

Prairie Avenue Transportation Plan

Final Traffic Study

Submitted to:

Cheyenne Metropolitan Planning Organization

August 18, 2004

SEH No. ACHMPO0301.00

Submitted by:

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Organization*

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Executive Summary

Short Elliott Hendrickson, Inc. (SEH®) prepared the Prairie Avenue Transportation Plan for the Cheyenne Metropolitan Planning Organization to identify short-term and long-term traffic impacts and to recommend mitigation measures associated with the closure of a segment of Prairie Avenue between Dell Range Boulevard and Powderhouse Road. This portion of Prairie Avenue carries a substantial amount of traffic destined for the Frontier Mall and other retail establishments near the mall. Residents living along Prairie Avenue west of Powderhouse Road have complained to the City about the volume of traffic, including large delivery vehicles, using the street. Concerned residents feel that this traffic should be limited to Powderhouse Road and Dell Range Boulevard.

The City is contemplating closure of the Prairie Avenue segment because of the insufficient drainage structure that exists under the road. A 10-year event is expected to exceed the capacity of the structure and a 100-year event is expected to overtop the structure by two to three feet. Gene MacDonald, PE, Cheyenne Surface Water Drainage Engineer, has identified this crossing as a significant life-safety hazard due to the potential of flood waters overtopping the roadway and sweeping a vehicle into the stream channel. Mr. MacDonald recommended that this crossing be replaced if the road remains open; however, removal of the structure would eliminate the drainage issue.

Short-term and long-term traffic conditions with and without the closure were evaluated during weekday morning, noon and evening peak hours.

A pedestrian crossing issue on Prairie Avenue east of Powderhouse Road was also studied to determine the best method to facilitate their crossing between Pointe Frontier and the Frontier Mall.

Dry Creek Drainage Structure and the Closure of Prairie Avenue

Based on the analysis performed, SEH has reached the following conclusions related to the closure of Prairie Avenue:

- **Changes in Traffic Volumes on Prairie Avenue.** The volumes will be reduced between Dell Range and Powderhouse Road if the structure is removed; however, they will increase at the Powderhouse Road intersection in the short term as a result of motorists destined for Prairie Avenue. Traffic volumes will increase on Prairie Avenue if it remains open due to the growth in background traffic and the traffic volumes expected to be generated by development north of Frontier Mall.
- **Traffic Operations.** The intersections in the study area are currently operating at acceptable levels of service. An acceleration lane from southbound Powderhouse Road to westbound Dell Range Boulevard would be required if Prairie Avenue is closed in the short term. In the long term, the intersection operations are expected to deteriorate due to increases in traffic volumes regardless of the decision to close Prairie Avenue. Improvements will be required to maintain acceptable operation.
- **Access to Businesses on Prairie Avenue.** Based on travel time studies, the business access will not be greatly affected.

SEH prepared a recommendation that has five issues to be considered by the City. They include:

- **Cost of Improvements.** The estimated cost to replace the structure and keep Prairie Avenue open is \$1,988,300 compared with \$2,058,800 to remove the structure and close Prairie Avenue.
- **Availability of Funds to Make Improvements in the Short Term.** The short-term cost to replace the drainage structure is \$1,105,500 compared with \$402,900 to remove it.

- The Traffic Operations at Dell Range Boulevard / Powderhouse Road and Powderhouse Road / Prairie Avenue. These intersections are currently operating at acceptable levels; however, modifications will be required at both intersections whether or not Prairie Avenue remains open. The costs to upgrade these intersections will be higher if Prairie Avenue is closed, but the operation at the intersections is projected to be similar in either case.
- The Quality of Life for the Residents of the Area. This is an issue that cannot be analyzed from a technical standpoint or quantified monetarily, but is more political in nature.
- Access to the Existing Medical Office Building and Future Office Building. The technical analysis indicates that access will not be greatly affected by the closure of Prairie Avenue.

Pedestrian Crossing Adjacent to Pointe Frontier

SEH considered the following options for the pedestrian crossing:

- Sign and mark the crossing according to MUTCD;
- Install pedestrian-activated, sign-mounted flashing lights;
- Construct a pedestrian refuge area;
- Construct a pedestrian crossing signal; and
- Construct a pedestrian overpass or underpass.

SEH recommended that a crosswalk be signed and marked at the east access to Point Frontier. In addition, a pedestrian refuge area should be constructed at the existing median to allow pedestrians to cross half of the street at one time. A sidewalk should be constructed on the north side of the Frontier Mall parking lot that extends east to align with the movie theater entrance. The mall management has agreed to restripe the parking lot to provide a pedestrian isle from the end of the sidewalk to the door adjacent to the movie theaters.

In Conclusion

The city has viable options for a solution for the drainage issue on Prairie Avenue. Cost, quality of life, traffic operations and business access are important factors in the solution analysis. SEH has provided a recommendation in this report that encompasses these critical issues.

Table of Contents

Executive Summary
Table of Contents

| | Page |
|--|-----------|
| 1.0 Introduction | 1 |
| 2.0 Project Description..... | 2 |
| 2.1 Proposed Improvements to the Drainage Structure..... | 2 |
| 2.2 Potential for Overtopping the Existing Drainage Structure | 2 |
| 2.3 Quality of Life for Residents of the Area | 3 |
| 2.4 Business Access | 3 |
| 2.5 Greenway Crossing on Prairie Avenue..... | 4 |
| 2.6 Study Area and Evaluation Parameters..... | 4 |
| 2.7 Surrounding Land Use..... | 4 |
| 3.0 Existing Conditions..... | 5 |
| 3.1 Circulation Network | 5 |
| 3.2 Potential Effects of Storey Boulevard and The Pointe Subdivision on Traffic in the Area | 5 |
| 3.3 Existing Traffic Volumes | 6 |
| 3.4 Existing Intersection Levels of Service | 7 |
| 3.5 Existing Traffic Volumes With the Closure of Prairie Avenue | 7 |
| 3.6 Levels of Service With the Closure of Prairie Avenue | 8 |
| 3.7 Travel Times..... | 8 |
| 4.0 Future Development Traffic..... | 9 |
| 4.1 Trip Generation..... | 9 |
| 4.2 Trip Distribution and Assignment..... | 10 |
| 5.0 Year 2025 Traffic Analysis | 10 |
| 5.1 Year 2025 Background Traffic Scenario (without development)..... | 10 |
| 5.1.1 Year 2025 Background Traffic Volume Forecasts and Improvements | 10 |
| 5.1.2 Year 2025 Background Intersection Levels of Service | 10 |
| 5.1.3 Year 2025 Background Traffic Volume Forecasts and Improvements With the Closure of Prairie Avenue | 10 |
| 5.1.4 Year 2025 Background Intersection Levels of Service With the Closure of Prairie Avenue | 11 |
| 5.2 Year 2025 Background + Development Traffic (Total Traffic) Scenario | 11 |
| 5.2.1 Year 2025 Total Volume Forecasts and Improvements | 11 |
| 5.2.2 Year 2025 Total Intersection Levels of Service..... | 11 |

Table of Contents (Continued)

| | | |
|------------|---|-----------|
| 5.2.3 | Year 2025 Total Volume Forecasts With the Closure of Prairie Avenue..... | 12 |
| 5.2.4 | Year 2025 Total Intersection Levels of Service With the Closure of Prairie Avenue | 12 |
| 6.0 | Cost Estimates for Alternative Improvements | 13 |
| 6.1 | Do Nothing | 13 |
| 6.2 | Replace the Drainage Structure Keeping Prairie Avenue Open | 13 |
| 6.3 | Closure of Prairie Avenue..... | 13 |
| 7.0 | Conclusions and Recommendations..... | 14 |
| 7.1 | Traffic Volumes on Prairie Avenue | 14 |
| 7.2 | Short Term Traffic Operations | 15 |
| 7.3 | Long Term Traffic Operations..... | 15 |
| 7.4 | Access to Businesses on Prairie Avenue | 16 |
| 7.5 | Recommendations..... | 16 |
| 8.0 | Pedestrian Crossing Adjacent to Pointe Frontier..... | 17 |
| 8.1 | Existing Conditions | 17 |
| 8.2 | Possible Pedestrian Crossing Treatment Alternatives..... | 18 |
| 8.3 | Gap Study | 19 |
| 8.4 | Recommended Pedestrian Crossing Treatment..... | 19 |

List of Tables

Table 1 – Intersection Level of Service Improvement Matrix and Cost Estimate
Summary

Table 2 – Weekday Trip Generation for Year 2025

Table of Contents (Continued)

List of Figures

- Figure 1 – Existing Traffic Volumes & Speed Data
- Figure 2 – Diverted Traffic Due to the Closure of Prairie Avenue (Short Term)
- Figure 3 – Existing Traffic with the Closure of Prairie Avenue
- Figure 4 – Trip Distribution
- Figure 5 – Year 2025 Background Traffic Volume
- Figure 6 – Diverted Traffic Due to the Closure of Prairie Avenue (Year 2025 Background)
- Figure 7 – Year 2025 Background Traffic Volume Due to the Closure of Prairie Avenue
- Figure 8 – Year 2025 Total Traffic
- Figure 9 – Diverted Traffic Due to the Closure of Prairie Avenue (Year 2025 Total)
- Figure 10 – Year 2025 Total Traffic with the Closure of Prairie Avenue
- Figure 11 – Possible Pedestrian Crossing Locations
- Figure 12 – Example of a Pedestrian Crossing Sign with Flashing Lights
- Figure 13 – Gap Frequency by Hour of Day on Prairie Avenue East of Powderhouse Road

List of Appendices

- Appendix A Turning Movement Count Data
- Appendix B Level of Service Analysis Worksheets
- Appendix C Detailed Cost Estimates for Transportation Improvements

Prairie Avenue Transportation Plan

Final Traffic Study

1.0 Introduction

This traffic study was prepared for the Cheyenne Metropolitan Planning Organization to identify short term and long term traffic impacts and to recommend mitigation measures associated with the closure of a segment of Prairie Avenue between Dell Range Boulevard and Powderhouse Road (see Figure 1). This portion of Prairie Avenue carries a substantial amount of traffic destined for the Frontier Mall and other retail establishments near the mall. Residents living along Prairie Avenue west of Powderhouse Road have complained to the City about the volume of traffic, including large delivery vehicles, using their street. They feel that this traffic should be limited to Powderhouse Road and Dell Range Boulevard.

The City is contemplating the closure due to a drainage structure that exists under Prairie Avenue for Dry Creek that is not sufficient to carry the necessary flows. Gene MacDonald, PE, Cheyenne Surface Water Drainage Engineer, has identified this crossing as a significant life-safety hazard due to the potential of flood waters overtopping the roadway and sweeping a vehicle into the stream channel. Mr. MacDonald recommended that this crossing be replaced if the road remains open. Section 2.2 discusses the capacity of the existing structure and the potential for overtopping. Removal of the structure would eliminate the drainage issue.

Short-term and long-term traffic conditions with and without the closure were evaluated during weekday morning, noon and evening peak hours.

A pedestrian crossing issue on Prairie Avenue east of Powderhouse Road was also studied to determine the best method to facilitate their crossing between Pointe Frontier and the Frontier Mall. This issue is discussed in Section 8 of the report.

2.0 Project Description

2.1 Proposed Improvements to the Drainage Structure

The Prairie Avenue Reconstruction Project¹ report outlines two alternatives for proposed improvements to street alignment and drainage issues along Prairie Avenue between Dell Range Boulevard and Powderhouse Road. The alternatives are:

- **Alternative 1** – Upgrade the drainage structure and improve the roadway to collector street standards.
- **Alternative 2** – Close Prairie Avenue approximately 150' northeast of Prairie Avenue/Dell Range Boulevard by removing the structure thus creating an open channel for drainage purposes.

Cost estimates for these alternatives as well as the “do nothing” alternative have been prepared and are discussed in Section 6.0 of this report.

2.2 Potential for Overtopping the Existing Drainage Structure

SEH reviewed stream flow information for Dry Creek near Prairie Avenue to estimate the potential for overtopping the structure. Based on United States Geological Survey records, on Friday, July 13, 2001, the City of Cheyenne experienced a thunderstorm event that produced a peak discharge of 428 cubic feet per second (cfs) measured at a location of 30 feet upstream of the Seminole Road Crossing, within the vicinity of Prairie Avenue. During this event, flow was observed to be overtopping the road at the Prairie Avenue Crossing. Overtopping resulted in erosion along the downstream road bank².

The 100-year flow for Dry Creek is estimated to be 2,500 cfs in the vicinity of Prairie Avenue³. Comparison of the 100-year flow rate to the 428 cfs from July 13, 2001 shows that overtopping of the Prairie Avenue crossing is probable at a 10-year frequency with the potential to occur more often.

Overtopping at this location is a function of the existing pipes sizes and the potential for clogging. Under existing conditions, overtopping at the Prairie Avenue crossing is probable during small and large storm events. For smaller events, 10 year event or smaller storm, the existing structures may be adequate, but if debris lodges along the

¹ Prairie Avenue Reconstruction Project. States West Water Resources Corporation. 1998.

² Water Resources Data Wyoming Water - Year 2001 Report. United States Geological Survey.

³ Master Drainage Plan - Dry Creek (Figure 1-5). CH2M Hill. November 1998.

upstream face of this crossing, flow conveyance is reduced causing the headwater depth to increase and enhance the potential for overtopping. Upstream vegetation is dense within the channel, providing substantial debris potential. The Dry Creek Master Drainage Plan considered this location to have a medium potential for blockage from debris. For larger events, such as the 100-year flood, the Master Drainage Plan suggests the pipes be replaced with larger structures. This potential overtopping frequency increases the risk to motorists and pedestrians that utilize this corridor.

2.3 Quality of Life for Residents of the Area

Residents living in the area have complained to the City about the amount of traffic on Prairie Avenue including the speed of vehicles. They have also noted large trucks using this portion of Prairie Avenue to deliver merchandise to the businesses in and around the mall. The expected increase of traffic resulting from the development of the area north of the mall is also a concern of the residents.

A neighborhood meeting was held on May 30, 2002 at Hobbs School with 33 residents signing the attendance sheet. The options of closing Prairie Avenue and improving the drainage structure were discussed. A petition was presented at the meeting that contained signatures of 108 residents of the area who favored the closure of Prairie Avenue. Only one resident who signed the petition indicated that he was in favor of reconstructing the drainage structure. Residents at the meeting voiced concern for the speed and volume of traffic, decreased property values, and the safety of children crossing Prairie Avenue going to and from school.

2.4 Business Access

Closure of Prairie Avenue would change the traffic patterns in the area requiring people to travel a different route to access existing and future businesses along the street. A medical office building exists on the northwest corner of Powderhouse Road/Prairie Avenue. The City is aware of the potential development of an office building on the north side of Prairie Avenue near Dry Creek. As discussed in Section 3.6, travel times were recorded along Prairie Avenue representing the existing conditions and on a route passing through Dell Range Boulevard / Powderhouse Road representing the condition if Prairie Avenue is closed. The travel times were virtually the same with a difference of 6 to 15 seconds depending on the direction of travel. This would suggest that business access would not be greatly affected by the closure.

2.5 Greenway Crossing on Prairie Avenue

The Greenway crosses Prairie Avenue at-grade near the drainage structure. Based on discussions with the City Parks staff, this is one of the most heavily used crossings in the City. The crossing is located where there is good sight distance for motorists approaching from both directions. The City Parks staff does not recall any accidents at the crossing involving a vehicle versus a pedestrian or cyclist.

2.6 Study Area and Evaluation Parameters

The study area for this project includes the streets adjacent to the proposed Prairie Avenue closure as well as those affected by the re-routed traffic. The following intersections would be directly affected by the proposed project and are included in the analysis (see Figure 1):

- Prairie Avenue / Dell Range Boulevard;
- Dell Range Boulevard / Powderhouse Road; and
- Prairie Avenue / Powderhouse Road.

Weekday morning, noon and evening peak hour traffic volumes were evaluated for the following scenarios:

- Existing traffic;
- Existing traffic with the closure of Prairie Avenue;
- Year 2025 background traffic;
- Year 2025 background traffic with the closure of Prairie Avenue;
- Year 2025 background plus development traffic; and
- Year 2025 background plus development traffic with the closure of Prairie Avenue.

2.7 Surrounding Land Use

The area near Prairie Avenue is moderately developed with opportunity for growth over the next 25 years. The region to the west of Powderhouse Road and to the north of Dell Range Boulevard is mostly residential with a light mix of office and commercial developments interspersed. The region to the east of Powderhouse Road is primarily retail and commercial. There is a large parcel northeast of Prairie Avenue / Powderhouse Road that is undeveloped. The approximate boundaries of the parcel are Prairie Avenue on the south, Storey Boulevard on the north, Powderhouse Road on the west, and future Converse Avenue on the east.

3.0 Existing Conditions

3.1 Circulation Network

The principal roadways affected by the possible closure of Prairie Avenue include Prairie Avenue, Dell Range Boulevard, and Powderhouse Road. A description of these roadways is provided in the following paragraphs.

Prairie Avenue is currently classified by the City as an east-west 2-lane collector street. The street is 28 feet wide without curb, gutter or sidewalk on the south side of the street near the proposed closure. However, it is approximately 40 feet wide from Hoy Road to Powderhouse Road. The posted speed limit is 30 miles per hour in the vicinity of the site. Prairie Avenue is bounded on the west side by a stop controlled T-intersection with Dell Range Boulevard as the main street. The roadway then runs east through the signalized intersection with Powderhouse Road and continues east through the study area to Dell Range Boulevard east of Frontier Mall. There are homes fronting the street west and retail exists east of Powderhouse Road. While the street is technically classified as a collector east of Powderhouse Road near the Frontier Mall, the cross section and volumes are more representative of a principal arterial.

Dell Range Boulevard is a 4-lane east-west principal arterial as designated by the City. It forms the south border of the study area between Prairie Avenue to the west and the signalized intersection with Powderhouse Road to the east. A center left turn lane exists along the length of the street in the vicinity of the site.

Powderhouse Road is a north-south 2-lane minor arterial as classified by the City. It has a center left turn lane and a posted speed limit of 35 miles per hour.

3.2 Potential Effects of Storey Boulevard and The Pointe Subdivision on Traffic in the Area

Storey Boulevard is currently being constructed approximately 3/4 mile north of Prairie Avenue between Powderhouse Road and Ridge Road. This connection will complete a continuous east/west roadway from the I-25 Frontage Road to east of College Drive. Once this road is complete, the traffic volumes are expected to change within the study area. The assumption was made that 10% of the southbound traffic on Powderhouse Road will begin using Storey Boulevard. This assumption is reflected in the long term volume scenarios.

The Pointe subdivision is a 296 acre mixed-use development located on the west side of Powderhouse Road south of Four Mile Road⁴. This development is currently being constructed with full build-out expected at some future date; probably 10 to 15 years in the future. The traffic impacts of this development will not be recognized until a substantial portion of the development has been constructed; therefore the traffic volumes for this development are included in the long term background traffic volumes.

3.3 Existing Traffic Volumes

To evaluate existing conditions and provide a baseline for the analysis, peak hour turning movement count data, daily traffic volumes, speed data, and cut-through traffic were collected in June 2003 at the major intersections and roadways within the study area (see Figure 1). Traffic data are provided in Appendix A.

The heavy movements occur during the noon and evening peak hours. The through volumes are highest at Prairie Avenue / Dell Range Boulevard. Very few vehicles perform the left turn from Prairie Avenue to Dell Range Boulevard or the right turn from Dell Range Boulevard to Prairie Avenue. At Dell Range Boulevard / Powderhouse Road, high traffic volumes utilize the eastbound and westbound through movements with few vehicles using the southbound free right turn. Finally, at Prairie Avenue / Powderhouse Road, the southbound left turn and the westbound right turn volumes are significantly larger than the other volumes at the intersection.

Cut-through traffic was identified through a license plate survey conducted during the morning, noon, and evening peak hours on an average weekday and during the noon peak hour on Saturday. Vehicles observed entering Prairie Avenue from Dell Range Boulevard and then emerging at Prairie Avenue / Powderhouse Road within one minute, and vice versa, were assumed to be cut-through traffic. The percentage of cut-through traffic along Prairie Avenue is highest during the noon and evening peak hours as well. 48% of the eastbound and 39% of the westbound traffic were identified as cut-through traffic during the noon peak hour. The opposite pattern was observed during the PM peak hour with 35% of the cut-through traffic traveling eastbound and 41% traveling westbound. On Saturday, the volume of cut-through traffic is approximately twice the volume observed at any time during the weekday. The percentages of cut-through traffic for eastbound and westbound Prairie Avenue are 43% and 44%, respectively.

⁴ The Point Subdivision - Traffic Impact Study. Western Research& Development, Ltd. June 28, 2002.

3.4 Existing Intersection Levels of Service

To evaluate the performance of the intersections within the study area, the Level of Service (LOS) was calculated using Synchro software. This software package utilizes criteria described in the Highway Capacity Manual⁵. LOS is a measure used to describe operational conditions at an intersection. LOS categories ranging from A to F are assigned based on the predicted delay in seconds per vehicle for the intersection as a whole and for individual turning movements. LOS A indicates very good operations, and LOS F indicates poor, congested operations. Acceptable operation for urban conditions is typically considered to be LOS D or better.

The results of the intersection LOS calculations are summarized in Table 1. The data in the LOS table shows that with the existing volumes and timing plans, the intersections within the study area operate at an acceptable level of service during the morning, noon, and evening peak hours. The intersections in the study area operate at LOS A during all peak hours with the exception of Prairie Avenue / Powderhouse Road and Dell Range Boulevard / Prairie Avenue which operate at LOS B during the noon peak hour.

3.5 Existing Traffic Volumes With the Closure of Prairie Avenue

To evaluate existing conditions due to the closure of Prairie Avenue, existing traffic volumes affected by the closure of Prairie Avenue were diverted and reassigned to the network. Figure 2 shows the diverted traffic volumes at the three intersections and Figure 3 contains the resulting volumes for all movements. The closure of Prairie Avenue will result in a substantial increase in the southbound right turn movement at Dell Range Boulevard/Powderhouse Road. An acceleration lane should be constructed from southbound to westbound to accommodate this increased volume (see Table 1).

Traffic was reassigned to the network based on either of the two following conditions:

Cut-through Traffic

Traffic using Prairie Avenue as a short cut was reassigned to the network based on existing traffic patterns and distribution percentages. Depending on the direction of cut-through, Prairie Avenue / Dell Range Boulevard and Prairie Avenue / Powderhouse Road were assumed to be the origin or destination intersections.

⁵ Highway Capacity Manual. Transportation Research Board Special Report 209. National Research Council. 2000.

Traffic patterns throughout the network will be altered, as a result of closing Prairie Avenue. The volume of traffic utilizing the southeast left turn movement at Prairie Avenue / Dell Range Boulevard decreases to insignificant numbers resulting in an increase in westbound through traffic on Dell Range Boulevard. Also, eastbound left turn and southbound right turn traffic increases at Dell Range Boulevard / Powderhouse Road. Lastly, the northbound approach at Prairie Avenue / Powderhouse Road is impacted the greatest with all movements showing an increase in traffic.

Neighborhood Traffic

Westbound Prairie Avenue traffic that originated in the adjacent neighborhood was directed east and added to the eastbound right turn at Prairie Avenue / Powderhouse Road. This traffic was then added to the southbound right turn movement at Dell Range Boulevard / Powderhouse Road and the westbound through movement at Prairie Avenue / Dell Range Boulevard.

Eastbound Dell Range Boulevard traffic to Prairie Avenue was reassigned from the eastbound left turn movement at Prairie Avenue / Dell Range Boulevard to the through movement and to the eastbound left turn movement at Dell Range Boulevard / Powderhouse Road. At Prairie Avenue / Powderhouse Road, the diverted traffic was assigned to the northbound left turn movement.

3.6 Levels of Service With the Closure of Prairie Avenue

Analysis of the scenario that includes the existing traffic due to the closure of Prairie Avenue is summarized in Table 1. The intersections will continue to operate at an acceptable level of service. At Dell Range Boulevard / Powderhouse Road, the intersection LOS degrades from LOS A to LOS B during the noon peak hour. At Dell Range Boulevard / Prairie Avenue, the existing LOS B during the noon peak hour improves to LOS A in this scenario.

3.7 Travel Times

A travel study was conducted to simulate vehicle travel times to determine the effect of closing Prairie Avenue. Travel times were recorded for both eastbound and westbound routes from west of Prairie Avenue / Dell Range Boulevard to Prairie Avenue east of Powderhouse Road. One route utilized Prairie Avenue (existing conditions) while the other route went through Dell Range Boulevard/Powderhouse Road (closure of Prairie Avenue). Four time trials were run during the morning from 8:20 – 9:20AM. Following is a summary of the results comparing average travel times with and without Prairie Avenue.

Eastbound Travel Time

The test vehicle utilizing Prairie Avenue took an average 1:15 (min:sec) to complete the route. The same vehicle took 1:30 to complete an alternate route, with Prairie Avenue closed, from Dell Range Boulevard to Powderhouse Road to Prairie Avenue.

Westbound Travel Time

The test vehicle utilizing Prairie Avenue took an average of 1:13 to complete the route. The same vehicle took 1:19 to complete an alternate route, with Prairie Avenue closed, from Prairie Avenue to Powderhouse Road to Dell Range Boulevard.

4.0 Future Development Traffic

4.1 Trip Generation

In order to determine future traffic impacts associated with the closure of Prairie Avenue, the amount of traffic generated by future development in the area was estimated. Trip generation estimates were calculated based on the rates contained in the Institute of Transportation Engineers (ITE) Trip Generation manual⁶. Expected land uses and trip generation estimates for future development in each Transportation Analysis Zone (TAZ) were provided by the City of Cheyenne⁷ (see Table 2). The Trip Generation manual estimates trip generation rates for retail land use based on square footage for most uses, however, the TAZ information provided by the City contains the future number of employees expected in each zone. Therefore, the trip generation rate assumptions used in the South Cheyenne Collector Street Project were used in this study. The trip generation rate per employee for retail development was calculated based on the average of the following land uses:

| | |
|------------------------------------|---------------------------|
| 815 – Free-standing Discount Store | 28.84 per employee |
| 816 – Hardware / Paint Store | 53.21 per employee |
| 817 – Nursery Garden Center | 22.13 per employee |
| | 30.00 per employee |

Based on the estimate, the area is expected to generate about 43,000 trips by the Year 2025 on an average weekday. Future development is predicted to generate approximately 1,540 trips during the morning peak hour and 3,920 trips during the evening peak hour of an average weekday.

⁶ Trip Generation. Institute of Transportation Engineers. 6th Edition. 1997.

⁷ Memo from George Delaplaine with the Wyoming Department of Transportation to Tom Mason with the Cheyenne MPO dated February 9, 2001.

4.2 Trip Distribution and Assignment

Trip distribution percentages for future development were based on current and future traffic patterns (see Figure 4). The site-generated traffic was assigned to the roadway network based on the assumed distribution.

5.0 Year 2025 Traffic Analysis

The following sections discuss the analysis for the Year 2025 traffic volume scenarios.

5.1 Year 2025 Background Traffic Scenario (without development)

5.1.1 Year 2025 Background Traffic Volume Forecasts and Improvements

Background traffic volumes were developed for the Year 2025 based on existing traffic counts and projected future growth rates. Based on the direction of the MPO, the future volumes were developed assuming a 2% annual growth rate to determine the background traffic volumes. An assumption was made in this scenario, as well as the other Year 2025 scenarios, that 10% of the southbound left turn traffic at Powderhouse Road/Prairie Avenue would divert to Storey Boulevard and Converse Avenue since these streets will likely exist by that time. The projected year 2025 background traffic volumes are presented in Figure 5.

5.1.2 Year 2025 Background Intersection Levels of Service

The 2025 background traffic volumes were analyzed to determine future operations and any potential capacity constraints caused by the background traffic growth. The 2025 background LOS scenario is summarized in Table 1. With projected background traffic volumes, existing lane geometry, and revised signal timing, all intersections in the study area are expected to operate at an acceptable level of service except for Dell Range Boulevard / Prairie Avenue which operates at LOS F during the noon peak hour. The delay experienced by the side street traffic results in a poor LOS for the entire intersection since it is stop controlled.

5.1.3 Year 2025 Background Traffic Volume Forecasts and Improvements With the Closure of Prairie Avenue

To evaluate Year 2025 background traffic conditions due to the closure of Prairie Avenue, traffic volumes affected by the closure of Prairie Avenue were diverted and reassigned to the network (see Figure 6). Traffic was reassigned to the network based on the same methods used in the existing traffic volume scenario. Year 2025

background traffic with the closure of Prairie Avenue is illustrated in Figure 7.

5.1.4 Year 2025 Background Intersection Levels of Service With the Closure of Prairie Avenue

The year 2025 background traffic volumes were analyzed to determine future operations and any potential capacity constraints caused by the closure of Prairie Avenue. The 2025 background LOS with the closure of Prairie Avenue scenario is summarized in Table 1. The results of the analysis reflect a revised signal timing plan at the intersections of Dell Range Boulevard / Powderhouse Road and Prairie Avenue / Powderhouse Road. All intersections are expected to operate at an acceptable level of service. At the signalized intersections, the additional traffic caused by the closure of Prairie Avenue is expected to degrade the LOS during all three peak hours. The intersection LOS improves at Dell Range Boulevard / Prairie Avenue during the noon and evening peak hours since the cut-through traffic is being diverted away from the intersection.

5.2 Year 2025 Background + Development Traffic (Total Traffic) Scenario

5.2.1 Year 2025 Total Volume Forecasts and Improvements

Trip generation forecasts were based on future land use projections provided by the MPO. The estimated site generated traffic volumes for the year 2025 were assigned to the existing roadway network and intersections according to the distribution percentages shown on Figure 4. The projected year 2025 total traffic volumes are presented in Figure 8.

5.2.2 Year 2025 Total Intersection Levels of Service

The Year 2025 total traffic volumes were analyzed to determine future operations and potential capacity constraints caused by the addition of site traffic from projected developments. The Year 2025 total traffic LOS scenario is summarized in Table 1. Prairie Avenue / Powderhouse Road is expected to operate at an acceptable LOS during all three peak hours. The other two intersections are expected to operate at LOS E and F during various peak periods. SEH modified the timing at both intersections and made the following geometric / signal phasing changes (see Table 1):

Dell Range Blvd / Powderhouse Road – Added westbound left turn phasing and optimized signal timing.

Prairie Avenue / Powderhouse Road – Created a southbound dual left turn with protected/permitted phasing and optimized signal timing.

5.2.3 Year 2025 Total Volume Forecasts With the Closure of Prairie Avenue

To evaluate Year 2025 total traffic conditions due to the closure of Prairie Avenue, traffic volumes affected by the closure of Prairie Avenue were diverted and reassigned to the network (see Figure 9). Traffic was reassigned to the network based on the same methods used in the existing traffic volume scenario. Year 2025 total traffic with the closure of Prairie Avenue is illustrated in Figure 10.

Three levels of improvements were included at Prairie Avenue / Powderhouse Road in the analysis for this scenario due to the poor levels of service as discussed below. Each additional level of improvement includes the improvements from the level before it. The purpose of this method is not only to compare the LOS between the Year 2025 Total and Year 2025 Total with the Closure of Prairie Avenue scenarios, but also to illustrate the improvements necessary to arrive at an acceptable intersection LOS. The following improvements were included in the analysis at Prairie Avenue / Powderhouse Road.

1st Level Improvements

- Revise existing signal timing plan.
- Create a southbound dual left turn.

2nd Level Improvements

- Add a second northbound and southbound through lane with shared right turn movements.
- Add northbound left turn phasing.

3rd Level Improvements

- Add an exclusive northbound right turn lane.

5.2.4 Year 2025 Total Intersection Levels of Service With the Closure of Prairie Avenue

The 2025 total traffic volumes were analyzed to determine future operations and any potential capacity constraints caused by the closure of Prairie Avenue. The 2025 total traffic LOS with the closure of Prairie Avenue scenario is summarized in Table 1. The results of the analysis reflect revised signal timing plans. With the closure of Prairie Avenue, the level of service at the intersections of Dell Range Boulevard / Powderhouse Road and Prairie Avenue / Powderhouse Road will degrade severely during the noon and evening peak hours. The LOS at Dell Range Boulevard / Prairie Avenue improves due to traffic being diverted away from this intersection. The LOS at Prairie Avenue / Powderhouse Road reaches acceptable levels during

morning, noon, and evening peak hours when 3rd level improvements are implemented.

6.0 Cost Estimates for Alternative Improvements

Cost estimates for the transportation improvements were prepared and are summarized in Table 1 along with the estimated costs to improve the drainage structure. Three alternatives are summarized below including:

- Do nothing - Prairie Avenue remains open with the existing drainage structure in-place;
- Replace the Drainage Structure Keeping Prairie Avenue Open; and
- Closure of Prairie Avenue.

Detailed cost estimates are contained in Appendix C.

6.1 Do Nothing

The estimated cost to keep Prairie Avenue open with the existing drainage structure in-place is \$882,800. The costs associated with this alternative include those for the improvements required by the Year 2025 Total Traffic volume scenario. SEH does not recommend this alternative due to the significant life-safety hazard that result from flood waters overtopping the roadway and sweeping a vehicle into the stream channel.

6.2 Replace the Drainage Structure Keeping Prairie Avenue Open

The estimated cost to keep Prairie Avenue open by replacing the drainage structure is \$1,988,300. The costs associated with this alternative include:

- \$1,105,500 to replace the drainage structure in the short term; and
- \$882,800 for improvements to intersections required by the Year 2025 traffic volume scenario.

6.3 Closure of Prairie Avenue

The estimated cost to remove the existing drainage structure and close Prairie Avenue is \$2,058,800. The costs associated with this alternative include:

- \$134,000 to remove the drainage structure in the short term;

- \$268,900 to construct an acceleration lane from southbound Powderhouse Road to westbound Dell Range Boulevard in the short term; and
- \$1,655,900 for improvements to intersections required by the Year 2025 traffic volume scenario.

The alternative requires an expenditure of \$402,900 in the short term and \$1,655,900 in the long term.

7.0 Conclusions and Recommendations

The following conclusions have been drawn based on the analysis performed.

7.1 Traffic Volumes on Prairie Avenue

If Prairie Avenue is closed, the volumes will increase on Powderhouse Road and Dell Range Boulevard due to the altered traffic patterns in the area. On Prairie Avenue, volumes will decrease substantially near Dell Range Boulevard because that portion of Prairie Avenue will only serve a park and a few homes.

The average weekday volumes on Prairie Avenue are expected to decrease by the following amounts if Prairie Avenue is closed:

- 2,380 vehicles in the short term (see Figure 2);
- 3,690 vehicles in the Year 2025 based on a 2% growth in background traffic volumes (see Figure 6); and
- 4,810 in the Year 2025 considering growth in background volumes and development in the area north of Frontier Mall (see Figure 9).

Near Powderhouse Road, the volumes are expected to change by the following amounts:

- Increase of 1,320 vehicles in the short term (difference in volumes shown in Figures 1 and 3);
- Increase of 360 vehicles in the Year 2025 background volumes due to the development of a proposed office building along the corridor (difference in volumes shown in Figures 5 and 7); and
- Decrease of 4,334 vehicles in the Year 2025 considering growth in background volumes and development in the area north of Frontier Mall (difference in volumes shown in Figures 8 and 10).

If Prairie Avenue remains open, daily traffic volumes are expected to increase by Year 2025 as follows:

- 1,675 vehicles on an average weekday based on a 2% annual increase in background traffic volumes and no further development in the area north of Frontier Mall (difference in volumes shown in Figures 1 and 5); and
- 5,965 vehicles considering the growth in background and development traffic (difference in volumes shown in Figures 1 and 8).

7.2 Short Term Traffic Operations

If Prairie Avenue is closed, the resulting traffic patterns will necessitate the construction of a southbound to westbound acceleration lane at Dell Range Boulevard / Powderhouse Road.

7.3 Long Term Traffic Operations

The expected growth in traffic by the Year 2025 will necessitate improvements to the study area intersections regardless of whether Prairie Avenue remains open. Table 1 contains a summary of improvements that will be necessary with their associated costs. The following is a discussion of each intersection.

Dell Range Boulevard / Powderhouse Road

- Revising signal operations (timing and phasing) and creating an eastbound dual left turn lane reduces the future impact caused by the closure of Prairie Avenue.
- The improvements to the intersection will help to keep it operating at LOS D or better, however, the LOS is projected to fall below acceptable levels regardless of whether Prairie Avenue remains open.

Prairie Avenue / Powderhouse Road

Three levels of improvements were studied to demonstrate the changes in LOS with each set of improvements. These improvements are described below.

- **1st Level Improvements.** Creating a southbound dual left turn and adjusting the signal timing accordingly will ensure that the intersection will operate at an acceptable LOS if Prairie Avenue remains open. However, the intersection operations are expected to decrease to LOS F during the noon peak and LOS E during the evening peak if Prairie Avenue is closed and the area north of Frontier Mall develops as expected.

- **2nd Level Improvements.** These improvements will be necessary based on the Year 2025 Total Traffic volume scenario. They include widening Powderhouse Road to add a second through lane as well as northbound left turn phasing. The intersection operation is expected to improve to LOS D during the evening peak hour; however, it is expected to remain at LOS F during the noon peak hour.
- **3rd Level Improvements.** An exclusive northbound right turn lane is expected to improve intersection operations to LOS E during the noon peak hour and LOS C during the evening peak hour.

Dell Range Boulevard / Prairie Avenue

- The operation of this stop controlled intersection is expected to deteriorate if Prairie Avenue remains open due to the delay on the side street approach. However, if Prairie Avenue is closed, the intersection operation is expected to improve because the volume of side street traffic has been substantially reduced.

7.4 Access to Businesses on Prairie Avenue

Based on travel time studies performed by SEH as a part of this project, there is a negligible difference in travel times with and without Prairie Avenue. This would suggest that access to the businesses on Prairie Avenue would not be affected by the closure of Prairie Avenue.

7.5 Recommendations

SEH does not believe that the technical aspects of the study lead to a clear cut recommendation regarding whether Prairie Avenue should remain open. However, SEH does not recommend the “Do Nothing” alternative because of the significant life-safety hazard that exists. Therefore, SEH recommends that the City either replace the structure to eliminate the life-safety hazard, or remove the structure and close Prairie Avenue. The City has a number of factors to consider including:

- **Cost of Improvements.** The estimated cost to replace the structure and keep Prairie Avenue open is \$1,988,300 compared with \$2,058,800 to remove the structure and close Prairie Avenue.
- **Availability of Funds to Make Improvements in the Short Term.** The short term cost to replace the drainage structure is \$1,105,500 compared with \$402,900 to remove it.
- **The Traffic Operations at Dell Range Boulevard / Powderhouse Road and Powderhouse Road / Prairie**

Avenue. These intersections are currently operating at acceptable levels; however modifications will be required at both intersections whether or not Prairie Avenue remains open. The costs to upgrade these intersections will be higher if Prairie Avenue is closed, however the operation at the intersections is projected to be similar in either case.

- **The Quality of Life for the Residents of the Area.** This is an issue that cannot be analyzed from a technical standpoint or quantified monetarily, but is more political in nature.
- **Access to the Existing Medical Office Building and Future Office Building.** The technical analysis indicates that the access will not be greatly affected by the closure of Prairie Avenue.

8.0 Pedestrian Crossing Adjacent to Pointe Frontier

SEH performed a pedestrian study to evaluate possible pedestrian crossing treatments on Prairie Avenue adjacent to the Pointe Frontier Retirement Community (see Figure 11). Based on discussions with Rich Pfeiffer, General Manager at Pointe Frontier, residents of Pointe Frontier have difficulty crossing Prairie Avenue because motorists do not yield when they attempt to cross Prairie Avenue to get to Frontier Mall. The Pointe Frontier residents typically cross the street at Pointe Frontier's west access which aligns with a mall access. However, the signalized intersection at Prairie Avenue / Powderhouse Road is approximately only 300' from this intersection. This traffic signal has pedestrian push buttons and pedestrian signals that would allow them to safely cross Prairie Avenue to get to Frontier Mall; however this is not a direct route from Pointe Frontier to the mall.

Individual discussions were held with Rich Pfeiffer, General Manager from Pointe Frontier, and a spokesperson from the mall. Both people indicated that a pedestrian crossing at the mall access would be beneficial for the mall, the retirement community, and other pedestrians who may utilize a crossing at this location.

8.1 Existing Conditions

Prairie Avenue is a five-lane street with a center left turn lane (see Figure 11). On the west side of the Pointe Frontier property, a common access exists with the nursing home and the retirement community. In addition, there is an access on the east side of Pointe Frontier. Residents of Pointe Frontier generally cross Prairie Avenue from the east side of the west access. There is currently no median at this location, however, a swale median begins at the east access and

extends east. The posted speed limit is 35 miles per hour in the study area. There are sidewalks on the north side of Prairie Avenue. While there are sidewalks on the south side of the street, they are discontinuous.

8.2 Possible Pedestrian Crossing Treatment Alternatives

The following discussion presents the various pedestrian crossing treatments that could be applied at this location.

- **Sign and Mark the Crossing According to Manual on Uniform Traffic Control Devices.** Signing and marking the crosswalk based on the Manual on Uniform Traffic Control Devices⁸ (MUTCD) serves to enhance the visibility of crosswalks; however, SEH does not recommend that a crosswalk be installed at the west access. The width of the road is a concern because signs would be out of the view of the motorists in the inside lanes and they would likely not see them. The median at the east access allows signs to be placed within the field of view of motorists in each lane.
- **Pedestrian-Activated, Sign-Mounted Flashing Lights.** This treatment is an enhancement to the standard signing and marking treatment. An example of a sign installed by the City of Boulder is contained in Figure 12. Again, this treatment is not appropriate for the west access for the same reason as described above. This treatment is proven to be highly effective in increasing visibility for pedestrians and warning motorists at multi-lane, high-volume pedestrian crossings. The City of Boulder has successfully installed a pedestrian crossing on Broadway, a four lane arterial with a raised median and approximately 27,000 ADT, utilizing this treatment.
- **Pedestrian Refuge Area.** If the crosswalk were installed at the east access, the existing median could be modified to serve as a refuge area. With a refuge area, pedestrians only have to cross one direction of traffic at a time and can wait safely in the median for a gap before proceeding across the other direction of traffic. Constructing a raised median at the west access is not feasible because it would eliminate the westbound left turn lane into Frontier Mall. A gap study was conducted that is discussed in the next section of the report.
- **Pedestrian Crossing Signalization.** The MUTCD has pedestrian volume and vehicle gap criteria, both of which must

⁸ Manual on Uniform Traffic Control Devices. Federal Highway Administration. 2003.

be satisfied to warrant a signal. A traffic signal is warranted by the MUTCD if the volume of pedestrians crossing the major street (Prairie Avenue) is 100 or more for each of any 4 hours in a day or 190 or more during any 1 hour. SEH did not collect pedestrian count data because the discussions with Rich Pfeiffer indicated that the volumes are well below that which is required to warrant a traffic signal. The MUTCD also has a provision in this warrant that prohibits the installation of a pedestrian crossing signal within 300' of an existing signal. A signal is not warranted at this location because of the low volume of pedestrians crossing Prairie Avenue and the proximity to the signal at Powderhouse Road. Therefore, it is not recommended that a signal be constructed at this location.

- **Pedestrian Overpass/Underpass.** A pedestrian overpass or underpass is not a practical solution to the problem. They are both extremely costly solutions and pedestrians need to be forced to utilize the structure for them to be successful.

8.3 Gap Study

Gap interval and frequency data were collected on Wednesday June 5, 2003 to evaluate whether pedestrians could cross the street, in the absence of a signal, and use the existing median at the east access for refuge. It was assumed that a 15-second gap in traffic is adequate for a pedestrian to cross one direction of traffic. This accounts for a 3-second period to recognize the adequate gap and 12 seconds to cross the street at 3 feet per second. Research has shown that the average walking speed is approximately 4.0 feet per second and the 85th percentile walking speed is approximately 3.0 per second. Figure 13 illustrates the number of acceptable gaps that occurred throughout a 12-hour period from 6:00 a.m. to 6:00 p.m. on June 5th. Based on the MUTCD, it is desirable to have at least 60 acceptable gaps per hour. Both graphs show that during each hour of the study period, at least 60 acceptable gaps occurred. The results show that a pedestrian crossing in this area should work with the current level of traffic on Prairie Avenue.

8.4 Recommended Pedestrian Crossing Treatment

SEH recommends that a crosswalk be signed and marked at the east access to Pointe Frontier. The median will need to be modified to provide a place for people to stand and wait for a gap in the opposing direction of traffic. The City should install the standard pedestrian crossing signs and pavement markings. The crossing could be enhanced with the addition of the pedestrian activated sign mounted flashing lights as described in Section 8.3, if necessary, based on motorist behavior or increased traffic volumes. In conjunction with

the pedestrian crossing, a sidewalk will need to be installed between the south edge of Prairie Avenue and the mall parking lot. This sidewalk should continue east to a point near the theaters. Frontier Mall management has agreed to restripe the parking lot to create a pedestrian walking isle near the theaters in conjunction with the expansion of the theaters.

A cost estimate was prepared to construct the sidewalk and install the signing and pavement markings. The estimated cost to construct these improvements is approximately \$12,000. The addition of the pedestrian activated, sign mounted flashing lights would cost approximately \$44,000. Detailed cost estimates are included in Appendix C.

The area north of Prairie Avenue is mostly undeveloped. As this area develops, there will be additional intersections with Prairie Avenue and increased traffic volumes. The location and treatment of the crossing should be reexamined in the future to determine if more favorable locations become available or if the treatment at the existing location needs to be enhanced with more or different devices. A future signalized intersection to the east of the proposed location should be reviewed to determine if it is a more favorable crossing location.

Tables

Table 1 – Intersection Level of Service Improvement Matrix and Cost Estimate Summary

Table 2 – Weekday Trip Generation for Year 2025

Table 1: Intersection Level of Service Improvement Matrix and Cost Estimate Summary

| Alternative Improvements | | Existing Traffic | Existing Traffic with the Closure of Prairie Avenue | 2025 Background Traffic (No Development) | 2025 Background Traffic with the Closure of Prairie Avenue | 2025 Total Traffic (Background + Development) | 2025 Total Traffic with the Closure of Prairie Avenue | Short Term Cost | Long Term Cost (Year 2025) 2 |
|---|--|------------------|---|--|--|---|---|-----------------|------------------------------|
| INTERSECTION IMPROVEMENTS | | | | | | | | | |
| Dell Range Blvd / Powderhouse Rd | | A/A/A | A/B/A | A/B/B | B/D/B | B/E/D | B/F/D | | |
| Revise Signal Timing | | | | • | • | • | • | | \$ 2,800 |
| Add SB to WB Accel Lane | | | • ¹ | | • | • | • | \$ 268,900 | \$ 749,100 |
| Add WB Left Turn Phasing | | | | | | • | • | | \$ 28,000 |
| Add EB Left Turn Phasing | | | | | • | | • | | \$ 28,000 |
| Create EB Dual Left Turn | | | | | | | • | | \$ 392,300 |
| Prairie Ave / Powderhouse Rd | | | | | | | | | |
| 1st Level Improvements | | A/B/A | A/B/A | A/B/B | A/D/B | A/B/B | B/F/E | | |
| Revise Signal Timing | | | | • | • | • | • | | \$ 2,800 |
| Create SB Dual Left Turn | | | | | | • | • | | \$ 100,100 |
| 2nd Level Improvements | | | | | | | B/F/D | | |
| Add NB / SB Through Lane w/ Shared Right Turns | | | | | | | • | | \$ 822,500 |
| Add NB Left Turn Phasing | | | | | | | • | | \$ 28,000 |
| 3rd Level Improvements | | | | | | | B/E/C | | |
| Add Exclusive NB Right Turn Lane | | | | | | | • | | \$ 251,400 |
| Dell Range Blvd / Prairie Ave | | A/B/A | A/A/A | A/F/C | A/C/B | B/F/F | A/E/D | | |
| DRAINAGE STRUCTURE IMPROVEMENTS ³ | | | | | | | | | |
| Road Upgrade and Drainage Modifications | | | | | | | | \$ 1,105,500 | |
| Remove the Drainage Structure Closing Prairie Avenue | | | | | | | | \$ 134,000 | |
| COST ESTIMATES FOR ALTERNATIVES | | | | | | | | | |
| Do Nothing ⁴ | | | | | | | | \$ 882,800 | |
| Total Cost with Prairie Ave Remaining Open ⁵ | | | | | | | | \$ 1,988,300 | |
| Total Cost with Closure of Prairie Ave ⁶ | | | | | | | | \$ 2,058,800 | |

Note:

1. The dot indicates which improvements are necessary for each volume scenario.

2. The inflation rate assumed for Year 2025 cost estimates was 5%.

3. Costs for the drainage structure modifications are based on the Prairie Avenue Reconstruction Project prepared by States West Water Resources Corporation. The report contains cost estimates based on 1998 unit costs. These estimates were inflated assuming 5% inflation.

4. The estimated cost to leave the structure in-place is \$ 882,800. These costs include the long term costs to construct all of the improvements warranted by the Year 2025 Total Traffic volume scenario.

5. The cost to modify the drainage structure and keep Prairie Avenue open is estimated to be \$ 1,988,300. These costs include cost to upgrade the structure plus the costs of the improvements required by the 2025 Total volume scenario.

6. The estimated cost to remove the drainage structure and close Prairie Avenue is \$ 2,058,800. These costs include the short term costs to remove the structure and construct the acceleration lane at Dell Range Boulevard/Powderhouse Road; and the long term costs to construct all of the improvements warranted by the Year 2025 Total Traffic without Prairie Avenue volume scenario (except for the accel lane which would already exist).

TABLE 2: Weekday Trip Generation for Year 2025

| TAZ | Proposed Use | | | | | Trip Generation Rates/Unit | | | | | | Trips Generated | | | | | | | |
|-----|--------------------------------|----------------|------|-----------|-------|----------------------------|--------------------------|------|------|------|-----------|--------------------------|-------|-------|-------|--|--|--|--|
| | | Dwelling Units | | Employees | | Trips/Day | Trips/Hour @ Peak - Hour | | | | Trips/Day | Trips/Hour @ Peak - Hour | | | | | | | |
| | | 2000 | 2020 | 2000 | 2020 | | A.M. | | P.M. | | | A.M. | | P.M. | | | | | |
| | | | | | | | In | Out | In | Out | | In | Out | In | Out | | | | |
| 114 | Single-Family Detached Housing | 175 | 200 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 239 | 5 | 14 | 16 | 9 | | | | |
| | General Office Building | | | 28 | 100 | 3.32 | 0.42 | 0.06 | 0.08 | 0.38 | 239 | 30 | 4 | 6 | 27 | | | | |
| | Net Trips Generated | | | | | | | | | | 478 | 35 | 18 | 22 | 37 | | | | |
| 115 | Single-Family Detached Housing | 250 | 255 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 48 | 1 | 3 | 3 | 2 | | | | |
| | Net Trips Generated | | | | | | | | | | 48 | 1 | 3 | 3 | 2 | | | | |
| 116 | Single-Family Detached Housing | 275 | 275 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 0 | 0 | 0 | 0 | 0 | | | | |
| | General Office Building | | | 0 | 93 | 3.32 | 0.39 | 0.05 | 0.18 | 0.86 | 309 | 36 | 5 | 16 | 80 | | | | |
| | Net Trips Generated | | | | | | | | | | 309 | 36 | 5 | 16 | 80 | | | | |
| 117 | Retail | | | 651 | 850 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 5,970 | 121 | 78 | 287 | 310 | | | | |
| | Net Trips Generated | | | | | | | | | | 5,970 | 121 | 78 | 287 | 310 | | | | |
| 118 | Retail | | | 213 | 250 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 1,110 | 23 | 14 | 53 | 58 | | | | |
| | Net Trips Generated | | | | | | | | | | 1,110 | 23 | 14 | 53 | 58 | | | | |
| 119 | Single-Family Detached Housing | 0 | 262 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 2,507 | 49 | 147 | 169 | 95 | | | | |
| | Net Trips Generated | | | | | | | | | | 2,507 | 49 | 147 | 169 | 95 | | | | |
| 260 | Single-Family Detached Housing | 0 | 63 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 603 | 12 | 35 | 41 | 23 | | | | |
| | Net Trips Generated | | | | | | | | | | 603 | 12 | 35 | 41 | 23 | | | | |
| 261 | Single-Family Detached Housing | 0 | 100 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 957 | 19 | 56 | 65 | 36 | | | | |
| | Net Trips Generated | | | | | | | | | | 957 | 19 | 56 | 65 | 36 | | | | |
| 283 | Single-Family Detached Housing | 0 | 100 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 957 | 19 | 56 | 65 | 36 | | | | |
| | General Office Building | | | 204 | 240 | 3.32 | 0.42 | 0.06 | 0.08 | 0.38 | 120 | 15 | 2 | 3 | 14 | | | | |
| | Net Trips Generated | | | | | | | | | | 1,077 | 34 | 58 | 67 | 50 | | | | |
| 284 | Single-Family Detached Housing | 0 | 100 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 957 | 19 | 56 | 65 | 36 | | | | |
| | Retail | | | 175 | 242.5 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 2,025 | 41 | 26 | 97 | 105 | | | | |
| | Net Trips Generated | | | | | | | | | | 2,982 | 60 | 83 | 162 | 142 | | | | |
| 285 | Single-Family Detached Housing | 0 | 297 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 2,842 | 56 | 167 | 192 | 108 | | | | |
| | Net Trips Generated | | | | | | | | | | 2,842 | 56 | 167 | 192 | 108 | | | | |
| 288 | Single-Family Detached Housing | 0 | 278 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | 2,660 | 52 | 156 | 180 | 101 | | | | |
| | Retail | | | 0 | 400 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 12,000 | 244 | 156 | 576 | 624 | | | | |
| | Net Trips Generated | | | | | | | | | | 14,660 | 296 | 312 | 756 | 725 | | | | |
| 289 | Retail | | | 131 | 170 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 1,170 | 24 | 15 | 56 | 61 | | | | |
| | Net Trips Generated | | | | | | | | | | 1,170 | 24 | 15 | 56 | 61 | | | | |
| 290 | Retail | | | 432 | 550 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 3,540 | 72 | 46 | 170 | 184 | | | | |
| | Net Trips Generated | | | | | | | | | | 3,540 | 72 | 46 | 170 | 184 | | | | |
| 94 | Single-Family Detached Housing | 70 | 50 | | | 9.57 | 0.19 | 0.56 | 0.65 | 0.36 | -191 | -4 | -11 | -13 | -7 | | | | |
| | Retail | | | 380 | 450 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 2,100 | 43 | 27 | 101 | 109 | | | | |
| | Net Trips Generated | | | | | | | | | | 1,909 | 39 | 16 | 88 | 102 | | | | |
| 95 | Retail | | | 259 | 275 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 480 | 10 | 6 | 23 | 25 | | | | |
| | Net Trips Generated | | | | | | | | | | 480 | 10 | 6 | 23 | 25 | | | | |
| 281 | Retail | | | 19 | 100 | 30.00 | 0.61 | 0.39 | 1.44 | 1.56 | 2,430 | 49 | 32 | 117 | 126 | | | | |
| | Net Trips Generated | | | | | | | | | | 2,430 | 49 | 32 | 117 | 126 | | | | |
| | | | | | | | | | | | 43,024 | 836 | 1,036 | 2,055 | 1,909 | | | | |

Figures

Figure 1 – Existing Traffic Volumes & Speed Data

Figure 2 – Diverted Traffic Due to the Closure of Prairie Avenue (Short Term)

Figure 3 – Existing Traffic with the Closure of Prairie Avenue

Figure 4 – Trip Distribution

Figure 5 – Year 2025 Background Traffic Volume

Figure 6 – Diverted Traffic Due to the Closure of Prairie Avenue (Year 2025 Background)

Figure 7 – Year 2025 Background Traffic Volume Due to the Closure of Prairie Avenue

Figure 8 – Year 2025 Total Traffic

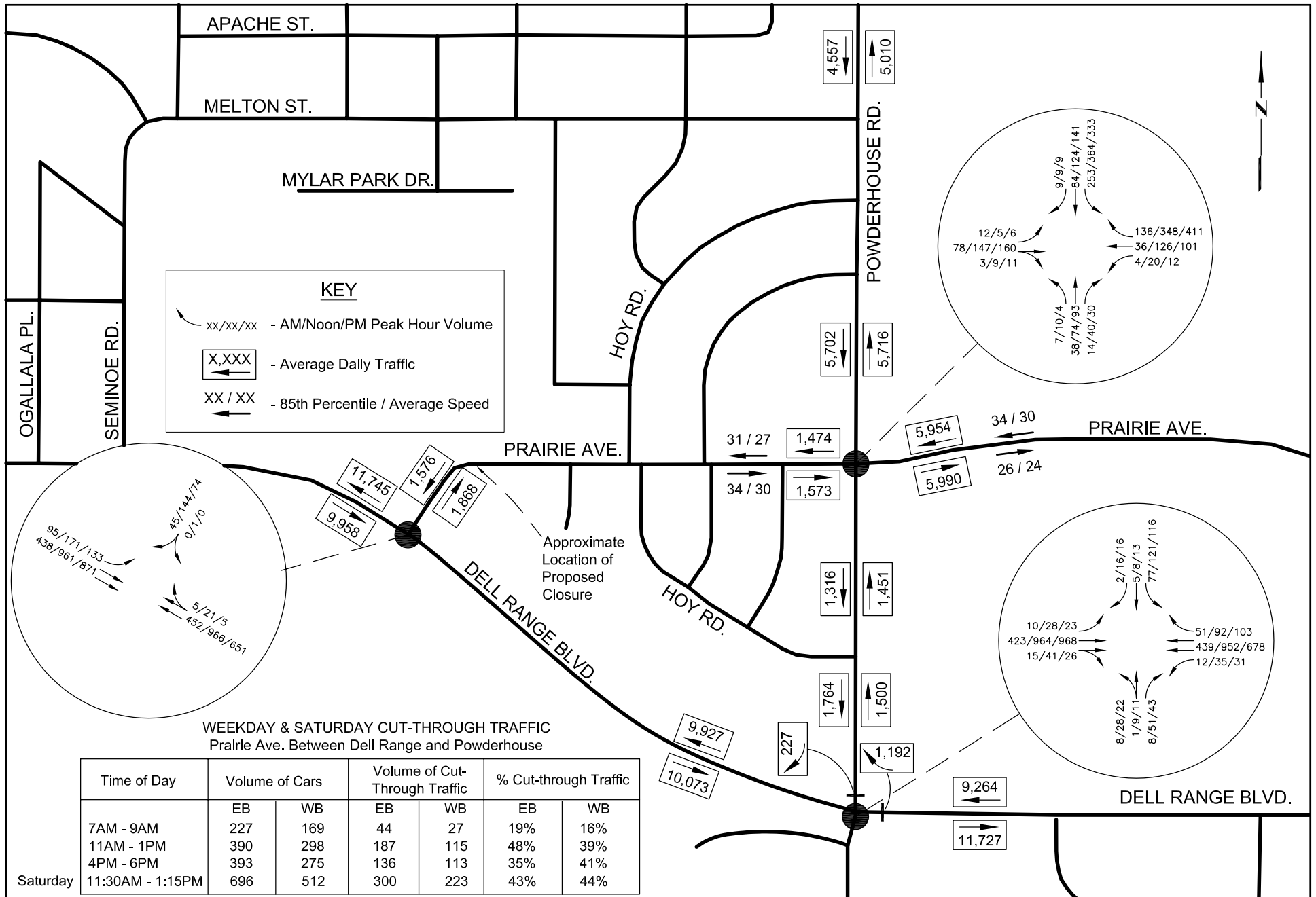
Figure 9 – Diverted Traffic Due to the Closure of Prairie Avenue (Year 2025 Total)

Figure 10 – Year 2025 Total Traffic with the Closure of Prairie Avenue

Figure 11 – Possible Pedestrian Crossing Locations

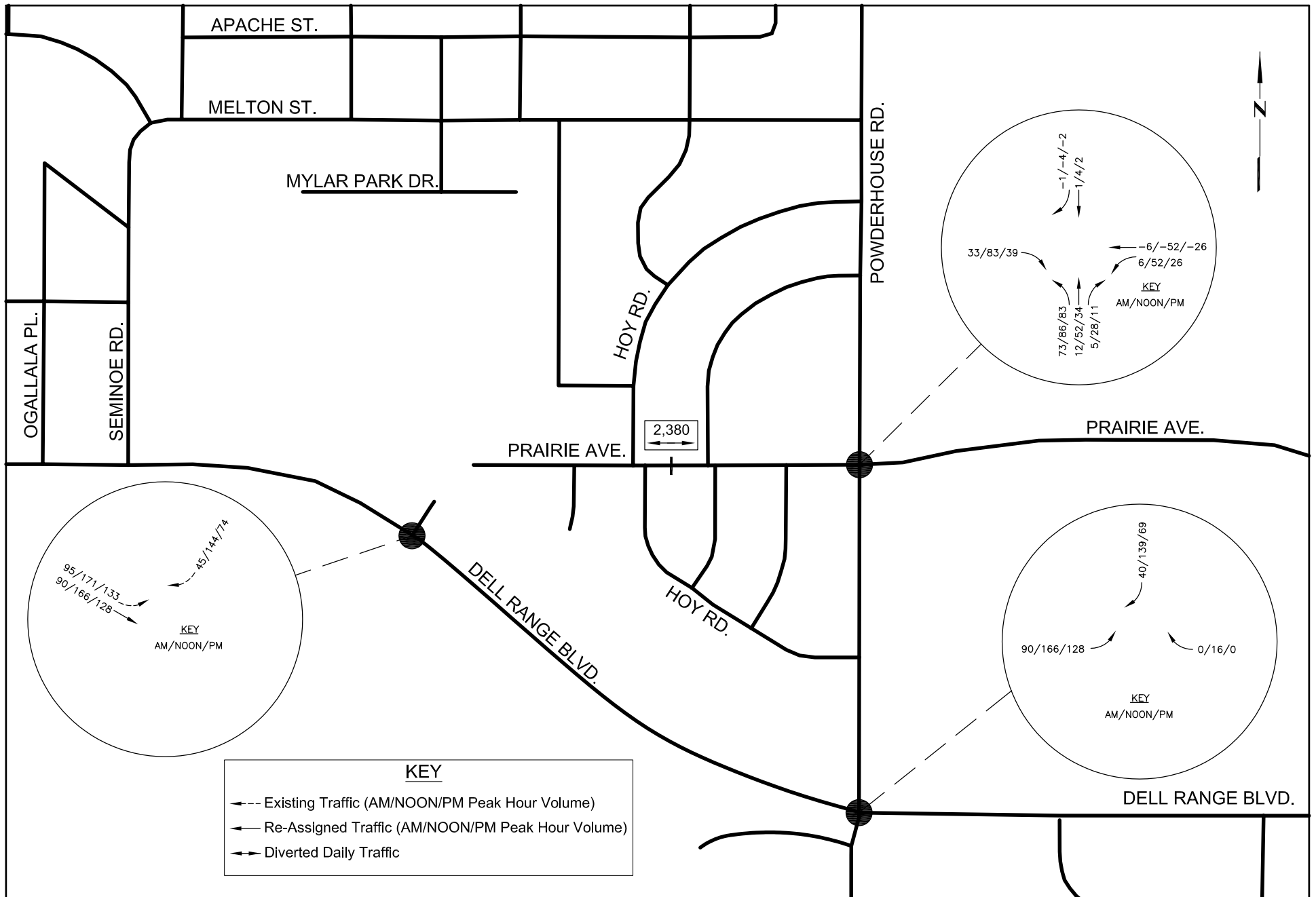
Figure 12 – Example of a Pedestrian Crossing Sign with Flashing Lights

Figure 13 – Gap Frequency by Hour of Day on Prairie Avenue East of Powderhouse Road



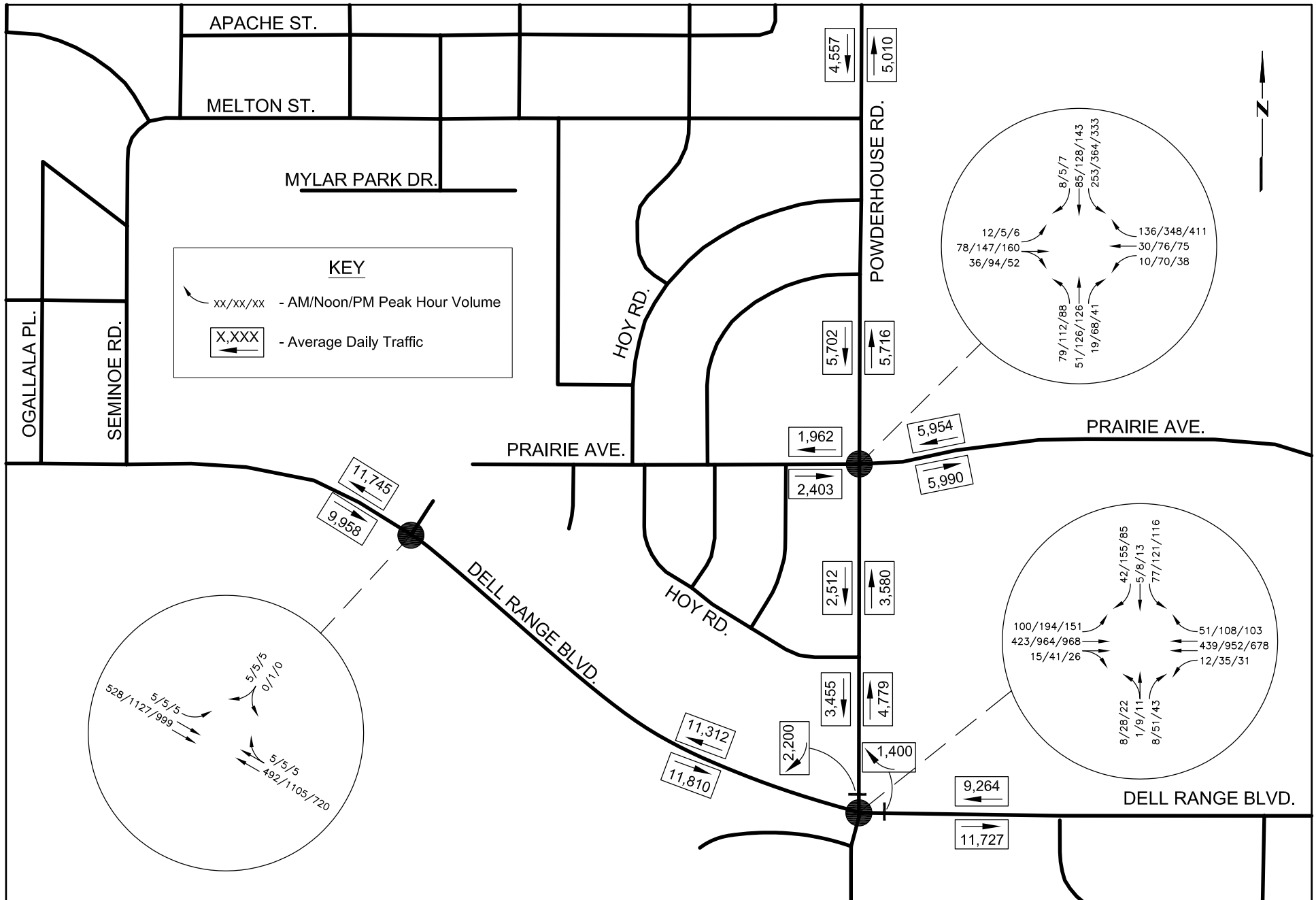
PRAIRIE AVENUE TRANSPORTATION PLAN
EXISTING TRAFFIC VOLUMES & SPEED DATA

| | | | | | | | | | |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 03/15/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 1 |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|



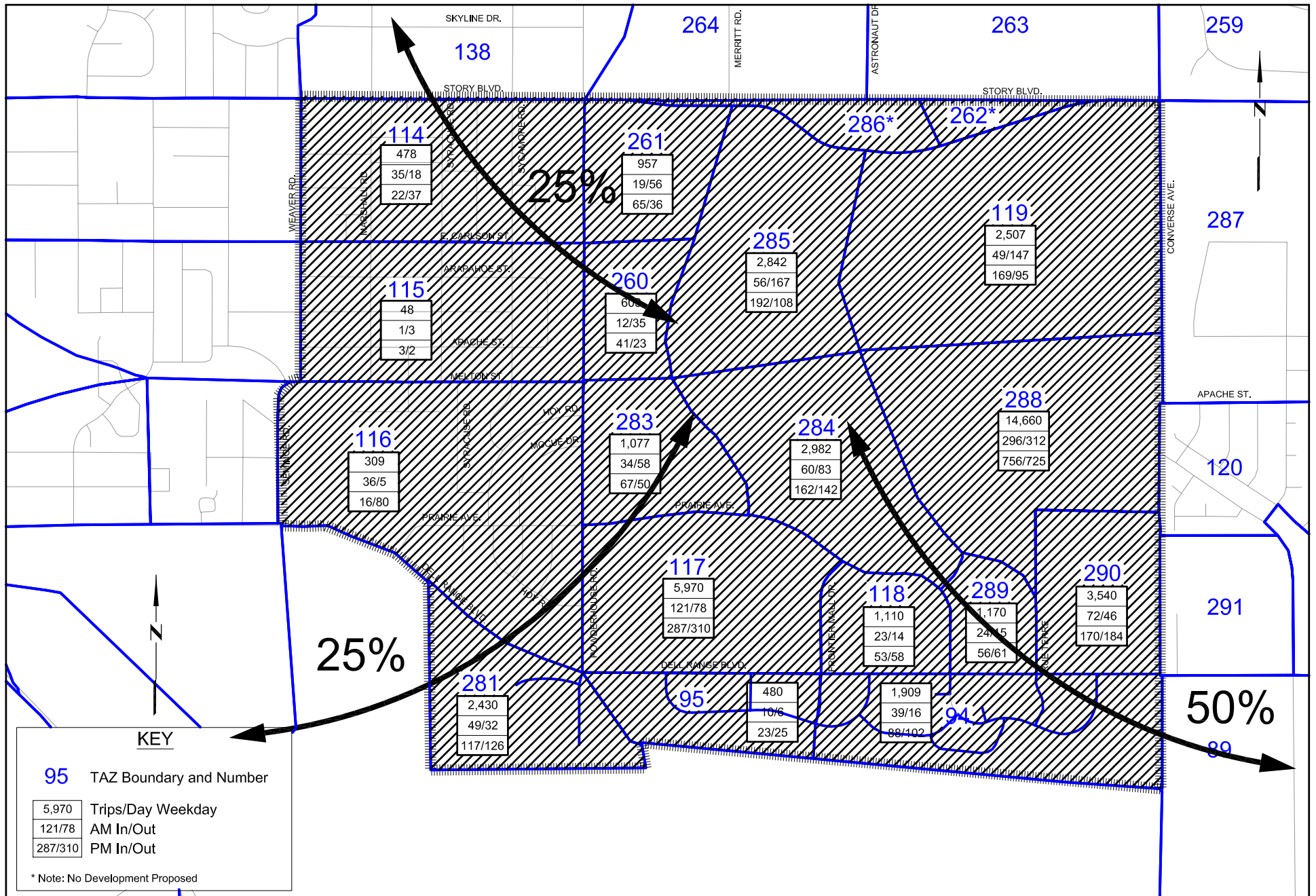
PRAIRIE AVENUE TRANSPORTATION PLAN
DIVERTED TRAFFIC DUE TO THE CLOSURE OF PRAIRIE AVENUE (SHORT TERM)

| | | | | | | | | | |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 7/2/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 2 |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|



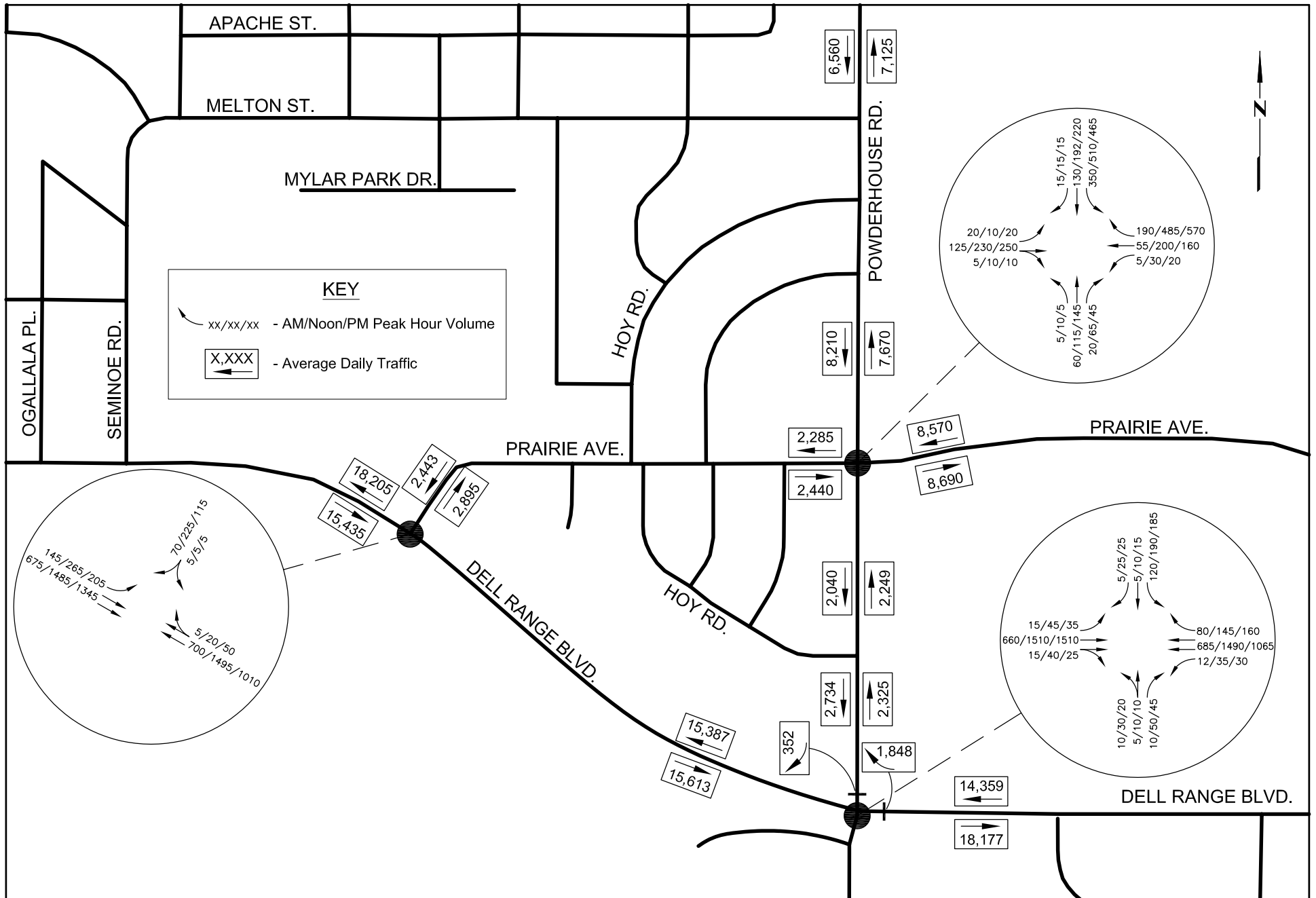
PRAIRIE AVENUE TRANSPORTATION PLAN
EXISTING TRAFFIC WITH THE CLOSURE OF PRAIRIE AVENUE

| | | | | | | | | | |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 03/15/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 3 |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|



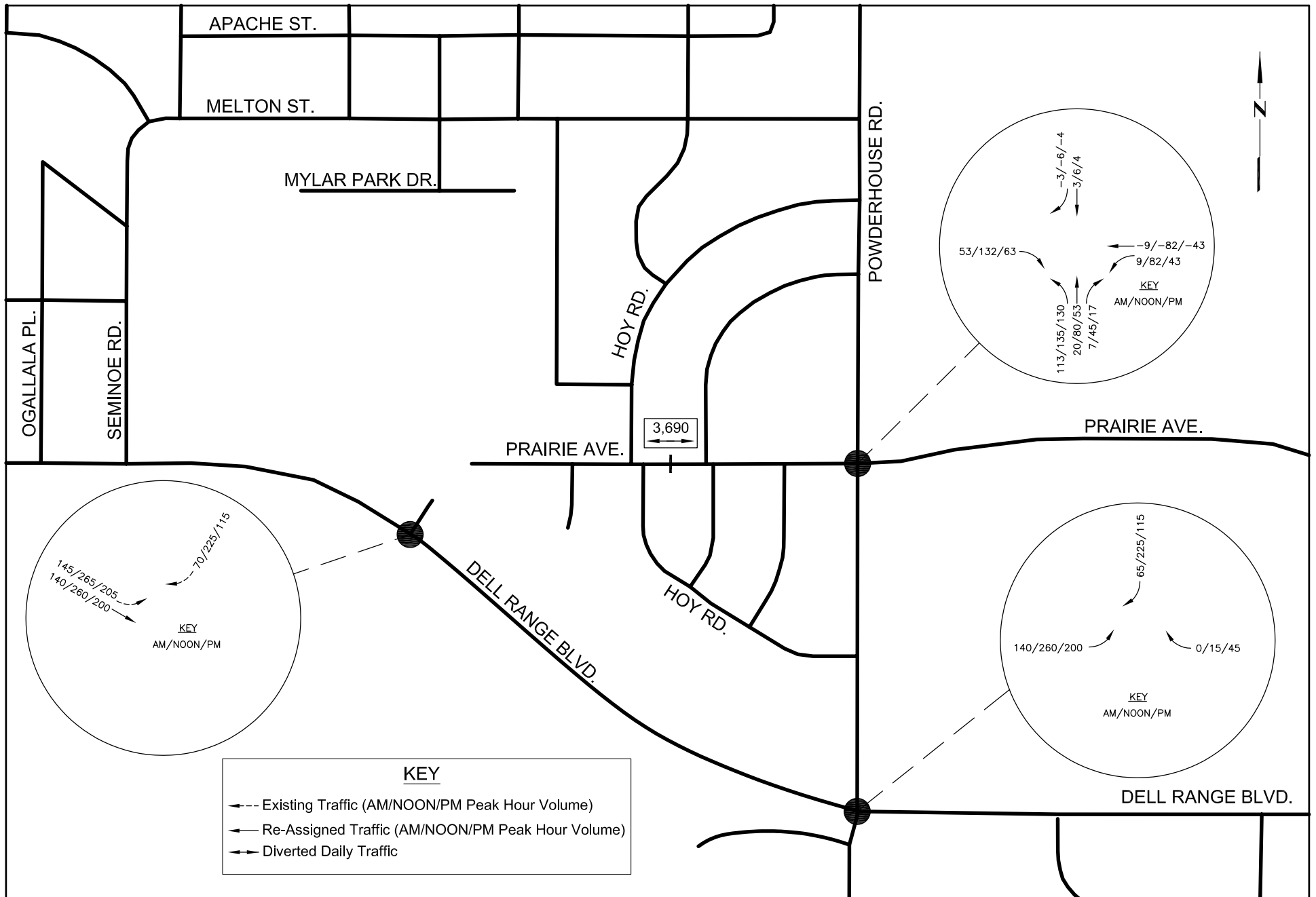
PRAIRIE AVENUE TRANSPORTATION PLAN TRIP DISTRIBUTION

| | | | | | | | | | |
|-------|----------|------|----------|----------|-----|-------|------------|--------|---|
| Scale | 1"=1250' | Date | 03/15/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 4 |
|-------|----------|------|----------|----------|-----|-------|------------|--------|---|



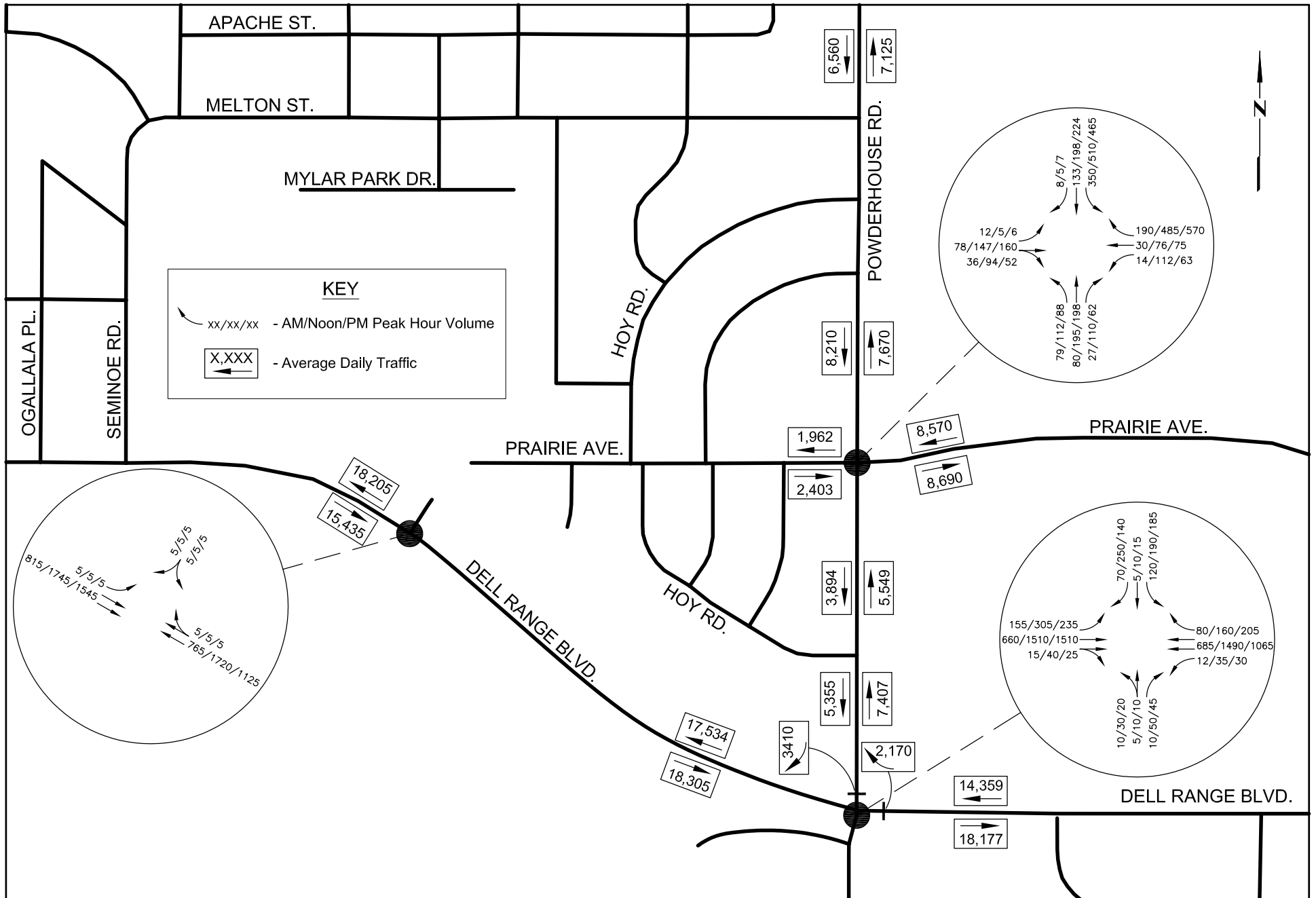
PRAIRIE AVENUE TRANSPORTATION PLAN
YEAR 2025 BACKGROUND TRAFFIC VOLUME

| | | | | | | | | | |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 7/2/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 5 |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|



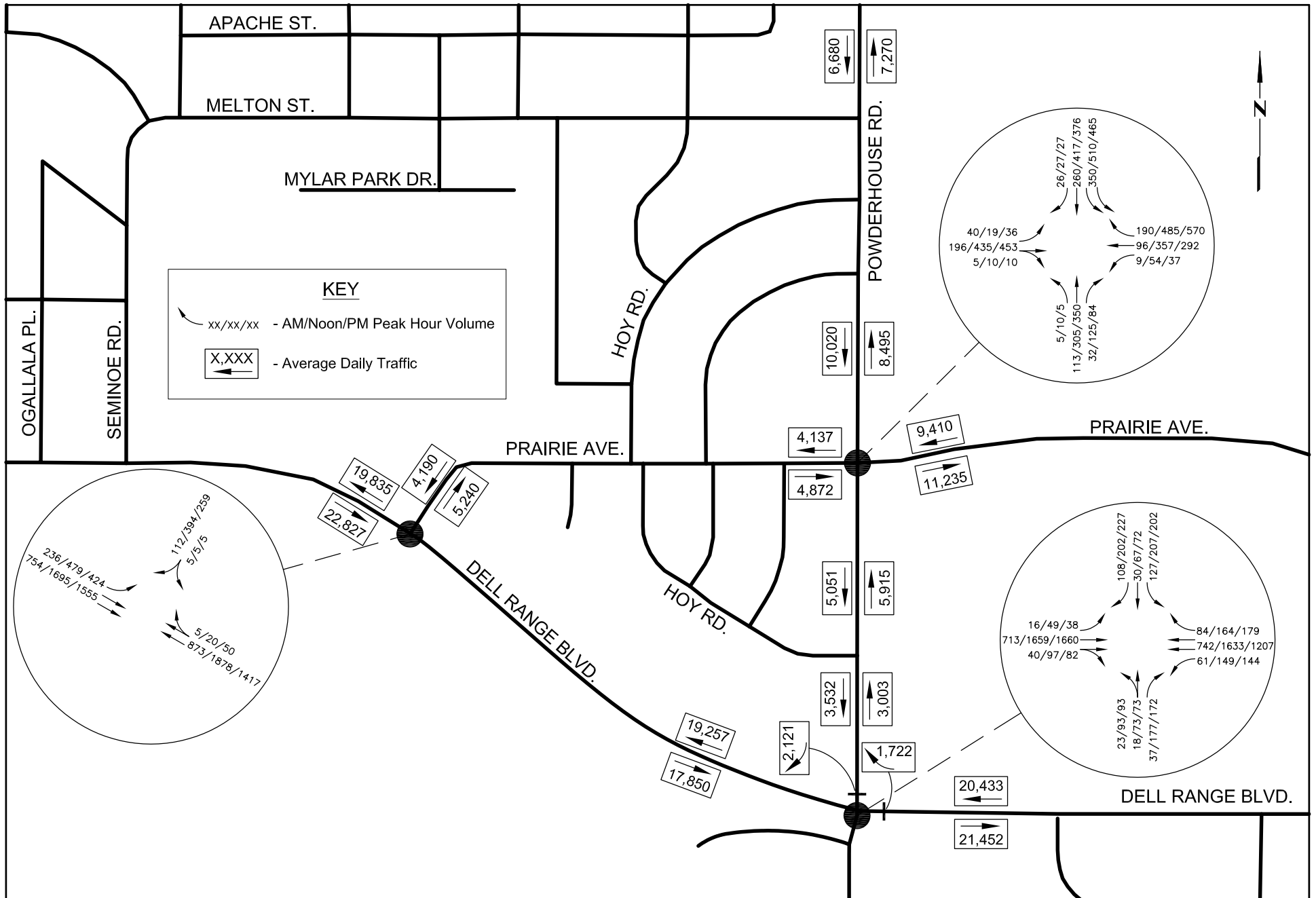
PRAIRIE AVENUE TRANSPORTATION PLAN
 DIVERTED TRAFFIC DUE TO THE CLOSURE OF PRAIRIE AVENUE (YEAR 2025 BACKGROUND)

| | | | | | | | | | |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 7/2/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 6 |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|



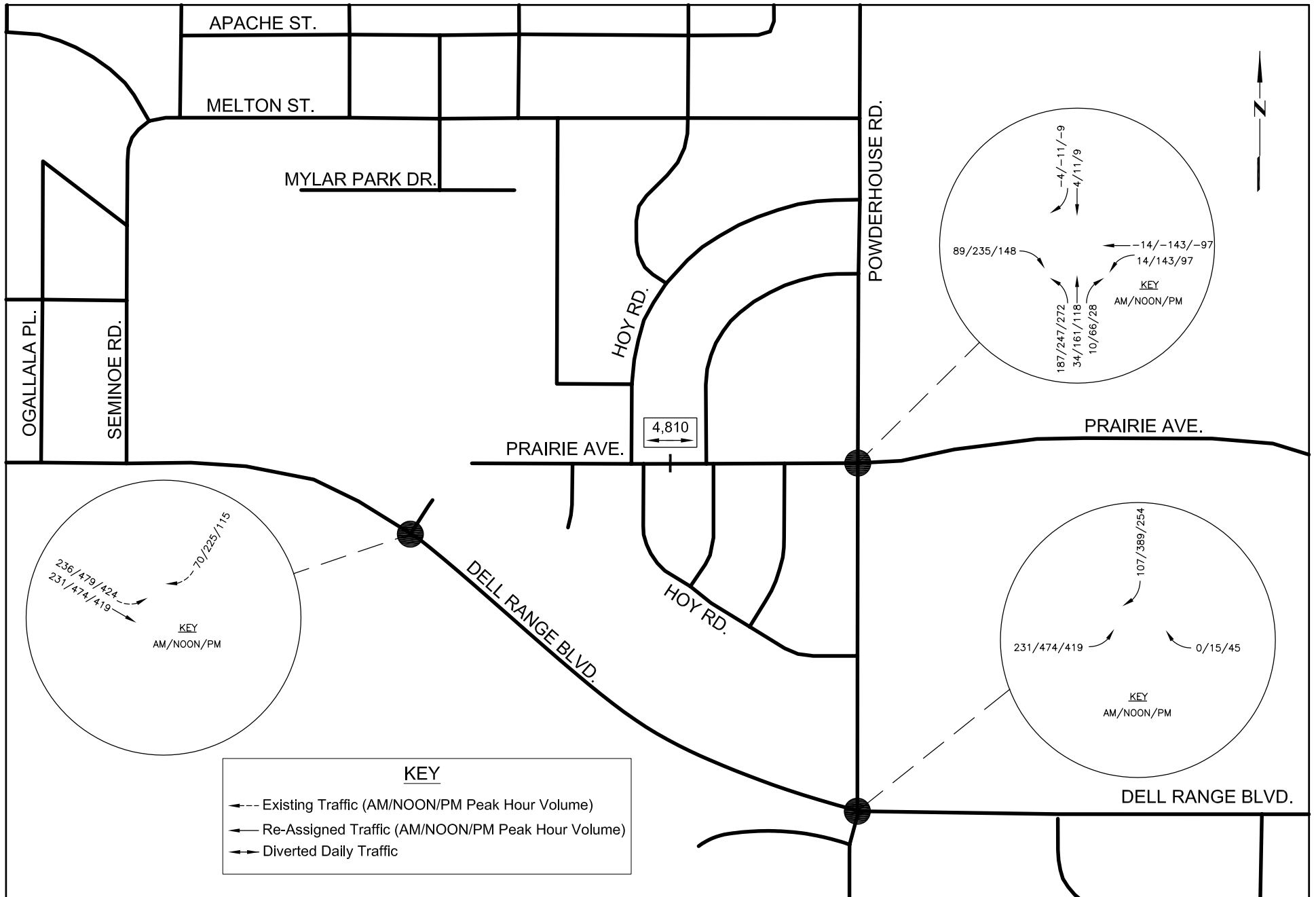
PRAIRIE AVENUE TRANSPORTATION PLAN
YEAR 2025 BACKGROUND TRAFFIC VOLUME DUE TO THE CLOSURE OF PRAIRIE AVENUE

| | | | | | | | | | |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 03/15/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 7 |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|



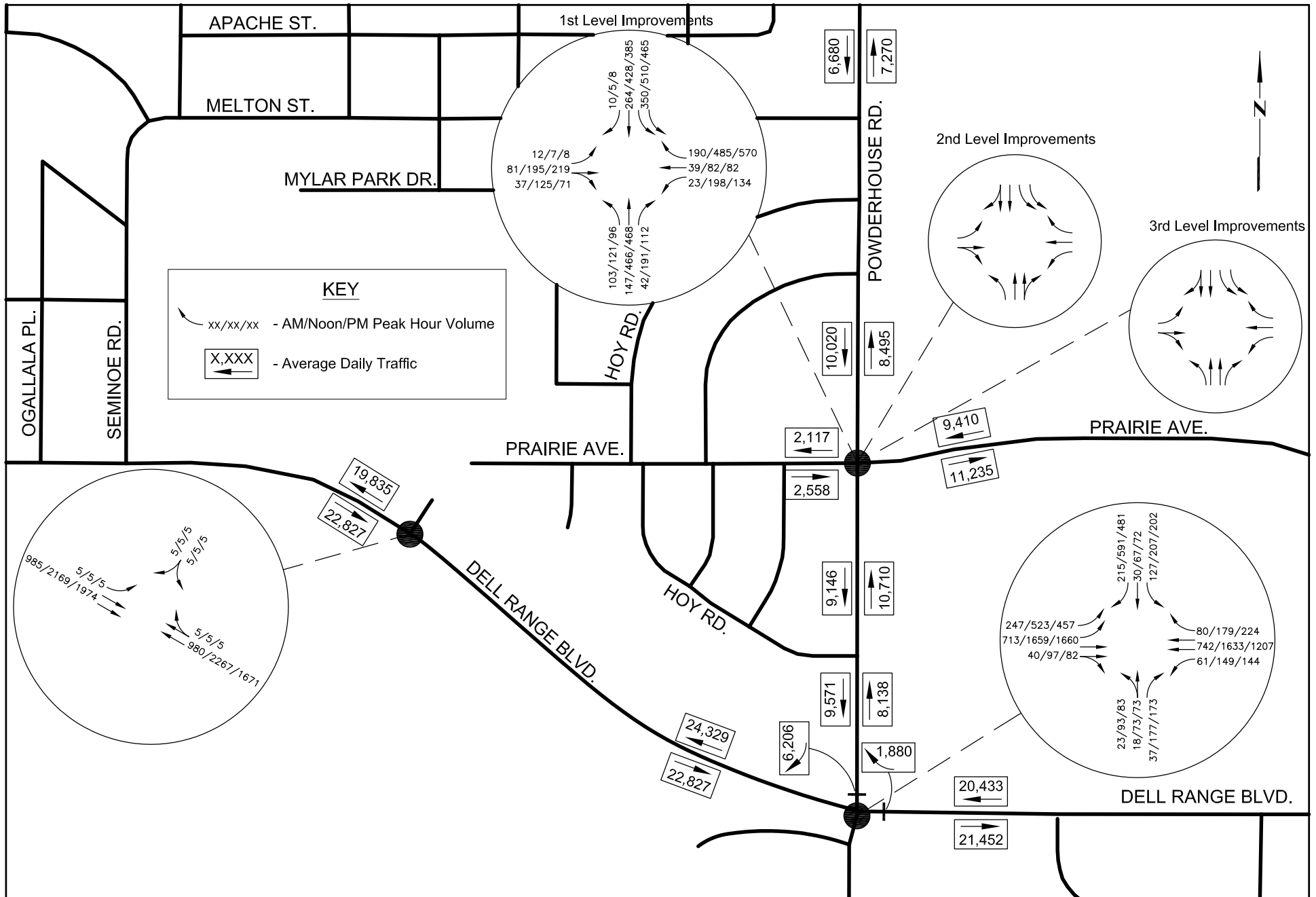
PRAIRIE AVENUE TRANSPORTATION PLAN
YEAR 2025 TOTAL TRAFFIC

| | | | | | | | | | |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 03/15/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 8 |
|-------|---------|------|----------|----------|-----|-------|------------|--------|---|



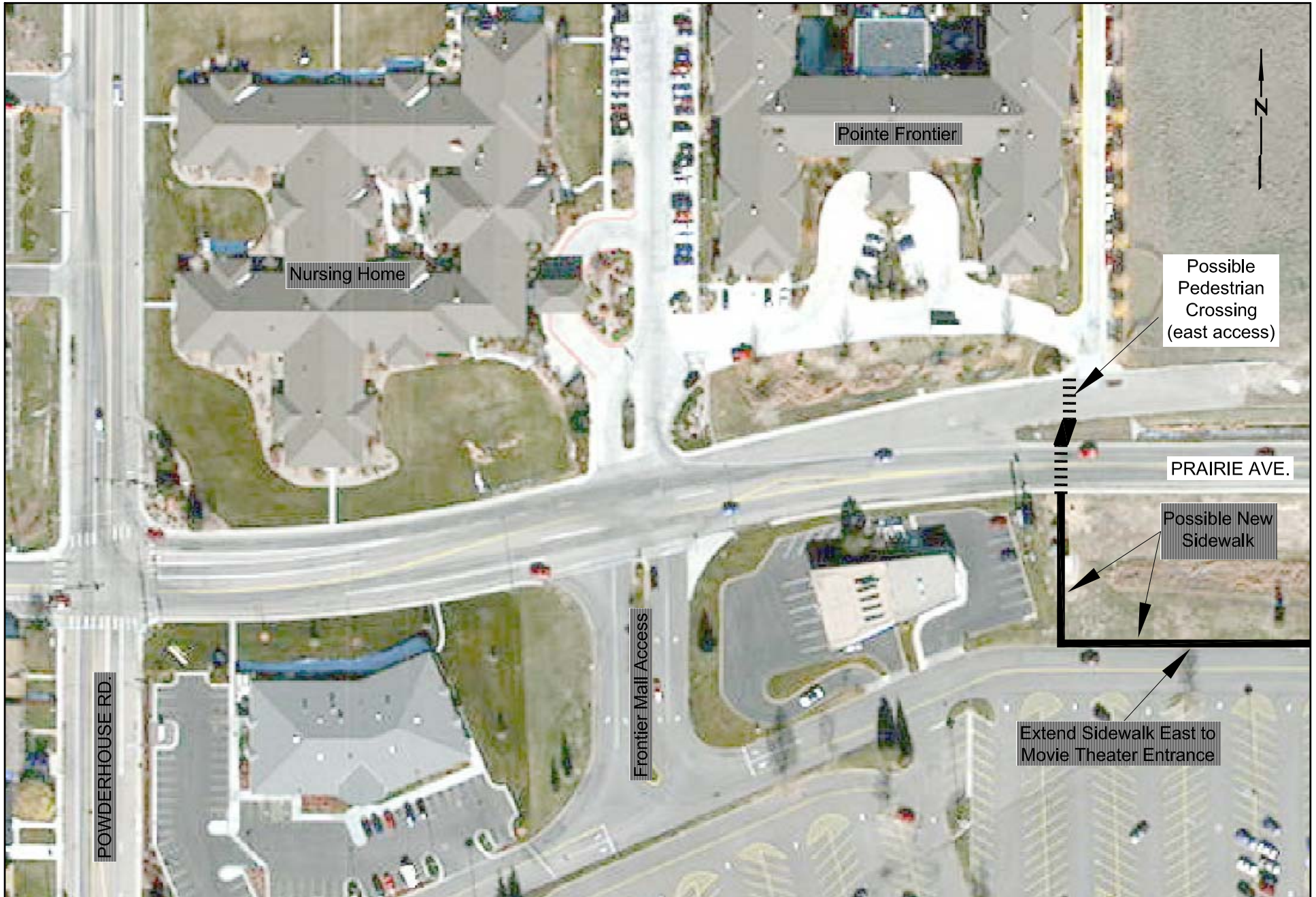
PRAIRIE AVENUE TRANSPORTATION PLAN
DIVERTED TRAFFIC DUE TO THE CLOSURE OF PRAIRIE AVENUE (YEAR 2025 TOTAL)

| | | | | | | | | | |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|
| Scale | 1"=500' | Date | 7/1/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 9 |
|-------|---------|------|--------|----------|-----|-------|------------|--------|---|



PRAIRIE AVENUE TRANSPORTATION PLAN
YEAR 2025 TOTAL TRAFFIC WITH CLOSURE OF PRAIRIE AVENUE

| | | | | | | | | | |
|-------|---------|------|----------|----------|-----|-------|------------|--------|----|
| Scale | 1"=500' | Date | 03/15/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 10 |
|-------|---------|------|----------|----------|-----|-------|------------|--------|----|

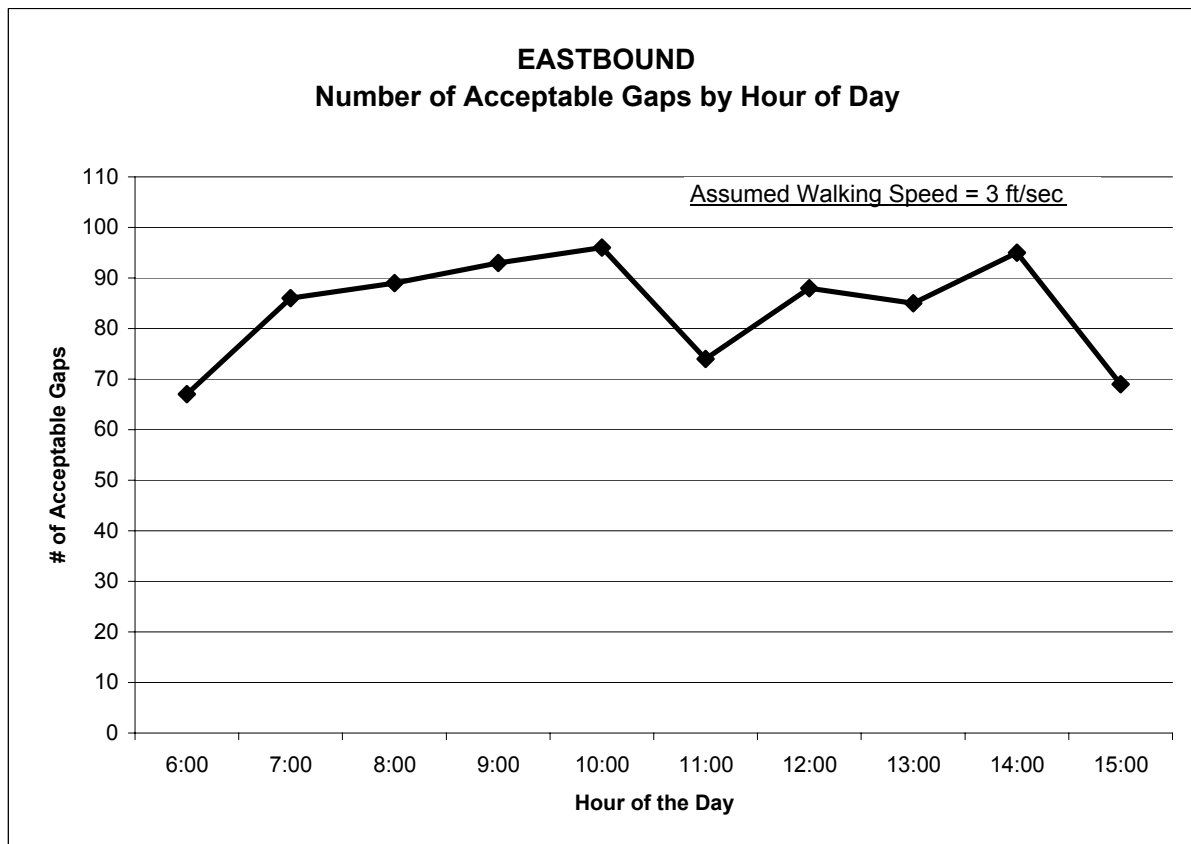
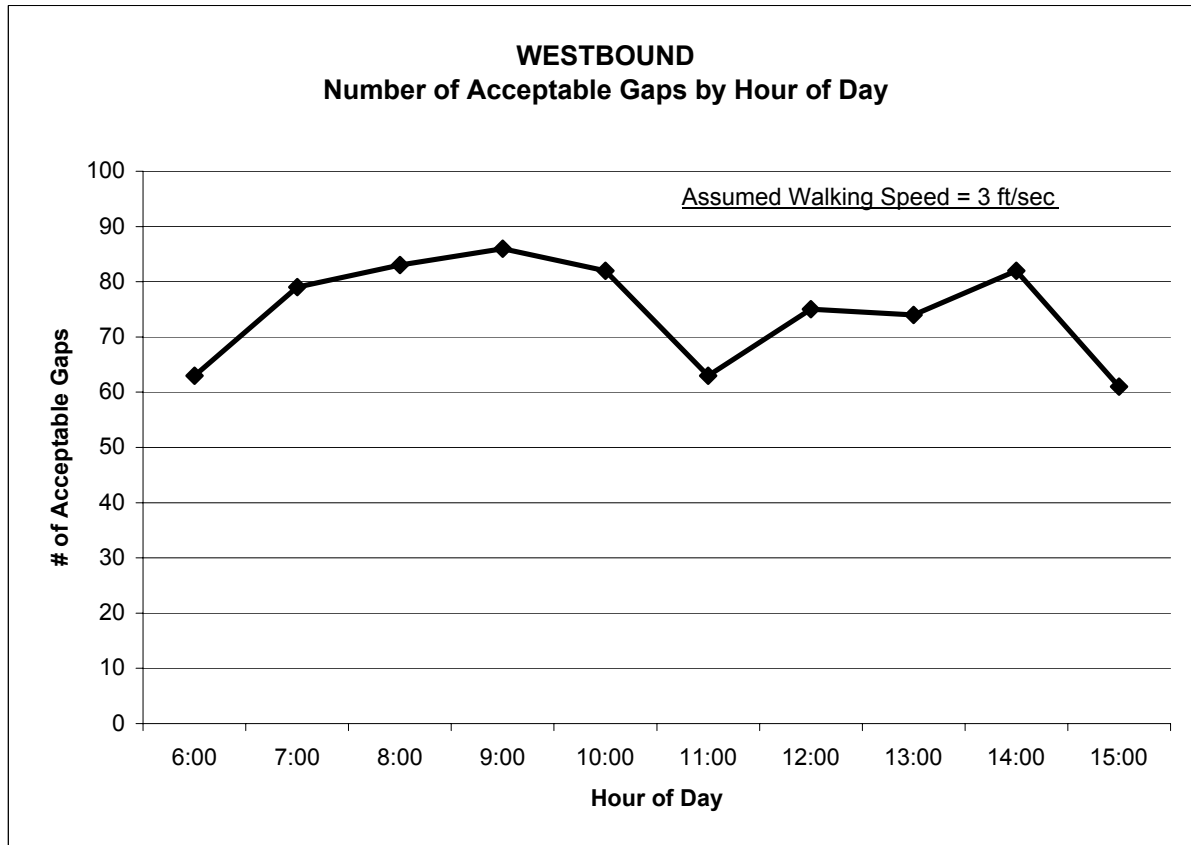


PRAIRIE AVENUE TRANSPORTATION PLAN
POSSIBLE PEDESTRIAN CROSSING LOCATION

| | | | | | | | | | |
|-------|---------|------|--------|----------|-----|-------|------------|--------|----|
| Scale | 1"=100' | Date | 7/2/04 | Drawn by | JEL | Job # | ACHMPO0301 | Figure | 11 |
|-------|---------|------|--------|----------|-----|-------|------------|--------|----|



Figure 13: Gap Frequency By Hour of Day on Prairie Avenue East of Powderhouse Road



Appendix A

Traffic Count Data

Appendix B

Level of Service Analysis Worksheets

Appendix C

Detailed Cost Estimates for Transportation Improvements

Engineer's Probable Costs for Construction Improvements
Prairie Avenue Transportation Plan
Cheyenne, Wyoming

DELL RANGE BOULEVARD / POWDERHOUSE ROAD
Southbound to Westbound Acceleration Lane

| Item # | Item | Units | QTY | Unit Price | Year 2004 | Year 2025 |
|----------------------------------|-----------------------------------|-------|------|--------------|-------------|--------------|
| | | | | | Total Price | Total Price* |
| 1 | Material Testing | LS | 1 | \$ 3,800.00 | \$ 3,800 | \$ 10,587 |
| 2 | Remove Existing Curb & Gutter | LF | 650 | \$ 5.00 | \$ 3,250 | \$ 9,055 |
| 3 | Remove Existing Concrete Sidewalk | SY | 560 | \$ 8.00 | \$ 4,480 | \$ 12,481 |
| 4 | Unclassified Excavation | CY | 300 | \$ 5.33 | \$ 1,599 | \$ 4,455 |
| 5 | Embankment | CY | 1200 | \$ 10.50 | \$ 12,600 | \$ 35,104 |
| 6 | Reconditioning | SY | 850 | \$ 1.00 | \$ 850 | \$ 2,368 |
| 7 | Crushed Base | TON | 400 | \$ 8.28 | \$ 3,312 | \$ 9,227 |
| 8 | Hot Plant Mix Bit Pvmt Type I | TON | 400 | \$ 15.91 | \$ 6,364 | \$ 17,730 |
| 9 | Concrete Sidewalk | SY | 560 | \$ 23.84 | \$ 13,350 | \$ 37,194 |
| 10 | Curb and Gutter Type A | LF | 650 | \$ 12.54 | \$ 8,151 | \$ 22,709 |
| 11 | Retaining Wall | SF | 3900 | \$ 25.00 | \$ 97,500 | \$ 271,635 |
| 12 | Work Zone Traffic Control | LS | 1 | \$ 15,500.00 | \$ 15,500 | \$ 43,183 |
| 13 | Mobilization | LS | 1 | \$ 8,500.00 | \$ 8,500 | \$ 23,681 |
| Subtotal = | | | | | \$ 179,256 | \$ 499,408 |
| Contingency (25%) = | | | | | \$ 44,814 | \$ 124,852 |
| Subtotal = | | | | | \$ 224,071 | \$ 624,260 |
| Engineering (10%) = | | | | | \$ 22,407 | \$ 62,426 |
| Construction Observation (10%) = | | | | | \$ 22,407 | \$ 62,426 |
| TOTAL = | | | | | \$ 268,900 | \$ 749,100 |

*Future cost reflects an assumed inflation rate of 5% annually.

DELL RANGE BOULEVARD / POWDERHOUSE ROAD
Create an Eastbound Dual Left-Turn Lane

| Item # | Item | Units | QTY | Unit Price | Year 2004 | Year 2025 |
|----------------------------------|-----------------------------------|-------|-----|--------------|-------------|--------------|
| | | | | | Total Price | Total Price* |
| 1 | Material Testing | LS | 1 | \$ 2,000.00 | \$ 2,000 | \$ 5,600 |
| 2 | Remove Existing Curb & Gutter | LF | 800 | \$ 5.00 | \$ 4,000 | \$ 11,100 |
| 3 | Remove Existing Concrete Sidewalk | SY | 60 | \$ 8.00 | \$ 480 | \$ 1,300 |
| 4 | Unclassified Excavation | CY | 730 | \$ 5.33 | \$ 3,891 | \$ 10,800 |
| 5 | Reconditioning | SY | 670 | \$ 1.00 | \$ 670 | \$ 1,900 |
| 6 | Crushed Base | TON | 350 | \$ 8.28 | \$ 2,898 | \$ 8,100 |
| 7 | Hot Plant Mix Bit Pvmt Type I | TON | 370 | \$ 15.91 | \$ 5,887 | \$ 16,400 |
| 8 | Concrete Sidewalk | SY | 60 | \$ 23.84 | \$ 1,430 | \$ 4,000 |
| 9 | Curb and Gutter Type A | LF | 800 | \$ 12.54 | \$ 10,032 | \$ 27,900 |
| 10 | Traffic Signal Modifications | LS | 1 | \$ 50,000.00 | \$ 50,000 | \$ 139,300 |
| 11 | Work Zone Traffic Control | LS | 1 | \$ 8,100.00 | \$ 8,100 | \$ 22,600 |
| 12 | Mobilization | LS | 1 | \$ 4,500.00 | \$ 4,500 | \$ 12,500 |
| Subtotal = | | | | | \$ 93,888 | \$ 261,500 |
| Contingency (25%) = | | | | | \$ 23,472 | \$ 65,375 |
| Subtotal = | | | | | \$ 117,360 | \$ 326,875 |
| Engineering (10%) = | | | | | \$ 11,736 | \$ 32,688 |
| Construction Observation (10%) = | | | | | \$ 11,736 | \$ 32,688 |
| TOTAL = | | | | | \$ 140,800 | \$ 392,300 |

*Future cost reflects an assumed inflation rate of 5% annually.

Engineer's Probable Costs for Construction Improvements
Prairie Avenue Transportation Plan
Cheyenne, Wyoming

PRAIRIE AVENUE / POWDERHOUSE ROAD
Long-Term (1st Level Improvements)
Create a Southbound Dual Left-Turn Lane

| Item # | Item | Units | QTY | Unit Price | Year 2004 | Year 2025 |
|----------------------------------|--------------------------------|-------|------|--------------|-------------|--------------|
| | | | | | Total Price | Total Price* |
| 1 | Signage | SF | 50 | \$ 25.00 | \$ 1,250 | \$ 3,483 |
| 2 | Thermoplastic Pavement Marking | SF | 1500 | \$ 5.00 | \$ 7,500 | \$ 20,895 |
| 3 | Traffic Signal Modifications | LS | 1 | \$ 12,000.00 | \$ 12,000 | \$ 33,432 |
| 4 | Work Zone Traffic Control | LS | 1 | \$ 2,100.00 | \$ 2,100 | \$ 5,851 |
| 5 | Mobilization | LS | 1 | \$ 1,100.00 | \$ 1,100 | \$ 3,065 |
| Subtotal = | | | | | \$ 23,950 | \$ 66,725 |
| Contingency (25%) = | | | | | \$ 5,988 | \$ 16,681 |
| Subtotal = | | | | | \$ 29,938 | \$ 83,406 |
| Engineering (10%) = | | | | | \$ 2,994 | \$ 8,341 |
| Construction Observation (10%) = | | | | | \$ 2,994 | \$ 8,341 |
| TOTAL = | | | | | \$ 35,900 | \$ 100,100 |

*Future cost reflects an assumed inflation rate of 5% annually.

PRAIRIE AVENUE / POWDERHOUSE ROAD
Long-Term (2nd Level Improvements)
Create Additional Northbound and Southbound Through Lanes with Shared Right-Turns

| Item # | Item | Units | QTY | Unit Price | Year 2004 | Year 2025 |
|----------------------------------|-----------------------------------|-------|-------|---------------|-------------|--------------|
| | | | | | Total Price | Total Price* |
| 1 | Material Testing | LS | 1 | \$ 3,800.00 | \$ 3,800 | \$ 10,587 |
| 2 | Remove Existing Curb & Gutter | LF | 1,030 | \$ 5.00 | \$ 5,150 | \$ 14,348 |
| 3 | Remove Existing Concrete Sidewalk | SY | 687 | \$ 8.00 | \$ 5,493 | \$ 15,304 |
| 4 | Unclassified Excavation | CY | 610 | \$ 5.33 | \$ 3,251 | \$ 9,058 |
| 5 | Reconditioning | SY | 610 | \$ 1.00 | \$ 610 | \$ 1,699 |
| 6 | Crushed Base | TON | 310 | \$ 8.28 | \$ 2,567 | \$ 7,151 |
| 7 | Hot Plant Mix Bit Pvmt Type I | TON | 330 | \$ 15.91 | \$ 5,250 | \$ 14,627 |
| 8 | Concrete Sidewalk | SY | 687 | \$ 23.84 | \$ 16,378 | \$ 45,629 |
| 9 | Curb and Gutter Type A | LF | 1,030 | \$ 12.54 | \$ 12,916 | \$ 35,985 |
| 10 | Traffic Signal Modification | LS | 1 | \$ 100,000.00 | \$ 100,000 | \$ 278,600 |
| 11 | Work Zone Traffic Control | LS | 1 | \$ 15,500.00 | \$ 15,500 | \$ 43,183 |
| 12 | Mobilization | LS | 1 | \$ 8,500.00 | \$ 8,500 | \$ 23,681 |
| Subtotal = | | | | | \$ 179,416 | \$ 499,853 |
| Contingency (25%) = | | | | | \$ 44,854 | \$ 124,963 |
| Subtotal = | | | | | \$ 224,270 | \$ 624,816 |
| Engineering (10%) = | | | | | \$ 22,427 | \$ 62,482 |
| Construction Observation (10%) = | | | | | \$ 22,427 | \$ 62,482 |
| 13 | Right-of-Way Acquisition | SF | 1,450 | \$ 18.00 | \$ 26,100 | \$ 72,715 |
| TOTAL = | | | | | \$ 295,200 | \$ 822,500 |

*Future cost reflects an assumed inflation rate of 5% annually.

PRAIRIE AVENUE / POWDERHOUSE ROAD
Long-Term (3rd Level Improvements)
Create an Exclusive Northbound Right-Turn Lane

| Item # | Item | Units | QTY | Unit Price | Year 2004 | Year 2025 |
|----------------------------------|-----------------------------------|-------|-------|-------------|-------------|--------------|
| | | | | | Total Price | Total Price* |
| 1 | Material Testing | LS | 1 | \$ 500.00 | \$ 500 | \$ 1,393 |
| 2 | Remove Existing Curb & Gutter | LF | 320 | \$ 5.00 | \$ 1,600 | \$ 4,458 |
| 3 | Remove Existing Concrete Sidewalk | SY | 213 | \$ 8.00 | \$ 1,707 | \$ 4,755 |
| 4 | Unclassified Excavation | CY | 350 | \$ 5.33 | \$ 1,866 | \$ 5,197 |
| 5 | Reconditioning | SY | 350 | \$ 1.00 | \$ 350 | \$ 975 |
| 6 | Crushed Base | TON | 180 | \$ 8.28 | \$ 1,490 | \$ 4,152 |
| 7 | Hot Plant Mix Bit Pvmt Type I | TON | 190 | \$ 15.91 | \$ 3,023 | \$ 8,422 |
| 8 | Concrete Sidewalk | SY | 213 | \$ 23.84 | \$ 5,078 | \$ 14,147 |
| 9 | Curb and Gutter Type A | LF | 320 | \$ 12.54 | \$ 4,013 | \$ 11,180 |
| 10 | Work Zone Traffic Control | LS | 1 | \$ 2,000.00 | \$ 2,000 | \$ 5,572 |
| 11 | Mobilization | LS | 1 | \$ 1,100.00 | \$ 1,100 | \$ 3,065 |
| Subtotal = | | | | | \$ 22,726 | \$ 63,315 |
| Contingency (25%) = | | | | | \$ 5,682 | \$ 15,829 |
| Subtotal = | | | | | \$ 28,408 | \$ 79,144 |
| Engineering (10%) = | | | | | \$ 2,841 | \$ 7,914 |
| Construction Observation (10%) = | | | | | \$ 2,841 | \$ 7,914 |
| 12 | Right-of-Way Acquisition | SF | 3,120 | \$ 18.00 | \$ 56,160 | \$ 156,462 |
| TOTAL = | | | | | \$ 90,200 | \$ 251,400 |

*Future cost reflects an assumed inflation rate of 5% annually.