



- Civil Engineering
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EGLIN STREET CORRIDOR STUDY

FINAL DRAFT REPORT

Prepared for:

Rapid City Metropolitan Planning Organization

August 2003

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Abbreviations

<u>Abbreviation</u>	<u>Word or Full Phrase</u>
AASHTO	American Association of State Highway and Transportation Officials
CIP	Cast-iron Pipe
CMP	Corrugated Metal Pipe
D	Diameter of round pipe or Height of box culvert
DM&E	Dakota, Minnesota and Eastern
FHWA	Federal Highway Administration
HW	Headwater depth
I-90	Interstate 90
LOS	Level Of Service
MEV	Million entering vehicles
MPO	Metropolitan Planning Organization
MVM	Million vehicle miles
PCCP	Portland Cement Concrete Pavement
RCB	Reinforced Concrete Box
RCDCM	Rapid City Drainage Criteria Manual
RCP	Reinforced Concrete Pipe
SDDOT	South Dakota Department of Transportation
sec	Seconds
SPUI	Single Point Urban Interchange
T_c	Time of Concentration
veh	Vehicle
VIC	Visitor Information Center
vpd	Vehicles Per Day
vph	Vehicles Per Hour

1.0 STUDY OVERVIEW AND PURPOSE

The Rapid City Metropolitan Planning Organization (MPO) has contracted with Ferber Engineering Company, Inc. and Interstate Engineering, Inc., to prepare a Corridor Analysis for Eglin Street (SD Highway 230) in northeastern Rapid City, SD. The project includes that portion of Eglin Street extending west of US Highway 16B (I-90 Business Loop / East North Street) to LaCrosse Street and extending east of Elk Vale Road (SD Highway 437) approximately one-half mile. Figure 1-1 is a vicinity map of the Eglin Street Corridor.

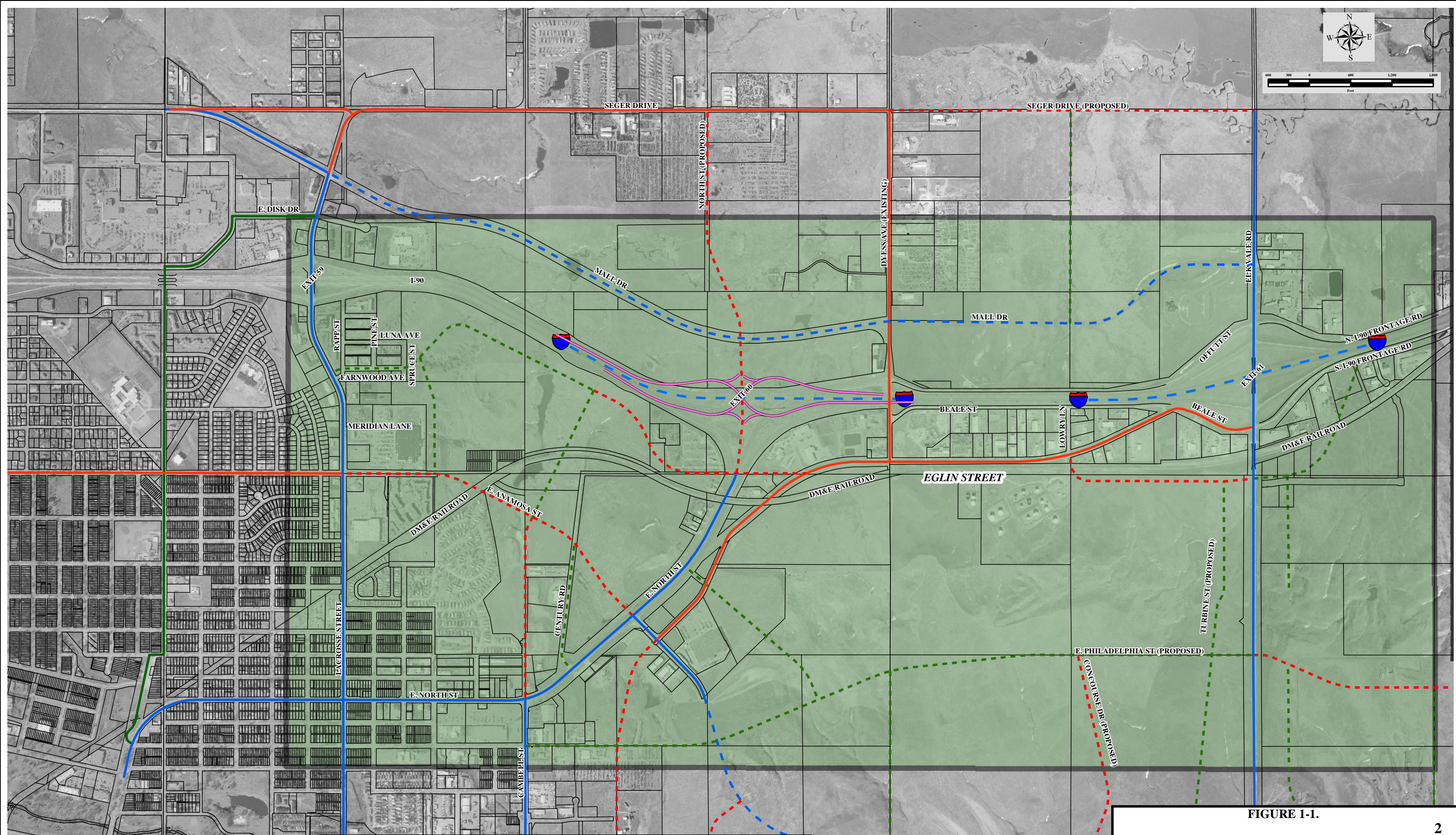
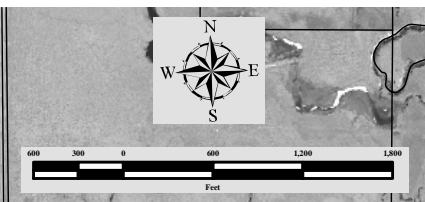
Eglin Street, as identified in the *Rapid City Major Street Plan*, lies south of and roughly parallel to Interstate 90 (I-90), from LaCrosse Street to east of Elk Vale Road. The proposed route will create new intersections at East North Street and LaCrosse Street as, well as impacting the Elk Vale Road Intersection. The proposed route may also impact the DM&E Railroad by revising or adding railroad crossings. When completed, Eglin Street as envisioned will provide the primary access to the planned commercial areas adjacent to I-90 from LaCrosse Street east to Elk Vale Road and beyond.

Eglin Street is classified in the *Rapid City Major Street Plan* as a Collector Street from LaCrosse Street to Cambell Street and east of Elk Vale Road, and as a Minor Arterial Street from Cambell Street to Elk Vale Road. This classification is local and does not necessarily represent any functional classification or any South Dakota Department of Transportation (SDDOT) or Federal Highway Administration (FHWA) classification.

SDDOT is concerned that reconstruction of Eglin Street, as envisioned by the *Rapid City Major Street Plan*, will have an impact on the design and operation of the new interchanges proposed for Exit 60 (East North Street) and Exit 61 (Elk Vale Road) on I-90. The SDDOT is anticipating beginning reconstruction of these two interchanges within the next two to three years. The reconstruction of these interchanges will cause changes in the entire transportation infrastructure within the Study Area.

The Eglin Street Corridor Study was commissioned to recommend changes to and support for the planned improvements provide to the transportation infrastructure of Northeast Rapid City. The Study will develop recommendations for the Eglin Street Corridor concerning:

- Horizontal and vertical alignment of Eglin Street and intersecting streets including number of lanes.
- Intersection location, geometric layout, and controls for intersections of Eglin Street with LaCrosse Street, East North Street (US 16B), and Elk Vale Road (SD 437).
- Traffic signal installation / modification including phasing, timing and required coordination with other existing signals.
- Weaving movements related to the reconstruction of Exits 60 and 61.
- The impact of the various roadway horizontal and vertical alignments on the sanitary sewer collection system.
- The necessity for and traffic impacts from eliminating the Dyess Avenue overpass.
- The geometry for continuation of Eglin Street east of Elk Vale Road.
- Minimum required major drainage facilities.



LEGEND		
	COLLECTOR	
	MINOR ARTERIAL	
	PRINCIPAL ARTERIAL	
	PROPOSED COLLECTOR	
	PROPOSED MINOR	
	PROPOSED PRINCIPAL	
	STUDY BOUNDARY	

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FIGURE 1-1.
STUDY AREA BOUNDARY
EGLIN STREET CORRIDOR STUDY

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BACKGROUND

A necessary first step in the Eglin Street Corridor Study was the collection and review of various previous studies and documents that relate to both the existing and future development of the Eglin Street Corridor. These documents include:

- *Rapid City Area Long Range Transportation Plan*, August 2000.
- *Rapid City Major Street Plan*, April 1, 2001.
- *Elk Vale Neighborhood Future Land Use Plan*, May 8, 2001.
- *North Rapid Neighborhood Future Land Use Plan*, December 1999.
- *Northeast Area Future Land Use Plan*, September 5, 2000.
- Rapid City Area Metropolitan Planning Organization, *East Anamosa Street Extension Study*, May 24, 2000.
- Rapid City Area Metropolitan Planning Organization, *Northeast Area Analysis*, June 28, 2002.
- *Preliminary Engineering Report for Northeast Sanitary Sewer Interceptor*, February 1996.
- SDDOT, *South Dakota Interstate Corridor Study, Phase I Report*, December 2000.
- SDDOT, *South Dakota Interstate Corridor Study, Phase II Report*, February 2001.

The ***Rapid City Area Long Range Transportation Plan*** identifies several projects that have an impact on or are related to the Eglin Street Corridor Study. These projects include the reconstruction of I-90 Exit 60, reconstruction of Elk Vale Road, including Exit 61, the extension of Mall Drive from LaCrosse Street to Elk Vale Road, and construction of East Anamosa Street from LaCrosse Street to Elk Vale Road. The ***Rapid City Area Long Range Transportation Plan*** also establishes transportation planning goals and objectives for the Rapid City Metropolitan Planning Organization.

The ***Rapid City Major Street Plan*** identifies existing and proposed major streets throughout the Rapid City Area. Eglin Street is identified on the Rapid City Major Street Plan as extending from east of Elk Vale Road to LaCrosse Street. The portions of Eglin Street east of Elk Vale Road and between East North Street and LaCrosse Street are identified as Proposed Collectors. The portion of Eglin Street between East Anamosa Street and Elk Vale road is identified as a Minor Arterial. The Rapid City Major Street Plan also identifies Dyess Avenue as a Minor Arterial.

The ***Elk Vale Neighborhood Future Land Use Plan*** identifies the proposed future land uses in the Eglin Street Corridor study area east of East North Street. The majority of the area will be used for Light or Heavy Industry, with General Commercial located adjacent to I-90 Exits 60 and 61.

The ***North Rapid Neighborhood Future Land Use Plan*** identifies the future land uses in the Eglin Street Corridor between East North Street and LaCrosse Street. The majority of the area will be used for General Commercial, Medium Density Residential or Business Park type uses.

The ***Northeast Area Future Land Use Plan*** identifies the future land uses in the area north of I-90 bounded by LaCrosse Street on the west and Elk Vale Road on the east. The Northeast Area is parallel to the Eglin Street Corridor on the north side of I-90. The predominate land use identified in the ***Northeast Area Analysis*** is predicted to be General Commercial.

The ***East Anamosa Street Extension Study*** helps to define the overall transportation network within the Eglin Street Corridor. The ***East Anamosa Street Extension Study*** also defines the proposed extension of water and sanitary sewer lines for the Eglin Street Corridor between East North Street and LaCrosse Street.

The ***Northeast Area Analysis*** in addition to developing a future land use plan for the area north of I-90, the Northeast Area Analysis addresses the transportation network, major drainage facilities, and extension of water and sanitary sewer utilities within it's study area.

The ***Preliminary Engineering Report for Northeast Sanitary Sewer Interceptor*** identifies the proposed alignment of the main outfall sewer line serving the Northeast Area. This study helps to define the potential alignment for sanitary sewer service to the Eglin Street Corridor.

The ***South Dakota Interstate Corridor Study*** provides alternative layouts for the proposed reconstruction of Exits 60 and 61.

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3.0 **EXISTING CONDITIONS**

3.1 **Roadways**

Figure 3-1 is a map of the Eglin Street Corridor study area. It shows the existing and proposed streets as planned in the Rapid City Major Street Plan.

Eglin Street as currently constructed lies south of and roughly parallel to I-90 from Beale Street to 300 feet west of Dyess Avenue where it turns southwest to parallel East North Street to East Anamosa Street. The portion of Eglin Street / Beale Street from Elk Vale Road to 100 feet west of Dyess Avenue is 24 feet wide with no curb and gutter. From 100 feet west of Dyess Avenue to 500 feet west of the DM&E Railroad tracks Eglin Street is 24 feet wide PCCP with no curb and gutter. From 500 feet west of the DM&E Railroad tracks to East Anamosa Street it is 36 feet wide with curb and gutter on both sides.

Eglin Street terminates at the intersection of Eglin Street and Beale Street. From the intersection to Elk Vale Road the route is labeled as Beale Street. East of Elk Vale Road to the eastern edge of the Corridor Study the route is labeled as S I-90 Frontage Road.

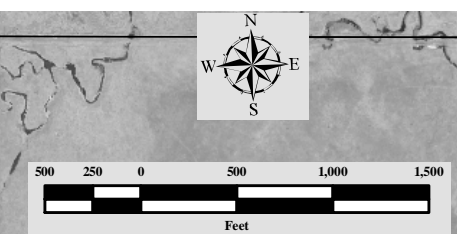
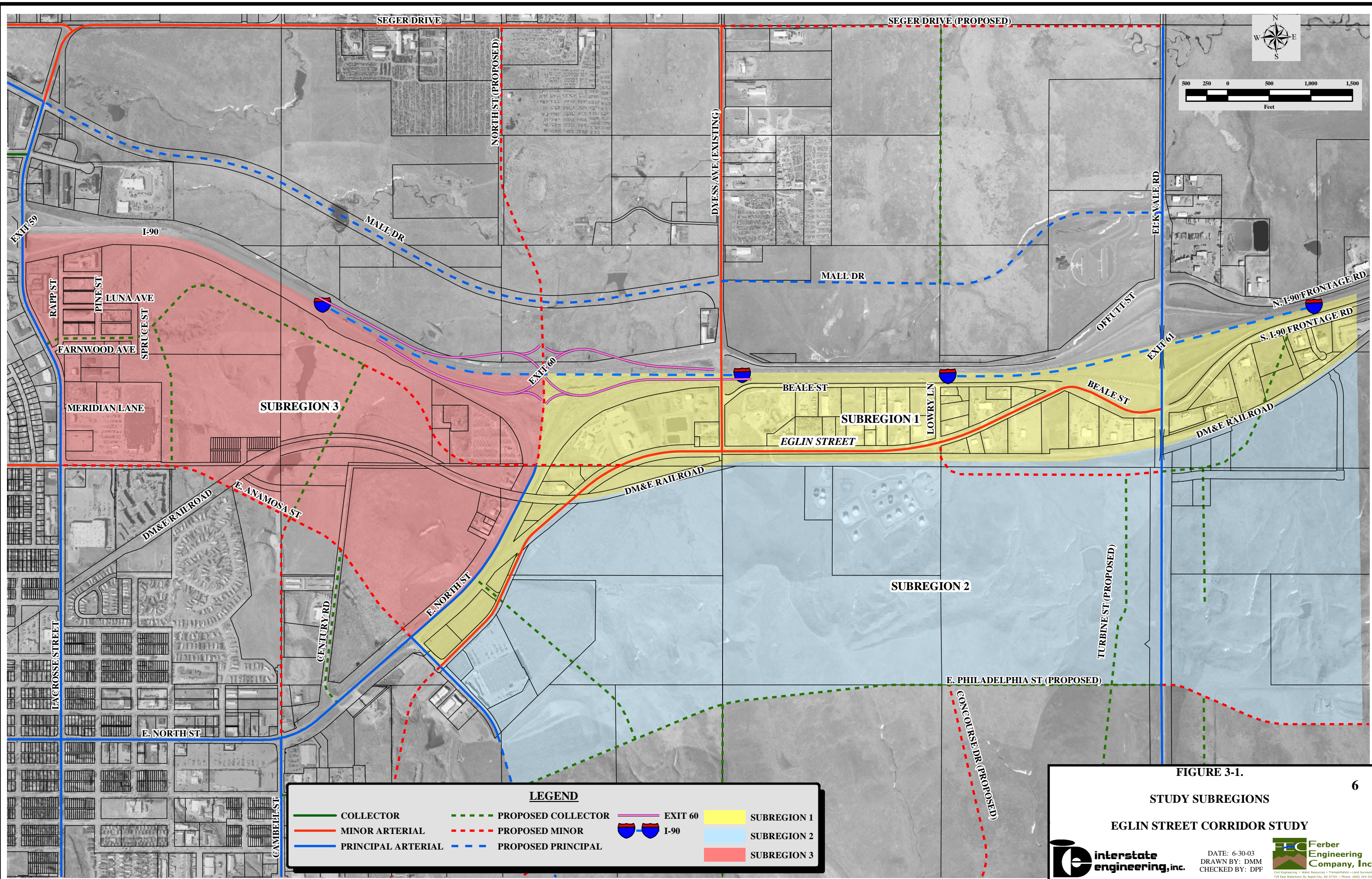
Eglin Street does not exist west of East North Street. At the west end of the Corridor, the alignment is shown as aligning with Farnwood Avenue between Spruce Street and Rapp Street. Farnwood Street is currently 24 feet wide bituminous pavement with curb and gutter on both sides.

Eglin Street provides the primary access to the Menards area, the SDDOT Region Office and Maintenance Shop, the Kanab Pipeline Rapid City Terminal, and numerous businesses located south of I-90 between East Anamosa Street and Elk Vale Road.

East North Street has historically served as the primary access to Rapid City and the Black Hills for westbound I-90 traffic. It is classified as a Principal Arterial and is a five lane urban section from Lacrosse Street to Cambell Street, and a four lane divided section from Cambell to I-90. East North Street provides only eastbound access to the interstate. To access westbound I-90 vehicles must use the Dyess Avenue on ramp by traveling from East North to East Anamosa to Eglin to Dyess. East North Street will be completely reconstructed in the next few years as part of the SDDOT Exit 60 interchange project that will include work through the area of the intersection with Eglin Street. Lane configuration will include four through lanes with dedicated left turn lanes.

LaCrosse Street is a Principal Arterial that provides access from East North Street to I-90 at Exit 59 and north to Mall Drive and Seger Drive. LaCrosse is a five lane urban street south of I-90 and is a four lane urban street north of I-90 tapering to a two lane paved rural section from Disk Drive to Seger Drive. LaCrosse Street is the primary connection from I-90 to the Rushmore Mall area via Disk Drive.

Interstate 90 is a four lane interstate highway with three interchanges in the study area. These interchanges are located at Exit 59, 60, and 61. The interchanges at Lacrosse Street (Exit 59) and Elk Vale Road (Exit 61) are diamond interchanges providing full access for all entering and exiting traffic. East North Street (Exit 60) provides eastbound access to I-90 and the Dyess Avenue grade separation structure provides westbound access.



LEGEND			
	COLLECTOR		PROPOSED COLLECTOR
	MINOR ARTERIAL		PROPOSED MINOR
	PRINCIPAL ARTERIAL		PROPOSED PRINCIPAL
	SUBREGION 1		EXIT 60
	SUBREGION 2		I-90
	SUBREGION 3		

FIGURE 3-1.

STUDY SUBREGIONS

EGLIN STREET CORRIDOR STUDY

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Elk Vale Road has recently been reconstructed south of the DM&E railroad and is a four-lane Urban Expressway. It is classified as a Principal Arterial and is a part of the Heartland Expressway connecting I-90 and Highway 79.

Mall Drive is a proposed Principal Arterial running within the study area from LaCrosse Street to Elk Vale Road. Right-of-way has been secured from LaCrosse Street to Dyess Avenue and through the Visitor Information Center (VIC). Also, grading has been done for a small portion of the street near the VIC.

Dyess Avenue is a Minor Arterial between Eglin Street and Seger Drive. It is a two lane rural road that connects industrial users north of I-90 to Eglin Street. Dyess Avenue currently serves as the westbound access to I-90, Exit 60. At the intersection with Eglin Street it is a 24-foot bituminous street without curb or gutter. The Dyess Avenue overpass is scheduled for removal as part of the reconstruction of Exit 60.

Lowry Lane currently exists as a local street that connects Eglin Street with Beale Street. The Kanab Pipeline Rapid City Terminal access is the southern leg of the Eglin / Lowry intersection. North of I-90, Lowry Lane is also a Proposed Collector street in the Rapid City Major Street Plan.

East Anamosa Street is a primary east / west route serving north Rapid City. It is classified in the Major Street Plan as an existing Principal Arterial on the east side of East North Street near Menards, and an existing Minor Arterial east of Lacrosse Street near Wal-Mart to I-90 on the west. The East Anamosa Street Extension will connect LaCrosse Street with East North Street and eventually connect to Elk Vale Road south of the study area.

East Philadelphia Street is a Proposed Collector that will run along the top of the ridge on the southern edge of the study area connecting Cambell Street and Elk Vale Road. East Philadelphia will provide access to the undeveloped property along the ridge south of the DM&E railroad.

Cambell Street is an existing Principal Arterial south of East North Street, a Proposed Minor Arterial between East North Street and proposed East Anamosa Street, and a Proposed Collector between East Anamosa Street and future Eglin Street.

3.2 Land Use

The boundaries of the Eglin Street Corridor as defined for this study include LaCrosse Street on the west, I-90 on the north, the ridge separating Rapid Creek from Box Elder Creek on the south, and a north-south line approximately one-half mile east of Elk Vale Road on the east. The land can be divided into three distinct subregions, as shown on Figure 3-1.

- Subregion 1 The area between Eglin Street and I-90 bounded on the west by East North Street / East Anamosa Street and extending one-half mile east of Elk Vale Road and including Menards.
- Subregion 2 The land lying south of Eglin Street bounded on the west by East North Street / East Anamosa Street and extending one-half mile east of Elk Vale Road.
- Subregion 3 The land lying west of East North Street and east of LaCrosse Street bounded on the north by I-90 and on the south by East Anamosa Street.

The existing zoning for the Eglin Street Corridor and surrounding areas is shown in Figure 3-2. The majority of the land within the corridor is currently zoned General Agriculture, Light Industry, Heavy Industry, or General Commercial.

3.2.1 Subregion 1

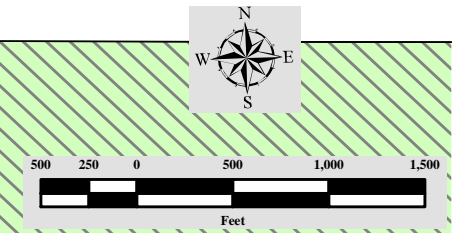
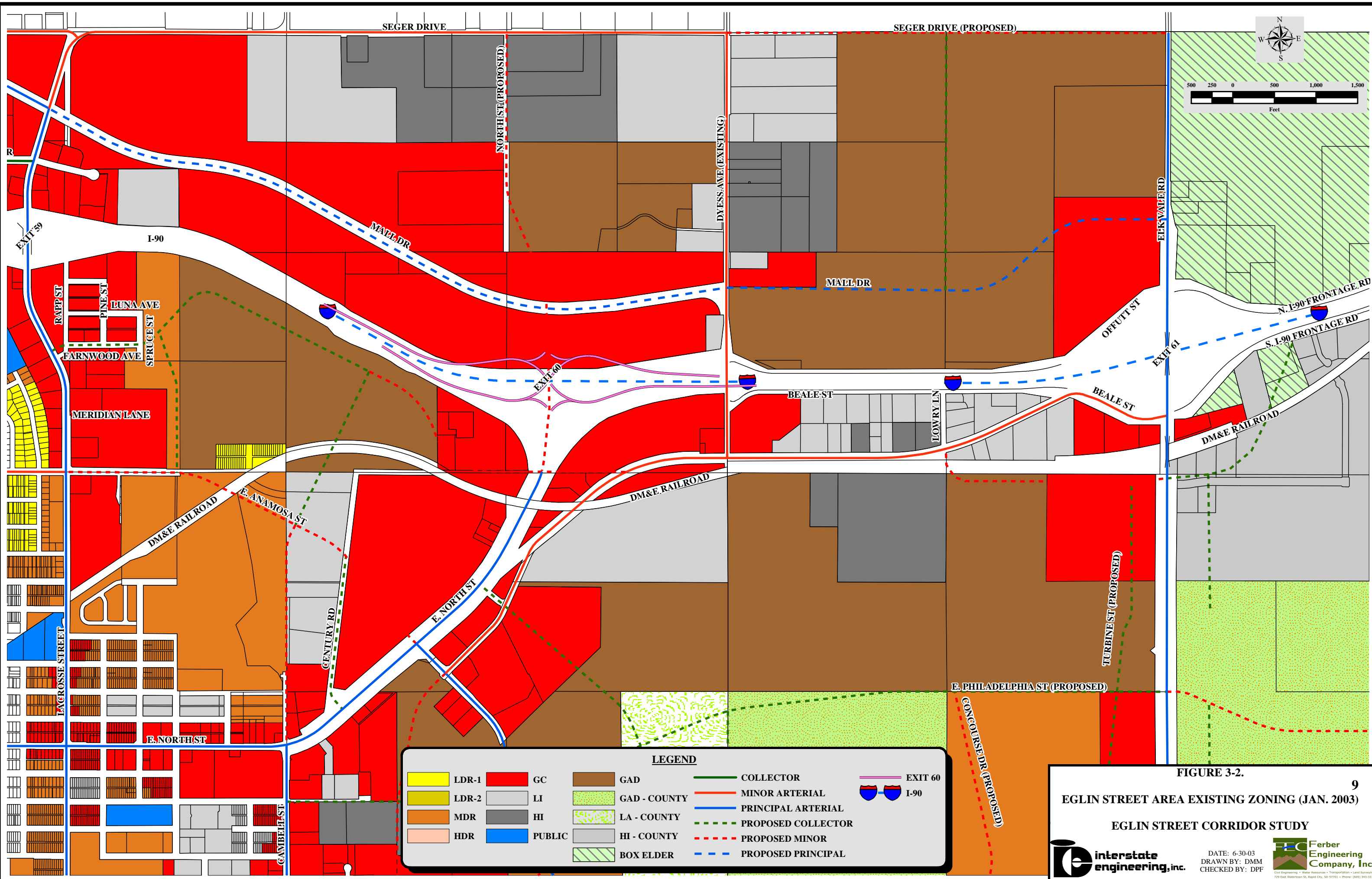
Existing development within the Eglin Street Corridor is mostly located within Subregion 1. The existing development reflects good access to transportation coupled with a lack of City utility infrastructure needed to support intensive development. Most of the businesses currently located in the corridor are low intensity uses related to the trucking industry. The SDDOT also maintains a regional facility in the western end of the corridor. Within the Eglin Street corridor between East North Street and Elk Vale Road, current development consists of 234,000 square feet of combined retail, office, service, and warehouse / manufacturing development. About 170 people currently work within this segment of the study corridor. The improved visibility and access resulting from the reconstruction of Exits 60 and 61 as well as the extension of City water and sanitary sewer service will create changes in the area. This change is reflected in the development of Menards, First Western Bank and the strip commercial center adjacent to East Anamosa Street.

3.2.2 Subregion 2

The only major land development within Subregion 2 is the Kanab Pipeline Terminal and Truck Loading Facility. The area between the Pipeline Terminal and Elk Vale Road has recently been over lot graded in anticipation of future development. The land east of Elk Vale Road in Subregion 2 has recently been over lot graded and development plats have been submitted for the Heartland Retail Center. A signalized full movement intersection at Elk Vale Road and Cheyenne Boulevard will provide the primary access to the proposed developments on both sides of Elk Vale Road.

3.2.3 Subregion 3

Existing development within Subregion 3 is located along and accessed from LaCrosse Street. There have been proposals presented for development of additional retail space on the East North Street frontage between East Anamosa Street and I-90. Further development of this area is awaiting access and utility improvements. The majority of undeveloped land is used for pasture at this time and will require significant grading prior to development.



LEGEND

LDR-1	GC	GAD	COLLECTOR	EXIT 60
LDR-2	LI	GAD - COUNTY	MINOR ARTERIAL	I-90
MDR	HI	LA - COUNTY	PRINCIPAL ARTERIAL	
HDR	PUBLIC	HI - COUNTY	PROPOSED COLLECTOR	
	BOX ELDER		PROPOSED MINOR	
			PROPOSED PRINCIPAL	

FIGURE 3-2.
EGLIN STREET AREA EXISTING ZONING (JAN. 2003)

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EGLIN STREET CORRIDOR STUDY

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3.3 Traffic Volumes

An extensive data collection process was conducted as part of the Eglin Street Corridor Study. Current and historical traffic volume data was available for many study area roadways and intersections. While some data was available as raw data from government agencies and local jurisdictions, existing planning studies were also utilized as a source for traffic volume data. Where necessary, traffic counts were conducted as part of this study to supplement and / or update available data. Traffic volume data for street / highway segments was obtained for the following streets / highways and intersections:

- Streets / Highways:
 - Interstate Highway 90 (including ramps)
 - LaCrosse Street
 - Anamosa Street
 - Eglin Street
 - Elk Vale Road
 - Dyess Avenue
 - East North Street
- Intersections:
 - Eglin Street / Elk Vale Road
 - Eglin Street / Dyess Avenue
 - LaCrosse Street / Farnwood Avenue
 - LaCrosse Street / I-90 Ramps
 - LaCrosse Street / Meridian Lane (Wal-Mart)
 - LaCrosse Street / Anamosa Street
 - East North Street / Anamosa Street
 - East North Street / I-90 Ramps

3.3.1 Daily Traffic Volume

Daily traffic volume on study area roadways varies from over 26,000 vehicles per day (vpd) on East North Street, to under 2,000 vpd on the north extension of Elk Vale Road. Traffic volumes on I-90 are as high as 40,800 vpd. On Eglin Street itself, daily traffic volume varies from 5,500 vpd just east of East North Street, to 1,600 vpd just west of Elk Vale Road. Daily traffic volume for study area roadways is shown on Figure 3-3.

3.3.2 Intersection Traffic Volume

Peak period turning traffic counts were conducted at numerous study area intersections. Turning traffic counts were conducted to enable an assessment of existing operating conditions, to enable identification of deficiencies, and to assist with forecasts of future intersection traffic. In addition to vehicle traffic, pedestrian traffic was also counted at study area intersections. Intersections where turning traffic counts were conducted are shown in Figure 3-4. Details of intersection turning traffic volumes are included in Appendix A.

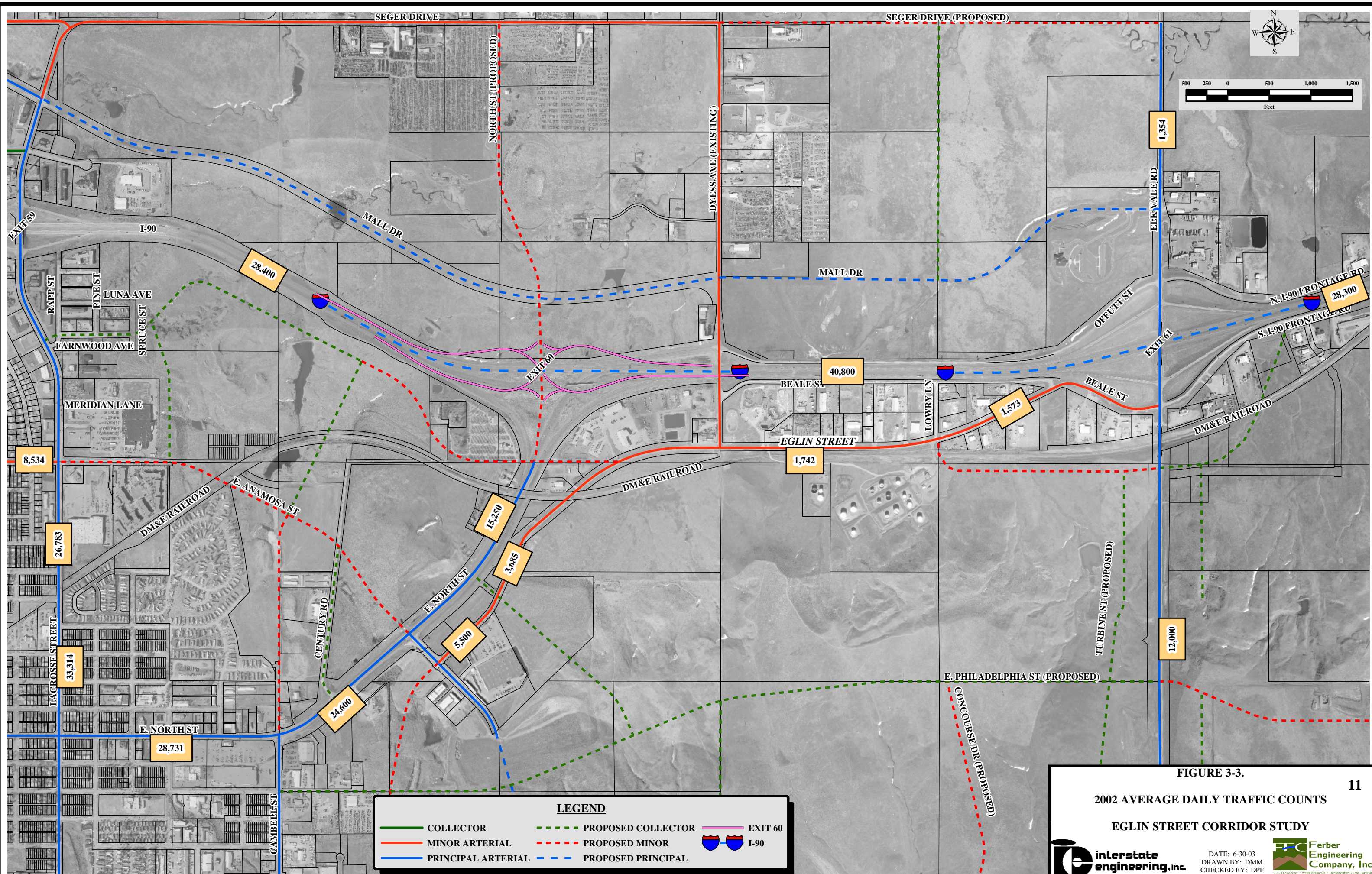


FIGURE 3-3.
2002 AVERAGE DAILY TRAFFIC COUNTS
EGLIN STREET CORRIDOR STUDY

LEGEND

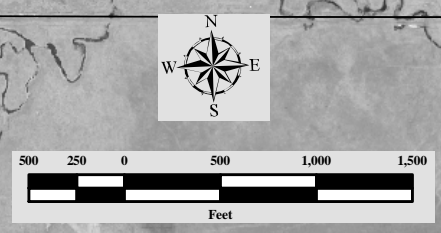
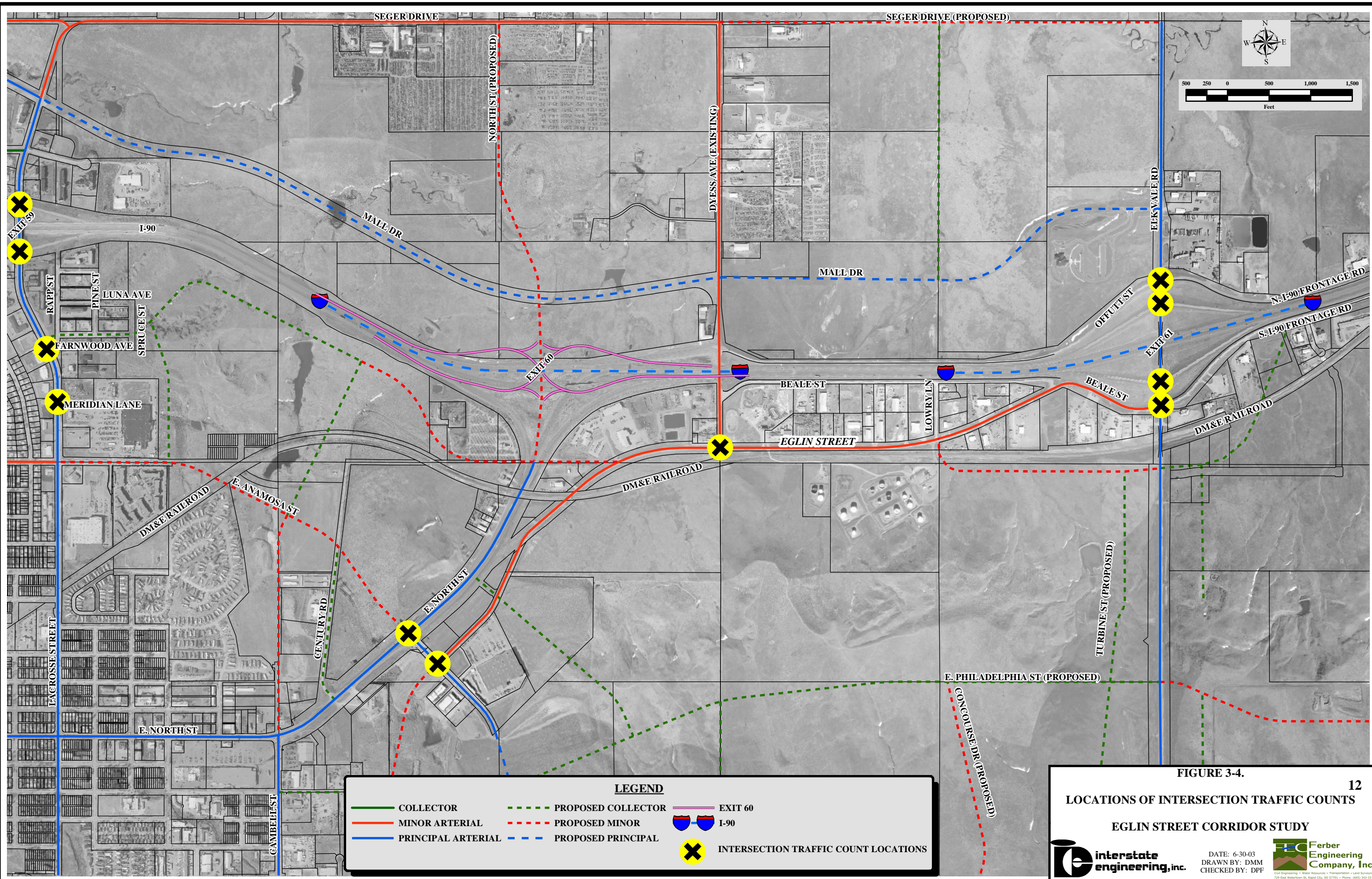
COLLECTOR	PROPOSED COLLECTOR	EXIT 60
MINOR ARTERIAL	PROPOSED MINOR	I-90
PRINCIPAL ARTERIAL	PROPOSED PRINCIPAL	

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	COLLECTOR		PROPOSED COLLECTOR		EXIT 60
	MINOR ARTERIAL		PROPOSED MINOR		I-90
	PRINCIPAL ARTERIAL		PROPOSED PRINCIPAL		INTERSECTION TRAFFIC COUNT LOCATIONS

FIGURE 3-4. 12

LOCATIONS OF INTERSECTION TRAFFIC COUNTS

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3.3.3 Existing Traffic Conditions

Traffic volume along the existing portion of Eglin Street (between East North Street and Elk Vale Road) varies from 5,500 vpd near East North Street, to about 1,600 vpd just west of Elk Vale Road. Hourly traffic volume varies throughout the day with the pm period carrying the highest flow rates. During the pm peak period, traffic flows vary from about 500 vehicles per hour (vph) near Anamosa Street, to about 150 vph near Elk Vale Road. Traffic volumes are well within the carrying capacity of this two-lane facility.

Primary street intersections within the existing portion of the Eglin Street corridor exist at Anamosa Street, Dyess Avenue and at Elk Vale Road. All of these intersections currently operate under stop sign control. Traffic volumes at these intersections vary, with the pm peak period traffic representing the heaviest demand period. During the pm peak period, the Eglin Street / East Anamosa Street intersection experiences a traffic demand of 493 entering vph. The traffic demand at the Eglin Street / Dyess Avenue during the same period is 387 entering vph, while the Eglin Street / Elk Vale Road intersection experiences a demand of 1,026 entering vph. Details of existing intersection traffic demand and operational analysis for the pm peak periods are contained in Appendix A. Figure 3-5 shows pm peak hour intersection traffic.

Intersection operating conditions are quantified by a measure called Level of Service (LOS), which expresses a measure of average vehicle delay. Conditions are classified from LOS "A" to LOS "F". LOS A represents very good conditions with relatively free flow and low delays, whereas LOS F represents very poor conditions with long delays and lengthy vehicle queues.

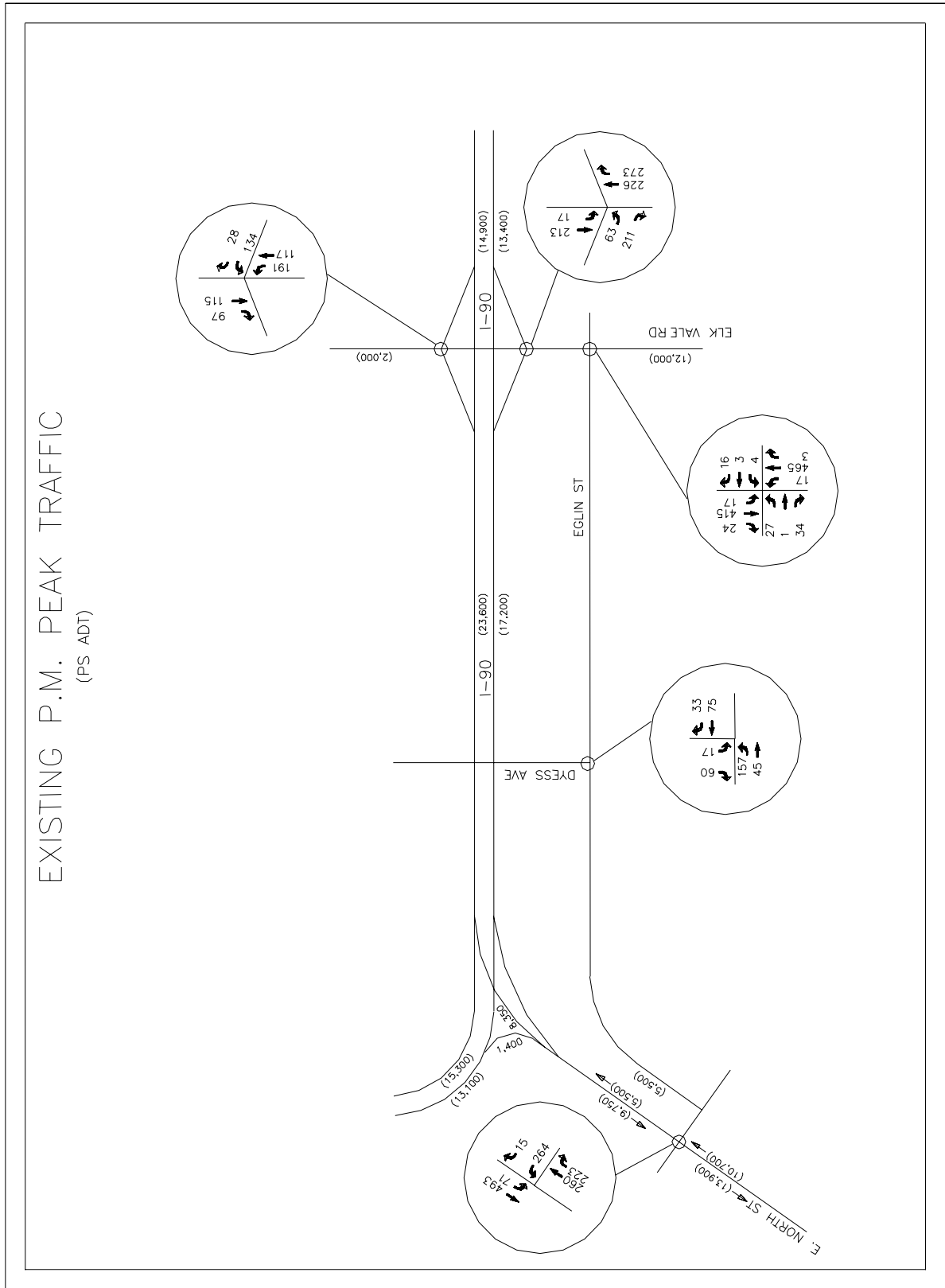
The busiest intersection of the corridor (Elk Vale Road intersection) currently operates with side street LOS C / D conditions, indicating that Eglin Street traffic experiences some delay due to heavy traffic volumes on Elk Vale Road. Delay for Eglin Street traffic averages 26 sec / vehicles for the eastbound approach and 19 sec / vehicle for the westbound approach.

The Eglin Street / Dyess Avenue intersection currently operates with LOS B conditions on the stop-controlled approach (southbound Dyess Avenue). Expected delay for the Dyess Avenue approach is about 11 sec / vehicle under existing pm peak period traffic demands.

The Eglin Street / Anamosa Street intersection also operates well under existing pm peak period demand. At this location, the stop-controlled approach (southwest bound Eglin Street) operates with expected delay of 10 sec / vehicle and LOS B.

As with most urban and suburban streets, the capacity of the facility is limited by the capacity of its intersections. With the exception of the Eglin Street / Elk Vale Road intersection, other intersections along the Eglin Street corridor operate well within capacity.

Figure 3-5. Existing Pm Peak Hour Intersection Traffic



Other study area intersections (not on Eglin Street) were also assessed as part of the existing conditions analysis. Intersections along the LaCrosse Street and East North Street corridors were assessed to determine existing pm peak operating conditions.

The intersections of Rapp Street and Meridian Street experience long delays and poor level of service for the side street left turn approaches to LaCrosse Street. Due to heavy traffic volume on LaCrosse Street, few gaps exist to allow side street movements. These side street approaches experience LOS E / F conditions during the pm peak period. The Anamosa Street / LaCrosse Street intersection carries a significant volume of traffic during the pm peak period. During the PM peak hour, this intersection accepts a total of 2,549 entering vehicles, with the heaviest demand on LaCrosse Street. Under traffic signal control, this intersection operates at overall LOS B conditions with no single lane group operating below LOS C.

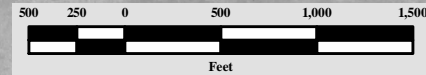
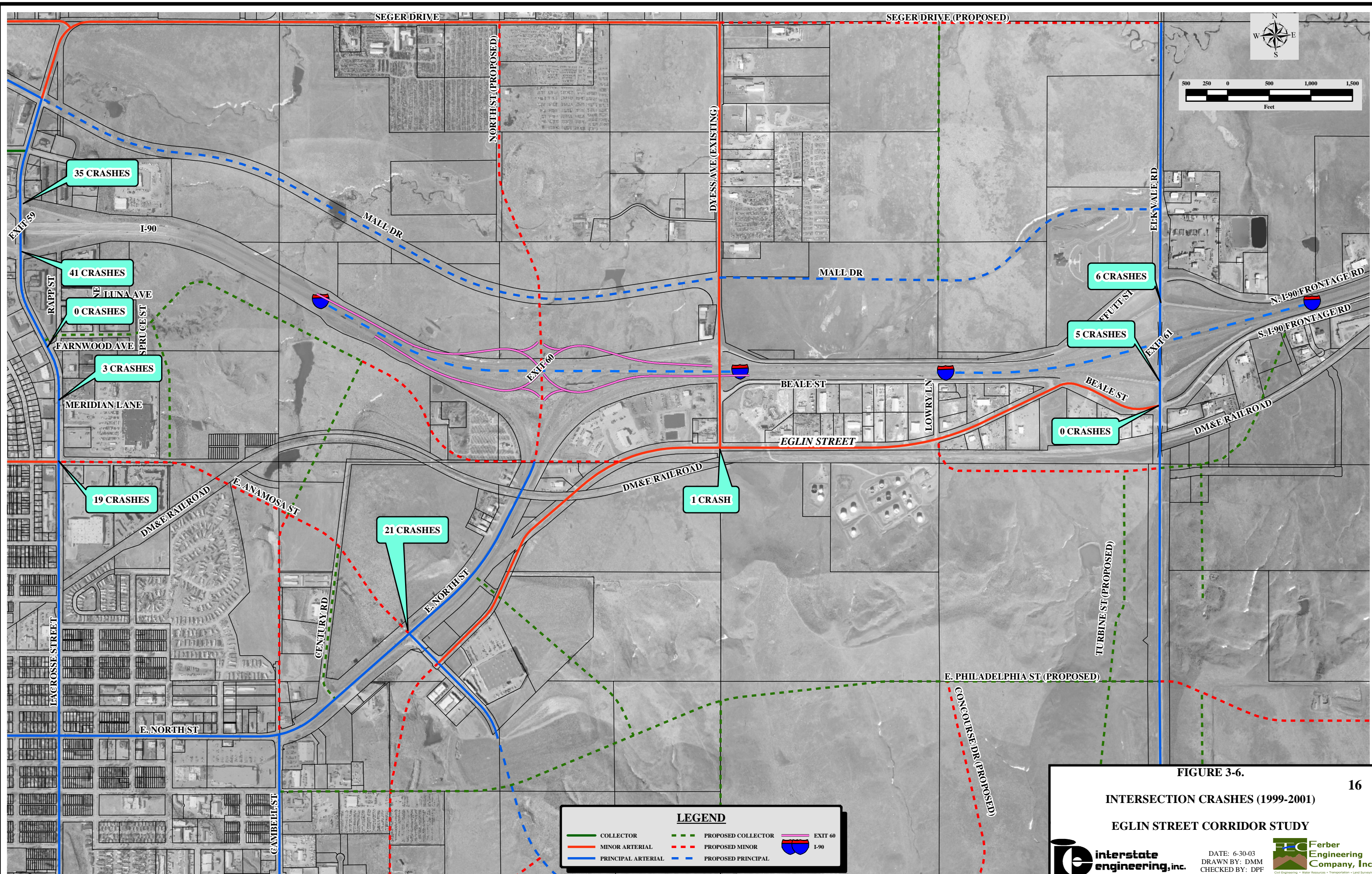
The Anamosa Street / East North Street intersection carries over 1,300 entering vehicles during the pm peak hour. Operating under traffic signal control, this intersection operates at overall LOS A conditions with no single lane group or approach operating below LOS B. Details of the existing conditions operations analysis are included in Appendix A.

3.3.4 Crash Experience

Crash data for a complete three-year period was obtained from both the City of Rapid City and the SDDOT for study area intersections and street segments. Crash data summaries and individual accident reports were provided for the years 1999-2001, inclusive. Crash data was sorted into classes of “intersection” or “non-intersection” based on the location of the crash. Crashes occurring within 50 feet of the intersection were classified as “intersection crashes”, with others being classified as “non-intersection” crashes.

Crash data was utilized to develop crash rates for intersections and street segments. Crash data was examined for trends in crash type that might be utilized to improve street safety while crash rates were utilized to identify locations where crash experience is higher than expected. Intersection crash rates are reported as crashes per million entering vehicles (MEV), while rates for highway sections are reported as crashes per million vehicle miles (MVM). Study area intersections experienced crash rates ranging from 0.0 / MEV to 2.18 / MEV while, nationally, intersections of this type would be expected to have an average crash rate of about 1.42 / MEV. Crash rates for study area sections ranged from 1.41 to 1.97 crashes / MVM. According to statistics compiled by the Federal Highway Administration Highway Safety Information System, 2-lane urban routes experienced crash rates between 2.09 and 5.41 per MVM, so crash rates would be expected to be in this range.

National averages for similar facilities provided by the Federal Highway Administration show all but one intersection operating at crash rates well below national averages. Crash experience for study area intersections and corridor segments are summarized in greater detail in the sections that follow. Intersection crashes and crash rates are shown in Figures 3-6 and 3-7, respectively. Street segment crashes and crash rates are shown in Figure 3-8.



LEGEND

— COLLECTOR	- - - PROPOSED COLLECTOR	EXIT 60
— MINOR ARTERIAL	- - - PROPOSED MINOR	I-90
— PRINCIPAL ARTERIAL	- - - PROPOSED PRINCIPAL	

FIGURE 3-6.

INTERSECTION CRASHES (1999-2001)

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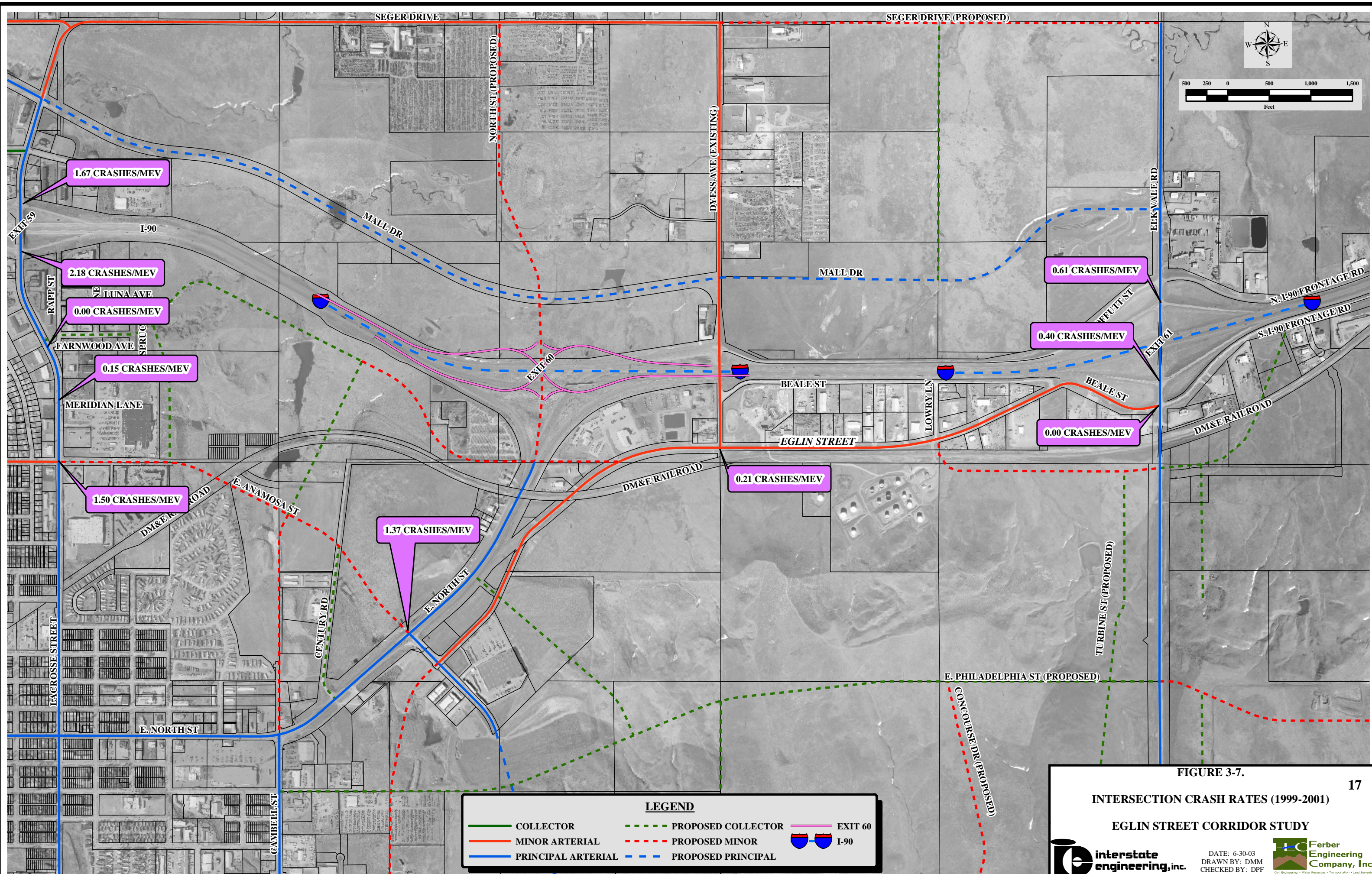


FIGURE 3-7.
 INTERSECTION CRASH RATES (1999-2001)
 EGLIN STREET CORRIDOR STUDY

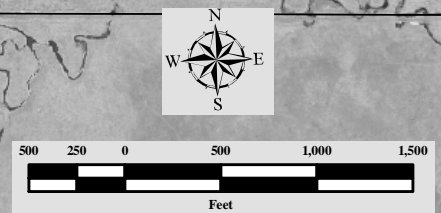
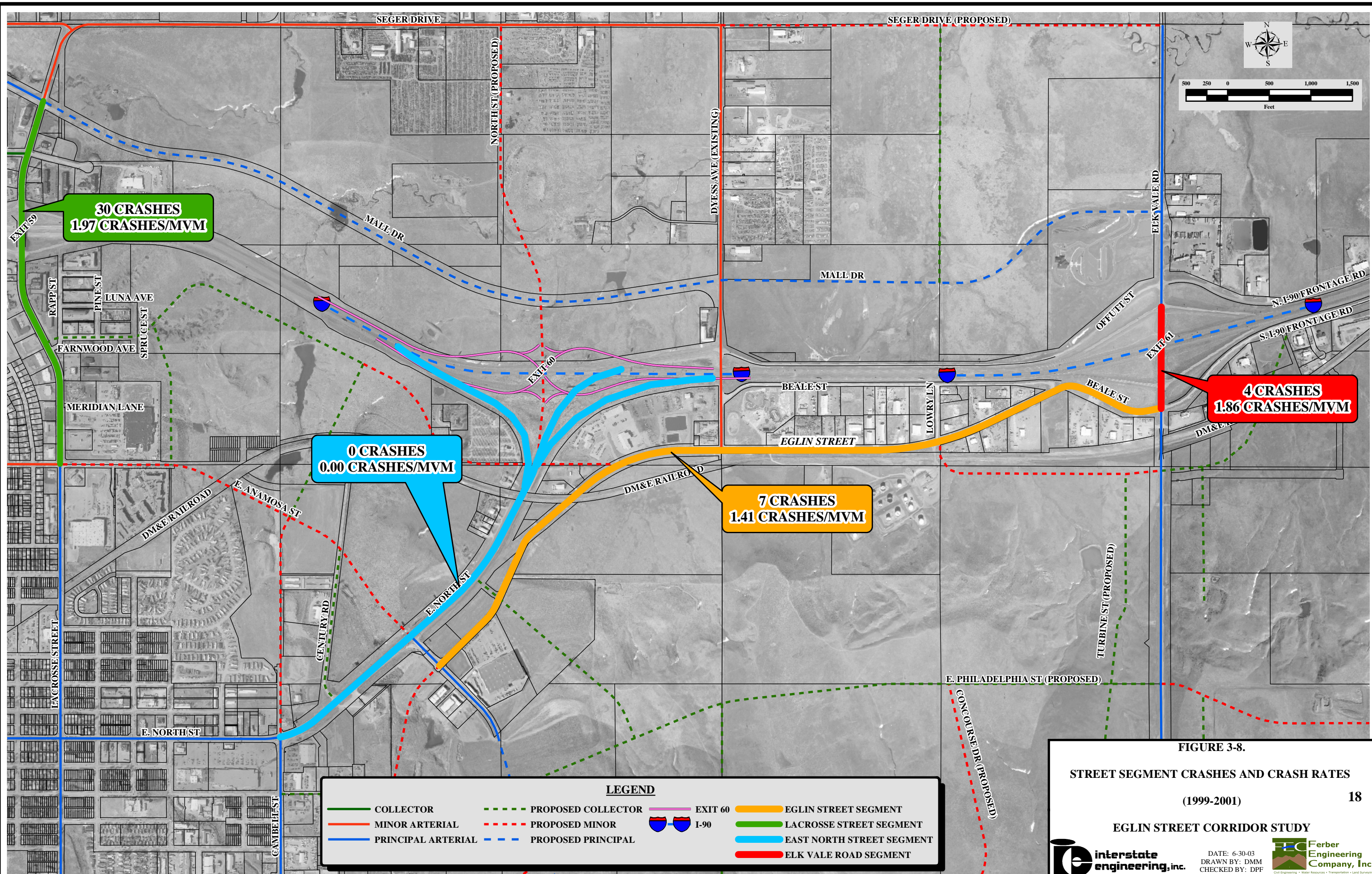


FIGURE 3-8.
STREET SEGMENT CRASHES AND CRASH RATES
 (1999-2001)

EGLIN STREET CORRIDOR STUDY

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Eglin Street Corridor Crash Experience: Based on the crash data provided, the Eglin Street corridor between East North Street and Elk Vale Road experienced one intersection crash and seven non-intersection crashes for the three year period of 1999-2001 (inclusive). Of the total crashes, none were fatal, four involved injuries of some type, and three resulted with property damage only (no injuries). The Eglin Street / Dyess Avenue intersection experienced the only intersection crash during the three-year study period – a single vehicle run-off-road crash. Other junction-related crashes occurred at driveway access points (2 crashes). The crash rate for this segment of Eglin Street is 1.41 crashes / MVM, well below expected for roadways of this type.

East North Street Corridor Crash Experience: Based on the crash data provided, the East North Street corridor experienced 21 crashes at the East North Street / Anamosa Street intersection, and no crashes in the remainder of the corridor between Campbell Street and I-90 during the three year study period. The 21 crashes at the East North Street / Anamosa Street intersection results with a crash rate of 1.37 crashes/MEV, just below national rates for similar intersections. Over one-half of the intersection crashes resulted from improper turn or lane change maneuvers, while one-third were primarily the result of traffic signal violations. Well over one-half of the crashes occurred during daylight conditions, with rear-end and left-turn crashes predominating. Detailed crash reports were provided for 11 of the 21 intersection crashes. Of the 11 crashes, none were fatal crashes, three resulted with injuries, and eight resulted with property damage only.

LaCrosse Street Corridor Crash Experience: The section of LaCrosse Street between Anamosa Street and I-90 experienced 30 crashes during the three-year study period (not including the I-90 interchange or Anamosa Street intersection). Eighteen (18) of the 30 crashes occurred at / near driveway access points and 25 of the 30 occurred during daylight conditions. Only seven of the 30 crashes were non-intersection related. Most crashes involved left-turn maneuvers (18 of 30), with a significant number (8 of 30) being rear-end type. Including intermediate intersection crashes, this segment of LaCrosse Street has a crash rate of 1.97 crashes/MVM. This rate is within the rate expected of a facility of this type.

I-90 / LaCrosse Ramp Crash Experience: The I-90 ramps experienced 76 crashes (35 crashes at the westbound ramp intersection, forty-one (41) crashes at the eastbound ramp intersection). Crash rates at the I-90 ramp intersections are 1.67 crashes / MEV and 2.18 crashes / MEV for the westbound and eastbound ramps, respectively. Both of the I-90 ramp intersections experience crash rates slightly above national averages for facilities of this type. Of the total crash experience at the I-90 ramps, no fatal crashes occurred. Thirty-three (33) crashes resulted with injuries while 43 resulted in property damage only. Rear-end type crashes predominated (44 crashes), followed by left turn types (18 crashes). Following too closely was listed as a contributing circumstance in 30 of the crashes, while failure to yield was cited as a factor in 22 crashes. Speeding was cited as a contributing circumstance in nine crashes.

LaCrosse Street / Anamosa Street Intersection Crash Experience: The LaCrosse Street / Anamosa Street intersection experienced 19 crashes. The LaCrosse Street / Anamosa Street intersection experienced a crash rate of 1.50 crashes / MEV, slightly above the expected rate. Intermediate intersections experienced crash rates of 0.15 crashes / MEV or lower. Detailed accident reports were available for 11 of the 19 intersection crashes at the LaCrosse Street /

Anamosa Street intersection. Details show that no crashes resulted in fatalities, while three resulted with injuries and eight resulted with property damage only. At this location, left-turn and angle crash types were predominate, with failure to yield and traffic signal violations being most frequently cited as a contributing circumstance.

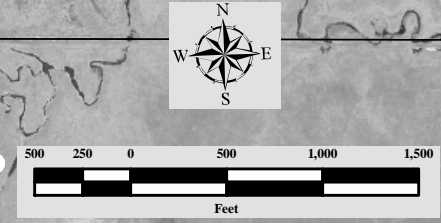
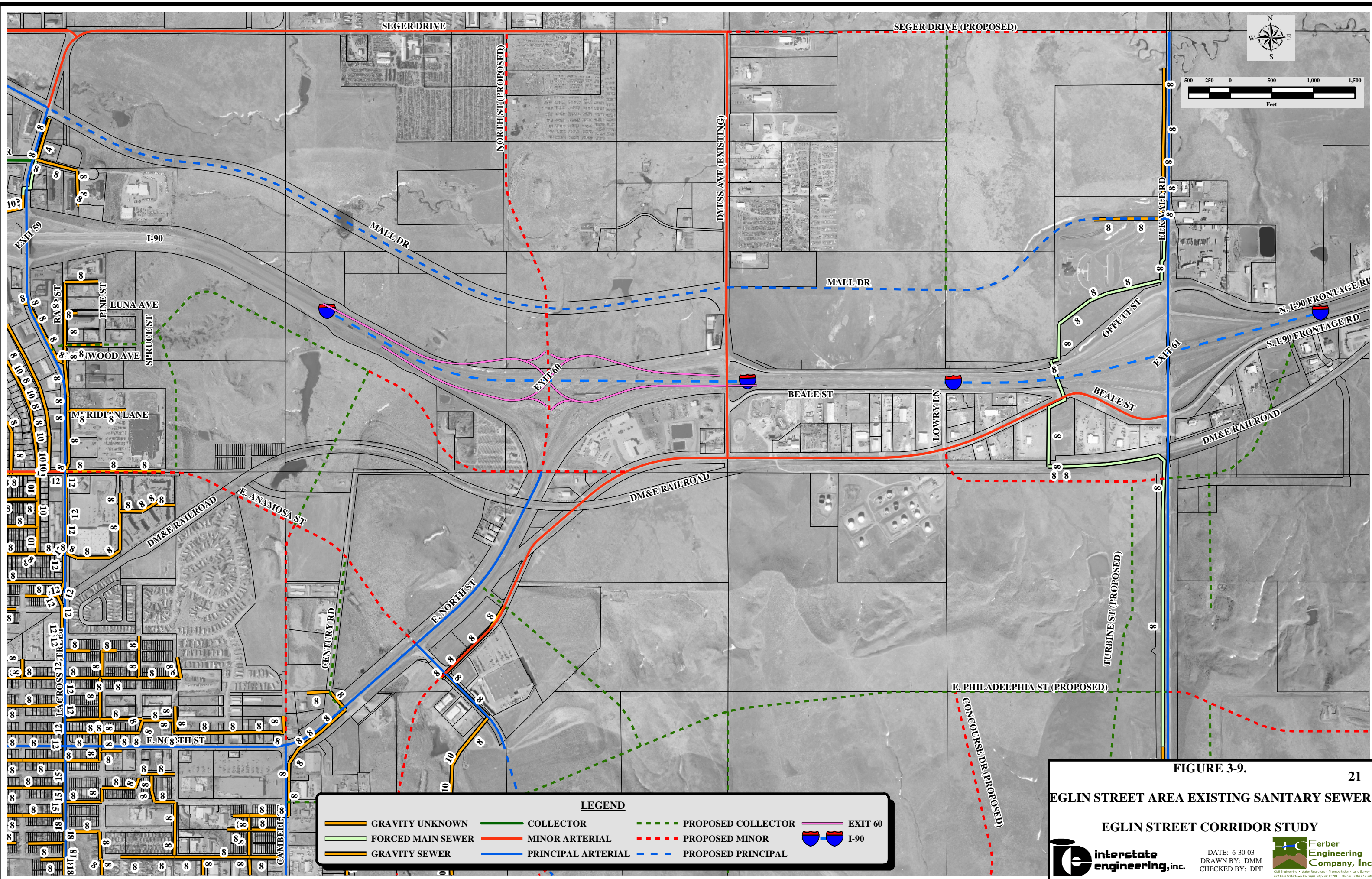
Elk Vale Road Corridor Crash Experience: The segment of Elk Vale Road from the westbound I-90 ramp intersection to south of the Eglin Street intersection experienced four crashes during the three-year study period, resulting with a crash rate of 1.86 crashes / MVM over this short, 0.32 mile stretch of roadway. This rate is within the rate expected for facilities of this type. Rear-end type crashes accounted for one-half of all crashes. Inclement weather (snow) was cited together with speed as a contributing circumstance in one crash.

Three intersections occur over this short segment of roadway. The westbound I-90 ramp intersection experienced six crashes (rate of 0.61 crashes / MEV) while the eastbound ramp intersection experienced five crashes (rate of 0.40 crashes / MEV) over the three-year study period. Rear-end crash types were predominate at the ramp intersections, with failure to yield and excessive speed being cited most often as a contributing circumstance. The Eglin Street / Elk Vale Road intersection experienced no reported crashes for the three-year study period. Intersection crash rates within the Elk Vale Road corridor are well within expected rates for this type of facility.

3.4 Utilities

The scope of the analysis included in the Eglin Street Corridor Study relating to utility extension was to “familiarize ourselves with the sanitary sewer plans for the *Northeast Area Analysis* and the *East Anamosa Corridor Study*”, and “evaluate the impact of roadway alternatives on development of sewer collection system within the study area”.

Figure 3-9 is a map of the existing sanitary sewer lines in the Eglin Street Corridor. With the exception of a small area east of LaCrosse Street, sanitary sewer service is unavailable in the Eglin Street Corridor. Existing developments within the corridor use individual on-site wastewater disposal systems. The Eglin Street Corridor lies within the Box Elder Creek drainage. The city has recently constructed a lift station and force main to pump sewer from the Box Elder Creek Basin to the Rapid City Wastewater Treatment Plant. The service is only available to the VIC at this time.



LEGEND			
	GRAVITY UNKNOWN		COLLECTOR
	FORCED MAIN SEWER		PROPOSED MINOR
	GRAVITY SEWER		PROPOSED PRINCIPAL
	EXIT 60		I-90
	PROPOSED COLLECTOR		
	PROPOSED MINOR		
	PROPOSED PRINCIPAL		

FIGURE 3-9. 21
EGLIN STREET AREA EXISTING SANITARY SEWER
EGLIN STREET CORRIDOR STUDY
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3.5 Drainage

Prior to completing the following drainage analysis for this project, we completed an existing drainage facility inventory for the project area. Figure 3-10 shows the existing drainage facility locations and sizes, as well as, drainage subbasin boundaries and the associated drainage areas that contribute to I-90.

In general the flow paths within the subbasins contributing to I-90 west of East North Street flow in a northeasterly direction and cross the interstate through a minimal number of manmade conveyance structures. The DM&E railroad embankment detains runoff from Subbasin E7, which enters a stock pond in Subbasin E3. Both subbasins E3 and E7 cross I-90 via a 48-inch RCP. Subbasin E6 crosses the DM&E railroad via a 48-inch cast iron pipe (CIP) and combines with Subbasin E5 to cross the I-90 Exit 60 Eastbound off ramp through a 24-inch reinforced concrete pipe (RCP), then through a 42-inch RCP under I-90. The smaller subbasins west of East North Street have their own smaller conveyances across I-90.

The drainage system on the east side of East North Street is much more complex than that described above. Subbasin E9 contributes to a stormwater retention area that exists between the existing Eglin Street and the DM&E railroad straight south of the SDDOT offices. All runoff from Subbasin E9 is assumed to be contained within this retention area. Subbasin E8 contributes to a 42-inch RCP crossing I-90 just west of the Dyess Street overpass.

Subbasin E10 contains the most complex drainage system within the Eglin Street Corridor Study. Within this subbasin, there are four railroad drainage crossings ranging in size from 10-inch CIP to 48-inch RCP. There are three existing Eglin Street drainage crossings that include two small reinforced concrete box culverts (RCB) and one 30-inch corrugated metal pipe (CMP). Multiple driveway crossings exist on both sides of Eglin Street. These vary in size from 18-inch CMP to 48-inch CMP. Although there are several smaller drainage paths, all runoff concentrates at I-90 near the Beale Street and Lowry Lane intersection. Here the entire Subbasin E10 must pass under I-90 via a 24-inch RCP.

Subbasin E11 was not analyzed in great detail because all but a small portion of the subbasin is located east of Elk Vale Road, which is outside the scope of our drainage investigation.

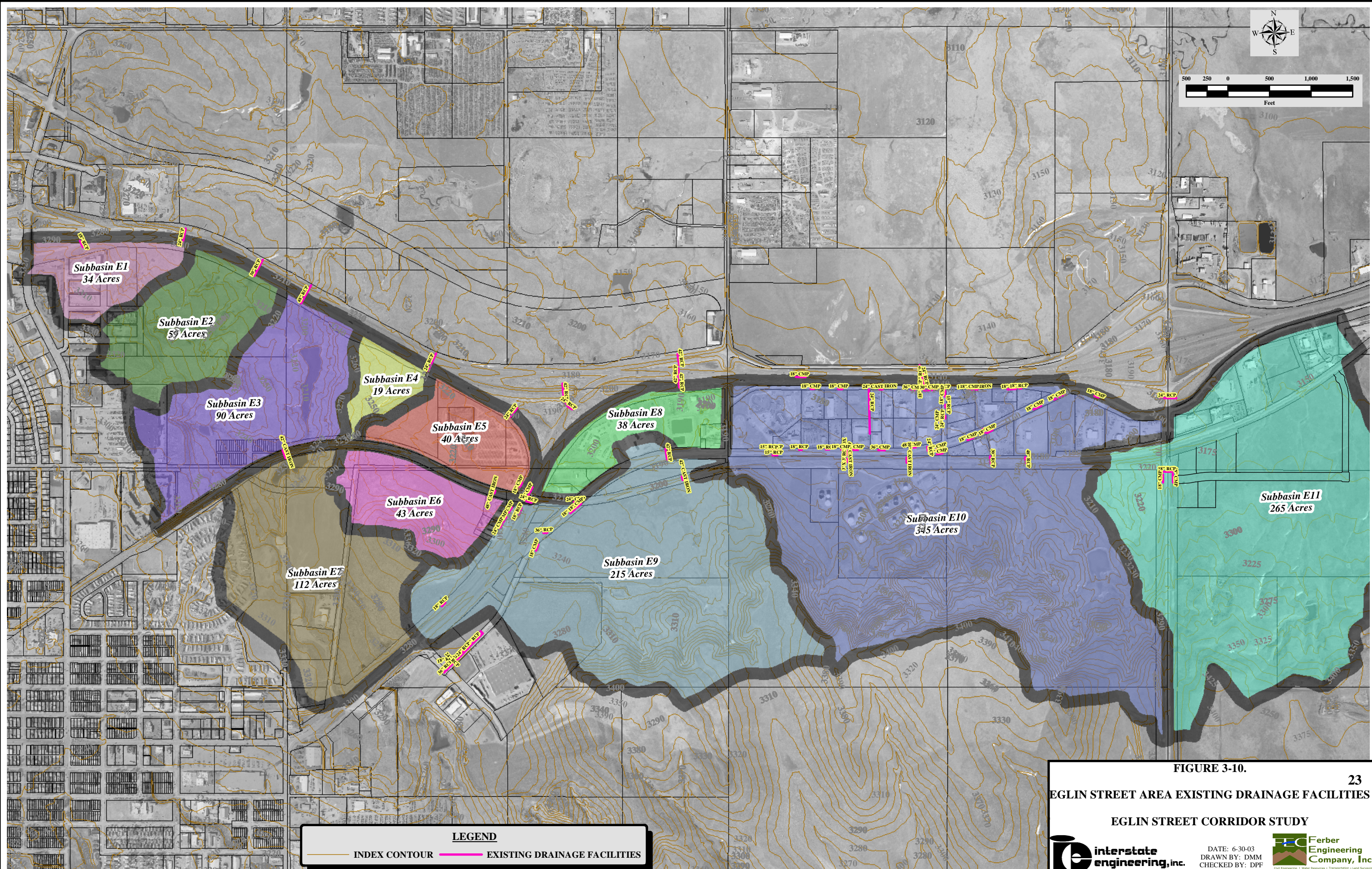


FIGURE 3-10.

23
 EGLIN STREET AREA EXISTING DRAINAGE FACILITIES

EGLIN STREET CORRIDOR STUDY

LEGEND

INDEX CONTOUR

EXISTING DRAINAGE FACILITIES



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4.0 FUTURE CONDITIONS

4.1 Planned / Programmed Roadway Improvements

The SDDOT has programmed the reconstruction of Exit 60 to begin in 2005, with the reconstruction of Exit 61 programmed to begin in 2007. These improvements will have significant impact on the transportation infrastructure within the Eglin Street Corridor.

Exit 60

The improvements to Exit 60 will include reconstruction of East North Street from west of the East Anamosa Street intersection to the proposed Mall Drive intersection.

Exit 60 will be constructed using a Single Point Urban Interchange with I-90 elevated above East North Street. In order to accommodate this interchange configuration the existing Dyess Avenue Overpass will be eliminated.

Eliminating the Dyess Avenue Overpass will disconnect Dyess Avenue north of I-90 from the local street network. The current proposal is to construct that portion of Mall Drive between East North Street and Dyess Avenue to re-establish the connection.

Exit 61

Exit 61 will be the northern terminus of the Heartland Expressway when completed. Elk Vale Road has recently been upgraded to 4-lane Portland cement concrete pavement (PCCP) with raised median from just south of the DM&E Railroad Crossing to the south. This interchange is scheduled to be reconstructed in 2007. The final interchange configuration has not been determined at this time. Preliminary discussion has focused on several configurations: partial cloverleaf, single-point urban interchange, traditional diamond, or tight-diamond.

Cheyenne Boulevard

Cheyenne Boulevard plans have been submitted to the City of Rapid City as part of the approval process for the Heartland Retail Center Development. Preliminary overlot grading activities have been completed, but construction of the roadway and the signalized intersection with Elk Vale Road is still pending. This intersection location was determined by the SDDOT.

4.2 Eglin Street Improvement Alternatives

The Eglin Street Corridor Study was commissioned to provide recommendations and support for changes to the transportation infrastructure of Northeast Rapid City. Eglin Street as identified in the Rapid City Major Street Plan lies south of and roughly parallel to I-90, from LaCrosse Street to east of Elk Vale Road. The proposed realignment will create new intersections at North Street and LaCrosse Street as well as impacting the Elk Vale Road Intersection. The proposed alignment may also impact the DM&E Railroad by revising or adding railroad crossings.

During the initial Technical Committee meeting, representatives of the SDDOT and Rapid City Planning and Engineering Departments identified requirements that must be met in any redevelopment of the Eglin Street Corridor. The requirements included:

- The City prefers that Eglin Street be continuous from LaCrosse Street to the eastern edge of the study area, including intersections with East North Street and Elk Vale Road.
- The SDDOT is eliminating the Dyess Avenue overpass in order for the Interstate grades to work with the reconstruction of Exit 60.
- The SDDOT is willing to allow Eglin Street to intersect with East North Street only if traffic modeling studies completed as part of this Corridor Study can verify that a proposed intersection between Eglin Street and East North Street will not significantly lower the Level of Service of the proposed new Exit 60 Interchange.
- The SDDOT is purchasing Control-of-Access in addition to Right-of-Way in preparation for the widening of Elk Vale Road and interchange reconstruction. The purchase of Control of Access in the Elk Vale Road Corridor is based upon criteria described in the SDDOT Access Control Manual. Any intersection between Eglin Street and Elk Vale Road will need to honor this Control of Access Policy.

Eglin Street is identified on the Rapid City Major Street Plan as a Collector Street between LaCrosse Street and Cambell Street extended and east of Elk Vale Road, and as a Minor Arterial Street between Cambell Street extended and Elk Vale Road. Design criteria were established and are included for both classifications. These design criteria are included as Table 4-1.

Three alternatives were identified for the possible extension of Eglin Street from LaCrosse Street to east of Elk Vale Road. These three alternatives as shown on Figure 4-1, along with a possible no-build alternative form the universe of alternatives considered for this extension. The proposed extension will commence at LaCrosse Street on the west and extend east of Elk Vale Road on the east. The primary purpose of the proposed street extension is to provide an alternative route through the study area. A secondary objective is to provide access to the undeveloped property within the corridor.

4.2.1 No-Build Alternative

The No-Build alternative, as the name implies, involves no additional construction other than previously programmed improvements, including the programmed reconstruction of Exits 60 and 61. The Dyess Avenue overpass will be eliminated. Eglin Street will continue to function as a local street providing access to the existing business located along its frontage. Traffic will continue to use Eglin to connect East Anamosa Street to Beale Street, Dyess Avenue, and Elk Vale Road.

Table 4-1. Street Design Criteria

Criteria	Urban Minor Arterial	Urban Collector	Urban Collector
Design Speed	40 mph	35 mph	30 mph
Horizontal Curvature:			
Maximum Superelevation ¹	4%	4%	4%
Desirable Superelevation	2%	2%	2%
Minimum Radius at max Super ¹	565	420	300
Vertical Alignment:			
Maximum Grade ¹	8%	10%	10%
Minimum Curbed Grade ^{2, 3}	0.50%	0.50%	0.50%
Minimum "K Value" - Sag ^{1, 2}	44	29	19
Minimum "K Value" - Crest ^{1, 2}	64	49	37
Sight Distance:			
Stopping ^{1, 2}	305 ft	250 ft	200 ft
Passing ^{1, 2}	1470 ft	1280 ft	1090 ft

- 1) American Association of State Highway and Transportation Officials *A policy on Geometric Design of Highways and Streets*, 2001
- 2) South Dakota Department of Transportation *Roadway Design Manual*, 2001
- 3) City of Rapid City, *Street Design Criteria Manual*

4.2.2 **Alternative #1**

Alternative #1 involves the most extensive construction. Eglin Street will be constructed beginning at LaCrosse Street just north of the existing intersection of LaCrosse Street and Rapp Street. Eglin Street will follow Farnwood Street to Spruce Street then meander northeast until it parallels I-90 three hundred feet south of the south Right-of-Way line. Eglin follows this alignment until it turns southeast to avoid the existing campground where it turns due east to intersect with East North Street along the south line of Section 29. From the intersection with East North Street, Eglin continues along the section line until Lowry Lane. From Lowry Lane, Eglin Street follows its current alignment for approximately 800 feet until turning southeast to cross the DM&E Railroad tracks with a grade separated crossing. From the railroad crossing, Eglin Street turns due east and intersects with Elk Vale Road approximately 400 feet south of the Railroad. Eglin continues due east to the eastern limits of the study area.

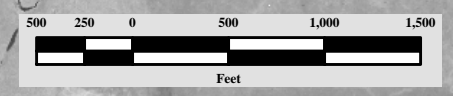
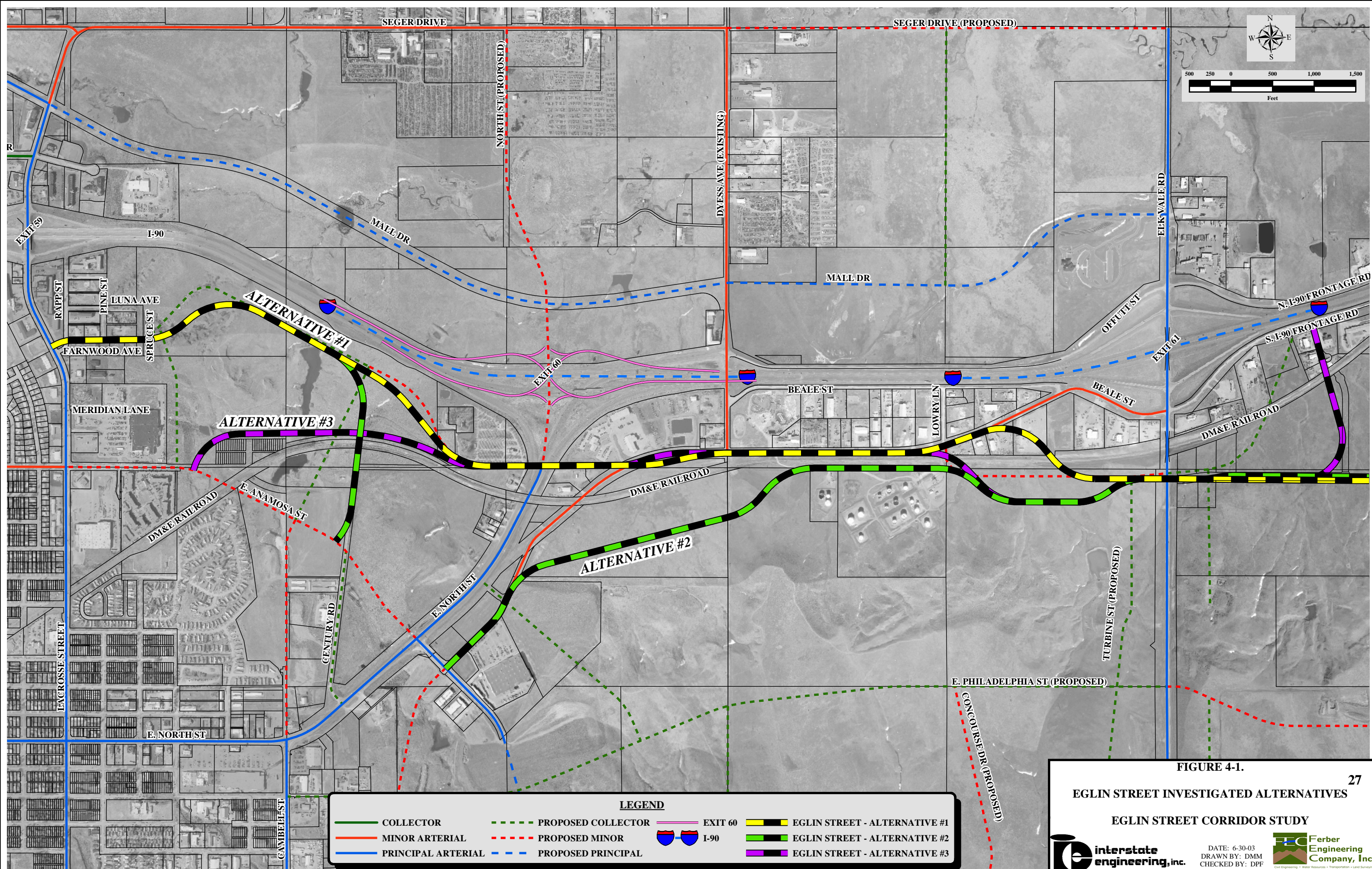


FIGURE 4-1.
EGLIN STREET INVESTIGATED ALTERNATIVES

LEGEND			
	COLLECTOR		PROPOSED COLLECTOR
	MINOR ARTERIAL		PROPOSED MINOR
	PRINCIPAL ARTERIAL		PROPOSED PRINCIPAL
	EGLIN STREET - ALTERNATIVE #1		EXIT 60
	EGLIN STREET - ALTERNATIVE #2		I-90
	EGLIN STREET - ALTERNATIVE #3		

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4.2.3 Alternative #2

The SDDOT stated that a new intersection between Eglin Street and East North Street would only be allowed if traffic studies could verify that creating the new Eglin / East North intersection would not significantly lower LOS at reconstructed Exit 60. Alternative #2 was developed to address the future Eglin Street without the Eglin / East North intersection.

Under Alternative #2, Eglin Street would begin at East Anamosa Street just south of the intersection of East Anamosa and East North Streets. Eglin Street would parallel East North Street until turning east on the south side of the DM&E Railroad tracks. Eglin Street would then parallel the DM&E tracks never crossing the tracks. Eglin Street would intersect with Lowry Lane just south of the Railroad Tracks, and would intersect Elk Vale Road near the planned intersection of Elk Vale Road and Cheyenne Boulevard.

West of East North Street, Eglin Street would serve as a collector street between LaCrosse Street and East Anamosa Street. The alignment would effectively copy the alignment used in Alternative #1 except that Eglin Street would terminate with an intersection with East Anamosa Street near the planned intersection between East Anamosa and Century Road.

4.2.4 Alternative #3

Rather than creating a new intersection between Eglin Street and LaCrosse Street, the western terminus of Alternative #3 reflects the routing the Eglin Street traffic onto East Anamosa and using East Anamosa to carry the traffic to LaCrosse Street. The proposed intersection of Eglin Street and East Anamosa Street will occur just east of Wal-Mart. Alternative #3 also depicts Eglin Street adjacent to the DM&E Railroad from East Anamosa to East North Street.

From the southwest corner of the existing campground west of East North Street to Lowry Lane, Alternative #3 and Alternative #1 are roughly the same. The routes diverge at Lowry Lane with Alternative #3 turning southeast to cross the DM&E Railroad with an at-grade crossing. From the railroad crossing east, Alternative #3 is the same as Alternative #2 through the intersection with Elk Vale Road. The eastern terminus of Alternative #3 is an intersection with the South I-90 Frontage approximately 2000 feet east of Elk Vale Road.

4.3 Alternative Comparison

The Rapid City Major Street Plan identifies Eglin Street as a Proposed Collector between LaCrosse Street and Cambell Street extended, and as a Minor Arterial between Cambell Street extended and Elk Vale Road. East of Elk Vale Road, Eglin Street is again identified as a Proposed Collector.

Urban Minor Arterial Streets as defined by AASHTO “interconnect with and augment the urban principal arterial system. It accommodates trips of moderate length at a somewhat lower level of travel mobility than principal arterials do.” “This system places more emphasis on land access than the higher system does and offers lower traffic mobility.”

Urban Collector Streets as defined by AASHTO, “provide both land access service and traffic circulation within residential neighborhoods and commercial and industrial areas. It differs from the arterial system in that facilities on the collector system may penetrate residential neighborhoods, distributing trips from the arterials through the area to their

ultimate destinations. Conversely, the collector street also collects traffic from local streets and channels it into the arterial system.

In order to function as envisioned in the Rapid City Major Street Plan, Eglin Street will have the primary function of providing adequate travel mobility between Elk Vale Road and Cambell Street while maintaining some level of access to adjacent property. Between LaCrosse Street and Cambell Street and east of Elk Vale Road, the travel function decreases in importance and the land access function has a greater priority.

The ability of the alternatives to satisfy the requirements established by the City and SDDOT is a primary consideration in the evaluation of the alternatives. We also considered the ability of the alternatives to meet the functional classifications. The cost of the various alternatives was included in our evaluation as was the impact of the various alternatives on the ability to extend sanitary sewer service to the study area.

4.3.1 Alternative #2

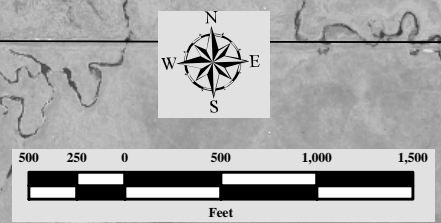
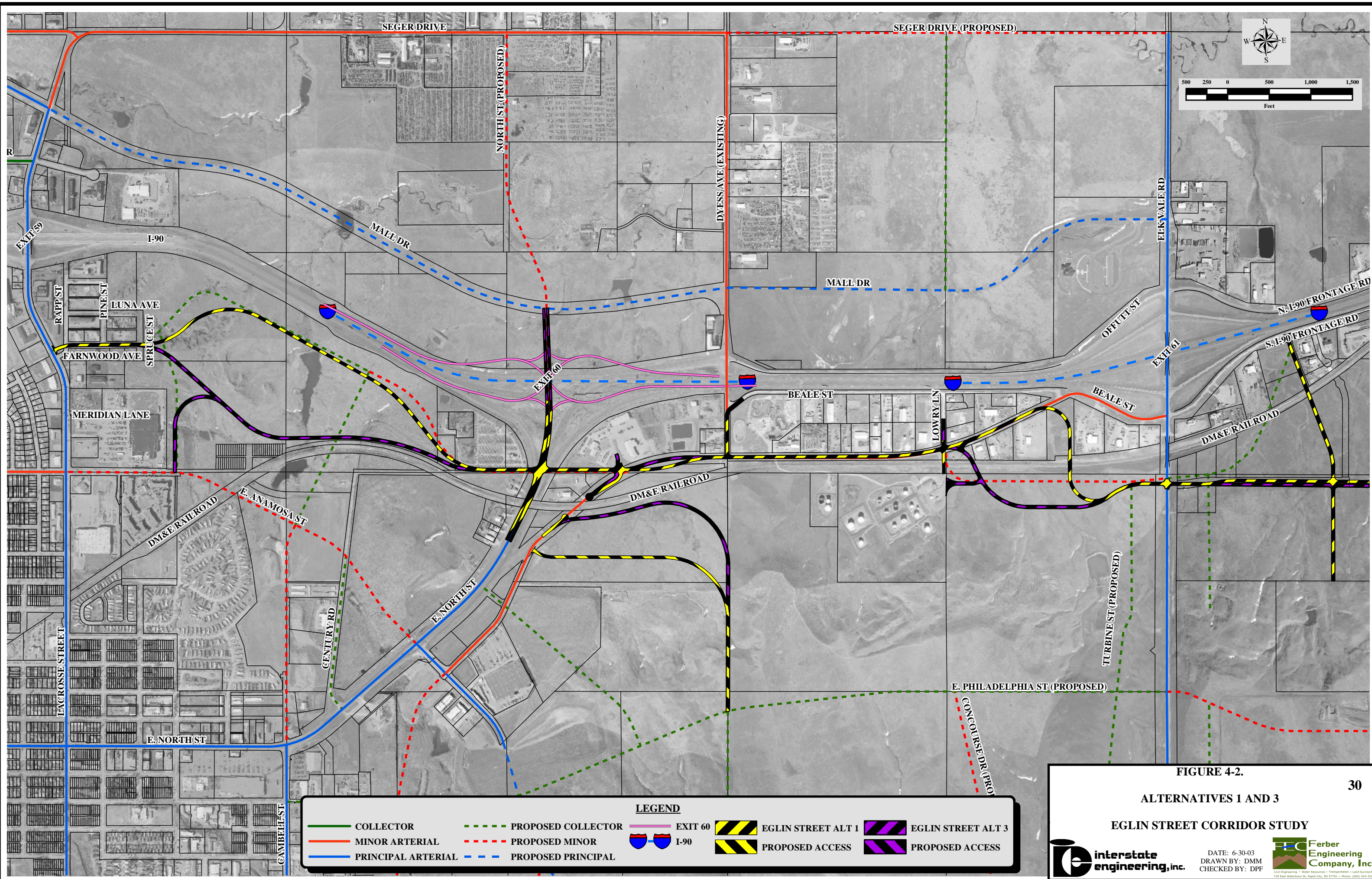
The City of Rapid City preference is for a continuous route from LaCrosse Street to Elk Vale Road. The traffic modeling of the revised street network including reconstructed Exit 60 and the proposed intersection between Eglin Street and East North Street showed that the addition of the Eglin Street intersection would not significantly lower the Level of Service at Exit 60.

Modeling studies showed that without an intersection between Eglin Street and East North Street, the traffic from the Eglin Street Corridor would overload the intersection of East Anamosa Street and East North Street and cause the intersection to operate at less than desirable LOS unless additional lane capacity was provided on East Anamosa Street between Eglin Street and East North Street.

Alternative #2 eliminated the two existing railroad crossings on the east side of East North Street. This was felt to be a positive result of Alternative #2. The other positive aspect of Alternative #2 was the improved access to undeveloped property south of the railroad tracks between East North Street and Elk Vale Road.

Acquiring sufficient right-of-way, especially between the Kaneb Pipeline Terminal and the DM&E Railroad was expected to be difficult and expensive.

Once the decision was made to allow the intersection between Eglin Street and East North Street, Alternative #2 was eliminated from consideration primarily because it didn't provide the route continuity desired. Alternatives #1 and #3 were revised according to steering committee recommendations and public input. The revised alternatives are shown on Figure 4-2.



LEGEND			
	COLLECTOR		PROPOSED COLLECTOR
	MINOR ARTERIAL		PROPOSED MINOR
	PRINCIPAL ARTERIAL		PROPOSED PRINCIPAL
	EXIT 60		I-90
	EGLIN STREET ALT 1		EGLIN STREET ALT 3
	PROPOSED ACCESS		PROPOSED ACCESS

FIGURE 4-2. 30

ALTERNATIVES 1 AND 3

EGLIN STREET CORRIDOR STUDY

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4.3.2 Alternatives #1 and #3

Between LaCrosse Street and East North Street, the differences between Alternative #1 and Alternative #3 include the alignment and the location of the western terminus. The two alternatives take different routes around the existing stock dam that is a major topographic feature of the area:

- Alternative #1 parallels I-90 at a distance of five hundred feet. Alternative #1 follows generally the route described for Eglin Street in the *Rapid City Major Street Plan*.
- Alternative #3 skirts the south end of the stock dam adjacent to the DM&E Railroad tracks.

Both alignments will provide access to the existing undeveloped land north of the DM&E Railroad and south of I-90. However, Alternative #3 is adjacent to the railroad tracks for a substantial distance, thereby limiting developable access to one side only.

Both Alternatives include an intersection with East North Street on the section line approximately 1,000 feet from I-90 centerline.

The western terminus of Alternative #1 is an intersection with LaCrosse Street along the Farnwood alignment. The western terminus of Alternative #3 is an intersection with East Anamosa Street just east of Wal-Mart. Traffic modeling completed in this study indicate that the addition of a signalized intersection along LaCrosse Street at Rapp Street will function effectively and will not negatively impact on traffic movement on LaCrosse Street. Likewise, our traffic models show that an additional signalized intersection along East Anamosa Street will function effectively and will not negatively impact on through traffic movement on East Anamosa Street. However, adding the westbound traffic will have a negative impact on the existing signalized intersection of East Anamosa Street and LaCrosse Street.

Alternative #3 is significantly shorter than Alternative #1 with a corresponding decrease in construction cost. We estimated the construction costs of Alternative #1 to be \$7,500,000 and Alternative #3 to be \$6,700,000. A detailed description of the cost estimates is located in Section 4.9.

Conceptual designs for Alternative #1 indicate that its grade will fall from a high point near the present Pine / Farnwood intersection all the way to a low point near the present intersection of Eglin Street and Lowry Lane. This grade will facilitate provision of sanitary sewer service for the area. Because the natural slope of the ground is to the northeast, the location of Alternative #1 towards the north end of the undeveloped area will also help in providing sanitary service.

Between East North Street and Lowry Lane Alternative #1 and Alternative #3 differ slightly in the way they transition from the East North Street intersection to the existing Eglin Street alignment in the vicinity the SDDOT property. Both alternatives follow the existing Eglin Street alignment from Dyess Avenue to Lowry Lane.

The two alternatives differ significantly at the proposed crossing of the DM&E Railroad. Alternative #1 includes a grade separated crossing located approximately 800 feet west of Elk Vale Road. Alternative #3 includes an at-grade crossing in the vicinity of Lowry Lane.

After crossing the railroad, Alternative #3 continues southeast until turning east to parallel the railroad tracks at a distance of 300 feet. Alternative #1 turns east almost immediately

after the grade separated railroad crossing. Both Alternatives intersect Elk Vale Road at the proposed signalized intersection 400 feet south of the railroad tracks.

The proposed at-grade railroad crossing proposed in Alternative #3 will allow Eglin Street to grade continuously from a high point at Elk Vale Road to a low point at Lowry Lane. This will facilitate serving the area south of the railroad crossing with sanitary sewer.

East of Elk Vale Road, Alternative #1 and Alternative #3 differ only in their terminus. Both alternatives are shown intersecting with Elk Vale Road 400 feet south of the railroad tracks. They both continue due east for approximately one half mile. At that point, Alternative #3 turns northerly to cross the DM&E Railroad and terminate in an intersection with the South I-90 Service Road. Alternative #1 continues east to the eastern edge of the study area boundary. The Heartland Retail Center is currently being developed in this area. Alignment #1 and Alignment #3 follow the development outlined for the Planned Commercial Development.

4.4 Route Continuity

The Eglin Street envisioned in the Rapid City Major Street Plan is a continuous 3-lane urban collector / minor arterial route from LaCrosse Street to east of Elk Vale Road. Part of this proposed Eglin Street does not exist. The corridor west of East North Street is mostly vacant pastureland, except for a 500-foot stretch of 2-lane Farnwood Street just east of LaCrosse Street.

The intersection of Eglin Street and East North Street does not exist. East of East North Street, Eglin Street is a 3-lane urban street for approximately 1,800 feet beginning at East Anamosa Street. This stretch of Eglin Street is not included in the Major Street Plan route. The portion of Eglin Street that exists today goes from the SDDOT entrance to the intersection with Beale Street. That portion of the Eglin Street is 2-lane built to a rural section. At Beale Street, the Eglin Street alignment is continuous through the intersection, but the name changes to Beale Street. Beale Street ends at its intersection with Elk Vale Road. The current intersection of Beale Street and Elk Vale Road is controlled by a 2-way stop on Beale Street. East of Elk Vale Road, the existing frontage road alignment is known as South I-90 Frontage Road.

The SDDOT is currently completing conceptual design for the reconstruction of the interchange at Exit 61 (Elk Vale Road & I-90). As part of the planning for this reconstruction, the SDDOT has been purchasing Right-of-Way for widening Elk Vale Road. The SDDOT has also been purchasing Control-of-Access. Their goal is to have relatively free movement at this interchange and throughout the Heartland Expressway Corridor.

Access to Elk Vale Road will be restricted to approximately one-quarter mile separation. The existing intersection of Beale Street (*Eglin Street*) falls less than one-quarter mile from the potentially signalized ramp terminals for the new interchange. Because of this spacing, the SDDOT has made a determination that this intersection will be allowed to exist in a right-in / right-out configuration only. The first full-movement intersection that will be allowed on Elk Vale Road south of the interchange will be the proposed Cheyenne Boulevard intersection.

Restricting turning movements at the Beale Street (*Eglin Street*) intersection with Elk Vale Road will limit the function of the intersection and the street to local status. In order to maintain the type of continuity envisioned in the Major Street Plan, Alternatives #1, #2, & #3

include some type of railroad crossing between Lowry Lane and Elk Vale Road, and intersect with Elk Vale Road at the Cheyenne Boulevard location approximately 400 feet south of the railroad.

Moving the intersection to this location also works to extend the corridor continuity east of Elk Vale Road. The existing South I-90 Frontage Road will change function and serve more of a local road for accessing businesses and advertising billboards along this section. By relocating the through route to the Cheyenne Boulevard location, the route can continue east indefinitely providing access to a significant undeveloped area.

4.5 Future Land Use

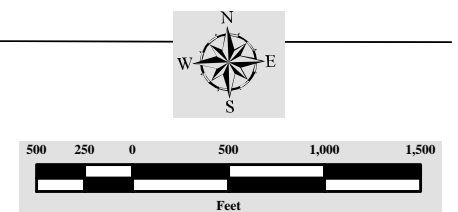
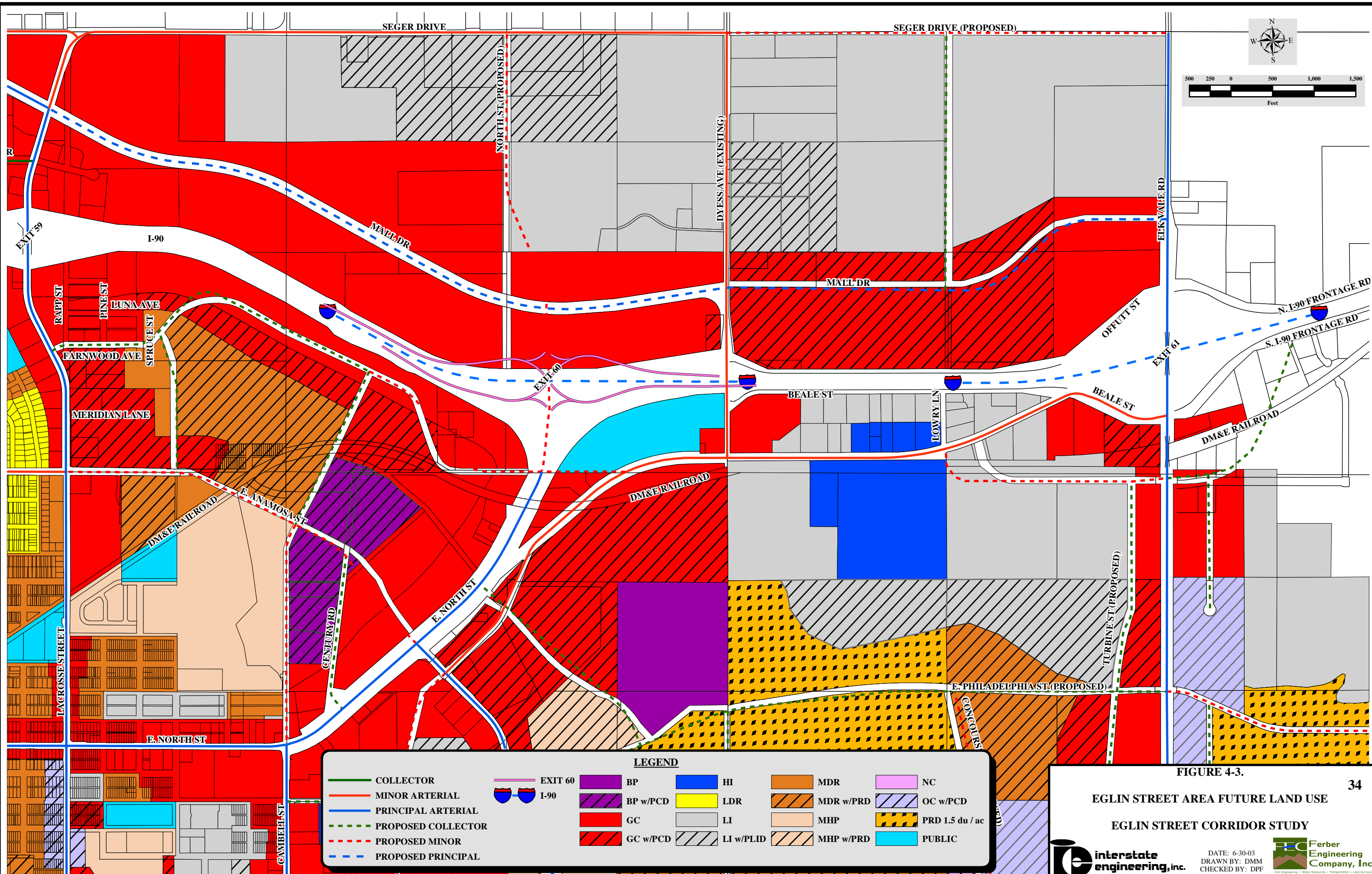
The City of Rapid City has recently identified build-out intensity for different land uses for various parts of the metropolitan planning area. Estimates for the Eglin Street Corridor study area have been developed as part of the neighborhood planning process as well as previous transportation planning efforts. Development of the Eglin Street Corridor is expected to follow similar trends as historical uses. The Future Land Use Plans for the area were partially described in the *North Rapid Neighborhood Future Land Use Plan*, the *Elk Vale Neighborhood Future Land Use Plan* and the *Northeast Area Future Land Use Plan*. The Future Land Use designations were projected onto the Eglin Street Corridor Base Map as shown on Figure 4-3.

Future Land Use for Subregion 1 is expected to remain essentially stable. The majority of the area will be devoted to Light Industry with some General Commercial development at the intersections of Eglin Street and East North Street, Eglin Street and Dyess Avenue, and Eglin Street and Elk Vale Road.

Future Land Use for Subregion 2 is anticipated to include additional Light Industry in the vicinity of the Pipeline Terminal, with General Commercial along Elk Vale Road and in the vicinity of the existing Menards development.

Development within Subregion 3 will include extending the existing General Commercial east from LaCrosse Street and along the north side of East North Street with the central area expected to develop as Medium Density Residential. A Business Park is identified along Cambell Street.

Based on planning efforts undertaken for this area, development along Eglin Street between East North Street and Elk Vale Road should nearly double existing non-residential square footage at build-out. While this area contains approximately 234,000 sq.ft. of non-residential building space today, it is estimated to have 449,250 sq.ft. of non-residential building space at build-out. It is development of the land along Eglin Street north of the railroad tracks (and south if I-90) that will drive travel demand for this portion of Eglin Street. Projected build-out land use (expressed as total non-residential building square footage) is shown in Figure 4-4.



LEGEND

COLLECTOR	EXIT 60	BP	HI	MDR	NC
MINOR ARTERIAL	I-90	BP w/PCD	LDR	MDR w/PRD	OC w/PCD
PRINCIPAL ARTERIAL		GC	LI	MHP	PRD 1.5 du / ac
PROPOSED COLLECTOR		GC w/PCD	LI w/PLID	MHP w/PRD	PUBLIC
PROPOSED MINOR					
PROPOSED PRINCIPAL					

FIGURE 4-3.

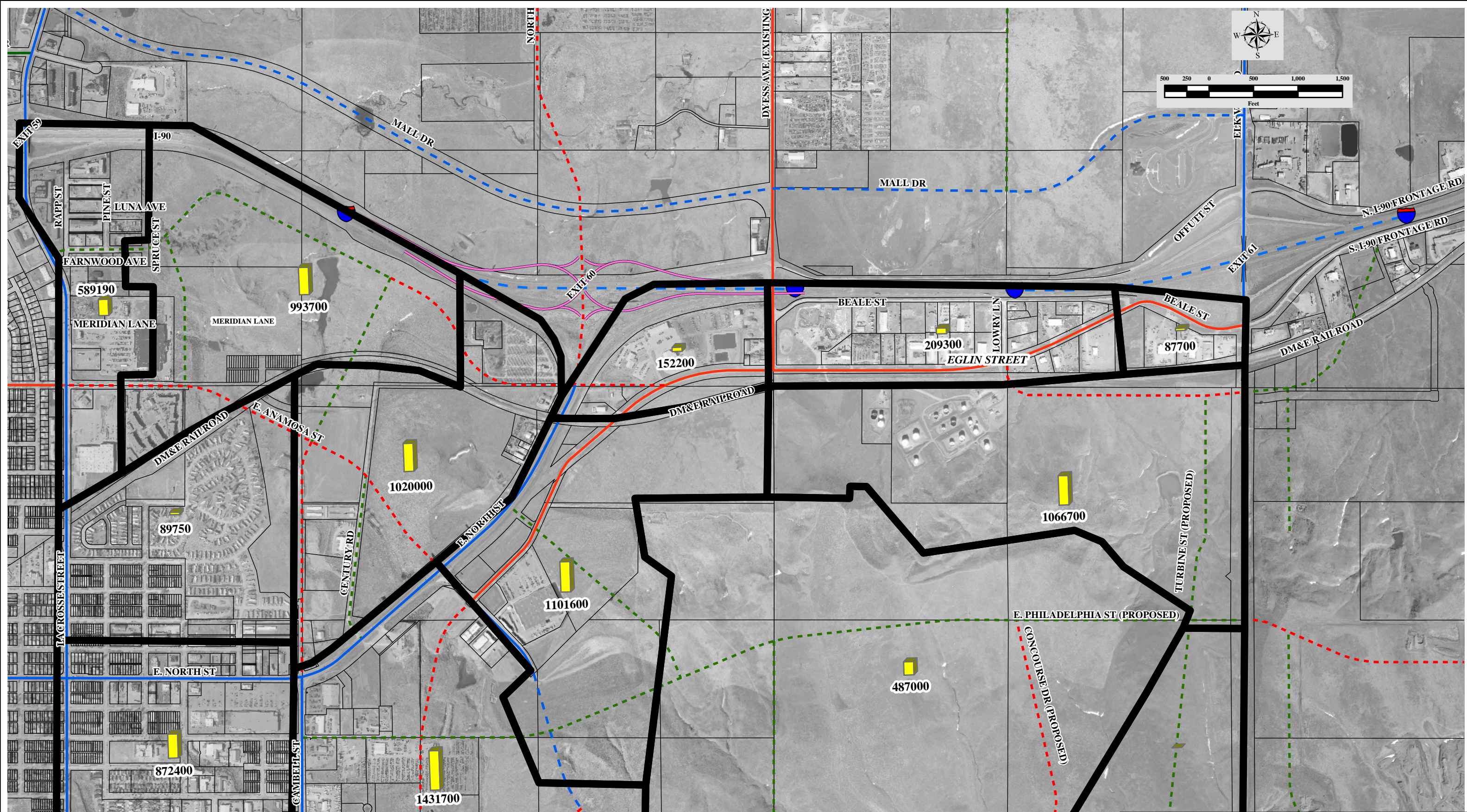
EGLIN STREET AREA FUTURE LAND USE

EGLIN STREET CORRIDOR STUDY



DATE: 6-30-03
 DRAWN BY: DMM
 CHECKED BY: DPF





LEGEND

	COLLECTOR		PROPOSED COLLECTOR		EXIT 60		BUILDOUT BOUNDARY
	MINOR ARTERIAL		PROPOSED MINOR		I-90		NONRESIDENTIAL BUILDOUT, SF
	PRINCIPAL ARTERIAL		PROPOSED PRINCIPAL				

FIGURE 4-4. 35

PROJECTED BUILDOUT LAND USE
EGLIN STREET CORRIDOR STUDY

interstate engineering, inc.

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4.6 Future Travel Demand

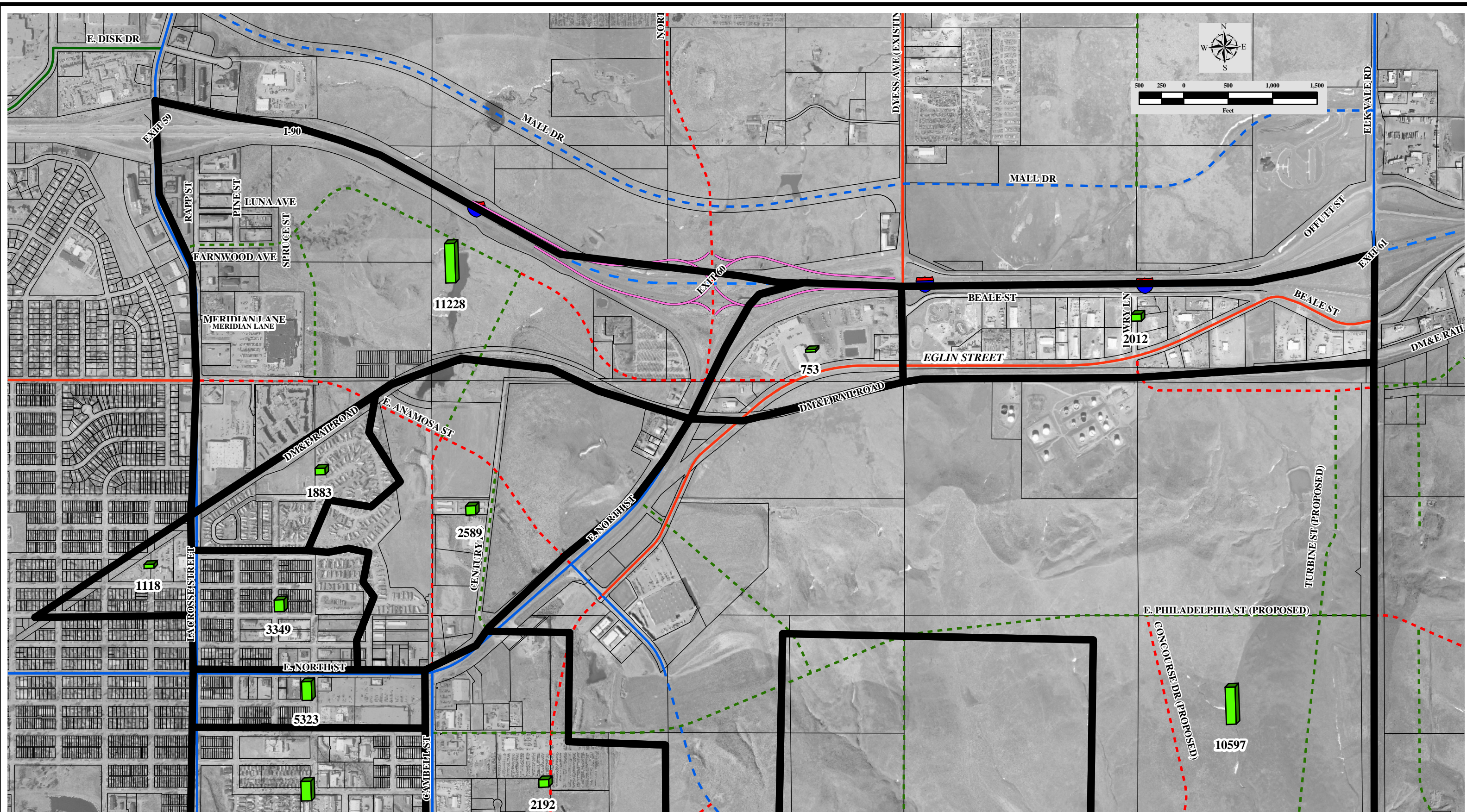
In addition to land use growth estimates, travel demand to this area under existing conditions can be compared to travel demand projected for future land uses to estimate daily and hourly traffic volume under future conditions. Existing land uses are estimated to produce 2,741 daily vehicle trips to the study corridor between East North Street and Elk Vale Road. The East Anamosa Street Extension Study estimated build-out travel demand for the same area at just over 6,000 vehicle trips per day...just more than double existing demand. Existing and future daily vehicle trips to the study area are shown in Figures 4-5 and 4-6, respectively.

4.6.1 Future Traffic Volume

Future daily traffic volume for study area streets was projected utilizing a variety of sources and means. Existing studies formed the primary basis for estimating future traffic volumes. The *Northeast Area Analysis* and the *East Anamosa Street Extension Study* were utilized to estimate future land uses, and to some degree, to estimate resulting future daily traffic volumes.

The *East Anamosa Street Extension Study* provided a good source for estimates of future traffic volumes although significant changes with future street networks and connections have transpired since that study was completed. The most significant change is the planned reconstruction of the I-90 / East North Street interchange (Exit 60) to allow full movement access between these two facilities. Under existing conditions, traffic destined for westbound I-90 from East North Street is required to utilize Eglin Street to get to Dyess Avenue, where westbound I-90 on-ramps exist. Exit 60 is planned to be reconstructed as a single point urban interchange (SPUI) to provide full access between I-90 and East North Street and the Dyess Avenue overpass and westbound on-ramp are anticipated to be removed. In addition, East North Street is also planned to extend north of I-90 to provide a connection to a Mall Drive extension. These changes required some adjustments to traffic projections made in the *East Anamosa Street Extension Study*. We also found that some future traffic projections listed in the *East Anamosa Street Extension Study* were actually less than current traffic counts.

Based on build-out development potential of the Eglin Street corridor between East North Street and Elk Vale Road and on recommendations of the *East Anamosa Street Extension Study*, a growth factor of 1.5 was applied to existing traffic volumes to establish year 2023 traffic (a 20-year projection). In addition, traffic volumes utilizing the Dyess Avenue route for I-90 access were removed from the local Eglin Street system. Lastly, additional traffic was added to the East North Street corridor to reflect increased demand on this facility due to the planned extension to Mall Drive. The resulting year 2023 daily traffic volume forecasts and forecast pm peak hour traffic were further re-assigned for each corridor alignment and intersection location alternative developed for Eglin Street. Future (year 2023) pm peak hour intersection traffic under existing roadway conditions is shown in Figures 4-7 and 4-8 for Eglin Street Alternatives 1 / 3 and 2, respectively.



LEGEND

COLLECTOR	PROPOSED COLLECTOR	EXIT 60	EXISTING TRAFFIC BOUNDARY
MINOR ARTERIAL	PROPOSED MINOR	I-90	YR 2000 DAILY TRIPS
PRINCIPAL ARTERIAL	PROPOSED PRINCIPAL		

FIGURE 4-5.

37

EXISTING TRAFFIC DEMAND (YR 2000 DAILY TRIPS)

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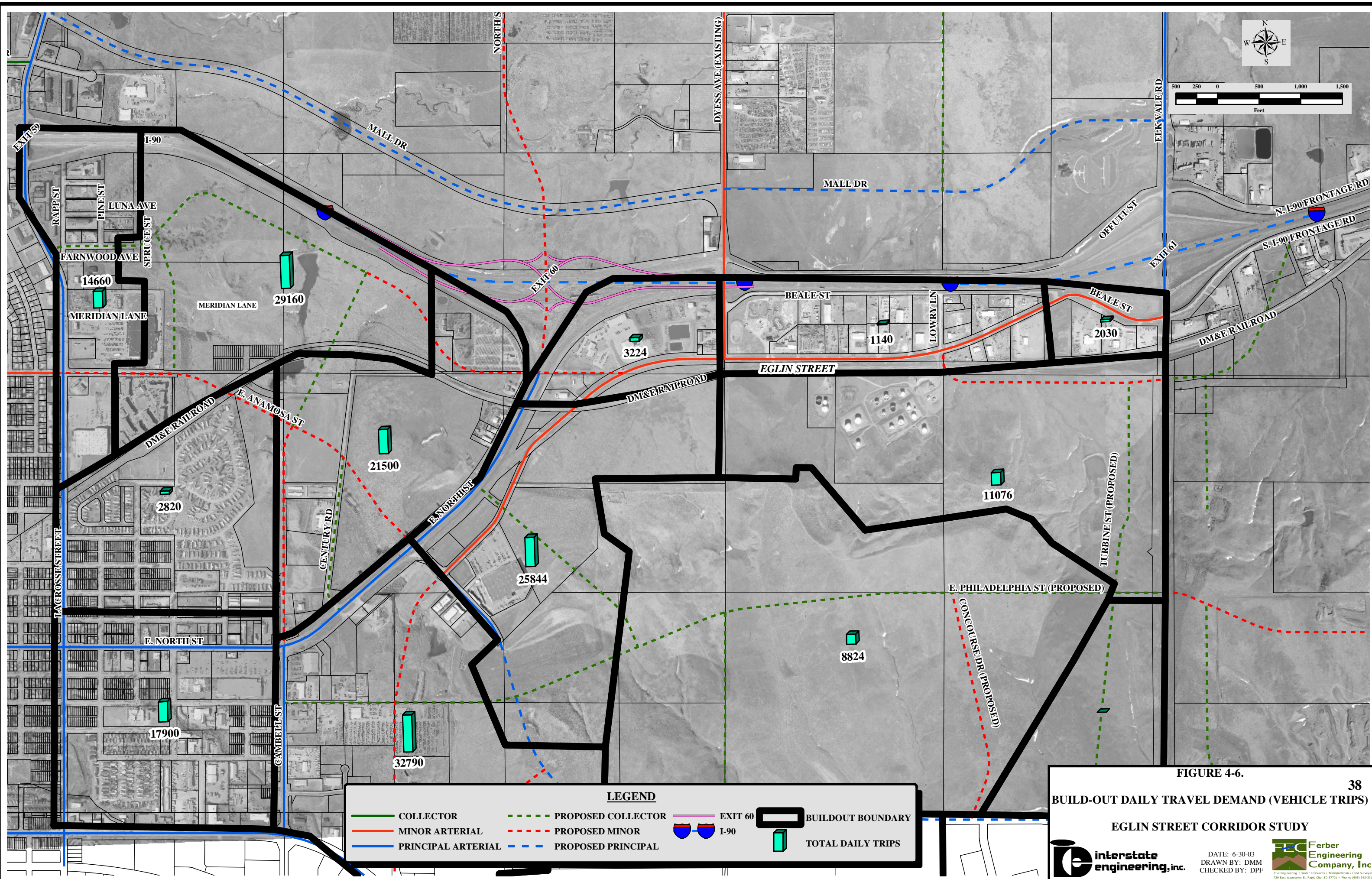


FIGURE 4-6. 38
 BUILD-OUT DAILY TRAVEL DEMAND (VEHICLE TRIPS)

LEGEND

	COLLECTOR		PROPOSED COLLECTOR		EXIT 60		BUILDOUT BOUNDARY
	MINOR ARTERIAL		PROPOSED MINOR		I-90		TOTAL DAILY TRIPS
	PRINCIPAL ARTERIAL		PROPOSED PRINCIPAL				

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Figure 4-7. Year 2023 PM Peak Hour Intersection Traffic, Alternative #1 & #3

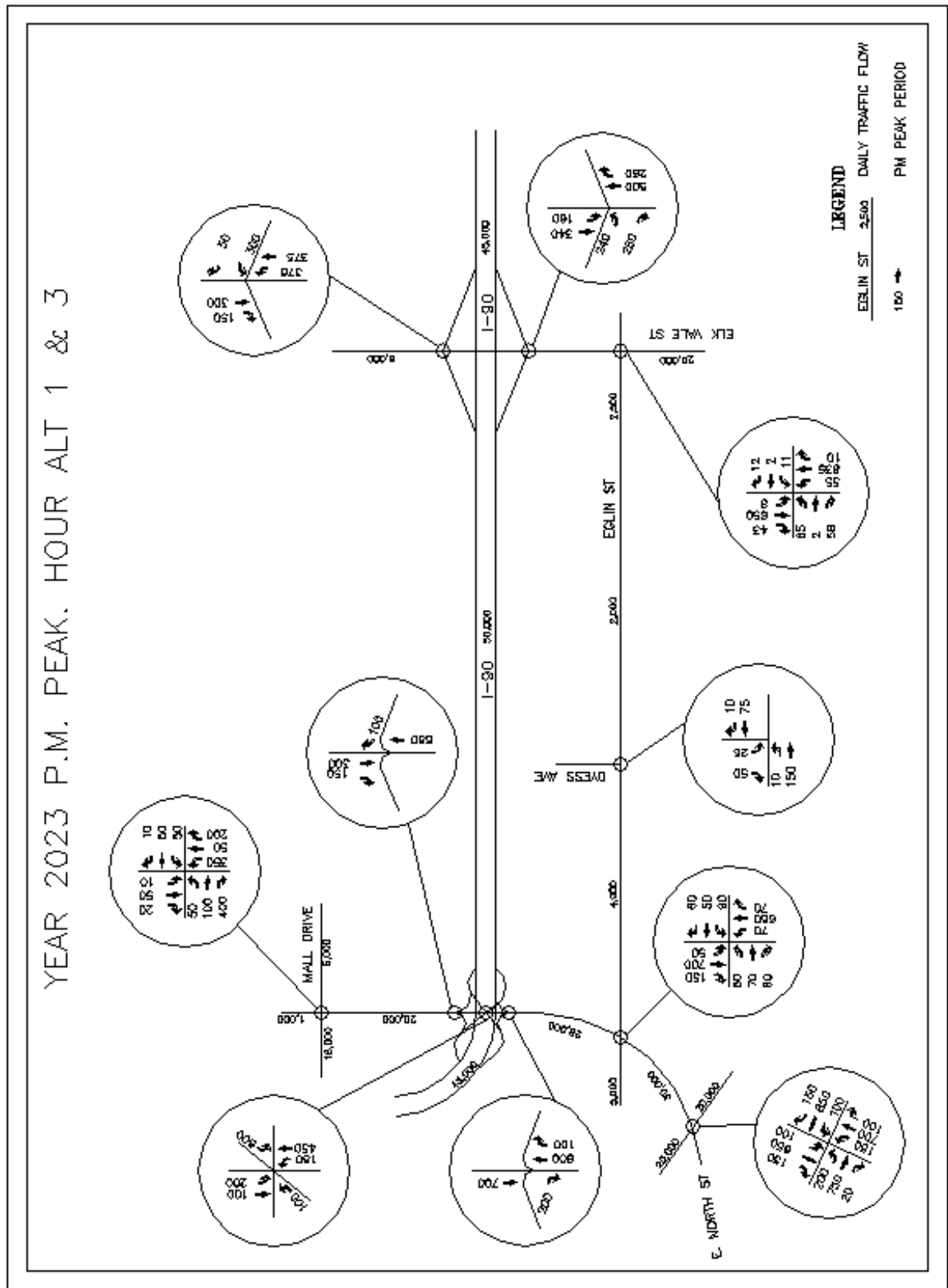
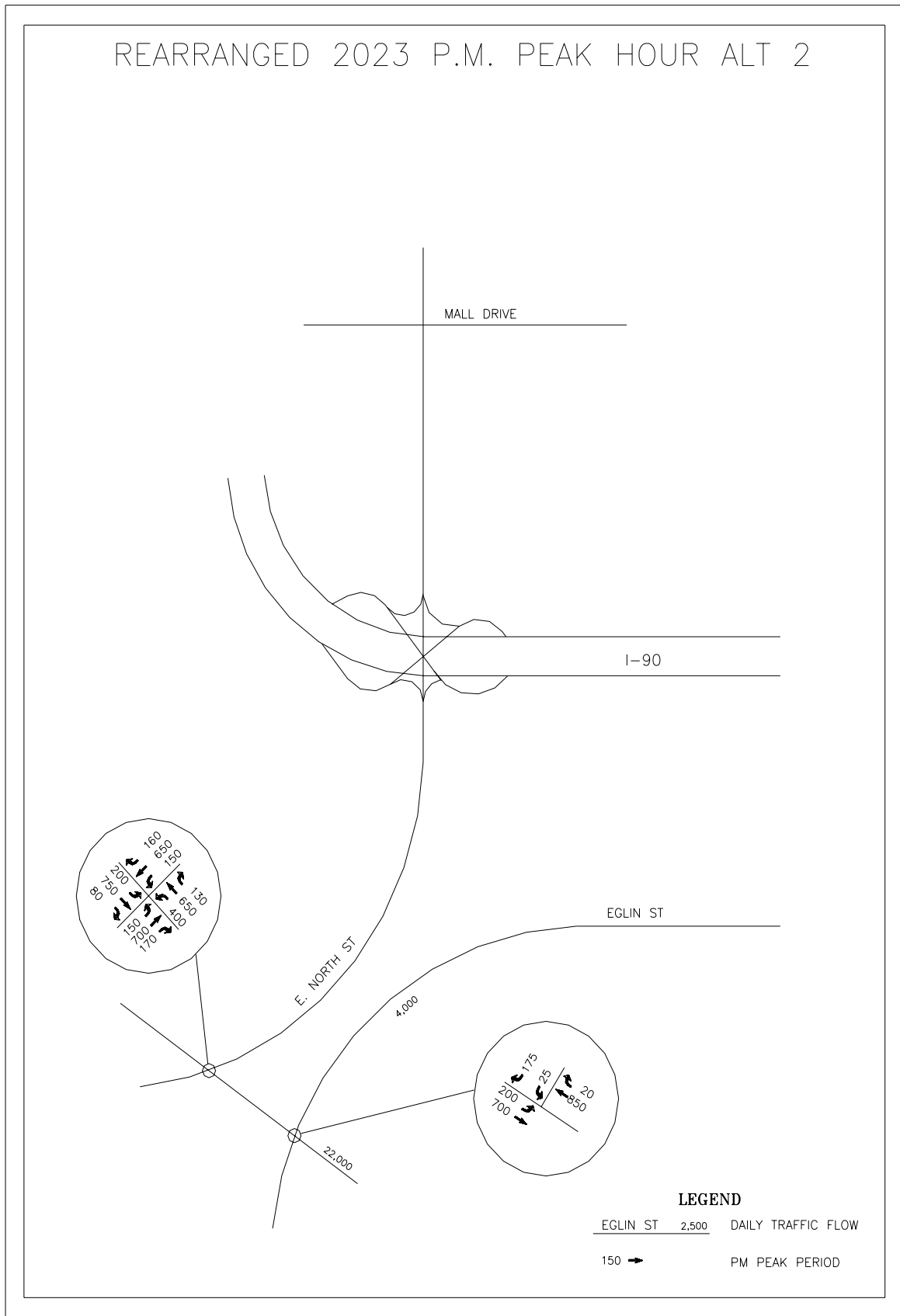


Figure 4-8. Year 2023 PM Peak Hour Intersection Traffic, Alternative #2



4.6.2 Street Network Assessment

Utilizing the design hour traffic volumes developed earlier (PM peak hour traffic), an operational assessment was performed. The assessment was conducted to identify performance problems and to assist with conceptual design of roadways and intersections. Additionally, it was desired to know if intersection and interchange spacing proposed by each alternative would provide adequate operational capacity without undesirable conflicts or congestion.

Elk Vale Road Corridor Operational Assessment: At the time this study was initiated, current planning by SDDOT involved reconstruction of the Elk Vale Road interchange (Exit 61) as a partial cloverleaf design, as recommended in the *SDDOT Interstate Corridor Study – Phase II*. Other recent improvements in this corridor include installation of traffic signals at the I-90 / Elk Vale Road ramp intersections.

Previous studies have indicated that, under existing lane geometry and traffic controls, the Exit 61 interchange ramp intersection can be expected to operate at LOS F by the year 2010. Overpass structure widening to accommodate turn lanes, installation of traffic signal control at the ramp intersections and other minor geometric improvements have been suggested to address expected operational deficiencies. Since this interchange is the northern terminus of the Heartland Expressway, complete reconstruction of the interchange to allow more free-flow traffic patterns between these two “system” facilities has also been suggested.

Based on the *SDDOT Interstate Corridor Study* results, projects are being developed to reconstruct the Exit 61 interchange and, in conjunction with the interchange reconstruction, it was anticipated that the existing Eglin Street intersection with Elk Vale Road would be restricted to right turns only. A separate study was recently completed for the SDDOT titled *The Exit 61 Traffic Operations Study*. That effort assessed several interchange configurations and their impacts to operations of the Elk Vale Road / Eglin Street intersection. The study demonstrated the need to restrict Eglin Street to right turns only at its intersection with Elk Vale Road under SDDOT policy and to maintain adequate operational and safety standards under the most likely interchange configurations.

Operational assessments undertaken with this study confirm that the Eglin Street intersection with Elk Vale Road will function poorly under future traffic conditions without installation of traffic signal control. Under future traffic demands, the Eglin Street intersection with Elk Vale Road is expected to operate at LOS E / F for side street (stop controlled) approaches. Delay is expected to reach an average of close to 90 seconds per vehicle for the eastbound approach, with traffic queues of about 150 feet. Further improvement alternative testing demonstrated that installation of a traffic signal was necessary to improve side street operations to LOS C or better. Due to the proximity of the Eglin Street intersection to the eastbound I-90 ramp intersection (less than 300 ft.), and in an effort to reduce the number of signalized intersections on this “system” road, installation of a traffic signal at this location is not prudent under existing intersection spacing conditions along Elk Vale Road.

Without traffic signal control, left turn and through movements from the Eglin Street approaches should be prohibited to reduce delay of right turn traffic and to prevent unsafe left turn and through maneuvers (vehicles performing maneuvers without sufficient gaps in through street traffic). This turn prohibition should be accomplished through the use of raised medians to further discourage improper turns.

Prohibition of left turn and through maneuvers from the Eglin Street approaches somewhat restricts access to / from the Eglin Street corridor businesses. To mitigate this loss of easy access, a connection from Eglin Street to Elk Vale Road has been proposed further south, across the DM& E Railway tracks. The connection was originally shown as a realignment of Eglin Street. The alternative was later revised to show a tie into a proposed access road (Cheyenne Boulevard) that intersects Elk Vale Road approximately 1,100 feet south of the eastbound I-90 ramp / Elk Vale Road intersection. The Cheyenne Boulevard / Elk Vale Road intersection (or a realigned Eglin Street / Elk Vale Road intersection) was assumed to operate under traffic signal control.

An assessment of the Cheyenne Boulevard intersection under year 2023 PM peak hour traffic shows good level of service as a signalized intersection. All intersection approaches are projected to operate at LOS B conditions or better, with no single lane group operating below LOS C. The optimum cycle length for this intersection is 45 seconds. A longer, 60-second cycle length was selected for operational analysis to enable good corridor coordination with I-90 ramp intersection signals (which require a longer optimum cycle length). Side street queues are predicted to be less than 100 ft. with a signal operating on a 60-second background cycle.

East North Street Corridor Operational Assessment: East North Street is a principal arterial street currently constructed with two through lanes and a center left-turn lane throughout the study area. The facility includes a depressed median separator east / north of its intersection with Anamosa Street. East North Street currently provides partial access to I-90 through a directional interchange. All movements except the westbound on-ramp are served by the existing interchange. Traffic desiring to get onto I-90 in the westbound direction currently utilize Eglin Street to get to Dyess Avenue. At Dyess Avenue, a westbound on-ramp exists to serve this demand.

Current planning by SDDOT indicates the East North Street / I-90 interchange will be reconstructed in the near future as a single point urban interchange. This reconstruction will enable all interchange movements to take place at East North Street. The reconstructed portion of I-90 will require removal of the overpass structure and westbound on-ramp at Dyess Avenue.

Eglin Street alignment alternatives developed with this study included access to East North Street at one of two possible locations:

1. Access to Anamosa Street just east of East North Street, utilizing the existing Anamosa Street intersection to gain access to East North Street (alignment Alternative #2).
2. Access directly to East North Street on the existing Eglin Street alignment (about 400 feet north of the DM&E railroad crossing...alignment Alternatives #1 and #3).

Retaining the existing alignment of Eglin Street and retaining the use of East Anamosa Street to gain access to East North Street was studied under year 2023 PM peak hour traffic conditions. This alignment corresponds to Alternative #2. The analysis assumed that the Anamosa Street extension further south and east was complete. Combining the Eglin Street traffic demand with the Anamosa Street demand places a significant amount of traffic at the Anamosa Street / East North Street intersection. The analysis showed the close proximity of the Eglin Street / Anamosa Street intersection to the Anamosa Street / East North Street

intersection may create vehicle storage problems. The expected vehicle queues for left turns at these two locations overlap, creating the need to construct a 6-lane roadway section to maintain side-by-side left turn lanes throughout the 450 ft. distance separating the intersections. This situation is illustrated in Figure 4-9. Even with the 6-lane section, the year 2023 PM peak hour traffic will result with overall LOS C conditions at this intersection, with some lane groups and approaches functioning at LOS D. Complete details of the East North Street corridor operations under this alternative are included in Appendix A.

Eglin Street corridor Alternatives #1 and #3 both include a new Eglin Street intersection with East North Street. The proposed intersection would be located about 400 feet north of the DM&E railway crossing and about 700 feet south of the proposed SPUI of East North Street and I-90. While this intersection will handle much less cross-street traffic than the Anamosa Street intersection, concerns were raised regarding the functionality of this intersection given its proximity to the interchange with I-90. Specifically, the City and SDDOT were concerned about the potential to create a “weave” section between these two intersections that could adversely impact capacity of safety of this segment of East North Street. A Synchro / SimTraffic model was created to examine the entire East North Street corridor under these alternatives.

For the future system model, a SPUI interchange was utilized for the East North Street / I-90 interchange. A signalized intersection was utilized for the Eglin Street / East North Street intersection. The model was developed to assess the function of individual intersections and to evaluate the potential for coordinated signal operations within the corridor. The model was extended north of the I-90 interchange to model the anticipated East North Street intersection with Mall Drive as well.

DRAFT

Figure 4-9. Left Turn Queues, Anamosa St. / East North Street – Alternative #2

The model shows all intersections can operate at overall LOS C or better, and that the Eglin Street / East North Street intersection will operate at overall LOS A. No single lane group or approach operates below LOS C at any corridor intersections. The Eglin Street intersection operates such that it fits nicely within a coordinated corridor and does not reduce corridor progression. Details of the operations analysis are contained in the Appendix.

The investigation into the potential “weave” revealed that prevention of a problem is largely related to the design and control of the SPUI. Although not a true weave, traffic from eastbound I-90 that is destined for eastbound Eglin Street does need to maneuver across through lanes on East North Street to reach the southbound left turn lane at Eglin Street. The eastbound I-90 to southbound East North Street movement will take place outside the signalized intersection of the SPUI, and could be designed one of two ways:

1. Right turn traffic must yield to southbound through traffic, or
2. Right turn traffic is provided with an acceleration / merge lane to join southbound East North Street traffic.

The use of an acceleration lane and merge condition is not recommended due to the short distance between the I-90 ramp intersection and the proposed Eglin Street intersection. Allowing ramp traffic to merge with southbound East North Street traffic will require a

lengthy acceleration / merge lane. Merging traffic destined for eastbound Eglin Street may stop in the acceleration lane, or may not use it at all. Those merging to go east on Eglin Street would need to merge with one through lane then cross another through lane before they could move to the left turn lane at Eglin Street.

Roadway design speed, not posted speed limits, will determine the length of acceleration lane that would be required under a merge alternative. Due to the limited effectiveness of speed limits at controlling travel speeds, the use of a lower posted speed limit to enable shorter acceleration/merge lengths is also not recommended.

Requiring interstate off-ramp traffic to yield to southbound East North Street traffic provides a safer means for ramp traffic access eastbound Eglin Street. The yield maneuver requires that traffic wait for a gap in traffic. When turning onto southbound East North Street, the traffic is already in the through lane and has to cross only one through lane to access the left turn lane for eastbound Eglin Street. Designing the off-ramp as a yield maneuver also will likely result with the greatest separation between the two intersections, providing the maximum length available for lane crossing maneuvers. Yield control is recommended for eastbound I-90 traffic exiting for southbound East North Street.

LaCrosse Street Corridor Operational Assessment: The western terminus of the Eglin Street Corridor Study is LaCrosse Street. A north-south principal arterial street, LaCrosse Street is a 5-lane facility with two through lanes in each direction plus a center left turn lane. At busier intersections, additional auxiliary lanes exist. LaCrosse Street is continuous from Omaha Street on the south, to north of I-90 on the north. For purposes of this study, it was desired to ascertain impacts to LaCrosse Street of the westward extension of Eglin Street.

Several alternatives were developed for Eglin Street west of East North Street. Alternatives included bringing Eglin Street to an intersection with East Anamosa Street east of LaCrosse Street, and an alternative bringing Eglin Street to LaCrosse Street with an intersection at the current Rapp Street / LaCrosse Street intersection.

Terminating Eglin Street at Anamosa Street does not pose any capacity or operational problems for Anamosa Street, but it does add to traffic at the Anamosa Street / LaCrosse Street intersection. Already forecast to carry heavy traffic volumes, the additional Eglin Street traffic only exacerbate the situation. Analysis of the Anamosa Street / LaCrosse Street intersection shows it operates at overall LOS B under existing PM peak hour traffic. The eastward extension of Anamosa Street is expected to significantly increase traffic demands at this intersection. Under conditions of future traffic, the Anamosa Street / LaCrosse Street intersection is expected to experience congestion. Analysis shows this intersection will operate at overall LOS E in the future with all approaches operating at LOS D or LOS E. The addition of Eglin Street traffic only makes operating conditions worse.

Under future traffic conditions, the remainder of the LaCrosse Street corridor functions adequately. The Meridian Street intersection is expected to operate at overall LOS A under year 2023 PM peak hour conditions. A future Eglin Street intersection (at Rapp Street) will also function adequately. A future Eglin Street / LaCrosse Street intersection is projected to operate at overall LOS B. The I-90 ramp intersections are projected to operate in the LOS B-C range under future PM peak hour traffic.

The LaCrosse Street corridor seems to function best on a signal cycle of about 100 seconds under future traffic demands. With a 100-second cycle, coordination within the corridor is good and the Rapp Street intersection location fits well into intersection spacing.

While the Rapp Street location works well within the LaCrosse Street corridor, the Farnwood Avenue intersection with Rapp Street occurs very close to the LaCrosse Street intersection. At its current location, the intersection may become blocked by traffic queues. While this should not impact operations on LaCrosse Street, it could create vehicle queues and left turn problems at Farnwood Avenue intersection. Access controls to prohibit left turns may be desirable at the future intersection of Eglin Street / Rapp Street.

4.7 Utility Assessment

Water distribution planning for the Eglin Street Corridor was included within the *Northeast Area Analysis*. No additional water planning is included within this report.

The sanitary sewer collection system for the Eglin Street Corridor was likewise outlined in the *Northeast Area Analysis*. The system, in general, is designed to drain to the northeast to ultimately be captured in the Northeast Sanitary Sewer Interceptor, and transported to the Elk Vale Road Lift Station. Mains are shown crossing I-90 near Lowry Lane on the east, and in the vicinity of the existing major drainage crossing of I-90 along the west line of Section 29. These lines are shown in the Northeast Area Analysis as 15-inch and 8-inch, respectively.

The preliminary profiles for Eglin Street Alternative #1 define a street that slopes from a high point just east of LaCrosse Street to a low point in the vicinity of Lowry Lane. This alignment works very well with the major sanitary sewer crossing depicted in the *Northeast Area Analysis*. The area south of Eglin Street generally slopes toward the north. Depending on site development grading, sanitary sewer could be routed to Eglin Street. Flows could then be conveyed to the Lowry Lane crossing.

We have performed very preliminary assessments of the ability for gravity sewer from the Eglin Street / Lowry Lane intersection to the Northeast Interceptor. Our preliminary analysis shows that a gravity connection is feasible.

4.8 Drainage Assessment

4.8.1 Hydrology

No drainage basin master planning has been completed in the Box Elder Creek watershed. Therefore, the following hydrologic analyses were completed strictly for the purpose of cost estimating for the *Eglin Street Corridor Study*. Simple hydrologic methods were used and are not necessarily indicative of the results that can be expected from a detailed hydrologic analysis using a hydrograph method.

Because no drainage master planning exists for the study area, some assumptions for these analyses were necessary:

- Hydrologic calculations were only completed for the fully-developed condition.
- No routing through existing areas of detention was completed.

- Proposed drainage crossings were located and sized to convey the fully developed flows along the historic flow paths.
- Additional detention was assumed to be needed under fully-developed conditions, but was not estimated in this study.
- A detailed drainage analysis must be completed prior to construction.
- Analysis of the storm inlet needs for the Eglin Street Alternatives was not completed.

To conservatively size the proposed drainage crossings for preliminary construction cost estimate, we used the Rational Method to estimate the storm runoff arriving at each crossing. The Rational Method is intended for use in smaller basins (200 acres or less) and yields more conservative results as the basin size increases. However, we chose this method as appropriate for the purpose of conceptual drainage crossing sizing.

We used the future land use, shown in Figure 4-1, for the study area to determine drainage coefficients for each subbasin shown on Figure 3-10. Table 2-1 and Figure 2-2 in the *Rapid City Drainage Criteria Manual* (RCDCM) were used to estimate the 10-yr and 100-year runoff coefficients and all rainfall intensities. The 2-yr runoff coefficients were estimated using Table 8-4 of *Stormwater Collection Systems Design Handbook* by Larry Mays, et al.

The runoff coefficients used for the analysis are shown in Table 4-2. We used area-weighted runoff coefficients to estimate the fully developed land use condition discharges.

Table 4-2. Rational Method Runoff Coefficients

FLU Code	C ₂	C ₁₀	C ₁₀₀
LI	0.71	0.76	0.82
HI	0.80	0.85	0.90
GC	0.87	0.88	0.89
OC	0.60	0.70	0.80
BP	0.71	0.72	0.82
PRD 1.5DU / AC	0.40	0.50	0.60
MDR	0.45	0.60	0.70
MHP	0.45	0.60	0.70
ROW	0.62	0.69	0.77
PUBLIC	0.40	0.50	0.60

We calculated the time of concentration (T_c) using $T_c = L / 180 + 10$ (equation 2-5, RCDCM), where T_c is the time of concentration (in minutes), L is the length of the basin (in feet) measured from the hydraulically most remote location to the point of interest. The corresponding rainfall intensity for the 2-, 10- and 100-year storms were then determined using RCDCM Figure 2-2. Table 4-3 is a summary of the Rational Method results for the subbasins at their most downstream point, as shown in Figure 3-10.

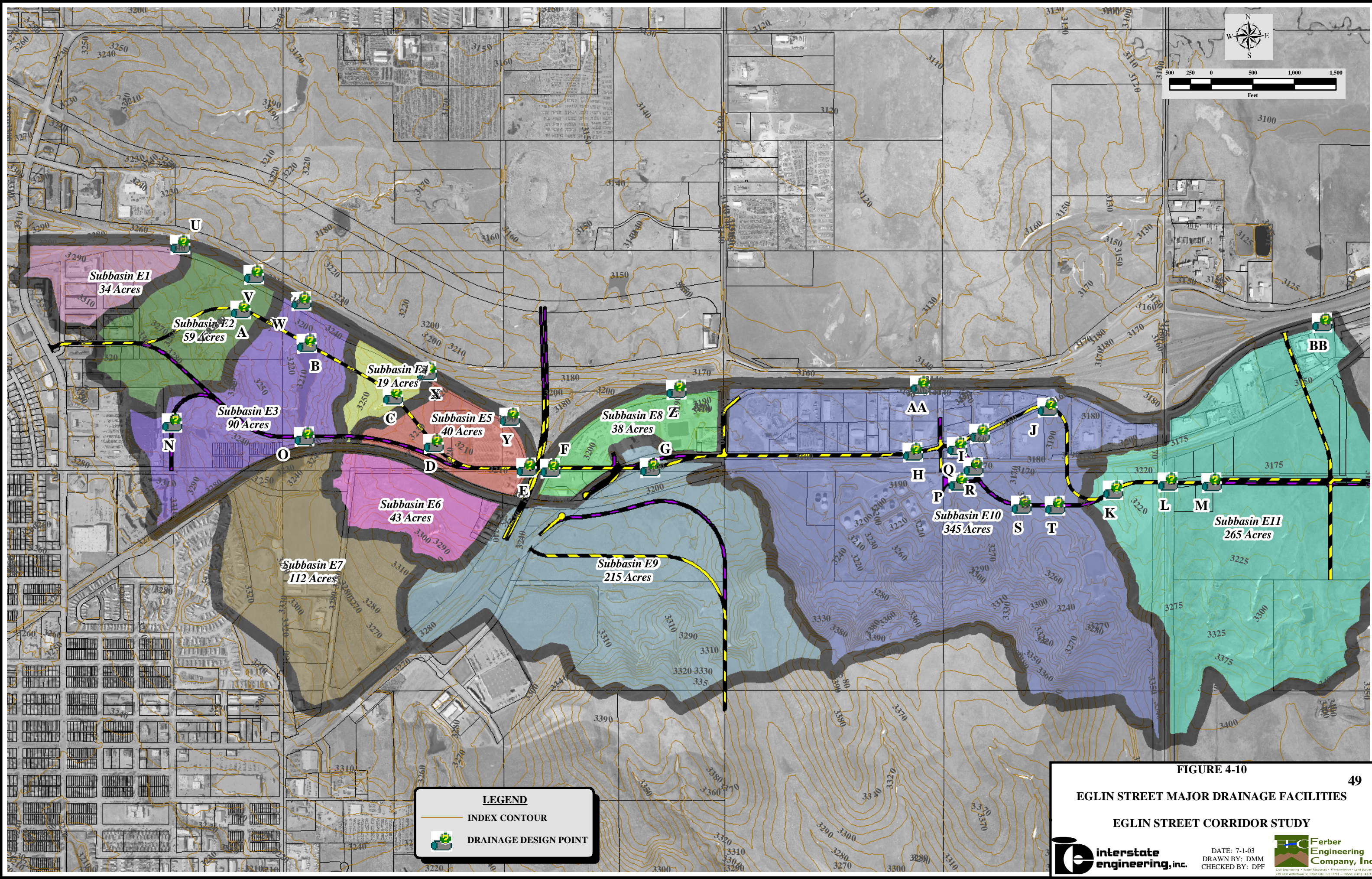
Table 4-3. Rational Method Results by Subbasin

Basin	Area (ac)	T _c (min)	Q ₂ (cfs)	Q ₁₀ (cfs)	Q ₁₀₀ (cfs)
E1	34	21	62	100	155
E2	59	25	83	140	230
E3	90	31	93	176	308
E4	19	18	38	60	93
E5	40	23	70	113	178
E6	43	22	76	120	190
E7	112	29	132	235	405
E8	38	22	44	79	137
E9	215	27	296	498	788
E10	345	37	373	661	1,183
E11	265	37	278	495	887

Figure 4-10 provides the design points where flows were calculated for these analyses. Table 4-4 tabulates the Rational Method results at the Eglin Street design points as shown in Figure 4-10. Table 4-5 tabulates the fully-developed peak discharges arriving at the south side of I-90.

Table 4-4. Rational Method Results by Design Point

Crossing Design Point	Contributing Area (ac)	Q ₁₀₀ (cfs)	Crossing Design Point	Contributing Area (ac)	Q ₁₀₀ (cfs)
A	30	121	K	27	116
B	112	642	L	27	100
C	10	52	M	27	108
D	8	44	N	9	46
E	43	215	O	112	545
F	10	41	P	17	76
G	195	662	Q	17	104
H	121	459	R	27	112
I	52	216	S	52	239
J	138	490	T	86	354



LEGEND

- INDEX CONTOUR
- DRAINAGE DESIGN POINT

FIGURE 4-10 49

EGLIN STREET MAJOR DRAINAGE FACILITIES

EGLIN STREET CORRIDOR STUDY

interstate engineering, inc. DATE: 7-1-03
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Table 4-5. Rational Method Results at I-90

I-90 Design Point	Contributing Subbasins	Q₁₀₀ (cfs)
U	E1	155
V	E2	230
W	E3, E7	713
X	E4	93
Y	E5, E6	368
Z	E8, E9	925
AA	E10	1,183
BB	E11	887

4.8.2 Hydraulics

Major Drainage Structures

The Eglin Street Alternatives drainage crossings were assumed to act under inlet control with HW / D equal to 1. By assuming $HW / D = 1$, ponding will only occur to the height or diameter of the crossing under investigation. We used RCDCM Figures 6-11 and 6-12 to estimate crossing sizes, where HW is the height of the free water surface above the invert of the pipe and D is the diameter of the pipe.

Table 4-6 presents the required drainage facility sizes for the Eglin Street Alternative #1. Table 4-7 presents the required drainage facility sizes for the Eglin Street Alternative 3. The design points in both tables are those shown in Figure 4-10. Sizing individual drainage structures crossing I-90 was beyond the scope of this study. The existing structures were sized to accommodate mostly undeveloped flows. As additional development occurs in the basins adjacent to and draining toward I-90 detention should be provided to restrict discharge to historical levels that can be accommodated in the existing structures.

Table 4-6. Estimated Drainage Crossing Sizes for Eglin Street Alternative 1

Design Point	Crossing Type	RCP Dia (in) / RCB Dim. (ft)	Design Point	Crossing Type	RCP Dia (in) / RCB Dim. (ft)
A	RCP	60	H	RCB	12 x 6
B	RCB	12 x 7	I	RCP	2 - 54
C	RCP	42	J	RCB	12 x 6
D	RCP	42	K	RCP	60
E	RCP	2 - 54	L	RCP	54
F	RCP	42	M	RCP	2 - 42
G	RCB	12 x 7			

Table 4-7. Estimated Drainage Crossing Sizes for Eglin Street Alternative 3

Design Point	Crossing Type	RCP Dia (in) / RCB Dim. (ft)	Design Point	Crossing Type	RCP Dia (in) / RCB Dim. (ft)
E	RCP	2 - 54	N	RCP	42
F	RCP	42	O	RCB	12 x 7
G	RCB	12 x 7	P	RCP	48
H	RCB	12 x 6	Q	RCP	54
K	RCP	60	R	RCP	2 - 42
L	RCP	54	S	RCP	2 - 54
M	RCP	2 - 42	T	RCB	11 x 5

Street Drainage and Storm Sewer

We *did not* complete an analysis of the storm inlet or storm sewer needs for either Eglin Street alternative. For cost estimating purposes, we assumed Eglin Street to be a Collector Street. With that assumption, we assumed that one Type B grate inlet and one 10-foot Type S curb opening inlet every 300 feet along the length of the alternatives. We also assumed that 24-inch RCP laterals will connect the inlets on station and flow will be conveyed through 30-inch RCP storm sewer mains to discharge points every 1,200 feet.

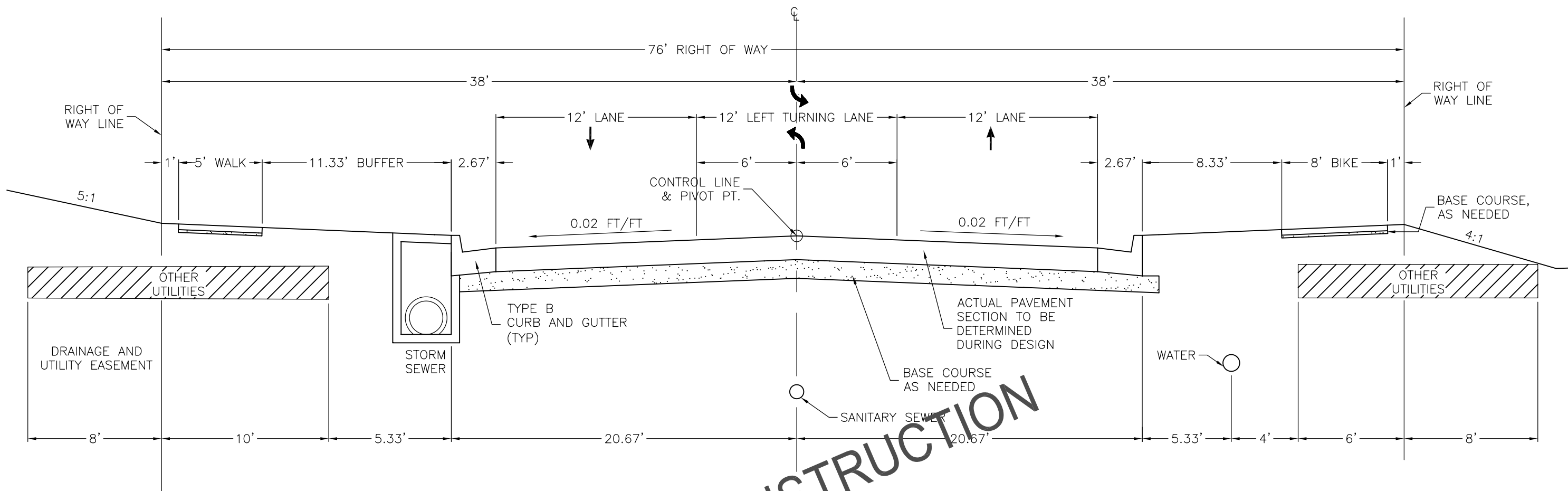
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4.9 Alternative Cost Comparison

Engineers Estimated Probable Construction Costs were calculated for Alternatives #1 and #3. These costs are summarized in Table 4-8. The costs estimates are preliminary and intended to be used to compare the alternatives only. The Eglin Street typical section is presented in Figure 4-11. The cost estimates were prepared assuming a 36-foot asphalt street section with curb and gutter, bike path and sidewalk, storm inlets spaced at approximately 300 feet, major storm drainage crossings, 10-inch PVC water main, 10-inch PVC sanitary sewer main, street lighting, and an unclassified excavation number estimated from the conceptual Eglin Street plan and profile sheets located in Appendix B. We estimated an approximate per foot cost of \$379. The lengths of the alternatives listed below run from LaCrosse Street to the north-south collector east of Elk Vale Road (Degeest Drive). In addition to the per foot cost we also estimated an approximate construction cost of various intersections, rail crossings and street ties. The detailed probable construction cost breakdown is found in Appendix C.

Table 4-8. Summary of Eglin Street Alternative Costs

Cost Item	Alternative 1 17,400 ft	Alternative 3 16,500 ft
Mainline Cost (\$347) per running foot)	\$6,594,600	\$6,253,500
LaCrosse Intersection	\$26,250	\$26,250
East North Street Intersection	\$99,200	\$99,200
Existing Eglin Intersection / SDDOT Entrance	\$30,000	\$30,000
Dyess Avenue Intersection	\$14,000	\$14,000
Lowry Lane Intersection	\$30,000	\$30,000
Grade Separated Rail Crossing	\$600,000	0
At Grade Rail Crossing	0	\$20,000
Beale Street Intersection	\$17,000	\$74,000
Tank Farm Access	0	\$134,600
Elk Vale Road Intersection	\$35,000	\$35,000
North-South Collector	\$28,000	\$28,000
Total	\$7,474,050	\$6,744,550



NOT FOR CONSTRUCTION

07-09-03 J:\EPDATA\J02-131\COLLTP.dwg

NO.	DATE	REVISION	APPROVED

HORIZ SCALE: NTS
 VERT SCALE: NTS
 DATE: 7-1-03
 DESIGNED: JRV
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FIGURE 4-11
EGLIN STREET TYPICAL SECTION
EGLIN STREET CORRIDOR STUDY

PROJECT NO.
 J02-131

5.0 RECOMMENDATIONS

The purpose of the Eglin Street Corridor Study is to recommend changes to and support for the planned improvements to the transportation infrastructure in the northeast area of Rapid City. The Rapid City Major Street Plan identifies Eglin Street as playing a major role in shaping the future development of the area.

Three alternatives plus a No-Build alternative were developed to address the possible improvements to Eglin Street needed to make the transition from the existing facilities to those envisioned in the Major Street Plan. These alternatives evolved during the course of the study based upon input from Steering Committee Members, Landowners and public comments.

We recommend Eglin Street be constructed as a 3-lane urban section for its entire length. We recommend a design speed of 40 mph except for the horizontal curves east and west of the railroad crossing near Lowry Lane. Because of right-of-way, intersection spacing, and other considerations, we recommend a 30 mph design speed through these curves. The maximum vertical grade is recommended to be 8%, with a maximum superelevation of 4%. The final recommendations are shown on Figure 5-1.

The recommended western terminus of Eglin Street is detailed in Figure 5-2. The location of this intersection was chosen because it aligns with a driveway approach on the west side of LaCrosse Street, and aligns with existing Farnwood Street on the east side.. This intersection will require eliminating the existing Rapp Street / LaCrosse Street intersection, instead teeing Rapp off Eglin Street approximately 100 feet from the Eglin / LaCrosse intersection. The recommended alignment will also require relocating the access to the Comfort Inn located on the south side of Farnwood / Eglin. This access would be moved to a location approximately 300 feet from the Eglin / LaCrosse intersection. The recommended alignment may also require changing Rapp and Pine to One-Way streets. During peak periods, west bound / south bound left turning queues will extend beyond the Rapp Street / Eglin Street intersection precluding free movement between Eglin and Rapp. Creating a one-way, counterclockwise loop using Pine / Luna / Rapp should allow fairly free movement.

East of Spruce Street, we recommend Eglin Street following the Major Street Plan alignment. This location will provide rear access to the desirable I-90 frontage. The other benefits include allowing development on both sides, retaining large areas for development south of Eglin, and easing the provision of sanitary sewer service. The existing topography throughout the area bounded by I-90, LaCrosse Street and East North Street is rough. The chosen alignment will allow the road to be built within the guidelines.

The recommended Eglin Street / East North Street intersection is detailed in Figure 5-3. This detail shows Eglin Street located north of the section line with all of the Right-of-Way coming from the property in Section 29. We recommend staying north of the section line primarily because the existing commercial development south of the section line west of East North Street is too close to the property line to allow adequate spacing.

The recommended initial construction of this intersection will include two through lanes each way on East North Street with single left turn lanes. Eglin Street includes one through lane each way with left turn lanes. The north bound / west bound left turn lane taper has been shortened to prevent left turn queues backing up past the DM&E Railroad Tracks. As traffic increases at full build out, an additional left turn lane may be required.

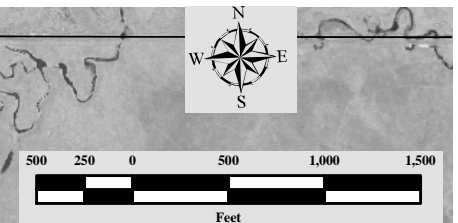
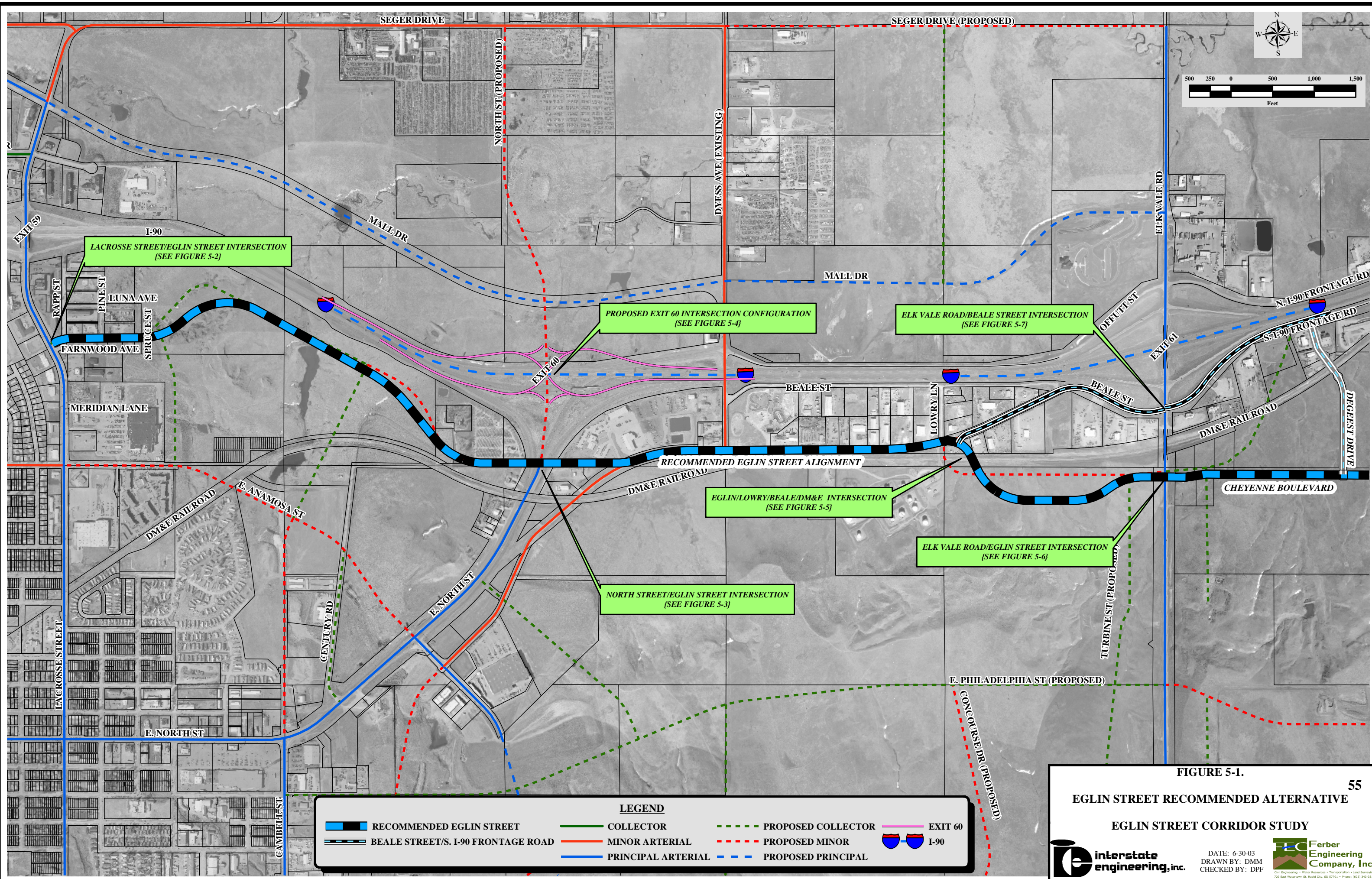
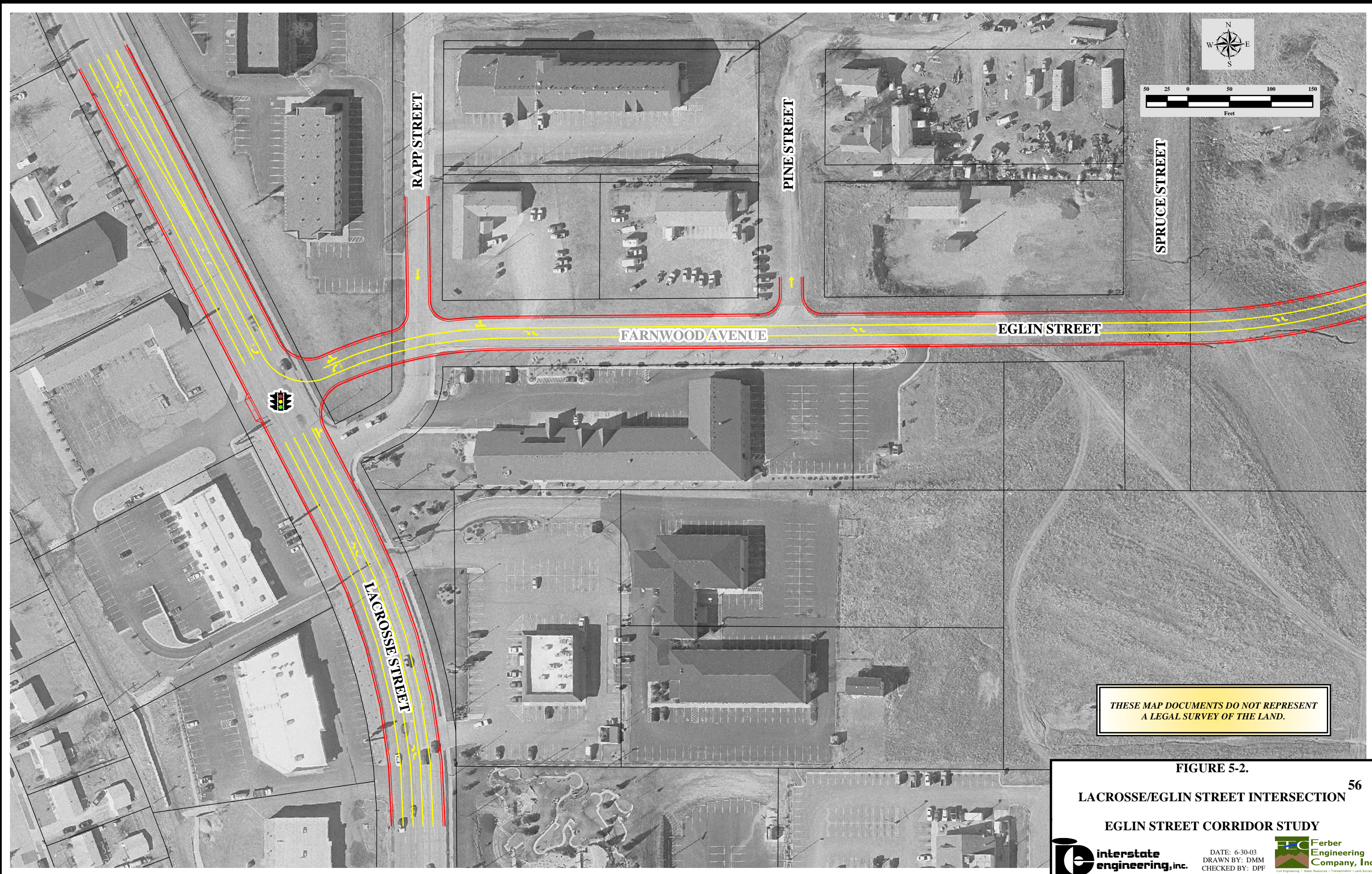


FIGURE 5-1.
EGLIN STREET RECOMMENDED ALTERNATIVE
EGLIN STREET CORRIDOR STUDY
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LEGEND			
	RECOMMENDED EGLIN STREET		COLLECTOR
	BEALE STREET/S. I-90 FRONTAGE ROAD		PROPOSED MINOR
	PRINCIPAL ARTERIAL		PROPOSED PRINCIPAL
	MINOR ARTERIAL		EXIT 60
	PRINCIPAL ARTERIAL		I-90




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FIGURE 5-2.


LACROSSE/EGLIN STREET INTERSECTION 56

EGLIN STREET CORRIDOR STUDY



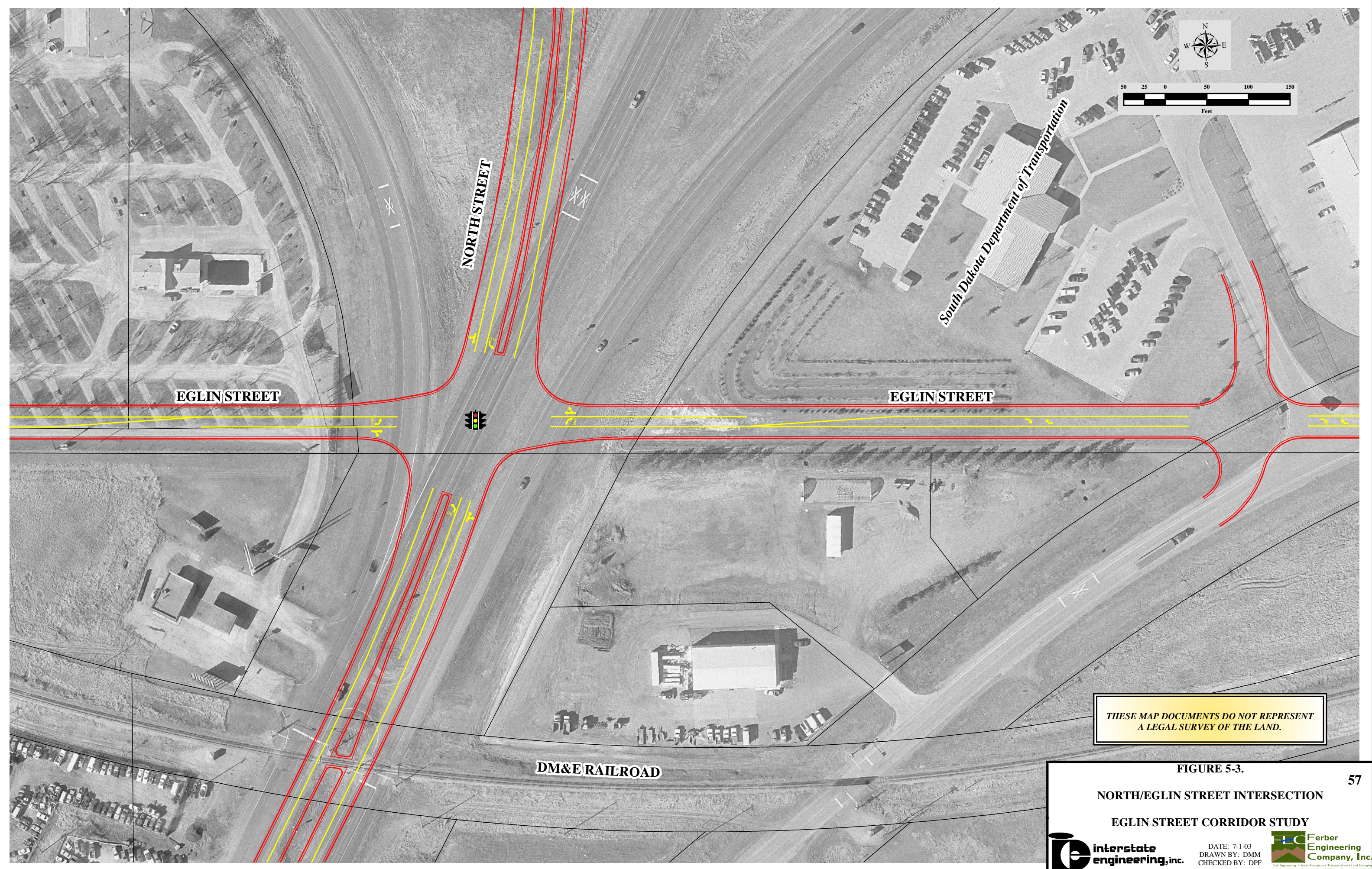
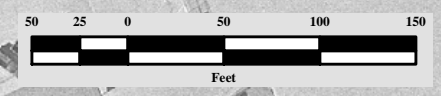
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EGLIN STREET

NORTH STREET

EGLIN STREET

DM&E RAILROAD

South Dakota Department of Transportation

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FIGURE 5-3.
NORTH/EGLIN STREET INTERSECTION
EGLIN STREET CORRIDOR STUDY



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At the time the East North Street / Eglin Street intersection is constructed, access to the existing adjacent commercial properties from East North Street will be eliminated. New access will need to be provided from Eglin Street in a manner that does not conflict with the operation of the intersection.

Figure 5-3 also shows the realignment of the approach to the SDDOT complex and the portion of existing Eglin Street fronting Menards. This intersection will not be signalized. With the construction of the Eglin / East North intersection, the existing street will need to be renamed. The recommended alignment shown at the June 9th Open House depicted the removal of this Menards frontage road railroad crossing. The City requested that this crossing be kept for continuity in the local street network. From a traffic standpoint, it is not necessary for the Menards frontage road to connect with Eglin Street. If necessary to accommodate additional railroad crossings elsewhere in the corridor, the existing crossing could be removed and the street cul-de-sac'd on both sides of the railroad. Figure 5-4 presents the SDDOT proposed Exit 60 reconstruction and its relationship to the Mall Drive and Eglin Street intersections.

East of the Eglin Street / East North Street intersection, the recommended alignment returns quickly to the existing Eglin Street alignment and follows the existing alignment to the intersection of Eglin and Lowry Lane.

From the outset of this study, the SDDOT has indicated that there would be restrictions placed on traffic movement at the existing intersection of Beale Street (*Eglin Street*) and Elk Vale Road. The SDDOT reasons that a full movement intersection between Beale (*Eglin Street*) and Elk Vale Road would ultimately have to be signalized, and any signalization of this intersection would impede traffic on Elk Vale Road. Figure 5-7 details the current right-in / right-out intersection proposed for this location.

Restricting turning movements at the Beale Street (*Eglin Street*) intersection with Elk Vale Road will limit the function of the intersection and therefore the street to the status of a local road. In order to maintain the type of continuity envisioned in the Major Street Plan, Alternatives #1, and #3 include a railroad crossing between Lowry Lane and Elk Vale Road, and intersect with Elk Vale Road at the Cheyenne Boulevard location approximately 400 feet south of the railroad.

We recommend that Eglin Street follow the alignment depicted in Alternative #3, as shown in Figure 5-5. The proposed intersection conforms more fully to the functional classification of Eglin Street as an Urban Minor Arterial. This alignment will include an at-grade railroad crossing on a 30-degree skew located 400 feet east of the existing entrance to the Kanab Pipeline Terminal. Beale Street and Lowry Lane will both remain as local streets and will intersect with Eglin Street at tee intersections. A new access to the Kanab Terminal will be constructed to the east. The trucks from I-90 accessing the Kanab Terminal will no longer be required to cross the DM&E Railroad tracks entering or leaving the facility.

This alignment also allows Eglin Street to be continuous from LaCrosse Street to Elk Vale Road. The recommended alignment for Eglin Street also addresses the continuity of the transportation network east of Elk Vale Road. Cheyenne Boulevard will intersect Elk Vale Road at this same location. Cheyenne Boulevard will continue east to the eastern limits of the study area providing access to additional undeveloped areas. Figure 5-6 details the full movement intersection planned at Eglin Street and Elk Vale Road.

Figure 5.6 also depicts the future intersection between Turbine Drive and Eglin Street. The intersection is shown 660 feet from Elk Vale Road. This is the minimum spacing required to allow proper development of intersection geometry. We assume both intersections will be signalized in the future. The preferred spacing for signal progression would be 1320 feet.

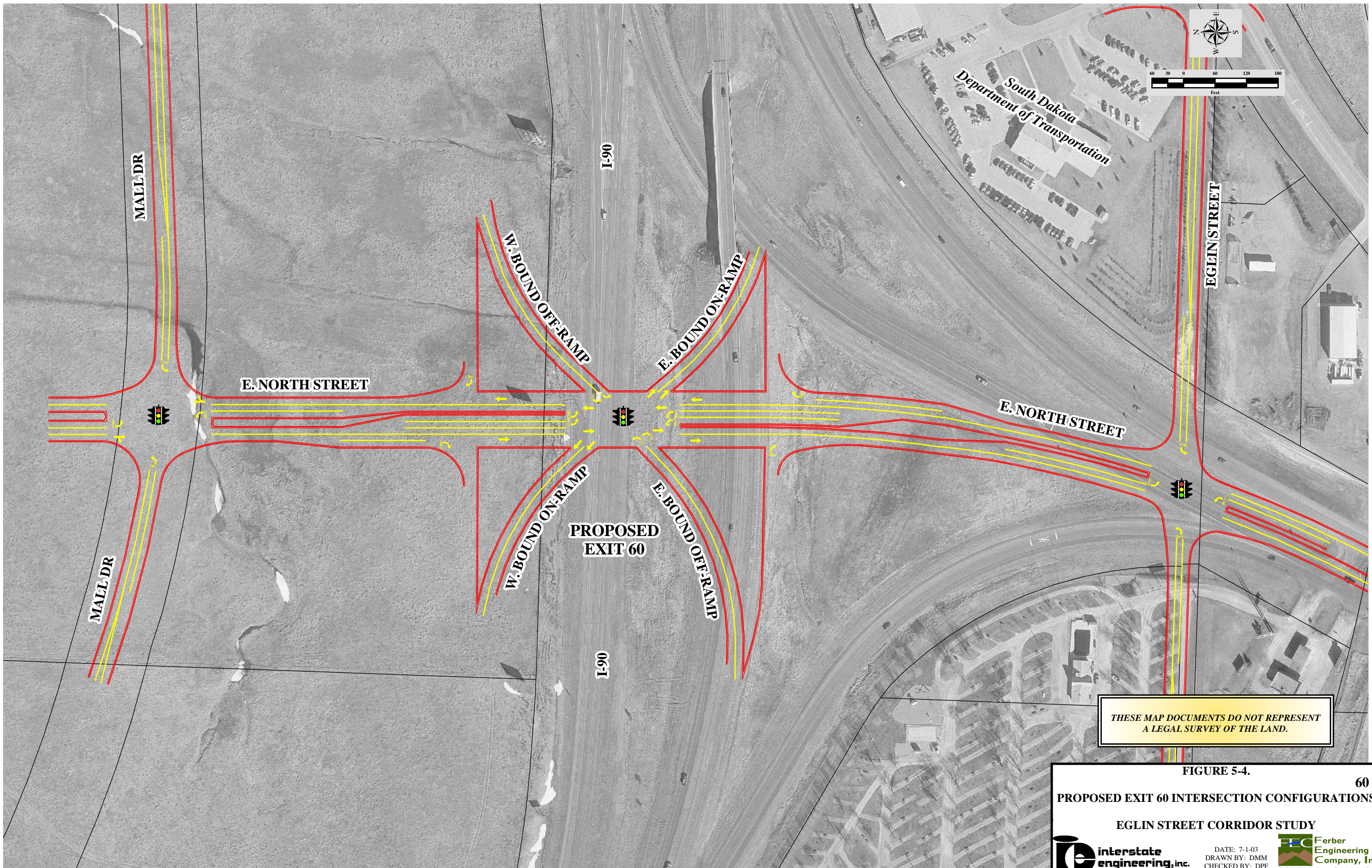
Restricting turning movements at the existing South I-90 Frontage Road / Elk Vale Road intersection will limit the function of the intersection and therefore the street to the status of a local road. We recommend that a secondary access be constructed between Cheyenne Boulevard and the South I-90 Frontage Road. Current plans for the Heartland Retail Center show a local north-south street ending in a cul-de-sac at the DM&E tracks. We recommend that the street be extended to the north to intersect with the existing South I-90 Frontage Road.

5.1 Intersection Spacing

This study has focused on Eglin Street itself and its intersections with other principal arterial streets. The Major Street Plan shows other proposed collector roadways intersecting Eglin Street including Cambell Street, Century Road, Turbine Drive, and Degeest Drive that are not specifically assessed within the scope of this study. These intersection locations should not to be construed as being “approved” by virtue of their inclusion in the Major Street Plan or their illustration in this study. Any new intersections on Eglin Street should be thoroughly studied before being allowed or approved since intersection frequency and spacing along Eglin Street can have a significant impact to capacity and traffic flow.

Future intersections, especially signalized intersections should be separated to provide adequate room to develop intersection geometry (auxiliary lane tapers and storage, deceleration, etc.) and to allow good traffic signal progression and coordination. The Rapid City Street Design Criteria lists 1,200 to 1,500 ft. as the desirable minimum distance between traffic signal installations, and specifies that all signals within 2,500 ft. be operated under coordinated control.

A rule of thumb for signal progression and intersection spacing is that a two-way progression with maximum bandwidths can be achieved only if the signal spacing is such that vehicular travel times between signals are multiple of one-half the common cycle length. Using this axiom, signal spacing along this corridor should be 1/4-1/2 mile. Minimum distances between signalized intersections should conform to the Rapid City Design criteria.



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FIGURE 5-4. 60
PROPOSED EXIT 60 INTERSECTION CONFIGURATIONS

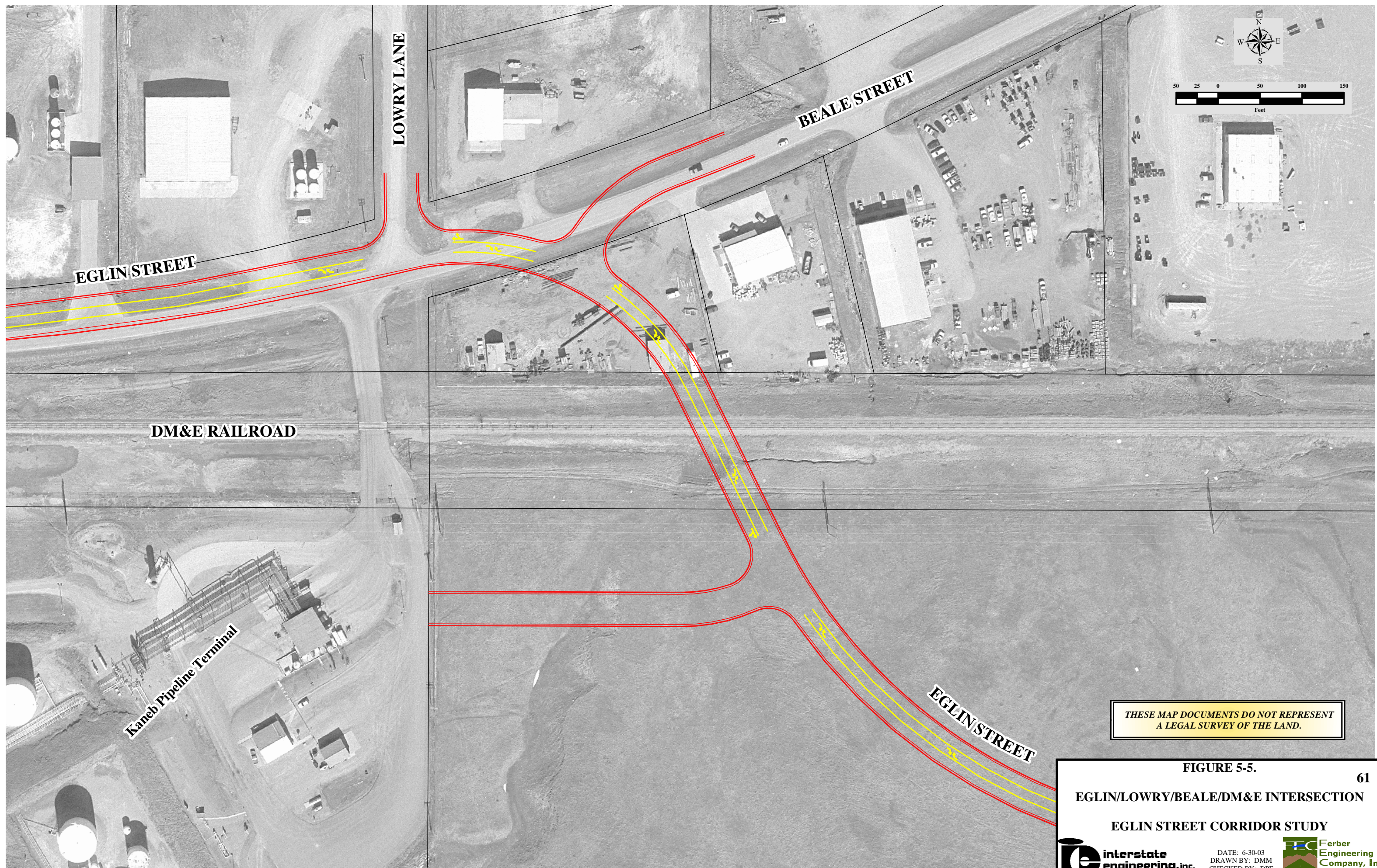
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EGLIN STREET

LOWRY LANE

BEALE STREET

DM&E RAILROAD

Kanab Pipeline Terminal

EGLIN STREET

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FIGURE 5-5.

EGLIN/LOWRY/BEALE/DM&E INTERSECTION

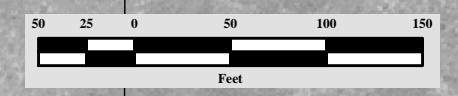
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DM&E RAILROAD

CHEYENNE BOULEVARD

EGLIN STREET

ELK VALE ROAD

TURBINE DRIVE EXTENSION

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FIGURE 5-6.

ELK VALE ROAD/EGLIN STREET INTERSECTION

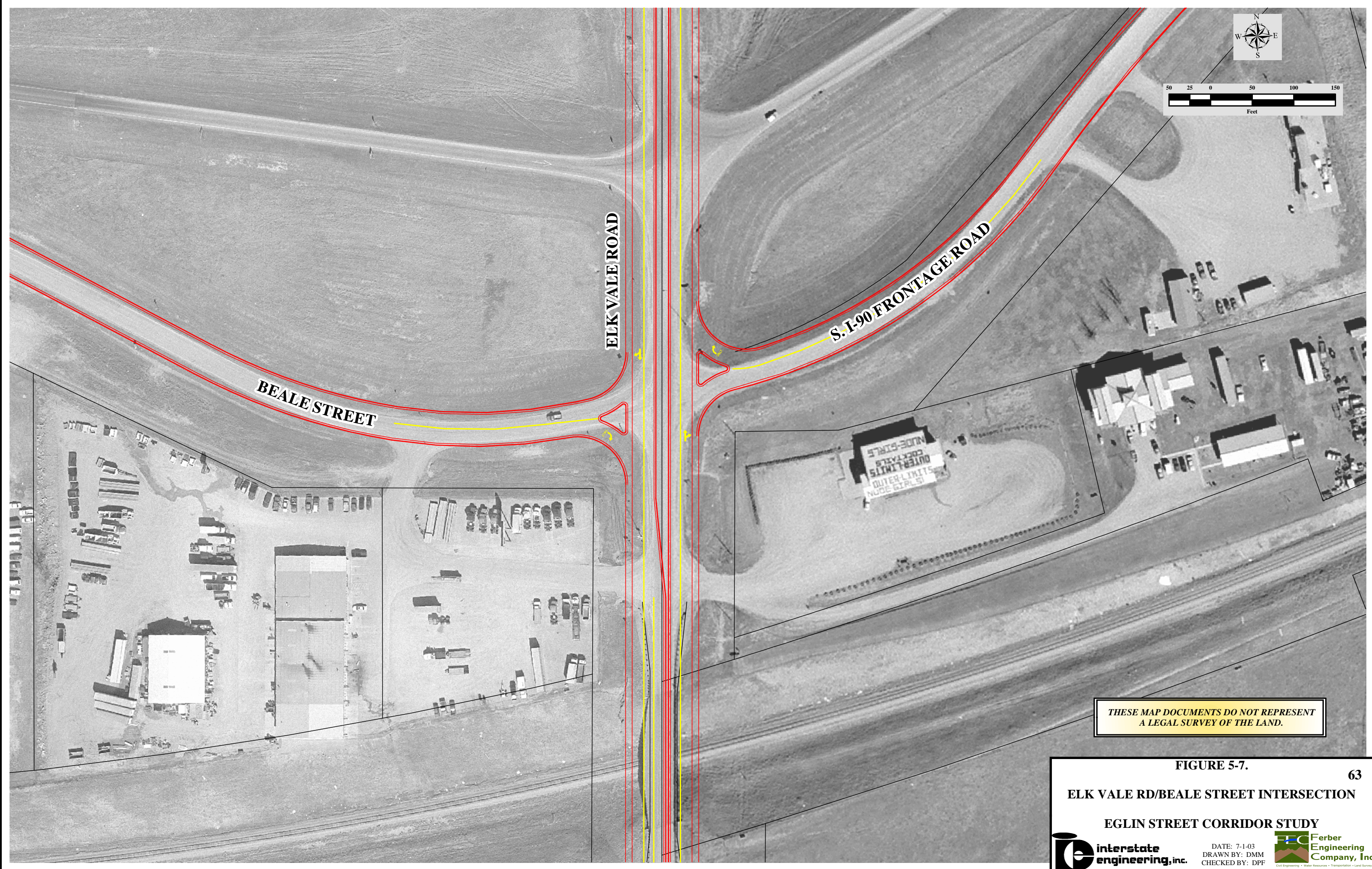
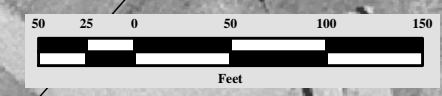
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FIGURE 5-7.

ELK VALE RD/BEALE STREET INTERSECTION

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6.0 Public Involvement

The involvement of the public is an important aspect of the Eglin Street Corridor Study. Rapid City has developed a database file containing the names of the property owners in the study area. The property owners were contacted individually as well as through the media to keep them informed of the progress of the study as well as inviting them specifically to the public presentations.

The consultant team in conjunction with the steering committee determined that open house format was the preferred format for public involvement. We felt that this format gives the interested parties maximum opportunity to interact with individual members of the consultant team and steering committee. The consultant team in conjunction with the Rapid City Area Metropolitan Planning Organization hosted three separate open houses.

The first open house was scheduled early in the process on February 18, 2003. The purpose for the first open house was to inform the public of the study purpose and scope and to share with the public some of the background information that would be used in the study process. Three very preliminary alignment alternatives were presented at that time.

The second open house was scheduled for April 22nd. The purpose of the second open house was to present to the public some of the preliminary findings and anticipated recommendations. The SDDOT utilized this opportunity to host an open house for the Exit 60 and 61 Interchange Reconstruction projects. At the second open house, Alternatives 1 & 3 were presented in revised format, and the public was informed that Alternative 2 had been dropped from further analysis.

The third and final open house was held on June 9, 2003. The purpose of the third open house was to present the findings and recommendations. The draft recommended alternative was presented at that time.

Copies of the study maps and alternative alignments were prepared and along with a narrative description of the study were made available to Open House participants. The hand-out also included a comment sheet. Copies of the open house, hand out materials and the public comments from each meeting are found in Appendix D. Also included in Appendix D are consultant team responses to the written public comments.