	186		124	
1045	168		135	
1100	182	722	129	524
1115	163		140	
1130	149		131	
1145	177		113	
1200	183	672	135	518

End Time	Northbound US Highway 83		Southbound US Highway 83	
1215	175		155	
1230	193		139	
1245	187		159	
1300	181	736	172	625
1315	155		174	
1330	169		184	
1345	180		164	
1400	173	677	177	698
1415	167		192	
1430	167		206	
1445	188		228	
1500	199	721	216	842
1515	271		188	
1530	233		203	
1545	273		187	
1600	266	1,043	189	765
1615	256		210	
1630	289		234	
1645	266		239	
1700	220	1,031	236	918
1715	218		260	
1730	251		285	
1745	229		281	
1800	232	930	275	1,101
1815	220		293	
1830	205		265	
1845	190		260	
1900	193	808	275	1,093
1915	170		296	
1930	171		235	
1945	158		238	
2000	150	649	219	988
2015	155		203	
2030	153		183	
2045	156		183	
2100	145	609	200	767
2115	125		179	
2130	132		181	
2145	119		170	
2200	109	485	169	698
2215	98		155	
2230	105		151	
2245	99		157	
2300	90	392	132	594
2315	71		104	
2330	61		93	
2345	56		74	
2400	31	219	70	341
Directional ADT	14,473		13,302	
ADT	27,775			



LOCATION MAP



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TRAFFIC SURVEY LAYOUT

MINES ROAD
(FM 1472)

LEGEND

TRAFFIC VOLUME DATA

TURNING MOVEMENT DATA

NOT TO SCALE

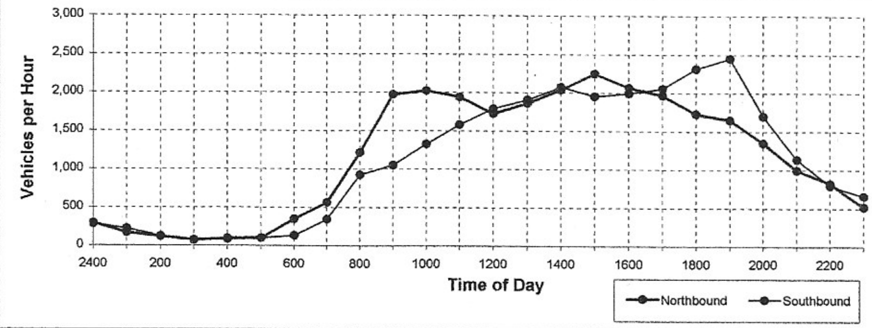
JOB NUMBER:	35-05
CLIENT:	ALLIANCE TRANSPORTATION GROUP
MAJOR STREET:	MINES ROAD (FM 1472)
MINOR STREET:	
CITY:	LAREDO, TEXAS
SURVEY DATE:	3 MAY 2005
SHEET NO.	1
OF	1

AC GROUP LLC
Traffic Data Surveyors

Average Daily Traffic Data

Project No. :	35-05
Station No. :	100
Counter No. :	5599 / 7589
Date:	3 May 2005
Day of Week:	Tuesday
Site:	North of Loop 20
Location:	Mines Road (FM 1472)
City/State:	Laredo, Texas

Mines Road (FM 1472)



End Time	Northbound Mines Road (FM 1472)		Southbound Mines Road (FM 1472)	
15	53		79	
30	57		62	
45	30		28	
100	31	171	58	227
115	35		25	
130	33		43	
145	31		19	
200	22	121	36	123
215	12		20	
230	24		23	
245	21		11	
300	20	77	15	69
315	26		25	
330	17		12	
345	21		19	
400	30	94	27	83
415	26		23	
430	12		23	
445	29		21	
500	33	100	32	99
515	51		34	
530	84		25	
545	135		24	
600	80	350	50	133
615	54		56	
630	130		69	
645	163		90	
700	218	565	132	347
715	188		130	
730	287		222	
745	324		280	
800	416	1,215	292	924
815	351		250	
830	455		239	
845	583		263	
900	581	1,970	297	1,049
915	601		286	
930	500		295	
945	439		372	
1000	481	2,021	372	1,325
1015	496		397	
1030	432		395	
1045	467		380	
1100	548	1,943	408	1,580
1115	410		394	
1130	483		487	
1145	406		464	
1200	425	1,724	446	1,791
1215	462		482	
1230	448		489	
1245	472		459	
1300	480	1,862	477	1,907
1315	483		516	
1330	491		596	
1345	518		494	
1400	546	2,038	468	2,074
1415	546		474	
1430	551		467	
1445	551		486	
1500	600	2,248	529	1,956
1515	503		585	
1530	564		522	
1545	497		427	
1600	501	2,065	456	1,990
1615	454		498	
1630	460		554	
1645	532		527	
1700	520	1,966	479	2,058
1715	358		612	
1730	420		610	
1745	430		592	
1800	521	1,729	503	2,317
1815	412		707	
1830	398		656	
1845	448		563	
1900	394	1,652	523	2,449
1915	382		466	
1930	346		481	
1945	304		388	
2000	320	1,352	363	1,698
2015	229		351	
2030	282		301	
2045	234		238	
2100	250	995	249	1,139
2115	192		217	
2130	182		217	
2145	209		180	
2200	241	824	181	795
2215	149		209	
2230	163		160	
2245	107		186	
2300	103	522	109	664
2315	95		73	
2330	86		90	
2345	56		62	
2400	60	297	57	282
Directional ADT	27,901		27,079	
ADT	54,980			

AC GROUP LLC
Traffic Data Surveyors

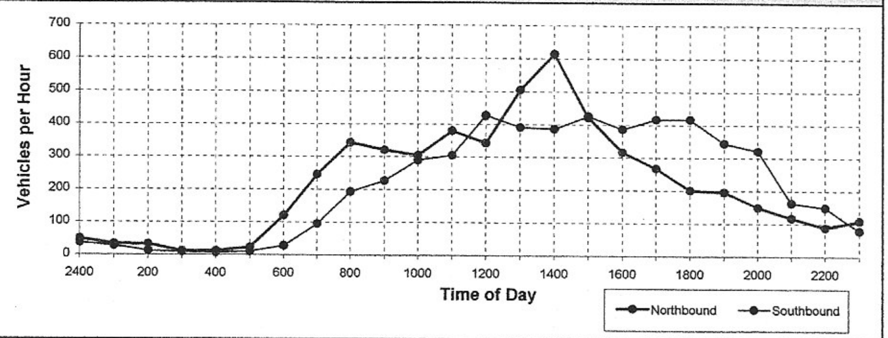
Average Daily Traffic Data

Project No. : 35-05
Station No. : 200
Counter No. : 7596 / 7592

Date: 3 May 2005
Day of Week: Tuesday

Site: Between El Pico and Las Tiendas
Location: Mines Road (FM 1472)
City/State: Laredo, Texas

Mines Road (FM 1472)

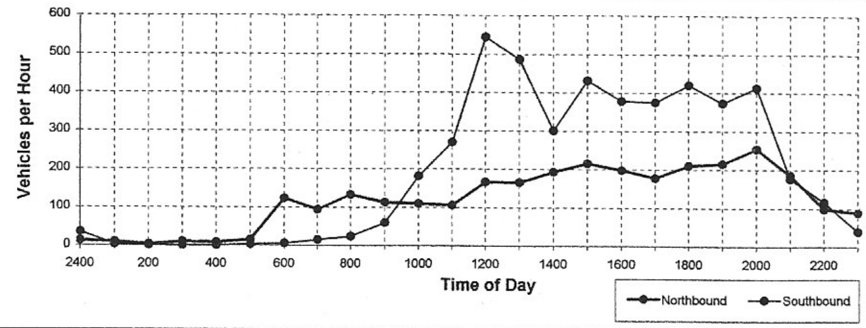


End Time	Northbound		Southbound	
	Mines Road (FM 1472)		Mines Road (FM 1472)	
15	14		18	
30	9		1	
45	5		7	
100	6	34	2	28
115	11		1	
130	5		4	
145	12		4	
200	5	33	4	13
215	1		6	
230	1		0	
245	6		2	
300	4	12	1	9
315	3		1	
330	1		2	
345	7		3	
400	2	13	1	7
415	4		0	
430	3		1	
445	7		0	
500	9	23	10	11
515	18		4	
530	19		5	
545	39		3	
600	45	121	16	28
615	35		10	
630	70		14	
645	67		27	
700	74	246	44	95
715	82		36	
730	78		52	
745	108		56	
800	75	343	49	193
815	75		53	
830	83		67	
845	79		60	
900	83	320	47	227
915	76		56	
930	91		66	
945	66		89	
1000	71	304	79	290
1015	94		88	
1030	98		65	
1045	84		84	
1100	103	379	67	304
1115	77		93	
1130	101		120	
1145	87		112	
1200	77	342	102	427

End Time	Northbound		Southbound	
	Mines Road (FM 1472)		Mines Road (FM 1472)	
1215	112		98	
1230	137		95	
1245	131		78	
1300	125	505	120	391
1315	177		122	
1330	152		101	
1345	156		77	
1400	129	614	86	386
1415	113		85	
1430	122		127	
1445	112		98	
1500	74	421	115	425
1515	65		101	
1530	110		93	
1545	82		85	
1600	59	316	107	386
1615	87		126	
1630	64		91	
1645	57		90	
1700	59	267	109	416
1715	46		108	
1730	52		112	
1745	54		102	
1800	49	201	94	416
1815	46		87	
1830	50		75	
1845	50		86	
1900	50	196	96	344
1915	41		114	
1930	32		55	
1945	25		89	
2000	52	150	63	321
2015	31		39	
2030	33		45	
2045	27		42	
2100	27	118	37	163
2115	18		43	
2130	19		43	
2145	18		26	
2200	33	88	38	150
2215	23		23	
2230	41		19	
2245	24		18	
2300	22	110	20	80
2315	9		13	
2330	18		14	
2345	17		8	
2400	6	50	2	37
Directional ADT	5,206		5,147	
ADT	10,353			

AC GROUP LLC
Traffic Data Surveyors

Mines Road (FM 1472)



Average Daily Traffic Data

Project No. : 35-05
Station No. : 300
Counter No. : 6406 / 6407

Date: 3 May 2005
Day of Week: Tuesday

Site: South of Camino Colombia
Location: Mines Road (FM 1472)
City/State: Laredo, Texas

End Time	Northbound Mines Road (FM 1472)		Southbound Mines Road (FM 1472)	
15	0		1	
30	4		2	
45	3		0	
100	3	10	0	3
115	0		0	
130	0		0	
145	0		0	
200	3	3	1	1
215	2		0	
230	5		0	
245	0		0	
300	3	10	0	0
315	0		0	
330	2		0	
345	2		0	
400	4	8	0	0
415	0		0	
430	5		0	
445	3		3	
500	8	16	0	3
515	16		4	
530	20		0	
545	25		1	
600	62	123	1	6
615	21		2	
630	14		7	
645	27		3	
700	32	94	3	15
715	28		5	
730	23		8	
745	38		3	
800	44	133	8	24
815	33		10	
830	26		18	
845	27		6	
900	27	113	26	60
915	23		24	
930	35		50	
945	28		58	
1000	24	110	50	182
1015	20		53	
1030	25		70	
1045	30		73	
1100	31	106	74	270
1115	45		132	
1130	43		141	
1145	36		165	
1200	43	167	107	545

End Time	Northbound Mines Road (FM 1472)		Southbound Mines Road (FM 1472)	
1215	42		99	
1230	52		84	
1245	39		174	
1300	33	166	130	487
1315	62		81	
1330	48		60	
1345	43		99	
1400	40	193	61	301
1415	60		147	
1430	59		78	
1445	63		109	
1500	34	216	98	432
1515	25		76	
1530	59		64	
1545	53		87	
1600	61	198	151	378
1615	57		95	
1630	40		56	
1645	38		123	
1700	43	178	101	375
1715	56		129	
1730	39		109	
1745	51		99	
1800	65	211	83	420
1815	47		43	
1830	50		95	
1845	45		117	
1900	74	216	118	373
1915	69		122	
1930	61		122	
1945	60		104	
2000	64	254	65	413
2015	48		45	
2030	48		47	
2045	44		39	
2100	46	186	46	177
2115	43		55	
2130	17		14	
2145	24		22	
2200	14	98	26	117
2215	43		18	
2230	23		7	
2245	12		6	
2300	11	89	9	40
2315	3		15	
2330	2		4	
2345	4		2	
2400	4	13	15	36
Directional ADT	2,911		4,658	
ADT	7,569			

Appendix B. City of Laredo Signal Timing

TRAFFIC SAFETY DIVISION
NAZTEC CONTROLLER PROGRAMMING SHEET
MODEL 920-METRO

DATE:
INTERSECTION NAME: F.M. 1472 & Sta. Maria

111	INTERVAL TIMES							
PHASE	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
MOVEMENT		**sb**	**wb**	**nb**				
MIN GRN		15	12	15			10	
GAP, EXT		1.5	2.0	1.5			2.0	
MAX 1		55	25	55			15	
MAX 2								
YELLOW	4.0	4.0	4.0	4.5	4.0	4.0	4.0	4.0
RED	1.0	1.5	1.0	1.5	1.0	1.5	1.0	1.0
WALK								
PED CLR								
ADD INIT								
TT REDUC								
TB REDUC								
MIN GAP								
MX IN GR								
WALK 2								
PED CLR2								
MAX 3								
MAX EXT								

FIXED TIME	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
For Recall	0.0	sb	wb	nb				
Min Time								

112	BARRIER PHASES	1	2	3	4	5	6	7	8
	BARRIER 1	1	1	1	1				
	BARRIER 2					1	1	1	1
	BARRIER 3								
	BARRIER 4								

113	CONFLICTING PHASES		
		PH 1 WITH	none
		PH 2 WITH	none
		PH 3 WITH	none
		PH 4 WITH	none

SELECTIONS:
PH 1 & 2 - NONE, 5, 6 OR 5 & 6
PH 3 & 4 - NONE, 7, 8 OR 7 & 8

DATE	**COMMENT**

114	RECALL	PH	TYPE	PH	TYPE
	SELECTIONS:	1	mem-off	5	mem-off
	MIN, MAX,, PED & MIN.,	2	mem-off	6	mem-off
	PED & MAX, MEM ON, MEM OFF	3	min	7	mem-off
		4	max	8	mem-off

115	PH ROTATION	PH PAIR	1/2	3/4	5/6	7/8
	RESERVICE PHASES	YES/NO	NO	NO	NO	NO
	REVERSE PHASES	YES/NO	NO	NO	NO	NO
	CONDITIONAL SERVICE	YES/NO	NO	NO	NO	NO
	INHIBIT BACKUP	YES/NO	NO	NO	NO	NO

(1 = ON, 0 = OFF)

116	PHASE OPTIONS	1	2	3	4	5	6	7	8
	PED PROTECT								
	NON ACTUATION 1								
	NON ACTUATION 2								
	LAST CAR PASSAGE								
	REST IN WALK								
	DON'T SKIP								
	SOFT RECALL								
	SELECT MAX 2								
	SELECT PED TIMING 2								
	FLASHING WALK								
	OMIT	1				1	1		1
	DUAL ENTRY								
	SIMUL. GAP								

12	CONTROLLER PARAMETERS		
RED REVERT TIME	0	INPUT . . ASSIGN	
V/O SAMPLE	0	TEST A: (NONE,DIM,FLASH,RAIL)	NONE
# OF SAMPLES	0	TEST B: (NONE,DIM,FLASH,RAIL)	NONE
EXCLUSIVE PED	OFF		
V/O STOP ON FUL	OFF	TXMIT ALARMS	OFF
REC PAT EVTS	OFF	% GRN SMPL TIME	0
H/W STN ID	OFF	CONSOLE TIME OUT	99

131	INITIALIZATION OF RINGS	RING 1	2
	PHASE (1-8 or ALL RED)	2	6
	INTERVAL (GRN,YEL,RED)	GRN	GRN
	IF YELLOW, NEXT PH (1-8 or NORMAL)	NORMAL	NORMA

132 RING INPUTS

RING..…………..........1.............………	1	2	3	4	5	6	7	8
	………………….2…………………..							
PHASES	1	2	3	4	5	6	7	8
USE OPP. RING'S INPUTS	0	0	0	0	0	0	0	0

INTERSECTION NAME: F.M. 1472 & Sta. Maria

141	FLASH PARAMETERS	
	ALLOW FLASH? (YES/NO)	yes
	VOLT MO. FLASH: (ON, OFF)	off

142	FLASH STATES	1	2	3	4	5	6	7	8
	VEH (RED,YEL,DRK)								
	PED (ON, OFF)								
	OVERLAP (RED,YEL,DRK)								
	TOGGLE INDICATION TYPES BY USING PHASE NUMBERS								

143	BEG/END FLASH	RING.............1	2
	BEGIN (NO. 1-8 or ANY PHASE)	ANY	ANY
	END (NO. 1-8 or ALL RED)	ALL RED	ALL RED

144	RETURN FROM FLASH CLEARANCE TIMES		
YEL		RED	

145	COMMON FLASH PH'S		1	2	3	4	5	6	7	8
	& OVERLAPS	PHASES								
		OVERLAPS								

151	OVERLAP PARAMETERS (ON/OFF)
INTERNAL PROGRAMMING	OFF
LOCK MODE	OFF
PH NEXT CONFLICT MODE	OFF
CALC. FROM PARENT PHASES	OFF

152									
PROGRAM OVERLAPS	PH	1	2	3	4	5	6	7	8
OVERLAP	1		1						
	2								
	3				1				
	4								
	5								
	6								
	7								
	8								

153								
OVERLAP #	1	2	3	4	5	6	7	8
TYPE (NRM =N , ILL= I , FLA=F)								

INTERSECTION NAME: F.M. 1472 & Sta. Maria

CONFLICTING PHASES	PH	1	2	3	4	5	6	7	8
154 OVERLAP	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								

155

CONFLICTING OVERLAPS	PH	1	2	3	4	5	6	7	8
OVERLAP	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								

156

SUPRESSION PHASES	PH	1	2	3	4	5	6	7	8
OVERLAP	1								
	2								
	3								
	4								
	5								
	6								
	7								
	8								

OVERLAP CLEARANCES

157	OVERLAP	1	2	3	4	5	6	7	8
ADD GRN		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
YEL CLR		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RED CLR		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

158	NON-NEMA OVERLAP	OLP	5	6	7	8
OUTPUT MAP	PED OUT (1-8,NONE)					

159

		INPUT PHASE							
PED OVERLAPS		1	2	3	4	5	6	7	8
PED OUT	1	1							
	2		1						
	3			1					
	4				1				
	5					1			
	6						1		
	7							1	
	8								1

INTERSECTION NAME: F.M. 1472 & Sta. Maria

161	ALARM PARAMETERS	
	TXMIT ALARMS	OFF
	RECORD PATTRN EVTS	OFF

MASK ALARMS			1	2	3	4	5	6	7	8
162	1-8	1								
	9-16	2								
	17-24	3								
	25-32	4								
	33-40	5								
	41-48	6								
	49-56	7								
	57-64	8								

MASK ALARMS			1	2	3	4	5	6	7	8
162	1-8	1								
	9-16	2								
	17-24	3								
	25-32	4								
	33-40	5								
	41-48	6								
	49-56	7								
	57-64	8								

17	ACTIVATE RUN TIMER? (YES \ NO)	

18

OUTPUT DIMMING	PH	1	2	3	4	5	6	7	8
	GRN								
	YEL								
	RED								
	WALK								
	PED CLR								
	DON'T WALK								
	OLP GRN								
	OLP YEL								
	OLP RED								

19

LAMP MONITOR		LIMIT IN. OFST		
DISPLAY MODE	OFF	SIGNAL	0	0
VALID SMPL AGE	0	STREET	0	0
		CAL PATTRN ..... PHASE INTVL		

INTERSECTION NAME: F.M. 1472 & Sta. Maria

21	TEST CONFIGURATION	MODE		NUMBER		
		CMND	COOR	OFST	PLAN	CMND
	CURRENT	RTC	RTC	9	99	99
	NEW	RTC	RTC	9	99	99

Repeated on page 13.

22	PLAN	CYCLE	L- TRANS%	S-	OFFSET	1	2	3	4
	1		17	17					
	2		17	17					
	3		17	17					
	4		17	17					
	5		17	17					
	6		17	17					
	7		17	17					
	8		17	17					
	9		17	17					
	10		17	17					
	11		17	17					
	12		17	17					
	13		17	17					
	14		17	17					
	15		17	17					
	16		17	17					

INTERSECTION NAME: F.M. 1472 & Sta. Maria

COORDINATION PLANS **EASY PROGRAMMING OFF**

			PHASE #							
23	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

			PHASE #							
	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

			PHASE #							
	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

			PHASE #							
	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

			PHASE #							
	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

			PHASE #							
	PLAN #		1	2	3	4	5	6	7	8
EASY SPLIT										
COORDINATED PHASE				&						

INTERSECTION NAME: F.M. 1472 & Sta. Maria

COORDINATION PLANS **FORCE OFFS PROGRAMMING ON**

USING PERMISSIVE STARTS AND FORCE OFFS

			PHASE #							
23	PLAN #	**1**	1	2	3	4	5	6	7	8
	PRIMARY FORCE OFF									
	VEH YIELD 1									
	SECONDARY FORCE OFF									
	PED YIELD									

			PHASE #							
23	PLAN #	**2**	1	2	3	4	5	6	7	8
	PRIMARY FORCE OFF									
	VEH YIELD 1									
	SECONDARY FORCE OFF									
	PED YIELD									

			PHASE #							
23	PLAN #	**3**	1	2	3	4	5	6	7	8
	PRIMARY FORCE OFF									
	VEH YIELD 1									
	SECONDARY FORCE OFF									
	PED YIELD									

			PHASE #							
23	PLAN #	**4**	1	2	3	4	5	6	7	8
	PRIMARY FORCE OFF									
	VEH YIELD 1									
	SECONDARY FORCE OFF									
	PED YIELD									

			PHASE #							
23	PLAN #	**5**	1	2	3	4	5	6	7	8
	PRIMARY FORCE OFF									
	VEH YIELD 1									
	SECONDARY FORCE OFF									
	PED YIELD									

			PHASE #							
23	PLAN #	**6**	1	2	3	4	5	6	7	8
	PRIMARY FORCE OFF									
	VEH YIELD 1									
	SECONDARY FORCE OFF									
	PED YIELD									

			PHASE #							
23	PLAN #	**7**	1	2	3	4	5	6	7	8
	PRIMARY FORCE OFF									
	VEH YIELD 1									
	SECONDARY FORCE OFF									
	PED YIELD									

PLEASE MAKE COPIES FOR ADDITIONAL PLANS AS REQUIRED.

INTERSECTION NAME: F.M. 1472 & Sta. Maria

COORDINATION PLANS **FORCE OFFS PROGRAMMING ON**

USING PERMISSIVE STARTS AND FORCE OFFS

		PHASE #							
23 PLAN #	**8**	1	2	3	4	5	6	7	8
PRIMARY FORCE OFF									
VEH YIELD 1									
SECONDARY FORCE OFF									
PED YIELD									

		PHASE #							
23 PLAN #	**9**	1	2	3	4	5	6	7	8
PRIMARY FORCE OFF									
VEH YIELD 1									
SECONDARY FORCE OFF									
PED YIELD									

		PHASE #							
23 PLAN #	**10**	1	2	3	4	5	6	7	8
PRIMARY FORCE OFF									
VEH YIELD 1									
SECONDARY FORCE OFF									
PED YIELD									

		PHASE #							
23 PLAN #	**11**	1	2	3	4	5	6	7	8
PRIMARY FORCE OFF									
VEH YIELD 1									
SECONDARY FORCE OFF									
PED YIELD									

		PHASE #							
23 PLAN #	**12**	1	2	3	4	5	6	7	8
PRIMARY FORCE OFF									
VEH YIELD 1									
SECONDARY FORCE OFF									
PED YIELD									

		PHASE #							
23 PLAN #	**13**	1	2	3	4	5	6	7	8
PRIMARY FORCE OFF									
VEH YIELD 1									
SECONDARY FORCE OFF									
PED YIELD									

		PHASE #							
23 PLAN #	**14**	1	2	3	4	5	6	7	8
PRIMARY FORCE OFF									
VEH YIELD 1									
SECONDARY FORCE OFF									
PED YIELD									

PLEASE MAKE COPIES FOR ADDITIONAL PLANS AS REQUIRED.
INTERSECTION NAME: F.M. 1472 & Sta. Maria

24		SP	CY	PLAN	CMND		SP	CY	PLAN	CMND
INPUT MAP		1	1	1	0		3	1	1	0
		1	2	1	0		3	2	1	0
		1	3	1	0		3	3	1	0
		1	4	1	0		3	4	1	0
		2	1	1	0		4	1	1	0
		2	2	1	0		4	2	1	0
		2	3	1	0		4	3	1	0
		2	4	1	0		4	4	1	0

25		PLAN	CYC	SPL		PLAN	CYC	SPL
OUTPUT		1	1	1		9	1	1
CYC/SPL		2	1	1		10	1	1
MAP		3	1	1		11	1	1
		4	1	1		12	1	1
		5	1	1		13	1	1
		6	1	1		14	1	1
		7	1	1		15	1	1
		8	1	1		16	1	1

26	COOR PARAMETERS		WALK RECYC	
	SYNC LNGTH	0.0	LV WALK BEF	TIMED
	PSEU SYNC	OFF	LV WALK AFT	TIMED
	COOR RUN	OFF	RECYC MODE	OFF
	APPLY HOLD	OFF		
	COOR TYP	NORM PROG		
	ELECT- MECH	OFF	INTERCONNECT	FREE
	CLOSE LOOP	OFF	PRE OUT DWELL	OFF
	STOP IN WALK	OFF	WALK = VEH PERM	OFF
			INH COOR FAIL	OFF

31	PREEMPT	1	2	3	4	5	6
ALLOWED		0	0	0	0	0	0
PRE OUT DWELL ONLY		OFF					

32	PREEMPT 1 PARAMETERS				
DELAY			0	TRACK LOCK	OFF
SKIP CLR		MINIMUM	0	FLASH	OFF
SKIP CLR	OFF	TYPE	FIRE	PED OMIT	OFF

33	PREEMPT 1							
PHASE / OVLPS	1	2	3	4	5	6	7	8
TRACK CLRNC 1 PHASES								
OLP'S								
TRACK CLRNC 2 PHASES								
OLP'S								
PREEMPTION PHASES								
OLP'S								
RETURN PHASES								

INTERSECTION NAME: F.M. 1472 & Sta. Maria

34	PREEMPT 1	INTVL	MIN	WLK	PCL	YEL	RED
	BEGIN CLRNCS		0	0	0	0.0	0.0
	TRACK 1 CLRNCS		0	0	0	0.0	0.0
	TRACK 2 CLRNCS		0	0	0	0.0	0.0
	RETRN CLRNCS		0	0	0	0.0	0.0

RAIL FLSH

35	FLASH 0	1	2	3	4	5	6	7	8
<RED/DRK/YEL> VEH									
<ON/OFF> PED									
<R/D/Y> OVERLAP									

36	RECALL	PHASE	TYPE	PHASE	TYPE
PREEMPT 1		1	MEM ON	5	MEM ON
		2	MEM ON	6	MEM ON
		3	MEM ON	7	MEM ON
		4	MEM ON	8	MEM ON

41	REAL-TIME CLOCK & CALENDAR			
	DATE	DAY	TIME	SEC
CURRENT	##-##-##	XXX	##:##	###
NEW				

42	TIME BASE PARAMETERS			
	DYLGT- TM(MO/WK)			REF-TIME
RL-TM CLOCK;		SPRG		60
CHANGE MODE:		FALL		
PULSE TIME:				
TOD DIMMING:				

INTERSECTION NAME: F.M. 1472 & Sta. Maria

43-1	CMND	0	OUTPUT	1	OFF	5	OFF
DETECTOR MAP				2	OFF	6	OFF
				3	OFF	7	OFF
				4	OFF	8	OFF

43-2	CONFLICTING PHASE'S		PHASE 1	WITH	NONE
CMND	0		PHASE 2	WITH	NONE
			PHASE 3	WITH	NONE
			PHASE 4	WITH	NONE

43-3	RECALL	PHASE	TYPE	PHASE	TYPE
CMD	0	1		5	
		2		6	
		3		7	
		4		8	

43-4 OPTIONS	0	2	3	4	5	6	7	8
REST IN WALK								
DON'T SKIP								
SOFT RECALL								
SELECT MAX 2								
" PED TIMING 2								
INHIBIT MAX								
DALLAS MODE								
RED REST								
DUAL ENTRY								
PED OMIT								

43-5	PHASE ROTATION, PAIR		1 / 2	3 / 4	5 / 6	7 / 8
CMD	0	RESERVICE				
		REVERSE PHASES				
		CONDITIONAL SERVICE				

SELECTIONS:

PH 1& 2 = NONE, 5, 5, 6 OR 5 & 6
PH 3 & 4= NONE, 5, 7, 8 OR 7 & 8

COMMANDS :	1	OFF PEAK
(STANDARD)	2	AM - PEAK
TRAFFIC SAFETY	3	PM - PEAK
LAREDO	4	NOON - PEAK
	5	OFF - OFF PEAK
	6 - 16	OTHER

SELECTIONS:

0	**MEM ON**
1	**MEM OFF**
2	**MIN**
3	**MAX**
4	**PED & MIN**
5	**PED & MAX**
6	**NON ACT**
7	**OMIT**
8	**NOT USED**
9	**RECALL**

PH RECALL, MEM ON,
MEM OFF, MIN, MAX
PED & MIN, PED & MAX

INTERSECTION NAME: F.M. 1472 & Sta. Maria

43-1	CMND	1	OUTPUT	1	OFF	5	OFF
DETECTOR MAP				2	OFF	6	OFF
				3	OFF	7	OFF
				4	OFF	8	OFF

43-2	CONFLICTING	PHASE'S	PHASE 1	WITH	NONE
CMND	1		PHASE 2	WITH	NONE
			PHASE 3	WITH	NONE
			PHASE 4	WITH	NONE

43-3	RECALL	PHASE	TYPE	PHASE	TYPE
CMD	1	1		5	
		2		6	
		3		7	
		4		8	

43-4 OPTIONS	0	2	3	4	5	6	7	8
REST IN WALK								
DON'T SKIP								
SOFT RECALL								
SELECT MAX 2								
" PED TIMING 2								
INHIBIT MAX								
DALLAS MODE								
RED REST								
DUAL ENTRY								
PED OMIT								

43-5	PHASE ROTATION, PAIR		1 / 2	3 / 4	5 / 6	7 / 8
CMD	1	RESERVICE				
		REVERSE PHASES				
		CONDITIONAL SERVICE				

SELECTIONS:
PH 1& 2 = NONE, 5, 5, 6 OR 5 & 6
PH 3 & 4= NONE, 5, 7, 8 OR 7 & 8

COMMANDS : (STANDARD) TRAFFIC SAFETY LAREDO

1	OFF PEAK
2	AM - PEAK
3	PM - PEAK
4	NOON - PEAK
5	OFF - OFF PEAK
6 - 16	OTHER

SELECTIONS:

0	**MEM ON**
1	**MEM OFF**
2	**MIN**
3	**MAX**
4	**PED & MIN**
5	**PED & MAX**
6	**NON ACT**
7	**OMIT**
8	**NOT USED**
9	**RECALL**

PH RECALL, MEM ON,
MEM OFF, MIN, MAX
PED & MIN, PED & MAX

INTERSECTION NAME: F.M. 1472 & Sta. Maria

43-1	CMND	2	OUTPUT	1	OFF	5	OFF
DETECTOR MAP				2	OFF	6	OFF
				3	OFF	7	OFF
				4	OFF	8	OFF

43-2	CONFLICTING	PHASE'S		
CMND	2	PHASE 1	WITH	NONE
		PHASE 2	WITH	NONE
		PHASE 3	WITH	NONE
		PHASE 4	WITH	NONE

43-3	RECALL	PHASE	TYPE	PHASE	TYPE
CMD	2	1		5	
		2		6	
		3		7	
		4		8	

43-4 OPTIONS	0	2	3	4	5	6	7	8
REST IN WALK								
DON'T SKIP								
SOFT RECALL								
SELECT MAX 2								
" PED TIMING 2								
INHIBIT MAX								
DALLAS MODE								
RED REST								
DUAL ENTRY								
PED OMIT								

43-5	PHASE ROTATION, PAIR		1 / 2	3 / 4	5 / 6	7 / 8
CMD	2	RESERVICE				
		REVERSE PHASES				
		CONDITIONAL SERVICE				

SELECTIONS:

PH 1& 2 = NONE, 5, 5, 6 OR 5 & 6
PH 3 & 4= NONE, 5, 7, 8 OR 7 & 8

COMMANDS :	1	OFF PEAK
(STANDARD)	2	AM - PEAK
TRAFFIC SAFETY	3	PM - PEAK
LAREDO	4	NOON - PEAK
	5	OFF - OFF PEAK
	6 - 16	OTHER

SELECTIONS:

0	**MEM ON**
1	**MEM OFF**
2	**MIN**
3	**MAX**
4	**PED & MIN**
5	**PED & MAX**
6	**NON ACT**
7	**OMIT**
8	**NOT USED**
9	**RECALL**

PH RECALL, MEM ON,
MEM OFF, MIN, MAX
PED & MIN, PED & MAX

INTERSECTION NAME: F.M. 1472 & Sta. Maria

43-1	CMND	3	OUTPUT	1	OFF	5	OFF
DETECTOR MAP				2	OFF	6	OFF
				3	OFF	7	OFF
				4	OFF	8	OFF

43-2	CONFLICTING		PHASE'S	PHASE 1	WITH	NONE
CMND		3		PHASE 2	WITH	NONE
				PHASE 3	WITH	NONE
				PHASE 4	WITH	NONE

43-3	RECALL	PHASE	TYPE	PHASE	TYPE
CMD	3	1		5	
		2		6	
		3		7	
		4		8	

43-4 OPTIONS	0	2	3	4	5	6	7	8
REST IN WALK								
DON'T SKIP								
SOFT RECALL								
SELECT MAX 2								
" PED TIMING 2								
INHIBIT MAX								
DALLAS MODE								
RED REST								
DUAL ENTRY								
PED OMIT								

43-5	PHASE ROTATION, PAIR		1 / 2	3 / 4	5 / 6	7 / 8
CMD	3	RESERVICE				
		REVERSE PHASES				
		CONDITIONAL SERVICE				

SELECTIONS:

PH 1& 2 = NONE, 5, 5, 6 OR 5 & 6

PH 3 & 4= NONE, 5, 7, 8 OR 7 & 8

COMMANDS :	1	OFF PEAK
(STANDARD)	2	AM - PEAK
TRAFFIC SAFETY	3	PM - PEAK
LAREDO	4	NOON - PEAK
	5	OFF - OFF PEAK
	6 - 16	OTHER

SELECTIONS:

0	**MEM ON**
1	**MEM OFF**
2	**MIN**
3	**MAX**
4	**PED & MIN**
5	**PED & MAX**
6	**NON ACT**
7	**OMIT**
8	**NOT USED**
9	**RECALL**

PH RECALL, MEM ON,
MEM OFF, MIN, MAX
PED & MIN, PED & MAX

INTERSECTION NAME: F.M. 1472 & Sta. Maria

43-1	CMND	4	OUTPUT	1	OFF	5	OFF
DETECTOR MAP				2	OFF	6	OFF
				3	OFF	7	OFF
				4	OFF	8	OFF

43-2	CONFLICTING	PHASE'S	PHASE 1	WITH	NONE
CMND	4		PHASE 2	WITH	NONE
			PHASE 3	WITH	NONE
			PHASE 4	WITH	NONE

43-3	RECALL	PHASE	TYPE	PHASE	TYPE
CMD	4	1		5	
		2		6	
		3		7	
		4		8	

43-4 OPTIONS	0	2	3	4	5	6	7	8
REST IN WALK								
DON'T SKIP								
SOFT RECALL								
SELECT MAX 2								
" PED TIMING 2								
INHIBIT MAX								
DALLAS MODE								
RED REST								
DUAL ENTRY								
PED OMIT								

43-5	PHASE ROTATION, PAIR		1 / 2	3 / 4	5 / 6	7 / 8
CMD	4	RESERVICE				
		REVERSE PHASES				
		CONDITIONAL SERVICE				

SELECTIONS:

PH 1& 2 = NONE, 5, 5, 6 OR 5 & 6

PH 3 & 4= NONE, 5, 7, 8 OR 7 & 8

COMMANDS :
(STANDARD)
TRAFFIC SAFETY
LAREDO

1	OFF PEAK
2	AM - PEAK
3	PM - PEAK
4	NOON - PEAK
5	OFF - OFF PEAK
6 - 16	OTHER

SELECTIONS:

0	**MEM ON**
1	**MEM OFF**
2	**MIN**
3	**MAX**
4	**PED & MIN**
5	**PED & MAX**
6	**NON ACT**
7	**OMIT**
8	**NOT USED**
9	**RECALL**

PH RECALL, MEM ON,
MEM OFF, MIN, MAX
PED & MIN, PED & MAX

INTERSECTION NAME: F.M. 1472 & Sta. Maria

43-1	CMND	5	OUTPUT	1	OFF	5	OFF
DETECTOR MAP				2	OFF	6	OFF
				3	OFF	7	OFF
				4	OFF	8	OFF

43-2	CONFLICTING PHASE'S	PHASE 1	WITH	NONE
CMND	5	PHASE 2	WITH	NONE
		PHASE 3	WITH	NONE
		PHASE 4	WITH	NONE

43-3	RECALL	PHASE	TYPE	PHASE	TYPE
CMD	5	1		5	
		2		6	
		3		7	
		4		8	

43-4 OPTIONS	0	2	3	4	5	6	7	8
REST IN WALK								
DON'T SKIP								
SOFT RECALL								
SELECT MAX 2								
" PED TIMING 2								
INHIBIT MAX								
DALLAS MODE								
RED REST								
DUAL ENTRY								
PED OMIT								

43-5	PHASE ROTATION, PAIR	1 / 2	3 / 4	5 / 6	7 / 8
CMD 5	RESERVICE				
	REVERSE PHASES				
	CONDITIONAL SERVICE				

SELECTIONS:

PH 1& 2 = NONE, 5, 5, 6 OR 5 & 6

PH 3 & 4= NONE, 5, 7, 8 OR 7 & 8

COMMANDS :
(STANDARD)
TRAFFIC SAFETY
LAREDO

1	OFF PEAK
2	AM - PEAK
3	PM - PEAK
4	NOON - PEAK
5	OFF - OFF PEAK
6 - 16	OTHER

SELECTIONS:

0	**MEM ON**
1	**MEM OFF**
2	**MIN**
3	**MAX**
4	**PED & MIN**
5	**PED & MAX**
6	**NON ACT**
7	**OMIT**
8	**NOT USED**
9	**RECALL**

PH RECALL, MEM ON,
MEM OFF, MIN, MAX
PED & MIN, PED & MAX

INTERSECTION NAME: F.M. 1472 & Sta. Maria

43-1	CMND	6	OUTPUT	1	OFF	5	OFF
				2	OFF	6	OFF
DETECTOR MAP				3	OFF	7	OFF
				4	OFF	8	OFF

43-2	CONFLICTING PHASE'S		PHASE 1	WITH	NONE
CMND	6		PHASE 2	WITH	NONE
			PHASE 3	WITH	NONE
			PHASE 4	WITH	NONE

43-3	RECALL	PHASE	TYPE	PHASE	TYPE
CMD	6	1		5	
		2		6	
		3		7	
		4		8	

43-4 OPTIONS	0	2	3	4	5	6	7	8
REST IN WALK								
DON'T SKIP								
SOFT RECALL								
SELECT MAX 2								
" PED TIMING 2								
INHIBIT MAX								
DALLAS MODE								
RED REST								
DUAL ENTRY								
PED OMIT								

43-5	PHASE ROTATION, PAIR	1 / 2	3 / 4	5 / 6	7 / 8
CMD 6	RESERVICE				
	REVERSE PHASES				
	CONDITIONAL SERVICE				

SELECTIONS:
PH 1& 2 = NONE, 5, 5, 6 OR 5 & 6
PH 3 & 4= NONE, 5, 7, 8 OR 7 & 8

COMMANDS :	1	OFF PEAK
(STANDARD)	2	AM - PEAK
TRAFFIC SAFETY	3	PM - PEAK
LAREDO	4	NOON - PEAK
	5	OFF - OFF PEAK
	6 - 16	OTHER

SELECTIONS:

0	**MEM ON**
1	**MEM OFF**
2	**MIN**
3	**MAX**
4	**PED & MIN**
5	**PED & MAX**
6	**NON ACT**
7	**OMIT**
8	**NOT USED**
9	**RECALL**

PH RECALL, MEM ON,
MEM OFF, MIN, MAX
PED & MIN, PED & MAX

INTERSECTION NAME: F.M. 1472 & Sta. Maria

Appendix C. Travel Demand Model Guide

INTRODUCTION

As part of the Laredo River Road Operational Analysis Travel Model, a traditional travel modeling process was used as an aid in development of the operational analysis. An extensive effort was made to develop a complete process that would produce a River Road Operational Analysis Travel Demand Model. The procedures established for this project were developed to conform to state-of-the-practice modeling procedures used and/or developed in the State of Texas. The overall objective of these efforts are to develop 24-Hour, AM peak, and PM peak traffic projections that can be input into traffic simulation models. The following compare an operational travel demand modeling versus planning modeling, describes the modeling processes and procedures, and explains how these processes and procedures were used for the development of the Laredo River Road Operational Analysis Travel Model.

Travel demand models are used to predict traffic volumes on proposed roadways for the development of transportation plans. The traffic forecast is based on forecasted demographics, i.e., population and employment. Since it is a computerized model simulation system, a roadway can be tested for its traffic forecast even if it does not yet exist. Based on the origins and destinations of expected population and employment concentrations, the computer simulation forecasts the traffic a roadway would be expected to carry, if it were built or improved. The traffic model can also be used to predict the impact of widening roadways (increasing their expected speed), as well as the impact of specific residential developments or shopping and employment centers.

The Laredo River Road Operational Analysis Travel Model has been developed using the state-of-the-practice software package TransCAD.

OPERATIONAL DEMAND MODELING VS. PLANNING MODELING

The River Road operational model is a refinement of the more commonly used TxDOT Laredo planning model. The intent of refinement of the planning model is to better reflect detailed changes in traffic loadings on the transportation network and incorporate new land uses that may not have been considered in the TxDOT model. The resulting forecasted traffic demand, including turning movements, are an input to an operational simulation model, CORSIM.

CORSIM is FHWA's microscopic traffic simulation tool. CORSIM is an integration of NETSIM and FRESIM. This simulation suite can simulate networks containing both surface streets and freeways. CORSIM does not forecast travel demand. CORSIM produces a vehicular level simulation of a given network, signalization, and other parameters. CORSIM requires an input level of traffic, either from existing counts or a travel demand forecast.

It is widely held in transportation planning that route choice behavior and the precision of trip end location is highly correlated. Research indicates that a finer level of detail in the zone system leads to fewer errors in the traffic assignment process. However, the promulgation of errors seems to "bottom out" at a very fine detail of zones and network, where the effort to produce the system does not yield more accurate results.

It is clear that the planning level model for Laredo is not refined to the degree needed to reduce the number of "wrong path choices" needed for the development of traffic for input into CORSIM.

There are several differences between a travel demand model created for planning purposes and a model designed for input to operational simulation. As noted above, the capacities seen in the corridor under analysis will vary significantly from the planning model. While a planning model is more regional in scope, a travel demand model developed for operational simulation is focused solely on the corridor under study.

LAREDO RIVER ROAD OPERATIONAL ANALYSIS TRAVEL MODEL REFINEMENT

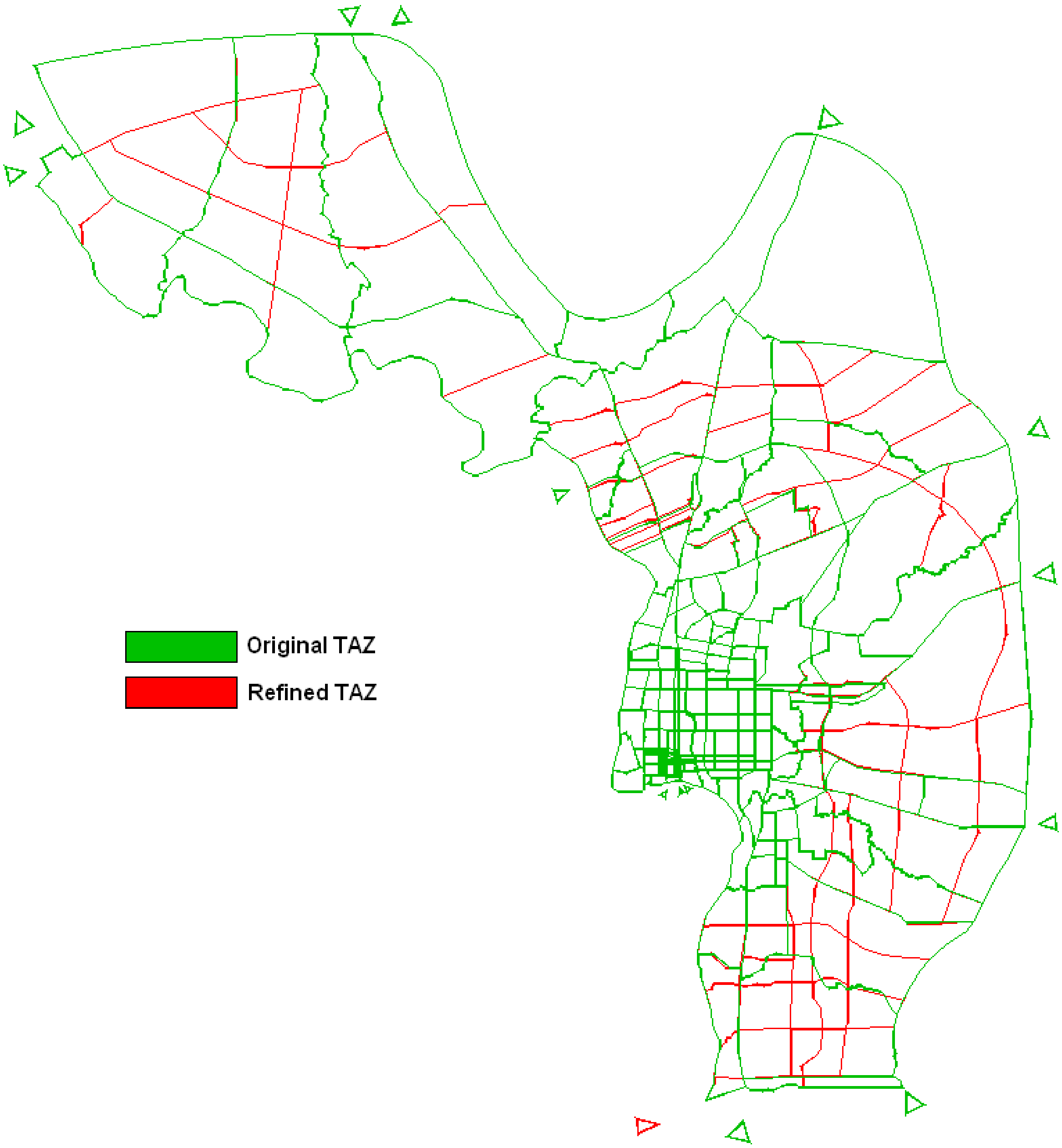
The initial phase of the modeling process was to assess the most feasible method of developing a travel demand model for the River Road Operational Analysis. The TxDOT Transportation Planning and Programming Division (TPP) has developed a modeling system for the entire Laredo metropolitan area. The 24-Hour Laredo Travel model was used as the basis for development of a refined River Road Operational Analysis Travel Model. It is anticipated that this model will be used in conjunction with the operational simulations of various design alternatives

After careful consideration, an area of the model zone structure and network was chosen for refinement to represent the study area. The zone structure, along with population and employment for 2030 were refined in the study area, and surrounding areas of influence.

Zonal Refinement

To refine the Laredo zonal information, digital aerial photography was obtained from the Texas Natural Resources Information System. This data were overlaid with the Laredo Planning model zones in the study area, the future year roadway network, and the proposed River Road corridor.

By



splitting zones into a finer level of detail, as shown in the above figure, the travel model produces more precise loadings of traffic onto the network. The initial zone structure divided the MPO study area into 211 zones, which includes 14 external zones.

After refinement the MPO study area had a final TSZ count of 286 zones, which included 15 external zones.

Close attention was paid to zonal definition in the River Road corridor as well as the larger zones in the more rural areas since consistency across the entire region is desirable.

Allocation of population, households and employment for input into operational model zone structure was performed by reviewing land uses contained in the original traffic serial zone and using the available aerial photography to visually inspect the existing development patterns.

In addition to zonal refinement, the network was detail coded to balance to the refined zonal structure. Several adjacent roadways were added to the study area. The refined network, in combination with an equilibrium traffic modeling technique, results in smooth loadings of traffic in the region.

Network Refinement

Networks were built around detailed analysis zone structures, commonly called Traffic Serial Zones. Special connector links referred to as centroid connectors represent access to the regional roadway network from zone centroids. Centroid connectors represent local roadway access between the centroid of zonal activity and the regional network. The operational characteristics of centroid connections reflect zone size, proximity of land development to the regional roadway network and local street speeds and capacities.

The physical and operational attributes of roadways, such as number of lanes, speed limit, one-way or two-way facility, and divided or undivided facility are obtained from roadway inventories. Additional traffic count data are obtained from saturation counts performed by TxDOT.

THE THREE-STEP TRANSPORTATION MODELING PROCESS

Travel demand forecasting quantifies the existing and future interaction between the supply of, and demand for, the transportation system. The supply of transportation is represented by the characteristics of the highway and transit networks. The demand for transportation is created by the separation and intensity of urban activities. Land use forecasts provide estimates of where people will live and where businesses will locate in the future. These forecasts include the intensity of activity in an area, such as the number of households, employees, and demographic data concerning income levels and household size. These forecasts are prepared for small geographic areas called traffic serial zones (TSZ). A TSZ map was prepared for the study area. Descriptions of the service characteristics of the highway and transit networks and the land use forecasts are direct inputs to the travel demand forecasting model.

The traditional travel demand forecasting process in Laredo has three principal components: Trip generation, trip distribution, and trip assignment.

<u>The First Step: Trip Generation</u>

Trip generation is the process by which the travel demand models translate the land use forecast into the number of trips in the study area's traffic serial zone for a typical day of the target year. Trip generation results in the total number of "trip ends" in the study area. A trip end is defined as the beginning or end of a trip. For example, a one-way trip from home to work has two trip ends. Trip generation models estimate total trip ends by applying trip generation rates to the land use forecast data.

Allocation of employment was performed using the aerial photography that was available for this project. The allocation to the refined zones maintained the zones initial employment forecast of the original zone except for those zones in the warehouse district which were under forecasted as compared to the existing inventory. These zones were increased to at least the existing level. Zones directly along the River Road corridor were also analyzed for development potential and some trips were added in those areas.

The total number of trips increased from 1,641,954 in the TxDOT planning model to 1,706,557 in the River Road Operational Model. This takes into account the under forecasted warehouse land use in the planning model.

The Second Step: Trip Distribution

Trip distribution is the conversion of trip ends (the product of trip generation) to interacting "trips." In other words, trip ends are joined to produce completed trips. To date, the most widely used trip distribution model is the "gravity model" which essentially describes trip interchange between zones as directly proportional to the relative attraction of each of the zones and inversely proportional to some function of the spatial separation between zones, usually time or distance.

Because experience demonstrates that the exponent of travel time is not constant for all intervals of time, the basic gravity model is revised to express the effect of spatial separation on zonal trip interchange, rather than the traditional inverse exponential function of travel time. Consequently, areas with large amounts of activity tend to exchange more trips, and areas farther from each other tend to exchange fewer trips. Thus, the distribution model calculates the trip interchange volume based on the travel time to reach the potential destination and the attractiveness of that destination. Originating trips from any one zone are allocated to competing destinations based on this combination of relative trip lengths and relative attractiveness. The trips for the new external were distributed based on the existing externals. A percentage of trips were removed from the 2030 network bridge externals in a logical fashion and placed at the new external in the operational mode. More trips were taken from those externals closest to the new external and less trips were taken as the distanced increased from the new external to the original external. The distribution of these trips remained the same as the 2030 planning model.

The TXDOT software ATOM2 was used for the River Road analysis remaining consistent with the TXDOT Laredo Planning Model.

The Third Step: Traffic Assignment

The fourth step in River Road Operational Analysis demand forecasting process, traffic assignment, is the procedure by which the travel demand models are used to estimate the volume of travel on each individual component of the transportation system. This involves "loading" the transit network with transit person trips by mode and the highway network with vehicle trips. Several techniques are available to determine which paths through the network are to be utilized by the transit and vehicle trips between zones.

Following the creation of production/attraction trip tables during trip distribution, the vehicle trip tables are summed and converted to O-D format and assigned to the appropriate network (base year for base year trip table and forecast year for forecast year trip table). Several iterations of the capacity restraint model are used before the computation of the final assignment results. Between each iteration, the capacity restraint model adjusts the link impedances based on the link's volume to capacity (V/C) ratio (regardless of whether or not the link volume is over-or-under capacity). The V/C ratio is calculated using a weighted average of the assigned volumes from the preceding iterations. The assignment method ensures that each trip that is assigned cannot change its path (route) chosen without increasing the travel time of the trip.

The output from the assignment step is an estimate of the total number of vehicle trips for each segment of the highway network. The transportation planner's job does not end with trip assignment. The results of the trip assignment process, like all other steps of the travel demand forecasting process, must be evaluated. For example, the transportation planner checks individual links, smooths individual link values along a facility or within a corridor, and summarizes vehicle miles of travel (VMT) to assess the reliability of the assignment. As the desire for accuracy increases, the transportation planner must complete additional analysis and reliability checks.

Time-of-Day Modeling

A time-of-day model was developed for the River Road network study. Two methods can be used to develop time-of-day estimates from 24-hour travel model forecast volumes: first, a factor using regional peak-to-24 hour estimates from traffic counts can be used to develop a "K" for the study area, and subsequent directional distributions can be applied to the 24-hour loadings. Another method, which is more widely practiced, is to develop time-of-day factors for trip origins and destinations by trip purpose. This information can be obtained from diurnal distributions of travel reported in regional travel surveys. The 1997 Austin Origin-Destination Home Interview Survey was used to compile diurnal distributions of travel by trip purpose. Diurnal distributions were applied to the 24-hour trip tables to obtain AM peak and PM peak hour trips.

ALTERNATIVE ANALYSES

To help identify the impacts of various roadway alternatives and policies, several series of 24 hour, AM, and PM 2030 model runs were performed, including with and without River Road scenarios. This data has been input into the CORSIM traffic simulation models to complete the operational analysis of the design alternatives.

CONCLUSION

The procedures established for this project conform to state-of-the-practice modeling procedures used and/or developed in the State of Texas. The overall efforts and procedures used to develop the Laredo River Road Operational Analysis Travel Model are sufficient to produce Time-of-Day and directional design hour traffic projections that can be input into traffic simulation models. This data has been input into the CORSIM traffic simulation models to complete the operational analysis of the final design alternative.

Appendix D. Level of Service Analysis Sheets

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	160	321	774	1647	1033	52
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	174	349	841	1790	1123	57
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	3729	590	1179			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	3729	590	1179			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	23	0			
cM capacity (veh/h)	0	451	588			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	523	841	895	895	749	431
Volume Left	174	841	0	0	0	0
Volume Right	349	0	0	0	0	57
cSH	0	588	1700	1700	1700	1700
Volume to Capacity	Err	1.43	0.53	0.53	0.44	0.25
Queue Length 95th (ft)	Err	991	0	0	0	0
Control Delay (s)	Err	223.6	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	Err	71.5			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	111.7%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	148	926	346	1337	2233	203
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	161	1007	376	1453	2427	221
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4016	1324	2648			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4016	1324	2648			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	0			
cM capacity (veh/h)	0	146	157			

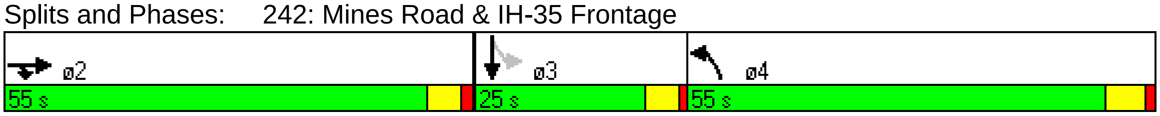
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	1167	376	727	727	1618	1030
Volume Left	161	376	0	0	0	0
Volume Right	1007	0	0	0	0	221
cSH	0	157	1700	1700	1700	1700
Volume to Capacity	Err	2.40	0.43	0.43	0.95	0.61
Queue Length 95th (ft)	Err	796	0	0	0	0
Control Delay (s)	Err	695.7	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	Err	143.0			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	162.7%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1863	2787	0	0	0	3433	0	0	1770	1842	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1863	2787	0	0	0	3433	0	0	1770	1842	0
Satd. Flow (RTOR)											3	
Volume (vph)	0	1478	766	0	0	0	1605	0	0	326	326	27
Lane Group Flow (vph)	0	1607	833	0	0	0	1745	0	0	354	383	0
Turn Type			Prot				Prot			Perm		
Protected Phases		2	2				4				3	
Permitted Phases										3		
Detector Phases		2	2				4			3	3	
Minimum Initial (s)		15.0	15.0				15.0			12.0	12.0	
Minimum Split (s)		20.5	20.5				21.0			17.0	17.0	
Total Split (s)	0.0	55.0	55.0	0.0	0.0	0.0	55.0	0.0	0.0	25.0	25.0	0.0
Total Split (%)	0.0%	40.7%	40.7%	0.0%	0.0%	0.0%	40.7%	0.0%	0.0%	18.5%	18.5%	0.0%
Yellow Time (s)		4.0	4.0				4.5			4.0	4.0	
All-Red Time (s)		1.5	1.5				1.5			1.0	1.0	
Lead/Lag							Lag			Lead	Lead	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode		Min	Min				None			Min	Min	
Act Effct Green (s)		51.0	51.0				51.0			21.0	21.0	
Actuated g/C Ratio		0.38	0.38				0.38			0.16	0.16	
v/c Ratio		2.28	0.79				1.35			1.29	1.33	
Control Delay		604.5	43.9				195.3			198.6	211.5	
Queue Delay		0.0	0.0				0.0			0.0	0.0	
Total Delay		604.5	43.9				195.3			198.6	211.5	
LOS		F	D				F			F	F	
Approach Delay		413.1									205.3	
Approach LOS		F									F	

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 2.28	
Intersection Signal Delay: 304.8	Intersection LOS: F
Intersection Capacity Utilization 152.4%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 242: Mines Road & IH-35 Frontage

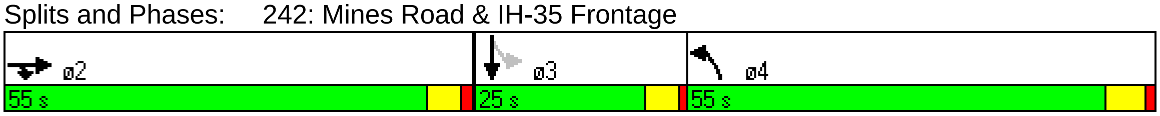


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1863	2787	0	0	0	3433	0	0	1770	1829	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1863	2787	0	0	0	3433	0	0	1770	1829	0
Satd. Flow (RTOR)											4	
Volume (vph)	0	1332	941	0	0	0	2284	0	0	318	312	41
Lane Group Flow (vph)	0	1448	1023	0	0	0	2483	0	0	346	384	0
Turn Type			Prot				Prot			Perm		
Protected Phases		2	2				4				3	
Permitted Phases										3		
Detector Phases		2	2				4			3	3	
Minimum Initial (s)		15.0	15.0				15.0			12.0	12.0	
Minimum Split (s)		20.5	20.5				21.0			17.0	17.0	
Total Split (s)	0.0	55.0	55.0	0.0	0.0	0.0	55.0	0.0	0.0	25.0	25.0	0.0
Total Split (%)	0.0%	40.7%	40.7%	0.0%	0.0%	0.0%	40.7%	0.0%	0.0%	18.5%	18.5%	0.0%
Yellow Time (s)		4.0	4.0				4.5			4.0	4.0	
All-Red Time (s)		1.5	1.5				1.5			1.0	1.0	
Lead/Lag							Lag			Lead	Lead	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode		Min	Min				None			Min	Min	
Act Effct Green (s)		51.0	51.0				51.0			21.0	21.0	
Actuated g/C Ratio		0.38	0.38				0.38			0.16	0.16	
v/c Ratio		2.06	0.97				1.91			1.26	1.33	
Control Delay		505.4	63.1				440.8			187.9	214.6	
Queue Delay		0.0	0.0				0.0			0.0	0.0	
Total Delay		505.4	63.1				440.8			187.9	214.6	
LOS		F	E				F			F	F	
Approach Delay		322.3									201.9	
Approach LOS		F									F	

Intersection Summary

Cycle Length: 135
Actuated Cycle Length: 135
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 2.06
Intersection Signal Delay: 358.6 — Intersection LOS: F
Intersection Capacity Utilization 164.2% — ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 242: Mines Road & IH-35 Frontage



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	95	715	1233	2200	1034	122
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	103	777	1340	2391	1124	133
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	5066	628	1257			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5066	628	1257			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	0			
cM capacity (veh/h)	0	426	549			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	880	1340	1196	1196	749	507
Volume Left	103	1340	0	0	0	0
Volume Right	777	0	0	0	0	133
cSH	0	549	1700	1700	1700	1700
Volume to Capacity	Err	2.44	0.70	0.70	0.44	0.30
Queue Length 95th (ft)	Err	2593	0	0	0	0
Control Delay (s)	Err	670.3	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	Err	240.8			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	160.2%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	143	1437	760	1358	2393	121
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	155	1562	826	1476	2601	132
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	5057	1366	2733			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	5057	1366	2733			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	0			
cM capacity (veh/h)	0	137	145			

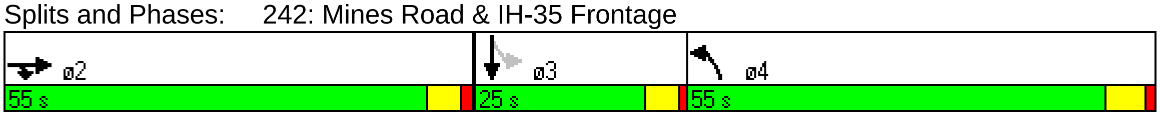
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	1717	826	738	738	1734	999
Volume Left	155	826	0	0	0	0
Volume Right	1562	0	0	0	0	132
cSH	0	145	1700	1700	1700	1700
Volume to Capacity	Err	5.70	0.43	0.43	1.02	0.59
Queue Length 95th (ft)	Err	Err	0	0	0	0
Control Delay (s)	Err	2176.2	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	Err	780.9			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	218.8%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1863	2787	0	0	0	3433	0	0	1770	1825	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1863	2787	0	0	0	3433	0	0	1770	1825	0
Satd. Flow (RTOR)											5	
Volume (vph)	0	2389	962	0	0	0	2697	0	0	183	664	100
Lane Group Flow (vph)	0	2597	1046	0	0	0	2932	0	0	199	831	0
Turn Type			Prot				Prot			Perm		
Protected Phases		2	2				4				3	
Permitted Phases										3		
Detector Phases		2	2				4			3	3	
Minimum Initial (s)		15.0	15.0				15.0			12.0	12.0	
Minimum Split (s)		20.5	20.5				21.0			17.0	17.0	
Total Split (s)	0.0	55.0	55.0	0.0	0.0	0.0	55.0	0.0	0.0	25.0	25.0	0.0
Total Split (%)	0.0%	40.7%	40.7%	0.0%	0.0%	0.0%	40.7%	0.0%	0.0%	18.5%	18.5%	0.0%
Yellow Time (s)		4.0	4.0				4.5			4.0	4.0	
All-Red Time (s)		1.5	1.5				1.5			1.0	1.0	
Lead/Lag							Lag			Lead	Lead	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode		Min	Min				None			Min	Min	
Act Effct Green (s)		51.0	51.0				51.0			21.0	21.0	
Actuated g/C Ratio		0.38	0.38				0.38			0.16	0.16	
v/c Ratio		3.69	0.99				2.26			0.72	2.89	
Control Delay		1228.5	68.0				592.8			70.1	878.2	
Queue Delay		0.0	0.0				0.0			0.0	0.0	
Total Delay		1228.5	68.0				592.8			70.1	878.2	
LOS		F	E				F			E	F	
Approach Delay		895.3									722.1	
Approach LOS		F									F	

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 3.69	
Intersection Signal Delay: 755.2	Intersection LOS: F
Intersection Capacity Utilization 253.7%	ICU Level of Service H
Analysis Period (min) 15	

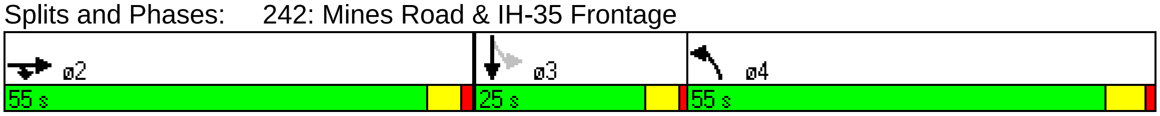
Splits and Phases: 242: Mines Road & IH-35 Frontage



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1863	2787	0	0	0	3433	0	0	1770	1840	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1863	2787	0	0	0	3433	0	0	1770	1840	0
Satd. Flow (RTOR)											3	
Volume (vph)	0	2221	1284	0	0	0	3221	0	0	185	602	54
Lane Group Flow (vph)	0	2414	1396	0	0	0	3501	0	0	201	713	0
Turn Type			Prot				Prot			Perm		
Protected Phases		2	2				4				3	
Permitted Phases										3		
Detector Phases		2	2				4			3	3	
Minimum Initial (s)		15.0	15.0				15.0			12.0	12.0	
Minimum Split (s)		20.5	20.5				21.0			17.0	17.0	
Total Split (s)	0.0	55.0	55.0	0.0	0.0	0.0	55.0	0.0	0.0	25.0	25.0	0.0
Total Split (%)	0.0%	40.7%	40.7%	0.0%	0.0%	0.0%	40.7%	0.0%	0.0%	18.5%	18.5%	0.0%
Yellow Time (s)		4.0	4.0				4.5			4.0	4.0	
All-Red Time (s)		1.5	1.5				1.5			1.0	1.0	
Lead/Lag							Lag			Lead	Lead	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode		Min	Min				None			Min	Min	
Act Effct Green (s)		51.0	51.0				51.0			21.0	21.0	
Actuated g/C Ratio		0.38	0.38				0.38			0.16	0.16	
v/c Ratio		3.43	1.33				2.70			0.73	2.47	
Control Delay		1112.6	188.3				786.6			70.6	694.3	
Queue Delay		0.0	0.0				0.0			0.0	0.0	
Total Delay		1112.6	188.3				786.6			70.6	694.3	
LOS		F	F				F			E	F	
Approach Delay		773.9									557.1	
Approach LOS		F									F	

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 3.43	
Intersection Signal Delay: 755.2	Intersection LOS: F
Intersection Capacity Utilization 253.7%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 242: Mines Road & IH-35 Frontage



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	114	618	1065	1838	1033	111
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	124	672	1158	1998	1123	121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4497	622	1243			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4497	622	1243			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	0			
cM capacity (veh/h)	0	430	556			

Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	796	1158	999	999	749	495
Volume Left	124	1158	0	0	0	0
Volume Right	672	0	0	0	0	121
cSH	0	556	1700	1700	1700	1700
Volume to Capacity	Err	2.08	0.59	0.59	0.44	0.29
Queue Length 95th (ft)	Err	2016	0	0	0	0
Control Delay (s)	Err	511.1	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	Err	187.5			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	145.6%	ICU Level of Service	H
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	164	1260	646	1296	2152	117
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	178	1370	702	1409	2339	127
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4511	1233	2466			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4511	1233	2466			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	0	0	0			
cM capacity (veh/h)	0	168	185			

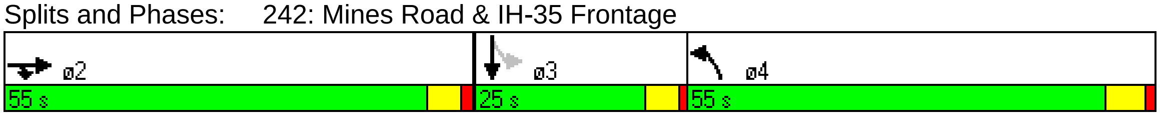
Direction, Lane #	EB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	1548	702	704	704	1559	907
Volume Left	178	702	0	0	0	0
Volume Right	1370	0	0	0	0	127
cSH	0	185	1700	1700	1700	1700
Volume to Capacity	Err	3.79	0.41	0.41	0.92	0.53
Queue Length 95th (ft)	Err	Err	0	0	0	0
Control Delay (s)	Err	1307.6	0.0	0.0	0.0	0.0
Lane LOS	F	F				
Approach Delay (s)	Err	435.0			0.0	
Approach LOS	F					

Intersection Summary			
Average Delay	Err		
Intersection Capacity Utilization	195.9%	ICU Level of Service	H
Analysis Period (min)	15		

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1863	2787	0	0	0	3433	0	0	1770	1831	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1863	2787	0	0	0	3433	0	0	1770	1831	0
Satd. Flow (RTOR)											4	
Volume (vph)	0	2345	900	0	0	0	2588	0	0	202	601	79
Lane Group Flow (vph)	0	2549	978	0	0	0	2813	0	0	220	739	0
Turn Type			Prot				Prot			Perm		
Protected Phases		2	2				4				3	
Permitted Phases										3		
Detector Phases		2	2				4			3	3	
Minimum Initial (s)		15.0	15.0				15.0			12.0	12.0	
Minimum Split (s)		20.5	20.5				21.0			17.0	17.0	
Total Split (s)	0.0	55.0	55.0	0.0	0.0	0.0	55.0	0.0	0.0	25.0	25.0	0.0
Total Split (%)	0.0%	40.7%	40.7%	0.0%	0.0%	0.0%	40.7%	0.0%	0.0%	18.5%	18.5%	0.0%
Yellow Time (s)		4.0	4.0				4.5			4.0	4.0	
All-Red Time (s)		1.5	1.5				1.5			1.0	1.0	
Lead/Lag							Lag			Lead	Lead	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode		Min	Min				None			Min	Min	
Act Effct Green (s)		51.0	51.0				51.0			21.0	21.0	
Actuated g/C Ratio		0.38	0.38				0.38			0.16	0.16	
v/c Ratio		3.62	0.93				2.17			0.80	2.57	
Control Delay		1198.1	55.7				552.4			76.6	737.6	
Queue Delay		0.0	0.0				0.0			0.0	0.0	
Total Delay		1198.1	55.7				552.4			76.6	737.6	
LOS		F	E				F			E	F	
Approach Delay		881.3									586.0	
Approach LOS		F									F	

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 3.62	
Intersection Signal Delay: 715.7	Intersection LOS: F
Intersection Capacity Utilization 243.7%	ICU Level of Service H
Analysis Period (min) 15	

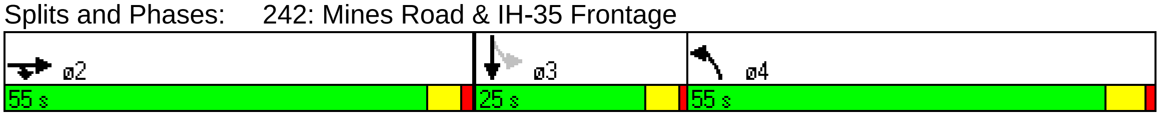
Splits and Phases: 242: Mines Road & IH-35 Frontage



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Total Lost Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Satd. Flow (prot)	0	1863	2787	0	0	0	3433	0	0	1770	1846	0
Flt Permitted							0.950			0.950		
Satd. Flow (perm)	0	1863	2787	0	0	0	3433	0	0	1770	1846	0
Satd. Flow (RTOR)											2	
Volume (vph)	0	2158	1276	0	0	0	3004	0	0	266	533	32
Lane Group Flow (vph)	0	2346	1387	0	0	0	3265	0	0	289	614	0
Turn Type			Prot				Prot			Perm		
Protected Phases		2	2				4				3	
Permitted Phases										3		
Detector Phases		2	2				4			3	3	
Minimum Initial (s)		15.0	15.0				15.0			12.0	12.0	
Minimum Split (s)		20.5	20.5				21.0			17.0	17.0	
Total Split (s)	0.0	55.0	55.0	0.0	0.0	0.0	55.0	0.0	0.0	25.0	25.0	0.0
Total Split (%)	0.0%	40.7%	40.7%	0.0%	0.0%	0.0%	40.7%	0.0%	0.0%	18.5%	18.5%	0.0%
Yellow Time (s)		4.0	4.0				4.5			4.0	4.0	
All-Red Time (s)		1.5	1.5				1.5			1.0	1.0	
Lead/Lag							Lag			Lead	Lead	
Lead-Lag Optimize?							Yes			Yes	Yes	
Recall Mode		Min	Min				None			Min	Min	
Act Effct Green (s)		51.0	51.0				51.0			21.0	21.0	
Actuated g/C Ratio		0.38	0.38				0.38			0.16	0.16	
v/c Ratio		3.33	1.32				2.52			1.05	2.12	
Control Delay		1069.6	184.7				706.1			122.3	545.1	
Queue Delay		0.0	0.0				0.0			0.0	0.0	
Total Delay		1069.6	184.7				706.1			122.3	545.1	
LOS		F	F				F			F	F	
Approach Delay		740.8									409.7	
Approach LOS		F									F	

Intersection Summary	
Cycle Length: 135	
Actuated Cycle Length: 135	
Natural Cycle: 150	
Control Type: Actuated-Uncoordinated	
Maximum v/c Ratio: 3.33	
Intersection Signal Delay: 688.6	Intersection LOS: F
Intersection Capacity Utilization 239.3%	ICU Level of Service H
Analysis Period (min) 15	

Splits and Phases: 242: Mines Road & IH-35 Frontage



Appendix E. Detailed Alignments and Costs

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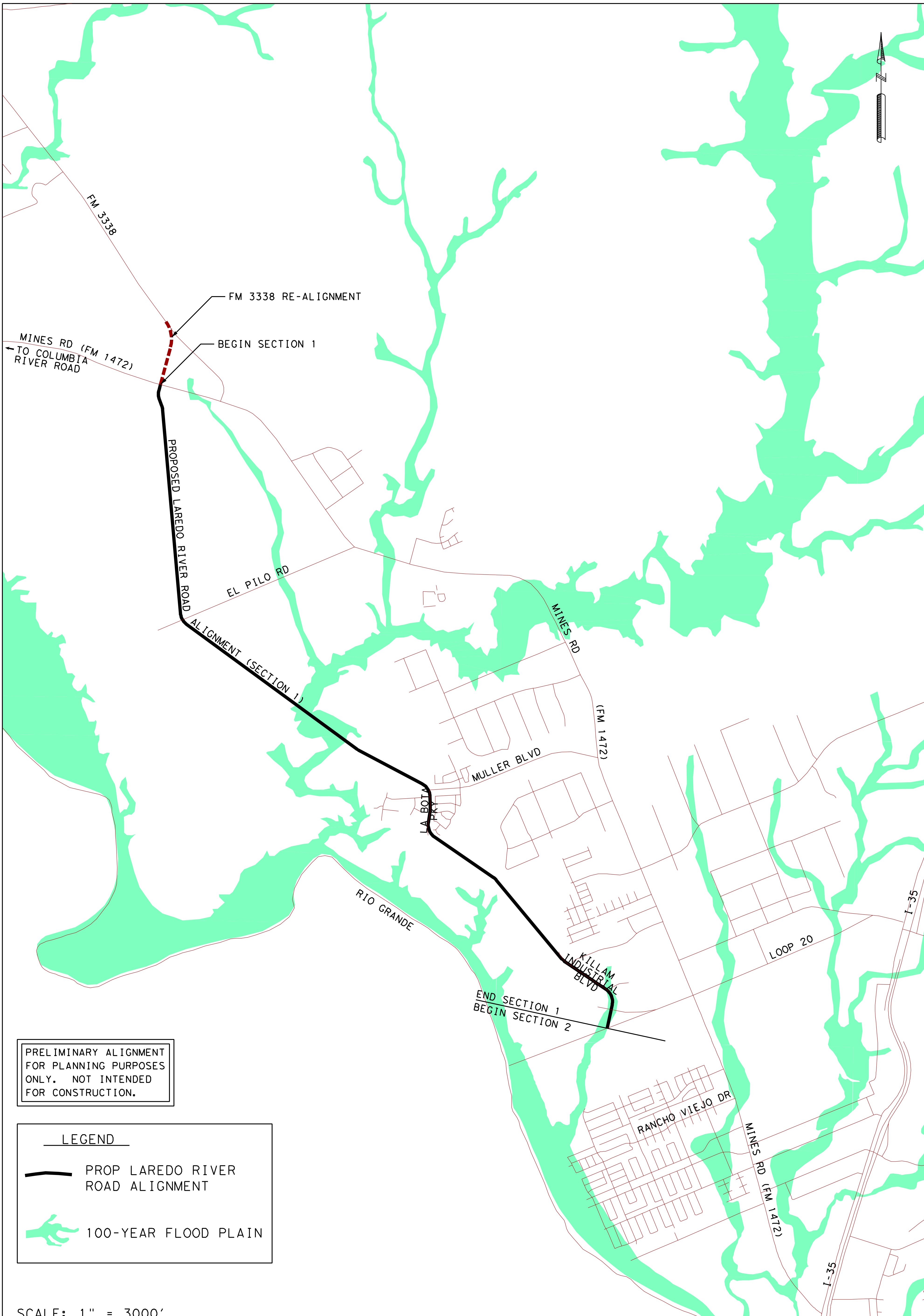


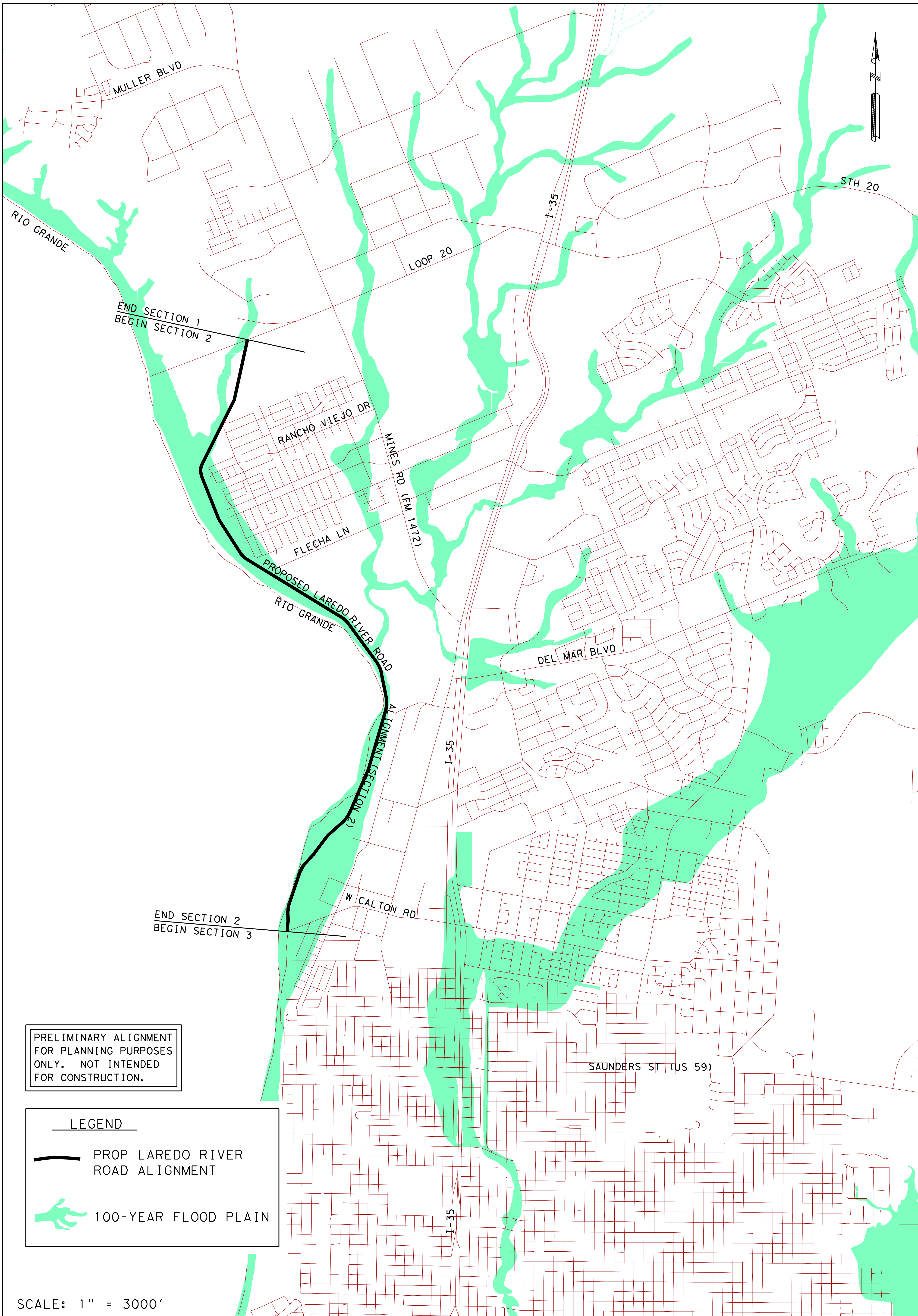
LAREDO RIVER ROAD ALIGNMENT - SECTION 1

CITY OF LAREDO

ALLIANCE Transportation Group, Inc.

PAPE-DAWSON ENGINEERS

555 EAST RAMSEY | SAN ANTONIO TEXAS 78216 | PHONE: 210.375.9000 FAX: 210.375.9010



LAREDO RIVER ROAD ALIGNMENT - SECTION 2

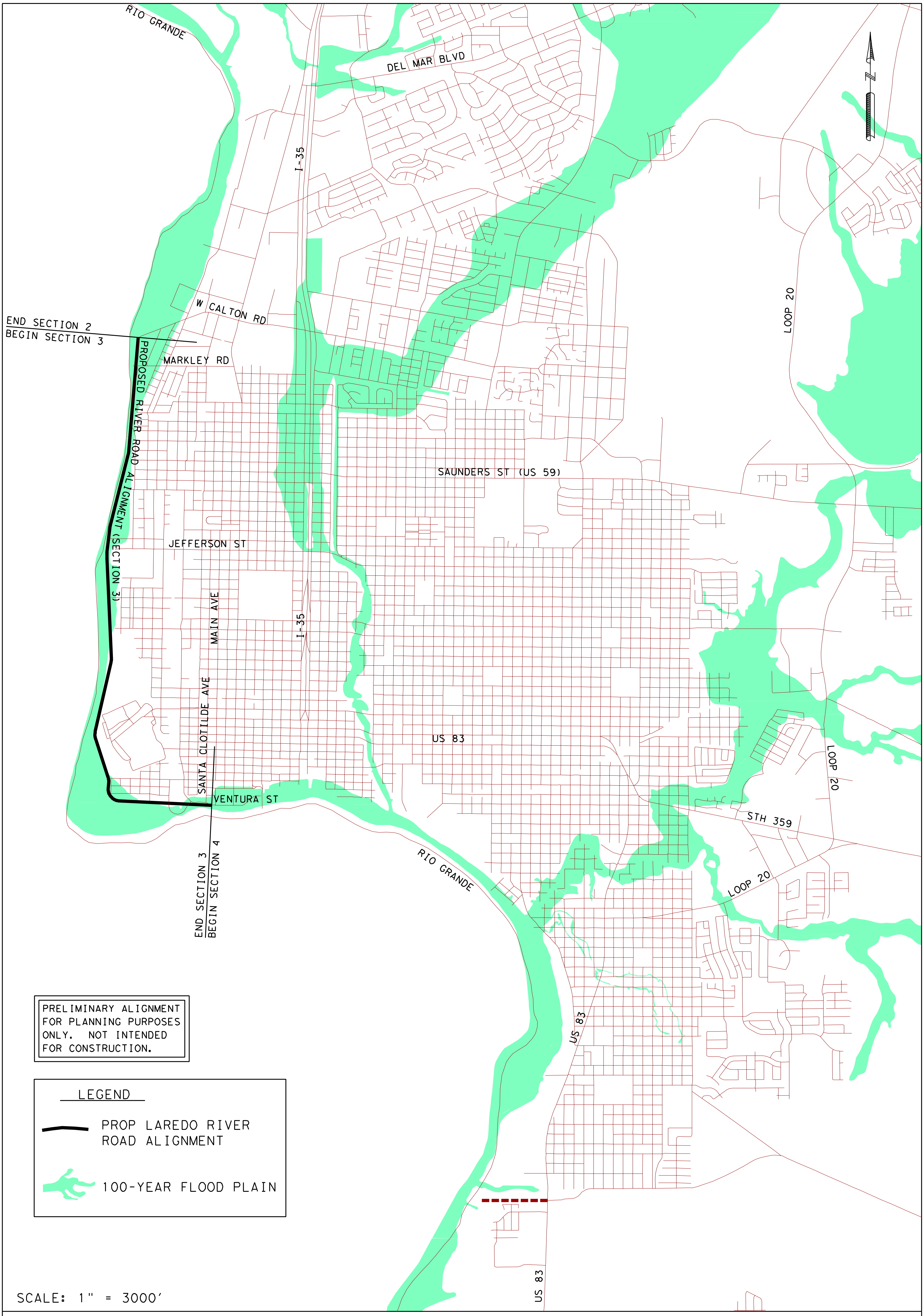
CITY OF LAREDO

ALLIANCE Transportation Group, Inc.

PAPE-DAWSON ENGINEERS
555 EAST RAMSEY | SAN ANTONIO TEXAS 78216 | PHONE: 210.375.9000 FAX: 210.375.9010

Design Filename: P:\63\72\00\design\Exhibit\Alignment\section03.dgn

Plotted on: 03/09/2006



LAREDO RIVER ROAD ALIGNMENT - SECTION 3

CITY OF LAREDO

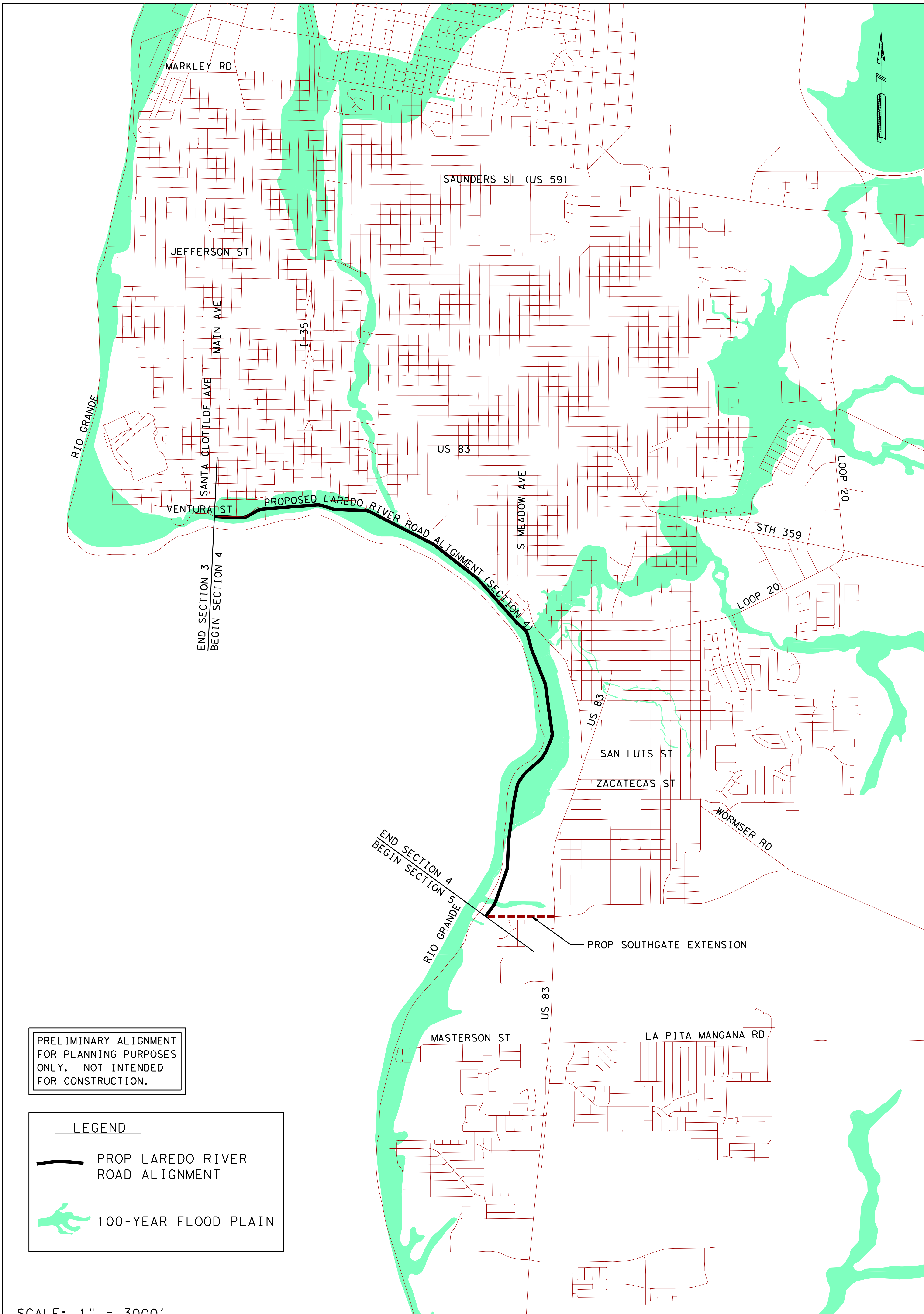
ALLIANCE Transportation Group, Inc.

PAPE-DAWSON ENGINEERS

555 EAST RAMSEY | SAN ANTONIO TEXAS 78216 | PHONE: 210.375.9000 FAX: 210.375.9010

Design Filename: P:\63\72\00\design\Exhibit\Alignment\section04.dgn

Plotted on: 03/09/2006



LAREDO RIVER ROAD ALIGNMENT - SECTION 4

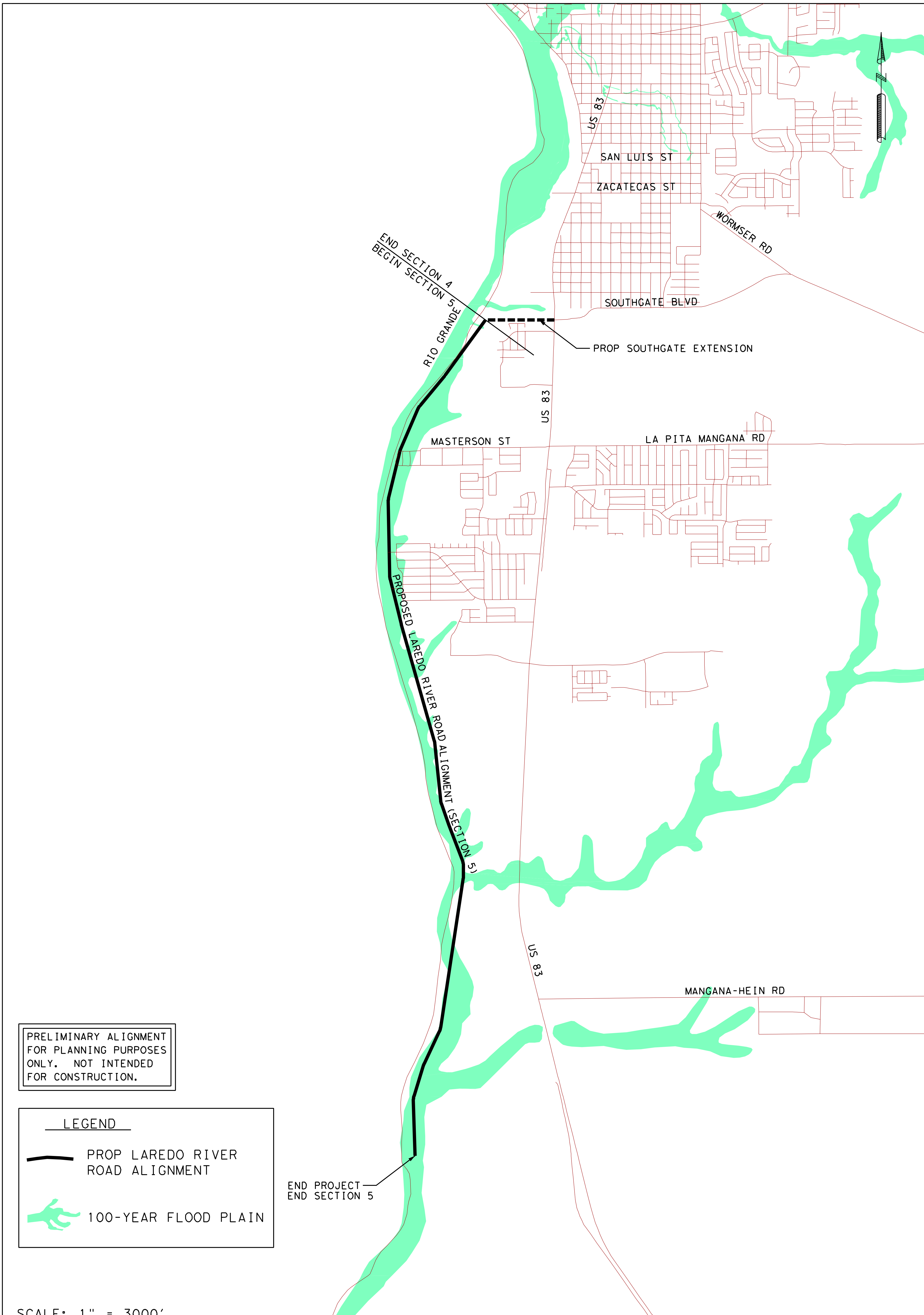
CITY OF LAREDO

ALLIANCE Transportation Group, Inc.

PAPE-DAWSON ENGINEERS

555 EAST RAMSEY | SAN ANTONIO TEXAS 78216 | PHONE: 210.375.9000 FAX: 210.375.9010

Design Filename: $FILE$ Plotted on: $DATE$



LAREDO RIVER ROAD ALIGNMENT - SECTION 5

CITY OF LAREDO

ALLIANCE Transportation Group, Inc.

PAPE-DAWSON ENGINEERS

555 EAST RAMSEY | SAN ANTONIO TEXAS 78216 | PHONE: 210.375.9000 FAX: 210.375.9010

Laredo River Road Feasibility Study
Preliminary Opinion of Probable Cost

Revised 3/9/2006

Item	Units	Quantity	Unit Cost	Total Cost ($)
Sections 1 - 5 Mines Road to 2 miles soufh of Mangana Hain Road (22.8 miles)				
Excavation	CY	328,825	$15.00	$4,932,375
Embankment	CY	426,379	$10.00	$4,263,790
Paving (3-lane, 36 ft section)	LF	114,900	$140	$16,086,000
Bridge Section (44 ft width)	SF	800,800	$70	$60,984,000
	Subtotal			**$86,266,165**
Contingency	LS	25.00%		$21,566,541
Mobilization, Bonding, Ins.	LS	14.00%		$12,077,263
Civil Design	LS	10.00%		$8,626,617
	Sections 1 - 5 Subtotal			***$128,536,586***
	Sections 1 - 5 Cost per Mile =			***$5,637,570***

Note: This information is intended to be used for planning level purposes only and is not intended for construction. It does not include other probable costs, such as: right-of-way, permits, fees, landscaping, sidewalks, pavement markings, signs, signalization, lighting, traffic control, among other items which may be required. Due to extended portions of this alignment being within the flood plain, it is anticipated that wetland/environmental issues will be a significant part of the overall design and/or approval process and are not reflected in the above costs.

Laredo River Road Feasibility Study
Preliminary Opinion of Probable Cost

Revised 3/9/2006

Item	Units	Quantity	Unit Cost	Total Cost ($)
Section 1 - Mines Road to Bob Bullock Loop (5.27 miles)				
Excavation	CY	154,678	$15.00	$2,320,170
Embankment	CY	100,376	$10.00	$1,003,760
Paving (3-lane, 36 ft section)	LF	27,800	$140	$3,892,000
Bridge Section (44 ft width)	SF	184,800	$70	$12,936,000
	Subtotal			$20,151,930
Contingency	LS	25.00%		$5,037,983
Mobilization, Bonding, Ins.	LS	14.00%		$2,821,270
Civil Design	LS	10.00%		$2,015,193
	Section 1 Subtotal			***$30,026,376***
	Section 1 Est. Cost per Mile =			***$5,702,851***
Section 2 - Bob Bullock Loop to Anna Avenue (4.43 miles)				
Excavation	CY	32,608	$15.00	$489,120
Embankment	CY	96,263	$10.00	$962,630
Paving (3-lane, 36 ft section)	LF	23,400	$140	$3,276,000
Bridge Section (44 ft width)	SF	114,400	$70	$8,008,000
	Subtotal			$12,735,750
Contingency	LS	25.00%		$3,183,938
Mobilization, Bonding, Ins.	LS	14.00%		$1,783,005
Civil Design	LS	10.00%		$1,273,575
	Section 2 Subtotal			***$18,976,268***
	Section 2 Est. Cost per Mile =			***$4,281,824***
Section 3 - Anna Avenue to existing River Road (3.58 miles)				
Excavation (CY)	CY	32,310	$15.00	$484,650
Embankment (CY)	CY	77,387	$10.00	$773,870
Paving (3-lane, 36 ft section)	LF	18,900	$140	$2,646,000
Bridge Section (44 ft width)	SF	61,600	$70	$4,312,000
	Subtotal			$8,216,520
Contingency	LS	25.00%		$2,054,130
Mobilization, Bonding, Ins.	LS	14.00%		$1,150,313
Civil Design	LS	10.00%		$821,652
	Section 3 Subtotal			***$12,242,615***
	Section 3 Est. Cost per Mile =			***$3,420,159***
Section 4 - River Road to vicinity of Meadow and US 83 (4.10 miles)				
Excavation (CY)	CY	69,184	$15.00	$1,037,760
Embankment (CY)	CY	65,800	$10.00	$658,000
Paving (3-lane, 36 ft section)	LF	16,000	$140	$2,240,000
Bridge Section (44 ft width)	SF	198,000	$70	$13,860,000
	Subtotal			$17,795,760
Contingency	LS	25.00%		$4,448,940
Mobilization, Bonding, Ins.	LS	14.00%		$2,491,406
Civil Design	LS	10.00%		$1,779,576
	Section 4 Subtotal			***$26,515,682***
	Section 4 Est. Cost per Mile =			***$6,451,742***
Section 5 - Vicinity of Meadow and US 83 to 2 miles south of Mangana Hein Road (5.45 miles)				
Excavation (CY)	CY	40,045	$15.00	$600,675
Embankment (CY)	CY	86,553	$10.00	$865,530
Paving (3-lane, 36 ft section)	LF	28,800	$140	$4,032,000
Bridge Section (44 ft width)	SF	242,000	$70	$21,868,000
	Subtotal			$27,366,205
Contingency	LS	25.00%		$6,841,551
Mobilization, Bonding, Ins.	LS	14.00%		$3,831,269
Civil Design	LS	10.00%		$2,736,621
	Section 5 Subtotal			***$40,775,645***
	Section 5 Est. Cost per Mile =			***$7,475,535***
	Total Est. Cost Sections 1 - 5			***$128,536,586***

Note: This information is intended to be used for planning level purposes only and is not intended for construction. It does not include other probable costs, such as: right-of-way, permits, fees, landscaping, sidewalks, pavement markings, signs, signalization, lighting, traffic control, among other items which may be required. Due to extended portions of this alignment being within the flood plain, it is anticipated that wetland/environmental issues will be a significant part of the overall design and/or approval process and are not reflected in the above costs.